Designing Home Care Reminder Systems: Lessons Learned Through Co-Design with Older Users

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***Abstract*— Technology for care at home is an important factor in supporting our ageing population. These technologies need to be both accessible and acceptable to a wide variety of users if they are to be taken up and successfully used in people's homes. This paper describes the user-centered co-design and evaluation of a multimodal reminder system for the home deployed on mobile devices. Six co-design sessions (N=25 users) were carried out with groups of older users to investigate the best methods and techniques for configuring reminders and how they should be delivered within the home. Both sketches and implemented prototypes were used to gather qualitative feedback on a variety of interaction features and techniques to find what worked best for an older user group. We present the findings from the sessions in terms of the re-design of a personalisable multimodal reminder system. We also present the co-design process used and go on to discuss the value this method adds to the design and evaluation of home care technologies for older users.**

Keywords- co-design; evaluation; older users; multimodal; reminder systems; configuration; personalisation.

I. INTRODUCTION

People with disabilities or chronic long-term conditions (LTCs) are increasingly being cared for at home [6]. Technology that can support or augment this care at home is often referred to as assisted or independent living technology (ALT) and is increasingly accepted as key in continuing to supporting our ageing population [18] and a general shift towards more self managed care. Assisted living technologies that include sensor based devices that alert the user or other stakeholder (friends, family or carers) to the state of the house or person (a tap is running, a person is in the bedroom) are often traditionally referred to as telecare. There are now a wider range of telecare and telehealth technologies that can also generally promote health and wellbeing, such as communication aids, remote rehabilitation and consultation systems, vital signs monitors and reminder systems to support daily living routines. Such technologies can enable people to live at home independently for longer, improve health and wellbeing, and support self care of long term conditions [4, 6].

Pervasive care technologies need to be accessible to a wide variety of users with a range of physical, cognitive and sensory impairments [1, 23]. They also need to be acceptable, usable to people with varying degrees of technical expertise and easily integrated into current living patterns if they are to be taken up and used in the homes of people managing their own care [4, 11]. Previous work has revealed many examples of existing home care technologies being prescribed to users and simply not being used [e.g. 4]. Making pervasive health technologies more attractive to users and more likely to be accepted and integrated into their daily lives is just as important as it is with other products such as mobile phones and digital TVs.

It is a significant challenge to design and deploy technologies for the home such that they are easy to set up and use yet configurable by and adaptable to a range of people including end users, friends and family and health and social care professionals [4, 11]. One way to address this challenge is to make these systems multisensory or 'multimodal' – that is they are able to offer alternative interaction modalities (such as speech, gesture, touch) for receiving and presenting information [16, 24]. Offering this choice, however, means that users need to be able to configure the system to their own needs and preferences.

End-user configuration of home care technologies allows personalisation and can potentially result in a system that is more appropriate to the users' needs, preference and social and physical context [11, 24]. This configuration can take place at set up (with help from friends or carers for example) and/or more dynamically as a person learns to use the system in a way that suits his/her needs and preferences over time. Such flexibility however introduces an additional design challenge. How will users want (and be able) to configure the system? Additionally, what factors influence configuration decisions or behaviors in the context of the home?

This paper describes the user centred development of a home care reminder system that is both multimodal (can present reminders in different ways to a variety of sensory modalities) and highly configurable by the end user (users can select which reminders to receive and exactly how they wish to receive them). Development of this reminder system involved formative Co-Design sessions with six groups (N=25) of older users (age 60+) where they were they

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interacted with both paper-based interface prototypes and prototypes running on mobile devices. The aim of the study 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. The paper reports (i) the process used during the Co-design sessions, (ii) the results from the sessions and what they might mean for the design of personalisable multimodal reminder systems and (iii) lessons learned from the Co-design process.

II. BACKGROUND

The following sections describe (a) reminder systems and the motivation for them to be multimodal and offer choice and (b) the pros and cons of methods for design and evaluation with diverse (in particular older) populations.

