



DELIVERABLE 6.2

Identification and discussion of relevant ethical norms for the development and use of robots to sup

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Short description

As required by Task T6.4, this deliverable identifies and begins to explore ethical norms that may be used to guide ACCOMPANY development and evaluation. It asks how multi-functioning humanoid robots, such as the Care-obot used by ACCOMPANY, improve on single-function robots and non-robotic telecare and telehealth technology given: a) how expensive they are to develop and b) existing ACCOMPANY plans and data collection. The deliverable proposes that one positive advantage of a multi-functioning humanoid robot is that it provides 'presence'. The paper then moves on to suggest five values against which a carebot might be assessed: autonomy, independence, enablement, safety, privacy, and social connectedness. The potential tensions between these values are briefly elaborated, including in relation to potentially different 'models' and associated norms that could be used to describe the relationship between a robot and user. It concludes with a set of scenarios and prompts in preparation for T6.7

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1 Introduction

What role might robots have in the future care of the elderly? Technology-assisted care is already a reality in much of Western Europe, but the technology typically used is not robotic. Indeed, some of the technology currently being used is decidedly low-tech, considerably less sophisticated than smart phones or the appliances of the smart home. Assistive technology for the elderly in the UK includes wearable alarms for summoning help; smoke, CO₂ and flood sensors; pillboxes that are designed to help the elderly to take all of their medication on time; and fall sensors. Two-way visual contact through webcams and television monitors is also available, though less widely, and relatively inexpensively. This enables family or paid support workers to ‘look in’ on an elderly person and their home without travelling.^{1,2} If the elderly are comfortable with computers, virtual visiting is cheap and easily accessed –no more difficult to obtain than a Skype account.

What, if anything, can robots add to this array of non-robotic assistive technology? There are a number of possible answers to this question, corresponding to differences between robots. A number of robots simulate the appearance, feel and behaviour of small domestic pets. These can have some of the beneficial effects of real pets – providing a facsimile of companionship and an outlet for a sort of affection for otherwise lonely and isolated people.ⁱ Such robots are relatively cheap, and their therapeutic benefits are in principle available not only to the elderly, but to younger, cognitively impaired people, including autistic children. Considerably more expensive are multi-function humanoid robots that are able to move about in an apartment or bungalow, carrying out tasks for an elderly person, their carers, or both. Care-O-bot® platforms can be programmed to speak to the elderly person, to fetch and lift things, and to act as an audio-visual portal to the world outside the elderly person’s home. In principle, the Care-O-bot® could help to lift an elderly person from a sitting to a standing position, and could help to brace the elderly person as they walk. It can also be programmed to learn and remember an elderly person’s daily routine, remind them of things, and summon help in the event of a fall or some other recognized mishap.

Both humanoid and non-humanoid robots add to the potential benefits for the elderly of non-robotic assistive technology. A common benefit of both kinds of robots is what we shall call “presence”. This includes, but comes to more than, *being there* with the elderly person. Being there in the minimal sense of being co-located with a person is open to a mop, a broom, or a newspaper. What is meant by “presence” is the kind of co-location of a thing with a person that brings it about that the person no longer feels alone. A child co-located with a bed will probably feel alone, even if the bed is comfortable and familiar. But a child co-located with a bed and a familiar cuddly toy will probably not feel alone, even though the cuddly toy is inanimate and inert and has degenerated after years of handling to an unrecognizable lump of cloth. This illustrates what is meant by ‘presence’. Evidence gathered in ACCOMPANY by

ⁱ See for instance Paro the seal <http://www.parorobots.com/index.asp>
ACCOMPANY Deliverable D6.2

MADoPA and reported in ACCOMPANY deliverable D1.2 suggests that this is a possibility that the potential users themselves are open to. The authors note that although it is unlikely that robots in their current state can respond to the emotional needs of users, users are nonetheless likely to form what they term 'attachment' to their robot. Users are also likely to give the robot gendered names. This shows that robots are likely to be *more* than present to users, since attachment goes beyond not feeling alone.

