

# WOULD YOU TRUST A COMPUTER TO RUN YOUR HOME? DEPENDABILITY ISSUES IN SMART HOMES FOR OLDER ADULTS

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## ABSTRACT

*Smart home technology has the potential to allow older adults to stay in their own homes when they might otherwise have to move into institutional accommodation. This technology has to be dependable. This paper argues that dependability in the home context is not just a matter of safety. The concept of a Seriously Bad Outcome (SBO) is introduced and illustrated with examples. It also suggests how SBOs can be used in the design process.*

## Keywords

*Older adults, smart homes, monitoring systems, assistive technology, dependability.*

## INTRODUCTION

Much has been made of the potential for smart home technology to allow older adults to remain in their own homes when they have problems that would normally require some kind of institutional accommodation. Information and communication technology can be used to raise alarms in the case of an older person falling, to compensate for sensory and mobility deficits when performing simple tasks, and to provide easier and more continuous communication with friends, family and carers. This has clear advantages for everyone. The older adult gets to stay in their home and the community saves money on expensive state provided care.

This position paper describes some of the initial conceptual work from a project that seeks to understand the dependability requirements of older people when supported by this kind of technology.

## SERIOUSLY BAD OUTCOMES

A common approach when making dependability arguments is to identify some very general bad outcome or "adverse consequence" (e.g, "controlled flight into terrain") and then to identify all the specific ways this bad outcome could arise. Finally, one makes arguments about the procedures and devices in place to prevent the bad outcome occurring in each of these cases.

In dependability arguments about physical systems the bad outcome is defined in terms of physical

monetary or environmental damage. Avoiding physical damage to the person (safety) is one of the most important concerns.

In the context of the home safety is also important but there are other bad outcomes that are viewed equally seriously by householders. Indeed, some risk of physical damage to the older adult in the home may be acceptable if the alternative is an unacceptable increase in the risk of some other bad outcome. As most of the terms in this area have come to take the meaning of physical damage we will use the term "seriously bad outcome" (SBO) to describe these outcomes that dependability analysis of the home is designed to avoid.

The remainder of this section outlines some putative SBOs. The final section speculates about how they could be used to identify new products and other interventions.

## Loneliness

Many older people experience crippling loneliness [1]. Having the opportunity to socialise may be a basic human need and loneliness can be quite as serious a bad outcome as personal injury.

A lot of the technology used in the home by older people has the aim of mitigating against this SBO. Hearing aids make it possible to communicate at all. Many smart home systems provide short cuts to make it easy to phone friends and carers. Video conferencing facilities have been suggested for the same purpose. Brownsell et al. [2] asked residents in sheltered housing if they would like to see someone they were talking to on the telephone on their televisions. 46% expressed an interest. Interviewees were found to be more receptive to the idea if they could see other residents. Mobility aids that allow people to visit others outside of their own homes have the same benefit.

It is also easy to see how assistive technology could end up leading to loneliness. Installing an effective alarm system might mean that the warden no longer calls to see if you are OK. Installing a hoist to get you in and out of the bath may mean that carers come less often if only certain carers are allowed to use it.

## Discrimination

Lifesaving technologies commonly go unused because they stigmatise the user. Hip protectors are hidden in the airing cupboard. Raised toilets that could save a fall are refused. Research at York that set out to identify the concerns of older people found that the concern "I don't want to be stereotyped or stigmatised in any way" was rated second only to "I want to keep my independence". This fear of being stereotyped is well justified. Butler [3] found that older people tend to be stereotyped as having negative characteristics, the tendency commonly referred to as ageism. They were characterised as being more ill, forgetful, slow, self-pitying, defensive, tired and unhappy than younger people (see also, [4]).

While technology or a care system may stigmatise the older adult separating them from the society they see themselves as belonging to it can also reduce discrimination. Pollard and Monk [5] carried out an experiment in which a younger person had a conversation with an older person and then rated them on certain attributes. Compared with an audio only link, a video conference link made it easier for the older person to communicate and this additional fluency reduced stereotyping.

## Other SBOs

One strongly feared consequence of moving to an institution is the loss of solitude and privacy this may entail. Having somewhere to be alone, or alone with your family, may also be a basic human need. Avoiding boredom may be another. Finally we must of course remember that safety is a prime consideration. To say that damage to the person is not the only SBO is not to say that it is not important.

## SBOs AND DESIGN

We envisage using SBOs to evaluate prototype designs and procedures and to inspire new interventions. SBOs are high level abstractions selected for their universal applicability. To use them in design they must be combined with detailed specific knowledge of the user, the home, activities within the home and the context of use.

The starting point in evaluating some prototype system is the activity that the system is designed to support. Consider the problem of designing a group videoconferencing terminal for housebound individuals. The activity to be supported is socialising with friends and family. To evaluate a prototype one would need to visit a range of potential users in their homes and see how the terminal would work for them,

i.e., how they would go about socialising using this invention, given their capabilities and the nature of their home. The procedures necessary to use the terminal would be evaluated to assess the risk of each SBO. One would then evaluate other activities, e.g., food preparation and clean up, personal hygiene, and entertainment, to check the terminal did not have some accidental impact. Where risks were identified the system would be modified to mitigate against those risks. This might be a case of re-designing the terminal (e.g., to make it more attractive or compact) or the way it was used (e.g., using a call centre to set up meetings rather than expecting the user to dial direct).

SBOs could be used to inspire new interventions by applying the same process to existing activities that are supported only by mundane tools. Evaluating a walking stick or a washing up mop could lead to technological interventions with lasting value for this user group.

## CONCLUSIONS

This paper presents some very early thoughts about dependability as it applies to older adults in their homes. To take it further we require better models of the concerns of older adults based on empirical data and experience of using SBOs in the design process. Nevertheless, we see this as a promising approach in the user centred design of dependable assistive technology.

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