A. Multimodal Reminder Systems

Reminder systems are one of a range of assisted living technologies and can be an important part of a telecare package [5, 11. 19]. Many people have problems remembering tasks and chores in and around the home. This can be a consequence of ageing [1], the conditions for which they need care [7, 23, 25] or the medications they are taking [2, 19]. Reminder systems can be used to set, manage, and deliver electronic reminders or notifications to someone in or around the home and might include notifications such as 'take your medication'; 'you have an appointment at 2pm' or 'remember to water the plants' [11, 19]. Being able to remember these tasks can be the difference between being moved into residential care and ageing in your own home [6, 18].

Recently, researchers have argued that good reminder systems should be multimodal [11, 21, 24]. Multimodality involves the combination of multiple sensory input and output channels for interaction with technology. An accepted advantage of multimodal interaction is providing choice of interaction methods to the user. We would argue that this is particularly important in pervasive health applications where the users are diverse and the context in which applications are used is varied and can change over time [4, 11].

A multimodal reminder system could provide alternative ways to deliver reminders to the user (visual, auditory, tactile and olfactory) [24, 25]. Different output modalities might be selected depending on users' capabilities and impairments, the type of reminder being delivered, user preferences, social context and the output devices available in the home for example. This multimodality could increase both the accessibility of the information being presented and the likelihood that the delivery method will be pleasant or acceptable to the user without becoming disruptive or annoying [24]. Users with sensory impairments for example can choose for reminders to be delivered in a modality appropriate to them. These settings can of course be changed at a later date and/or tailored for multiple users in the home. Mrs. Smith might choose to receive her medication reminders via speech while Mr. Smith received his by text message to his mobile phone.

As people become familiar with a reminder system (or indeed any home care technology) or as their care needs or physical and social context change, the optimum configuration of how the reminders are delivered might change [4, 11, 24]. A system this flexible would need to be configurable or personalisable by either the end users themselves or stakeholders in their care (friends, family, and care professionals). This configuration might take place both initially as they set up the system for use and over time as they use the system and become familiar with its settings and behaviour. It is unclear exactly what form this end user configuration, or personalisation should take – especially given that the likely users are older people living at home often with complex care needs [6, 7].

B. Challenges in Eliciting Requirements from Older Users

The Human Computer Interaction and Design communities have been aware of the importance of involving users in the design process for many years [e.g. 7, 13]. Involving users can take many different forms. Traditionally User Centred Design involved technology developers taking the views and opinions of users into consideration when designing their products. This was often achieved reasonably passively in the early days of design and would have likely involved surveys and market research conducted remotely rather than engaging with users directly.

Participatory Design [13, 14] was introduced in the 1980's in an attempt to involve users more actively in the design process. Participatory design methods are often more community-centred and enable people who will be served by a designed outcome to participate in designing solutions to their problems [13]. This can include methods such as focus groups, qualitative interviews and contextual case studies where the users are more directly involved in the design process early in the development of the system. The motivation for this is to get to the heart of the requirements and needs of real users [17]. We would argue that this type of design process can also lead to better 'buy in' from the intended users – a concept which is of particular importance in uptake and prolonged use of pervasive healthcare applications and interventions.

Many user centred design techniques which recommend involving users still fail to consider the particular challenges of older users [17]. Inclusive Design and Universal Design have become more commonplace and encourage the design of products with accessibility and 'access for all' at the heart of design. This is of particular importance when including older users and users with sensory, physical and cognitive impairment. These methods tend to focus on designers ensuring that products can be used by as wide a range of people as possible, and have produced a range of guidelines and standards to assist designers in achieving this objective [17]. There is, however, increasing evidence that guidelines alone are not sufficient [17].

More recently, User eXperience research (UX) has become popular. UX aims to use tools to engage non-designers by asking, listening, learning, communicating and creating

solutions more collaboratively. This approach also endeavours to probe the *experiences* of the users when interacting with a product (rather than the usability or functionality alone) and can include measures such as engagement, ownership, perceived control and autonomy - all concepts that should be at the heart of successful pervasive applications for health. Health applications designed without understanding a person's underlying expectations, attitudes and experiences can lead to a usable product but one that is not necessarily acceptable or integrated easily into a person's daily living behaviours. User Experience research therefore has a lot to offer in the case of designing pervasive health and wellbeing applications, particularly with and for older users.

