Keeping Everyone Happy: *Multiple Stakeholder Requirements for Home Care Technology*

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I. Home Care Systems

We refer to 'Home Care Systems' as the technology and services required to support and realise activities of the network of care. Such technology typically includes sensors, devices, displays, data, and networks, and computing infrastructures which provide the means to collect, distribute, analyse and manage care related information. Such home care support can range from simple stand-alone electro-mechanical alarms installed in a person's home, perhaps to indicate a bath overflowing, to systems integrated into the home's physical infrastructure that monitor patient state, perform sophisticated analyses, deliver customised information to patients and clinicians and support communication among them.

It is argued that home care technologies can support and enable people to better manage their health and well being at home. This argument has been made more enthusiastically in recent years as the ageing population increases. One argument is that telecare and home care technologies are socially beneficial – they can allow people to remain at home longer, in a familiar environment, close to family and friends. An even bigger driver however is that it is politically and economically beneficial – it is costly and impractical to provide sufficient specialized care facilities given the increasing ageing population. Despite these drivers, the true potential of home care technology has yet to be realized. We would argue that this is in part due to the complex and dynamic nature of the home care domain rather than a lack of sufficient progress in the technology.

Living in the home, and managing health and well being, have unique interaction problems. The home can be a highly personalized environment where generically configured devices or systems may be unacceptable, regardless of their potential clinical benefits. In addition, the home is often a shared environment and therefore it is likely that user requirements are subject to both change and conflict as our care needs or circumstances change over time.

II. The Network of Care

We refer to 'Network of Home Care' as the (sometimes large and complicated) network of people that receive or deliver that care (both formally and informally) or have some interest in that care (directly or indirectly).

Home care systems can involve multiple users and/or multiple stakeholders. There are likely to be partners living in the same space, friends and family living elsewhere who are involved in care or interested in its status, visiting medical personnel such as community nurses and remotely located medical staff, such as a consultant in a clinic that the patient visits. We refer to these people as stakeholders if they have a direct or indirect interest in how the system works, how the system is used, or the data it provides.

Many stakeholders may want to come in to contact with the data or devices of the home care system themselves directly either in the clients home or remotely. In this case, these stakeholders also have to be considered potential end users of the home care system. In addition, stakeholders would also include external agencies responsible for designing, installing, maintaining and prescribing the available equipment and/or changes in legislation or policy on how the devices or services can be prescribed and used.

It is likely that with multiple occupants, end users, and external stakeholders that people's needs, perspectives and accountabilities will differ. A system's configuration may be acceptable for some but not for others. For example, the user may wish to have care messages and alerts presented by speech, but this might be annoying and disruptive to the carer if delivered via loud speakers while they are in the home. Similarly, information provided on a television might either be disruptive of TV use by others in the household or it might allow private and potentially embarrassing health information to be read by others.

The challenges concerning involving multiple stakeholders in the design and requirements process include:

- Different perspectives on the system being developed

- Different backgrounds, which can cause communication problems
- Different objectives, which influence views on the requirements
- Different abilities to express requirements and requirement documentation using a technical platform
- Different involvements – for example, some stakeholders are allowed to make decisions and others are not

We argue that it is the complex nature of the network of home care and the resulting social and professional interactions that make it particularly difficult to design and deploy acceptable and usable technologies for home care.

III. Sources of Change in Home Care

There are many sources of change within the domain of home care. People have changing needs, beliefs, and preferences regarding their care plan and how they might want to interact with existing and emerging home care technologies. In addition, the devices and services available to the user are likely to change over time depending on a person's capabilities or location within the home and the current devices and services available. The resulting interaction methods can therefore also change in accordance with the room location, available devices or displays, or preferred modalities [2].

Users of home care technologies can be of any age and ability but a large number of users are either elderly, or have physical, sensory or cognitive impairments. This results in a user group that should be offered appropriate choices of both traditional and novel methods of interacting with the technology and the information. Offering choices of modalities and interaction is desirable and yet not necessarily straightforward to solve. It is necessary therefore, that home care systems should be able to support preferences and capabilities that vary both between users and as care needs change.

New devices and services may become available purely as a person's context or location changes within the home. Presenting information to the television for example makes more sense in the living room than in the bathroom and presenting information to a loudspeaker makes more sense if there is a person who prefers speech output and there is no other audio output to that device at that time. So, as new devices and services become available, the user must be made aware of these and offered ways to interact with these devices and/or services.

We argue that home care systems need to offer configuration possibilities that support this change. Design and requirements methods must therefore also support the need to represent this change and allow designs and requirements to be monitored and adapted over time [2].

IV. Research Statement

Our work involves exploring and better understanding the features of home care that are sources of change and or conflict [4, 9]. We argue that methods need to be adapted and developed to support the dynamic nature of home care systems [2]. We propose that this can be achieved by both systems that support and enable change as well as design and requirements methods that acknowledge and support change. This work will focus on the methods for engaging multiple, distributed, stakeholders [5, 12] and capturing their changing and often competing requirements and needs.

Our work involves:

(1) Working with each of the stakeholder groups to appropriately capture their independent requirements, needs and wants [1, 7]
(2) Bringing stakeholders together in order to create empathy and shared knowledge between the stakeholder groups [6, 12]
(3) Identifying and categorising conflicts in arising requirements in home care [4, 9]
(4) Promoting negotiation of conflicting requirements 8, 10]
(5) Provide methods and tools that enable requirements to be monitored and adapted as care needs or circumstances change over time [2, 5]

V. Open Research Questions

How (Can) we keep everyone happy? The following are some suggestions for discussions points for the workshop that relate directly to our ongoing g work in this area.

- If there are multiple stakeholders involved in the end use of home care technologies, should all be included in the design process? How? To what extent? Who should be ranked 'highest' if each places similar but competing design demands on the system?

The question of who owns the different data input/output from the system needs to be clarified. It is important that peoples' privacy is not disrespected as this remains one of the fears of Home Care Systems. If two users want access or control over the system's data at any time then there needs to be some negotiated rules in place regarding this issue.

- Who owns the data? Who controls the data?

It is likely in the home care context that user requirements will change. This may be as a result of changes in the medical conditions, new devices, changes in family circumstances, or simply changes in what people believe or the way they behave.

- If peoples' needs and requirements are likely to change over time (as in the context of home care) how can design and requirements methods best support this change?

At the workshop we will present:

- A selection of findings from a variety of design and requirements activities conducted over the past three years with a variety of real home care stakeholders
- Some useful insights in to how the methods used to capture requirements (including forum theatre [7, 12], and single and mixed stakeholder focus groups) can have a strong influence on the success and outcomes of the design and requirements process in the home care domain.
- Some examples of conflicting requirements in home care and suggestions on how these might be resolved.

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