Care of the elderly, especially care in the sense that contrasts strongly with neglect and care that the elderly might greatly prize, requires presence *and more*. As we shall see, the more in question exceeds what can be provided by even a quite capable Care-O-bot®.ⁱⁱ In this sense of 'care', it is doubtful that a robot that is able to care will soon be on the market. Since the threshold for care is quite a lot higher than even the presence-plus provided by the Care-O-bot®, and since other kinds of presence can be provided more cheaply by non humanoid robots and by non-robotic assistive technology – especially Skype technology – we are not convinced that the Care-O-bot® – especially at its current costs and low capabilities – is the right form for machine-assisted care to take. On the contrary, we think it more likely that machine-assisted care will be some combination of non-robotic assistive technology and non-humanoid, single-function robots. It is true that humanoid, multi-function robots are more likely than non-humanoid, single-function robots and non-robotic technology to *combine* a relatively wide range of capabilities with a single, unified presence, but how important it is to combine capabilities, and how important the lifting, fetching and walk-assisting capabilities of the Care-O-bot® are, is unclear to us. It is possible that a humanoid robot has a role in assisting elderly people who are isolated to keep up their skills of social interaction. This is a possibility that the design of the Siena partner in the ACCOMPANY consortium has tried to realize. But it is also possible that less is more in robotic technology in particular and assistive technology in general.

The rest of this deliverable falls into three parts. In the first, we describe relatively low tech assistive technology, and its ethical benefits, that provide the context for the development of robotic interventions such as that being developed in ACCOMPANY. In the second part we discuss what robots can add to assistive technology: namely "presence", and what might need to be added to presence to produce a caring robot. We distinguish between non-humanoid and humanoid (multi-functioning) robots and what each can contribute to the care of the elderly. Finally, we consider whether multi-functioning robots add significantly to the benefits of non-robotic assistive technology, or non-robotic assistive technology in combination with relatively simple and relatively cheap single-function robots.

ⁱⁱ See the work for ACCOMPANY collated by Zuyd and reported in ACCOMPANY deliverable D1.1
ACCOMPANY Deliverable D6.2

2 Non-robotic Assistive Technology and the competent elderly

Widely used non-robotic technology already enables people with physical disabilities to live relatively independently in homes of their own. Ramps, handholds, special kinds of lighting, highly legible telephone handsets and walkers are among the kinds of equipment that might be added to a conventionally designed house to adapt it to a disabled resident.^{3, 2,4} Then there is a variety of sensors and alarms, some designed to alert the householder to a risk, and some designed to alert a source of outside help.² Telecare equipment can also include, though less standardly, combinations of television and webcam equipment enabling “virtual” visiting by health care or social workers.^{5,6} Telehealth is another use of assistive technology. Here the purpose of the technology is typically to monitor a medical condition that has required or could require hospitalization and that facilitates timely interventions if the condition worsens.⁷

In considering the ethical value of assistive technology, it is useful to ask *whom* it assists, or assists primarily. Some technology primarily assists a householder or a patient; other technology may be designed primarily to reduce the burden on *carers* of patients or householders. To begin with patients or householders, the healthy elderly are one target group for non-robotic assistive technology. The frail elderly are another; the elderly with dementia are a third. The younger but intellectually disabled are further class.ⁱⁱⁱ Other technology assists family or a care organization located at one remove from the house-holder or patient. Some carers may be elderly and looking after elderly spouses. Others may be from the next generation – children or nieces and nephews of elderly people. Still other carers will be elderly or younger neighbours, or paid care assistants or social workers.

The mentally competent but not very physically capable elderly are probably the central client group catered for by policy documents on telecare.^{8,9,10} These are people who meet the legal standards for making decisions about their welfare, entering into contracts, making wills and so on, but who may be to varying degrees physically disabled or at least much less mobile and agile than people in their 40s and 50s. This class is representative of the growing proportion of ageing adults in the general population of the UK and other Western countries whose health and life expectancy are much better than those of previous generations, and whose eventual demands on public care provision are as yet unknown.^{iv} Telecare is, among other things, a way of extending the time of the competent and mobile elderly away from hospitals and residential care homes, publicly funded ones in particular. The physically and intellectually disabled are in principle distinct classes of users of telecare: although it is true that many elderly people suffer from dementia and physical disability, it is not clear that the

ⁱⁱⁱ But as ACCOMPANY is aimed at the elderly, this group of potential users will not be discussed here.

^{iv} Though predictions for care needs based on current demand extrapolated to the expected increase in the proportion of elderly in the population suggest something of an explosion in the need for care; e.g. OECD (2011), ‘Health at a Glance 2011: OECD Indicators’, OECD Publishing, http://dx.doi.org/10.1787/health_glance-2011-en

ethical issues raised for telecare by the physically disabled can readily be inferred from the ethical issues raised for telecare by the elderly disabled.