Working with older people during design and evaluation has several advantages. This population is so diverse that the approach is both in keeping with Inclusive Design – it forces designers to consider the real problems associated with sensory, physical and cognitive impairments – and with Design for All – the population of older people are so diverse that it enables you to consider both technology novices and experts and both frequent and infrequent users.

Engaging older users in traditional methods of user centred design has been done [5, 8, 11, 12] but does pose several potential challenges [17]. Surveys and questionnaires designed to capture the needs of older users are often treated with suspicion and answered not as intended (what would you like in the future) but rather answered with "I don't need this right now, I am okay". Postal surveys can help reach those not connected via email [11] but still often only reach the healthy active ageing since they are often distributed most easily through clubs with active members rather than adults with more care needs and who are less connected.

Focus groups can work well because the design team have the opportunity to interact on a more personal level and explain the motivations for the research questions. Problems encountered in the past however include users not being able to 'imagine' what the technology is capable of doing either now, or in the near future [4]. This makes eliciting requirements for future pervasive healthcare applications challenging. Methods are needed that 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 work included Co-design sessions with older users. Co-design has been introduced as a process for including and involving users in the development of products or systems. In Co-design the users are often referred to as partners in design to emphasise the equality their opinions and experiences have with those of the designers or developers. The aim of these sessions was to evaluate existing ideas and prototypes (based on previous user requirements work [11]) and to encourage design (and redesign) of our proposed system. We describe how we used Co-design to verify and modify our design concepts in real time with the intended users of our system (people over 60) and reflect on the lessons learned during the process of Co-design.

III. Reminder System Prototypes

The first phase of our work involved creating a variety of prototype reminder interfaces which all highlighted both *multimodality* (the ability to choose how you receive a reminder) and *configurability* (the ability to personalize the reminders). We developed a variety of low fidelity paper based screenshots of the interfaces people might use to configure reminder systems (See Figure 1 for an example) and a series of working prototypes on mobile devices for people to interact with during the sessions (see Figures 2, 3 and 4 for examples).

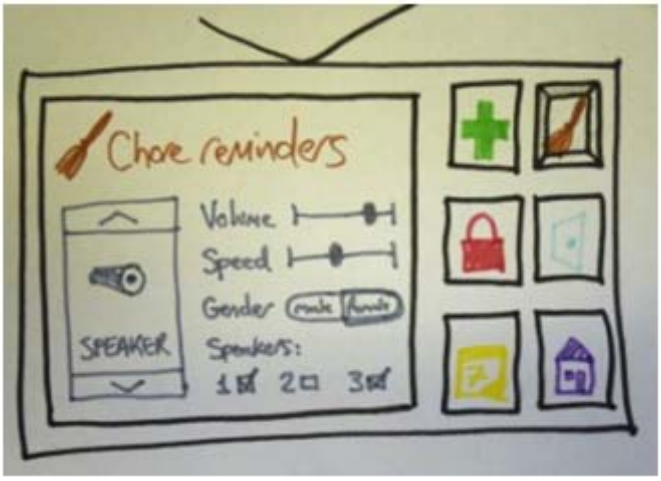

Figure 1: Paper based sketch of a reminder interface based on [11]

The design of these initial prototypes was based on a large mixed methods study conducted in the MultiMemoHome Project (www.multimemohome.com) which involved a questionnaire (N=372), a series of focus groups with older adults and adults with sensory impairments (N=25) and a set of contextually rich and user led 'Home Tour' interviews to understand peoples living spaces and the technologies they might use for reminder delivery within the home. The results from these studies are all presented in [11]. The combination of these three methods in this paper developed a richer understanding of how people currently use reminder strategies (technological or otherwise) in the home and allowed us to design prototypes based on these existing strategies and user needs.

McGee-Lennon *et. al*. [11] categorised the different types of reminders people want in the home as (i) care-based reminders (e.g. take your medication), (ii) house reminders (such as 'turn off the tap' or 'water the plants'), (iii) appointments (such as 'opticians on Tuesday at 4pm'), (iv) chores (such as take the bins out), (v) going out (such as 'remember your keys') and (v) personal (such as 'buy a birthday present for James'). We developed both sketches and working prototypes of a reminder system that supported the setting and receiving of notifications based around these established reminder categories (see Figure 2).

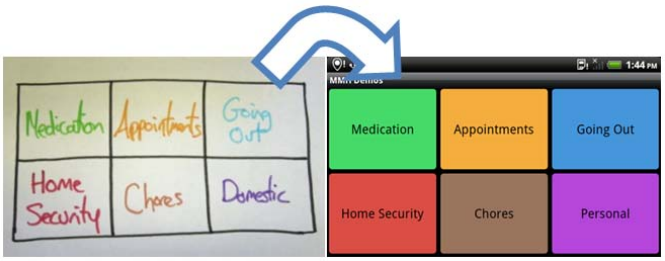

Figure 2: Paper based sketch and resulting interface design for reminder categories found in [11].

Prototypes were developed in Android and deployed on three different sized devices - HTC Desire HD Smartphone (4.3" device), HTC Flyer (7" device) and the Asus Eeepad Transformer (10.1" device). The working prototypes were useful to engage the users and to allow them to interact with the system and test out different interaction methods for configuring it. Using three different sized devices also allowed us to probe preferences for how reminder systems should be deployed in the home – via mobile phone apps, and via tablet PCs that can be placed on a table or fixed to a wall in the hallway, for example.

Paper prototypes were included in order to provide the maximum number of alternative interfaces to the users and also to encourage creative thinking beyond what was presented to them in what might look like a working system in the prototypes. The paper prototypes also allowed us to provide interaction techniques and alternatives that were not easy to simulate such as tangible 'radio' knobs. The inclusion of both low- and high-fidelity prototypes allowed us to examine practical design issues (with the working prototypes), provocative design concepts to challenge design ideas (the paper prototypes) and also the identification of opportunities for further design work.

Since our aim was to explore end user configuration of reminder systems, we also developed a set of design sketches and working prototypes for 'configuration interfaces' (see Figure 3 and Figure 4 for examples). These interfaces allowed users to choose where the reminder was delivered (e.g. TV, watch, panel in hallway) and the modality in which it was delivered (audio, visual, tactile and olfactory). For example, if the reminder was being delivered via sound then a user can select speech, Auditory Icon or Earcon. The user can also further configure a reminder's parameters to suit (for a speech reminder the user could alter the volume, gender and speed of the message) - see Figure 4 for an example.

The designs incorporated a range of interaction techniques and metaphors in order to capture a wide variety of techniques for configuring the reminders. These included familiar home based interfaces (radio dials and 'heating panel' controls) and visual drag and drop (I want this reminder played to this device).

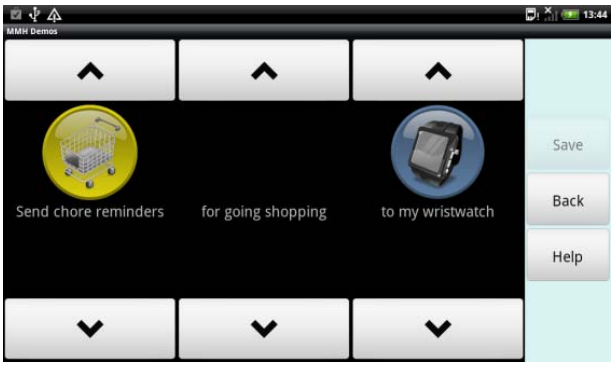

Figure 3: Screenshot of configuration interface for a tablet PC. Users can personalise which reminder to set and how it should be delivered

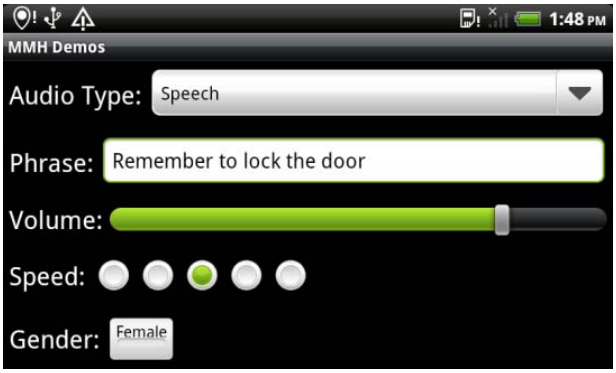

Figure 4: Screenshot of configuration interface for a Smartphone. Users can further personalise how a sound reminder is delivered.