The decision of mentally competent but not very physically capable people to take assistive technology into their homes^v is a decision to live with a certain loss of privacy in return for effective emergency or care response or more effective management of long-term medical conditions. Widely used sensors detect falls, bed-wetting and chair-wetting and the length of time people spend in bed or in the bathroom.² Sensors can also detect whether external doors have been opened at odd hours, or left open.¹¹ Widely used medical equipment detects signs of deteriorating asthma, chronic heart and lung ailments or diabetes.^{12,13} Some of this equipment is adapted for use in telehealth care and sends information automatically to central response centres or medical practices.¹⁴ Telehealth equipment can also send information about amounts of medication taken at different times.^{vi}

Users of telecare and telehealth equipment are sometimes conscious of being under surveillance and dislike the Orwellian 'Big Brother' aspects of telecare and telehealth.^{15, 16, vii} Do these aspects count against telecare morally? Whether they do depends on whether the purpose of the monitoring is sufficiently similar to that of state security surveillance, and whether sensors are necessary for that purpose. State security surveillance seeks to collect evidence of behaviour that is illegal or damaging to the security of the state. It is not done for the benefit of the person surveilled, but for the wider public, or, for the maintenance of the state. Telecare and telehealth, on the other hand, are operated for the benefit of the person monitored, and, in Western countries, are only introduced into people's homes with their consent.^{viii} They are an early warning system for a health problem or a health emergency. Far from leading to arrest, prosecution and imprisonment, they trigger rescue or medical intervention for a particular person identified in advance as being medically needy. Beyond that, telecare is at least often claimed by its promoters to maintain the independence of its users.^{17, 4} This purpose often has greater official weight than relieving a care burden.^{18,15,19,20,8,9,10}

Although user-centred assistive technology can at the same time reduce the burden of carers, it need not do so, especially if the user has habits that carry some risks, or has a lifestyle that is not risky but is disapproved of by family or carers. For example, if user-centred telecare facilitates private communication or visits to an elderly person from

^v It is important to remember that all assistive technology is introduced into a person's *home*. The significance of its being a home and the significance of 'home' to individuals means, as we explain below, that it should only be introduced with appropriate consent from the autonomous person whose home it is.

^{vi} The US Food and Drugs Administration recently approved the use of an ingestible sensor in pills to monitor the medication intake of patients: <http://proteusdigitalhealth.com/proteus-digital-health-announces-fda-clearance-of-ingestible-sensor/>

^{vii} For a full discussion of the ethics of surveillance in telecare, see T Sorell and H Draper, 'Telecare, Surveillance and the Welfare State' *American Journal of Bioethics* 12 (2012) pp. 36-44.

^{viii} Thought there are, of course, concerns that in the future genuine willingness may be undermined by the elderly being presented with 'this or nothing' choices.

someone the elderly person but not the family approves of, say a younger member of the opposite sex, whom the family suspects is only after the elderly person's money, then it might add to the worries and burdens of the carers.²¹

This possibility notwithstanding, there are good *moral* reasons why user-centredness rather than carer-centredness is the appropriate default position for elderly care in general, including the design of assistive technology for the elderly, and robot-assisted care in particular. One reason is that the elderly person is an adult, with a life of their own to lead. The elderly person is no less an adult than someone much younger whose choice of, for example sexual or other companions would normally not be anyone else's business, not even the business of the younger person's friends or family. Likewise, a middle-aged person can form relationships that his or her family disapproves of, but their disapproval is not normally taken to be decisive for what the middle-aged person should do, even if the middle-aged person is dependent on e.g. his daughter for meals, laundry and general organization.

If the elderly adult is to be treated differently from the younger adult, and if that difference in treatment is to be justified morally, then there has to be something about being elderly that makes one less able to lead one's own life. Although there may be some facts of old-age that make one less able to lead one's own life – declining mobility, worsening memory, for instance – these do not mean that one is not able to make decisions about how one's life should be run. After all, many much younger people who are forgetful or who are not very agile or mobile through some accident are not taken to be incapable of decision-making, and the quality of their decision-making may be no better than that of an old person who has age-related forgetfulness. Unless an elderly person is cognitively impaired – and cognitive impairment need not attend old-age even when elderly people are no longer mobile – there is every reason to treat the elderly as all other unimpaired adults are treated, namely as able to make their own decisions, including exercising the right to make their own mistakes and take the consequences.

From a moral point of view, the decision-making of the user may even have to be allowed to extend to the question of what counts as an emergency. Under some telecare and telehealth regimes, it can be the judgment of telecare *monitors* that triggers an emergency intervention. Why should not people who are medically needy but perfectly competent trigger a rescue or medical intervention themselves?^{ix} This would be more in keeping with the autonomy-promoting aims of assistive technology. Some assistive technology works in exactly this way. To see this, we need distinguish between assistive technology which makes the elderly person the judge of when an intervention is needed, and assistive technology that vests the judgement in an outsider, albeit a benign outsider who has the interests of the elderly person at heart.