IV. Co-design Sessions

The aim of this study was to both (i) iteratively evaluate the design concepts created based on [11] and presented in section III and also to Co-design the next iteration of the reminder system with older users as partners in design (re-design). This offers the benefit of presenting evidence-based concepts and prototypes to the users for feedback which might be otherwise difficult to visualize or verbalise. It also however allows the users to engage with the design ideas in a non-restrictive way in order to enable them to be the co-designers of the final system.

The study involved six Co-design sessions with 25 older users (over 65) – see Table 1. These users included 'active old' (over 65 but active and independent and caring solely for themselves currently). These users can often be considered our 'future old' since they are not receiving social care currently but might be in the next 5-10 years. We also included users aged 75+ to make sure we represented 'older old' users, and recruited users with sensory impairments.

Table 1: Overview of Co-Design Groups

Group	No. participants	Demography
1	3	Older users (65-85)
2	2	Older users (65-85)
3	7	Older users (65-85)
4	6	Hearing Impaired (40-70)
5	3	Visually Impaired (40-70)
6	4	Older users (65-85)

Initial designs (both as low fidelity paper prototypes and early prototypes running on devices), were qualitatively evaluated in facilitated design groups (see Table 1 for details). The research questions used to facilitate these design sessions were based on our original research motivations – if reminder systems are to be both multimodal and configurable, what would the interface for configuration look like? The prompting questions used to guide the sessions were as follows:

(1) If you were setting reminders, how would you want to set them initially?

(2) If you wanted to change reminders later on, how would you want to go about changing them?

(3) How would you want to interact with the reminder system overall?

Users were asked to interact with the prototypes and provide subjective feedback and reactions to the interface designs (see Figures 3 and 4). Rather than purely being focused on evaluating the design concepts presented by the design team, the participants were also encouraged to modify designs and introduce better ways to interact with the system. To facilitate this process we engaged in a 'Keep, Lose, Change' exercise.

The 'Keep, Lose, Change' exercise involved allowing users to interact with the paper based and interactive prototypes both individually and in groups. Colour coded 'Sticky notes' (post it's) were provided in order to allow users to capture issues and themes in real time (on the colour coded sticky notes) and indicate which features and interaction techniques and metaphors they would definitely keep (green sticky notes), lose completely (red sticky notes) and keep but change in some way (orange sticky notes) as they interacted with and discussed the prototypes – see Figures 5 and 6. This exercise allowed the older users not only to engage with the prototypes and provide feedback in real time, but it also encouraged 'live coding' of the emerging issues and themes done jointly between the researchers and the older users (see Figure 6). The feedback and issues collected were not limited to design features but could include emotional responses or anecdotes provided by the users when interacting with the prototypes.

Figure 5: Users interacting with prototypes in design session.

Figure 6: Live coding performed in design sessions.

The sessions were also recorded using a digital audio recorder and a second researcher collected observation notes. A thematic analysis (based on the Framework approach [22]) was performed on the combination of the sticky notes, the audio recordings, and the observation notes. Due to the nature of the 'Keep, Lose, Change' Exercise, the first set of codes emerged by default from the sticky notes captured and organized in the sessions. The researchers then examined the notes and audio recordings for further themes and finally performed a third pass of coding to organise and categorise the full set of codes.

This process was both (i) iterative, as from the thematic analysis, requirements were refined, and changes to the design considered (the new designs were then presented in the next design session) and (ii) inclusive allowing both researchers and older users to code the designs during the sessions. In addition, the Co-design process encompasses both evaluation of existing designs and concepts and design or re-design of the final version of the system.

One thing that was not observed strongly in these sessions but would be of great interest would be to monitor and categorise conflicts in opinion. So if someone wanted to keep a feature and someone else wanted to lose a feature a

technique would need to be established for resolution. The researchers could count and categorise the conflicts and make design decisions based on these. Given the group based nature of the session another option might be to develop a strategy for negotiation when these conflicts arise. This negotiation process itself would be an interesting subject for further research in Co-Design exercises such as the one presented here.