^{ix} We assume here responsible use of emergency facilities (see Draper, H Sorell, T (2002) 'Patients' responsibilities in medical ethics' *Bioethics* 16, 4: 335-353) and also note that there are anecdotal reports on elderly users using alarm devices because they feel lonely and this is one means, perhaps their only means, of getting human contact.

Among the earliest assistive technology devices were alarms that elderly people could set off if they fell or were in distress.^{22,24} These alarm devices can be worn, and so need never be out of reach. Alarms belong to a wider class of assistive technology devices in the control of the person receiving the care. These can include sensors for over-running baths and smoke that alert the user rather than a remote telecare hub, and that can prompt the user to use their alarm if they feel they cannot cope.^{4,17} Again, sensors monitoring medication use might alert the healthy elderly *users* rather than a remote carer that tablets had not been taken. The user would then be free to take the tablets if he or she chose. Instead of outsider-controlled assistive technology, we have here the technology of the “smart home”, that is the technology that keeps track *for the householder* of hazards, but that does not keep track of the householder himself and does not make *decisions* for the householder. It is smart home technology that should probably be preferred to outsider-controlled technology in the care of the competent but capable elderly as it better respects their autonomy. Locating control with the user fits in with one finding from surveys of users of telecare, namely that they dislike the way it takes away their control over *revealing* increasing frailty or disability.¹⁵ This desire to retain control was also reflected in the data collected by MADoPA and reported in ACCOMPANY deliverable D1.2.

Outsider-controlled telecare might come into its own during periods when elderly people who could otherwise profit from ‘smart home’ technology were asleep or ill. Flood or fire sensors or sensors indicating a break-in might also be connected to a remote central hub when the user decided to delegate the relevant control. But there would be no question of remote monitoring of comings or goings by the mentally capable elderly, or remote monitoring of their chair or bed occupancy. The trigger for increasing use of telecare would be freely disclosed or independently revealed disability. To the extent that physical or intellectual disability is a spectrum disorder, the thresholds for needing telecare might vary with the condition or the user or the user’s home circumstances. This threshold might be reached immediately by intellectually disabled people and dementia sufferers, whether elderly or not, when their capacity to make autonomous decisions is impaired. Where autonomy is absent it cannot be undermined. One exception here might be when concerns have already been raised independently about the health status of an elderly person. An example that was discussed by the participants in ACCOMPANY deliverable D1.2 was of an elderly gentleman who had removed his hearing aids prior to taking a nap. When he did not answer his door or phone over a period of time, the fire brigade was called to break down the door, as no one had a spare key to his house. Safeguards would, however, need to be introduced so that means of checking on someone’s health status could not be misused where there is no genuine or perceived emergency.

User control can sometimes be the other side of the coin of user isolation. The elderly householder who autonomously manages her life, whether or not she has a chronic illness, may often do so alone. Assistive technology sometimes reduces regular human contact, in particular the visits of, or to, care assistants and other carers.^{23,24,12,25} Whether telecare *must* increase isolation in order to serve its standard twin purposes of promoting independence and reducing the public expenditure involved in hospitalization or maintaining state-run care homes is not always easy to determine.^{26,27,28} If relatively cheap equipment makes possible

virtual visiting, then important facets of human contact are retained. They can even be enhanced, since technology reduces the size of the obstacle posed by distance and the familiar problem of having to be in two places at once. When one visits virtually, one *is* in two places at once. A television monitor and user-controlled webcam is a perfectly serviceable portal for contact with even quite remote friends or social networks. The equipment enables elderly people to see the people they are conversing with and even their home environments in real-time. Indeed, it sometimes enables people to carry out virtual visits more effectively than visits in person, since earphones make others much more audible for the hard of hearing than being co-present with the same people in a room with a great deal of background noise.^x

It is true that equipment for virtual visiting also creates opportunities for intrusion. But when it is user-controlled and combined with the usual array of sensors and monitors, it may at least in principle provide health and social gains for the elderly, cost-savings for health and social services, and a more manageable care burden for friends and family living separately from users.

3 Carebots vs low tech assistive technology

What do robots actually add, and what can they potentially add, to non-robotic assistive technology? What in particular can the Care-O-bot® in ACCOMPANY add? ACCOMPANY is user- rather than carer-centred. That is, the project is setting out to design a robot that is mainly of use to the elderly person whose flat or house it occupies. It has not been conceptualized as a piece of technology that helps the elderly person's family or care providers by being their representative in the elderly person's house, doing for the elderly person what the family or carers do, and allowing carers more time of their own. Instead, it has been designed to serve as a multi-functioning, humanoid presence in an elderly person's home, capable of acting as companion, helper and enabler, and sensitive to the wishes of the user before the wishes of others.