V. KEY FINDINGS - REMINDER SYSTEM CONFIGURATION

As described in IV, the analysis involved thematic analysis and coding of the main themes and issues during the Co-design sessions. The Keep Lose Change exercise allowed live coding by the older users sticking design feature changes to the interface sketches. These were located on or near the feature that the issue or comment related to. Issues that were not directly related to interaction interfaces themselves were also captured on sticky notes and organized in a coding chart by the researchers during and after the session. A further phase of coding was performed by both researchers present at the design sessions and the categorizations of the themes were validated with one independent researcher for clarity in the way they were grouped and organized.

The four main themes (with subthemes shown in italics) emerging from the Co-design sessions were:

CONFIGURATION

(*Setting reminders, Changing reminders*)

MODALITY

(preference, impairment, device, location, social context)

REMINDERS

(*medication, appointments, going out, home security, chores, personal (e.g. remembering to remember))*

DEVICES

(input, output, size, portability)

The prototypes received positive feedback from the user groups based around two primary features intentionally present in all of the design options as described in our motivations in sections I and II - (1) multimodality and (2) configuration/personalisation.

A. Multimodality and Configuration of Reminders

Multimodality was appreciated primarily due to the ability to tailor the reminder system according to:

Impairments:

"I could change the sounds and make them a coloured light I suppose… since I could see it better if I had my hearing aid turned off" [male, age 68]

Personal preferences

"*If I didn't like that voice I could change it to another one*" [female age 82]

And appropriateness of different modalities for different types of reminders:

"…It could just send me a private message say… using the tactile thing… so no-one else could hear it [my medication reminder]" [female age 71]

In addition, different people most certainly wanted different levels of control over the configuration of the system. Some participants made it clear that they would prefer the system to be set up to their needs and preferences beforehand while many others appreciated the fact that they could tailor the system themselves and that these settings could also be changed over time as they became more familiar with the system.

B. Reminders

The reminder categories represented in our prototypes were already pre-validated from a large body or user-centred work on reminders for the home [11] and therefore will not be presented in full again here. While the research questions presented in the design sessions were not directed at the reminders themselves, but rather how these could be configured there was still evidence that these reminder categories represented well what older users would want from a reminder system for the home. One notable addition to our reminder system designs as a result of the sessions was the possibility of incorporating a 'remembering to remember' reminder delivery type. It was clear that many users did not want explicit 'help' or instruction from the system all the time but would perhaps want implicit reminders that simply reminded them that they had something to remember to do.

"...sometimes I don't need to be told what to do… but just that there is something that I need to do… you know… like if I hear a bleep I know it is the washing machine needing emptied… you know…" [female, age 67]

This category is interesting from a multimodal system design perspective in that it suggests that there are different roles for different modalities – speech might be preferable when the context of the message is important but a simple beep might suffice if the user just needs prompted.

C. Devices

Presenting our working prototypes on three different sized devices revealed some interesting findings. It was clear that different people preferred different devices with almost half preferring the portability of the mobile phone approach and half preferring the idea of a tablet PC that could act as a home care reminder panel in the hallway.

"I mean I like the other one [tablet] but how would I get the reminders when I am not where it is…" [male, 73]

And

"*That [the mobile phone] would be good for carrying in your pocket but I think I would prefer it if I could just know*

where to look in the hall… on my way in or out [of the house]." [male, 74]

Despite our primary intention not being to investigate the device that is used to deliver the reminders it is clear that in the older population the delivery technology is a concern and, in particular, how it fits in with the house and daily living.

Three additional themes emerged from the data (not directly associated with the research questions). These were:

INTERFACE DESIGN (*icons, text, buttons, colours*)

DIALOGUE (*to do, done, querying, system status)*

STAKEHOLDERS (*friends, family, carers, visitors*)

D. Interface Design

Many users commented on the visual design of the interfaces. Although these were generally positively received, and not in fact the subject of evaluation or design, there were several comments regarding the icon design. A direct result of these comments has been the design of a full set of icons which the users can now personalize to suit their own categories of reminders in their system. Furthermore, users can select whether to have text, icons, or both in the screen where they can select the reminders to set up or configure.