Multi-functioning, humanoid robot companions are at one end of a spectrum of robotic products with care or enablement functions.^{xi} At the companion end of the robotic spectrum can also be found non-humanoid companion devices such as dolls and simulations of small animals. There are also hybrids of humanoid robots and companion animals. Riken have developed the Riba robot (Robot for Interactive Body Assistance): an adult-sized robot

^x There is considerable literature on teleconsultation and within this evidence that focussing on a single item can improve concentration, see for instance Sävenstedt, S., Zingmark, K., Hydén, L.-C. and Brulin, C. (2005), 'Establishing joint attention in remote talks with the elderly about health: a study of nurses' conversation with elderly persons in teleconsultations', *Scandinavian Journal of Caring Sciences*, 19: 317–324.

^{xi} ACCOMPANY deliverable D1.1 reviewed technology currently being developed with EC funding. ACCOMPANY Deliverable D6.2

designed to look like a streamlined white teddy bear that can pick up and carry humans from a bed to a wheelchair.^{xii} At the other end of the spectrum are devices that are more like clothing, and, when worn, markedly increase the strength of users.^{xiii} In between are robotic devices^{xiv} whose functions, including monitoring and functioning as an interactive portal, are carried out separately by different kinds of telecare devices. Other robots are single function machines that enable the user to be more independent, such as My Spoon^{xv} and vacuuming and floor washing robots.^{xvi}

The literature on the ethics of robotics sometimes identifies tensions between the design and use of carebots – including some that are similar to the Care-O-bot® used in ACCOMPANY – and the morally desirable treatment of elderly persons as autonomous adults. Vallor²⁹ identified the following concerns from her review of the literature:

1. The objectification of the elderly as “problems” to be solved by technological means^{30,31}
2. The potential for carebots to either enhance or restrict the capabilities, freedom, autonomy, and/or dignity of cared-fors^{31, 32,33}
3. The potential of carebots to enhance or reduce engagement of cared-fors with their surroundings^{31, 32}
4. The potential of carebots to enhance or intrude upon the privacy of cared-fors³¹
5. The quality of physical and psychological care robots can realistically be expected to supply^{30,34}
6. The potential of carebots to either reduce or enhance cared-fors’ levels of human contact with families and other human caregivers³⁰
7. The potential of carebot relations to be inherently deceptive or infantilizing^{30,31,35}

Issue 2 is the one that ACCOMPANY principally tries to address. Far from restricting the capabilities, freedom, autonomy and dignity of users, ACCOMPANY aims at maximizing those things. We shall first explain *how* ACCOMPANY sets out to enhance or at least preserve the autonomy and capabilities of users. We shall consider whether ACCOMPANY addresses other issues on Vallor’s list. Finally, we shall return to the question of whether the ACCOMPANY Care-O-bot® and carebots generally do better than lower tech solutions in assistive technology.

The ACCOMPANY Care-O-bot® is designed to be stationed in the home of the elderly person. It is not brought into the elderly person’s home from time to time. Nor does it divide its time between a number of different rooms in an institutional care-home corridor. Instead, it

^{xii} <http://rtc.nagoya.riken.jp/RIBA/index-e.html>

^{xiii} For a video of the Cyberdane HAL “power suit”, see <http://www.youtube.com/watch?v=fy7ipDAyXtl&feature=related>

^{xiv} These are the so-called “Remote Presence” robots manufactured by intouch. See <http://www.intouchhealth.com/products-and-services/products/rp-7i-robot/>

^{xv} My Spoon helps users to feed themselves. <http://www.secom.co.jp/english/myspoon/usage.html>

^{xvi} Such as those produced by iRobot <http://www.irobot.com/uk/home.aspx>

is a semi-permanent fixture in one person's home. Its role in that person's home is partly that of helper, partly that of enabler, partly that of co-learner, and partly that of companion.

The Care-O-bot® is able to lift and carry household objects, and also to fetch objects at the command of the user. It is also able to remind the user of different scheduled or routine events, such as a visit, or the need to place a shopping order, or to go to a doctor's appointment. The robot is able to keep track of the user's position in the house and perhaps to register falls or other signs of harmful incidents. It is able to distinguish the user from other people who might enter the home, and it is able to treat the orders or requests of the user as having more authority than those of visitors. The co-learner role is a matter of the process by which the robot and the user accommodate themselves to one another. The user's routine will shape many interactions between the user and the robot. If the user is used to waking at 9 am rather than 7 am, the robot can learn that and be ready to fetch a morning drink. If a routine-disrupting appointment is made, the robot can register that and prompt the user to get dressed for a visit or to go out at a certain time. The robot can also take part in recreational pastimes – providing music to go with a song, or perhaps staying in the same room as the user as he or she watches television. Through its tray/tablet it can offer a video and internet portal, making possible virtual visiting.

Although the Care-O-bot® is in most respects at the service of its elderly user, the Siena roboticists in the ACCOMPANY consortium are seeking to endow it with capabilities that contribute to maintaining the social skills of the user by making the obedience of the robot less than absolute. Specifically, they are seeking to program the robot to be able to disregard commands if these are delivered in a sharp tone of voice or requested roughly.³⁶ The effect of this is to remind a user who may be interacting socially mainly with the robot that it, as the local representative of the social world, needs to be treated with a kind of consideration, and that the social skills of responding to gentleness with gentleness need to be kept up. The Siena work also makes possible a high degree of sensitivity to tactile interactions between the user and the robot. The tablet interface between the user and the robot can register the pressure exerted on it when the user squeezes it, and can process a hard squeeze as an indication of urgency in a command. Again, the robot can simulate 'emotional synchronization' with the user, apparently taking up a position near the user and directing its attention where the user does when, for example, the user watches television.

In what ways does the Care-O-bot® promote the autonomy and independence of the elderly person? To begin with, the Care-O-bot® takes the user's routine and the preferences embodied in this routine as its frame of reference. It is not introduced into the user's home with an agenda of its own or with an outsider's agenda. So its defining goals are in a certain sense borrowed from the user. This means that the user's choices are foremost and, other things being equal, are implemented unquestioningly. So the agent's autonomy is not at all impaired. It *would* be impaired if the choices of others started to supplant the user's choices. But in ACCOMPANY scenarios this does not happen. Far from introducing new choices, still less choices at variance with those of the user, the Care-O-bot® takes its cue from the user's choices. The robot is also able to co-ordinate those choices through scheduling and

prompting abilities. In both of these ways the ACCOMPANY Care-O-bot® promotes the autonomy of the user.

User safety constrains the autonomy-respecting features of carebots. Sharkey and Sharkey³¹ ask what would happen if an elderly person instructed a lifting and carrying robot to release him or her over the side of a high balcony in an apartment building. Even if that suicidal request were competent and highly autonomous – not the result of treatable depression, for example – there would be a good moral reason for programming a carebot not to comply with it, namely that the robot would not normally be able to *tell* that such a request was competent and autonomous. Likewise, one would expect a carebot with monitoring abilities to abort an activity requested by the user if, while undertaking that activity, it registered that the user had fallen or that his or her vital signs had suddenly changed. But notice that we would expect the same behaviour of an autonomy-respecting *human* helper as well, since loss of life and sudden medical emergencies disrupt or undermine the exercise of autonomy.

Autonomy – choosing for oneself and acting in accordance with one's choices – is different from independence. Independence is being able to act on one's choices without depending on the consent or co-operation or resources of others. If someone chooses to live the life of a sailor, for example, but can only succeed in doing so if a shipping company offers employment, then there is a clear sense in which the agent is not an independent sailor, however much his choice of sailing as an occupation is autonomous. Independence might only be achieved if he owned a suitable boat or ship for as long as he wanted to live the life of a sailor.

In the case of the elderly, autonomy sometimes can co-exist more or less constantly with dependence rather than independence. In other words, the choices of the elderly can often need to be realized through the efforts of *others*. Although an elderly person can still make his or her own choices, he or she may not be physically strong enough, or mobile enough, or rich enough to see them through. Carebots can act against some sources of dependence, like physical weakness, but not others, such as lack of wealth.^{xvii} Sometimes in the discussion of the elderly, independence is not understood with respect to one's command of means for realizing choices in general, but rather in terms of one's ability to keep oneself clean, fed, sheltered, unharmed and legally occupied without the constant assistance of other people. Carebots readily promote independence in this limited sense, but not independence in all of the respects in which it affects autonomous choices.

Carebots in general and the ACCOMPANY Care-O-bot® in particular also address issues other than autonomy and independence on Vallor's list. Issue 6 ('The potential of carebots to either reduce or enhance cared-fors' levels of human contact with families and other human

^{xvii} ACCOMPANY deliverable D1.1 noted that there are inconsistencies across the EU in how assisted technologies for the elderly may be funded, and not all EU citizens in need of help can be sure of receiving state funded assistance.

caregivers’) notes the potential isolation of elderly people whose main interactions are with machines.