E. Dialogue

Comments regarding dialogue included a desire to have further query-based interaction with the reminder system. This included options to view a history of 'attended to' reminders and to have an overview of 'upcoming' reminders. Another design feature under the category of Dialogue was to have an option to query the system to 'ask' whether or not a task has been done. Finally, users wanted additional functionality from the reminder system to be able to provide family members with a 'status report' of the system which might allow others to infer your whereabouts (for example – latest reminder is "John, you have a doctor appointment at 2pm on Thursday"). These features are now being implemented in our final reminder system.

F. Stakeholders

The stakeholder theme was cross cutting in that our users provided many anecdotes and examples of why and how other users might be users of the system and/or people who may share responsibility for setting the system up. For example:

"*I would want it to work that way for me… but my husband would probably set it up to suit him you see…"* [female, 76]

Additional features are being considered such as multiple user profiles which would allow different settings to be stored for different people on the same system. Given the likelihood that the home is a shared interaction space this is a desirable feature, one which was highlighted in our groups which included members of the same family and husband and wife pairs. The issue of multiple stakeholders in care is complex and is discussed for example in [4, 11]. It is clear that reminder systems and home care technology in general needs to consider that the end user may be more than one person (a service user and their family for example) and might include configuration by health and/or social care professionals (to deliver remote care or appointment reminders for example). This should be accommodated for in the system and should be explored in further research.

VI. LESSONS LEARNED - CO DESIGN WITH OLDER USERS

The aim of our work was to evaluate and re-design prototype reminder systems with older users. Section V presented the key findings on end user configuration and personalisation of the reminder system prototypes we presented to our user groups. The results from these sessions are being used to develop our final reminder system which will be deployed on mobile devices in the homes of users for 6 weeks during the summer of 2012. Through both data logging of system interactions with the system and qualitative post hoc interviews we will explore how the reminder systems are configured in practice in the wild and over time. A second aim of this work however was to engage older users in Co-design and to reflect on the benefits of Co-design and methodological lessons learned through the Co-design sessions.

Engaging groups of older users in Co-design in the ways described allowed us to truly involve users in the process and generate evaluation findings and further requirements in real time during the sessions with the users themselves. This 'live coding' of the issues during Co-design is particularly useful in working with older users in the area of design of home care technologies for several reasons. Eliciting requirements for technologies and interaction techniques is difficult in general but particularly difficult in a population that may not be familiar with what is and is not available technically via the current technology. In particular, we were presenting participants with ways of setting and receiving reminders that are novel interactions for this user group such as gesture and speech input and tactile and olfactory output. Encouraging discussions over how the system might look and behave using these multimodal interaction techniques fostered discussions that were difficult to achieve via questionnaires, interviews of focus groups alone.

In addition, actively engaging users in the coding enabled ongoing clarification and validation of the issues that were emerging and allowed us to explore user experience rather than just focus on usability issues. For example, our findings included social and experiential reasons behind suggestions for interaction and use such as who they might use the system with, where they might use it, and what type of ongoing dialogue people might want with the system.

Including both working prototypes and paper prototypes is recommended. 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 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. Older users were also willing to make suggestions regardless of their prior exposure to possible solutions when the paper prototypes were being discussed. The Keep Lose Change exercise format further adds to this open and honest response strategy by encouraging both positive and negative comments – something which is not always evident in regular focus groups.

VII. CONCLUSIONS

This study has illustrated the importance of Co-design with older users in the area of home care and pervasive health technology design. A final reminder system is being implemented based on the findings from the sessions and clustered around the seven themes presented here. Further longitudinal evaluations are also being conducted in the homes of real users to allow us to explore user preferences and configuration behaviours and patterns over time and in the real social context of the home. Reflecting on the process of Co-design has further demonstrated the need for truly participatory co creation and design with this user group in order to design better technologies for home care. Engaging users in this way can be used both to design and formatively evaluate prototypes and to capture the needs of users in an inclusive and collaborative way.

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