We have already seen that, in telecare, technology can be the gateway to human contact rather than a barrier. This is because it can act as a portal for two-way communication and more. These portals can open the way to interactions that are in almost every sense a visit, that is, the temporary occupation by invitation of another person’s space.

What about carebots? Although both afford the possibility of visits, there is a clear difference between having a two-way television in one’s house and having a Care-O-bot®. The Care-O-bot® is a *presence* in its own right in a way a television is not. To put it in another way, the television is not a subject of interaction but at most a medium of interaction. On the other hand, a Care-O-bot® is a subject of interaction – a possible conversation partner and a possible participant in synchronised activity. Admittedly, the Care-O-bot®’s current conversational abilities are so limited as to be conversational only in an inverted commas sense; admittedly, the extent to which its presence fills a gap left by human contact is probably very restricted; still, there is a sense in which the Care-O-bot® in ACCOMPANY and other carebots fulfil the conditions for what, at the beginning of this paper, we called “presence”: when carebots are co-present with people, those people can feel that they are not alone. This does not seem to be a power of television sets. It is of course possible for an image on a two-way television to produce the feeling of not being alone. But a Care-O-bot® resident in one’s home can create this feeling even when it is not functioning as a virtual visiting portal. This is an important difference between non-robotic assistive technology and robots.

Can *only* a carebot – typically an adult-sized humanoid fetcher-carrier-lifter with restricted linguistic capacities – have presence, or is presence open to much simpler robots? Much simpler non-humanoid robots undoubtedly *can* have presence. The Paro^{xviii} – a small fur-covered robot that looks like a seal – is specifically designed for therapeutic uses with the elderly. It is programmed to exhibit a range of responses to being petted, including moving its tail and opening and closing its eyes. It also ‘learns’ actions that the user likes or dislikes (it responds to being hit as well as petted), can respond to voice direction and tone, and detects the difference between day and night as is more or less active accordingly. Although the evidence regarding Paro’s actual effectiveness as a companion is open to more than one interpretation, some studies have concluded that animal robots have some of the therapeutic powers of real domestic animals, but without the care-burdens of owning a real domestic animal.³¹ If the isolation and loneliness of elderly people were the only or the main problem that robots were being introduced to solve, then, a multi-functioning humanoid robot may not be needed. And there would be lower-tech solutions to the loneliness problem if there were regular two-way virtual visiting between actual human beings. Or a combination of simpler robots and two-way television may be the best of both the high-tech and low-tech worlds for

^{xviii} <http://www.parorobots.com/index.asp>

combating loneliness, providing both permanent and low-maintenance presence but also regular human contact.

4 An ethical framework for judging carebots in elderly care

When what is in question is the promotion of autonomy, independence and some form of human contact, what, if anything, recommends a carebot solution to elderly care over a telecare, or single function and simple companion robot solution, or a combination of telecare and single function and simple companion robots? If the money cost of a multi-function, humanoid carebot is taken into account, the answer may be 'Nothing'. On the other hand, if financial costs are disregarded, then the answer on the basis of the previous discussion may be that the carebot solution delivers physical help, and the ability in principle to *integrate* telecare and sophisticated presence. By 'sophisticated presence', we mean that the carebot interacts and can even initiate interaction with the user. Moreover, the quality of interaction is more sensitive and more challenging than the passive twitches and facial expressions of Paro. Besides, and here it takes over some of the functions of telecare, the ACCOMPANY Care-O-bot® can keep track remotely of the location and condition of the user. It does so, however, from close at hand, enabling quicker intervention or emergency response than conventional telecare devices relaying data to a remote information hub (assuming that the carebot is not itself programme to summon help from a similar hub). In other words, cost considerations apart, a carebot may give us in a single package a highly desirable embodiment of assistive technology alongside practical help with lifting, carrying and fetching.

The previous discussion, however, may be inadequate for a full answer to the question of the comparative value of low-tech and robotic assistive technology. So far we have been guided by a list of ethical issues raised by philosophers and technologists who have reflected on the capabilities of robots designed or used for elderly care and the needs of elderly people as they present themselves in ordinary experience. But perhaps the common sense of philosophers and technologists is a bad guide to the needs or preferences of the elderly. Again, perhaps the preferences and needs of the current population of elderly people are subject to cultural variation, while the list of issues depends on the assumption that the experience of the elderly, especially in the West, is more or less uniform.^{xix,37}

A place where cultural variation may need to be taken into account is in relation to issue 7 on Vallor's list: "The potential of carebot relations to be inherently deceptive or infantilizing".

To illustrate, let us go back to the RIBA robot and others which are given the appearance of teddy bears or children's toys. Although these robots are meant to be used by elderly people and other adults, they are bound to strike many people in the West as infantilizing if not

^{xix} Jennifer Parks, for instance, notes that cultural difference may be significant in terms of both how people respond to robots vs humans and different robotic persona.
ACCOMPANY Deliverable D6.2

bizarre. If they do not give this impression in Japan, however, there may be no moral objection from infantilization to that design being used there. Here is a case where the strength of a moral objection to a given carebot design may vary from place to place. On the other hand, if a design is proposed that seems to no-one anywhere to be infantilizing and that dispenses with the teddy bear motif, then there may be a reason for preferring that design to go into production.

Any development of an ethical framework for evaluation of carebots must be informed by the attitudes of elderly people themselves, with allowances being made for big variations in technophobia between people who currently are around 60 and people who are currently over 80 years of age. The importance to an ethical framework of taking into account user-attitudes is connected with the value of autonomy. If carebot use is to take its cue from the wishes of individual elderly users of carebots, and if surveys of elderly people reveal a range of design-relevant preferences which do not correlate with the design features of the carebot that engineers intend to realize,³⁸ that may suggest that engineers think they know better than their elderly users what carebots should be like, or that they do not know and have not bothered to find out what elderly users of carebots might be looking for. Either way, the potential of the engineer-designed carebot to promote the autonomy of elderly users might be compromised.

ACCOMPANY has conducted research among samples of elderly people in the UK, the Netherlands, Italy and France. The project is investigating what users might want from a carebot, and has found that mobility, self-care and isolation are major preoccupations, while co-learning seems not to be.^{xx} Does this finding mean that ACCOMPANY should drop co-learning from its designs for robots? Not necessarily. Co-learning may have other effects that elderly people could benefit from and that they want, even if they want other effects more. Again, there could be a therapeutic rationale for some design features that elderly people don't want or don't want much, so long as on balance groups of the elderly have been consulted and listened to in relation to design, and so long as the ACCOMPANY Care-O-bot® accommodates itself to individual users rather than coming with an agenda of its own. To go back to Siena's methods of keeping up elderly people's social skills by adjusting its behaviour to the elderly person's tone of voice, this might have what is broadly speaking a therapeutic benefit even if the elderly person doesn't like it much.

Vallor's list of ethical issues indeed anticipates the way that the Siena design might be justified. For it in effect asks philosophers and technologists to think about:

- 3. The potential of carebots to enhance or reduce engagement of cared-for with their surroundings
- and
- 5. The quality of physical and psychological care robots can realistically be expected to supply

^{xx} See ACCOMPANY deliverables D1.1 and D1.2
ACCOMPANY Deliverable D6.2

The Siena innovations try to improve social skills and indirectly the psychological well-being of elderly users. They also introduce companionship into such routine ways of engaging with one's surroundings as watching television and help with such tasks as moving objects from one room to another, which promotes living in orderly and clean surroundings.

Even when the attitudes of users are taken into account, there may be conflicts within the range of ethical values that are individually relevant to elderly care. We have already seen that autonomy can conflict with safety: a carebot that is otherwise dedicated to fulfilling the wishes of its elderly user should not – morally should not – comply with a request that is suicidal. Similarly, although elderly autonomous people have a right to privacy at least as extensive as younger people, there may be occasions when a carebot should report a fall to a non-resident carer or a medical assistance hub, even if that is against the wishes of the elderly person himself or herself.

Against this background, what sort of ethical framework should be proposed for the design of carebots. The framework must identify and define values that should be promoted or at least respected by carebot design and use in relation to the elderly, and it must say which value is, or which values are, overriding when there is a conflict. The previous discussion has already identified some of the relevant values. These are

- autonomy – being able to set goals in life and choose means;
- independence – being able to implement one's goals without the permission, assistance or material resources of others;
- enablement – having or having access to means of realizing goals and choices;
- safety – being able readily to avoid pain or harm;
- privacy – being able to pursue and realize one's goals and implement one's choices unobserved;
- social connectedness – having regular contact with friends and loved ones and safe access to strangers one can choose to meet.

It is, however, inevitable that circumstances will arise when these principles are in tension. When this happens one is likely to be given priority over another. The preceding discussion has suggested that autonomy is a crucial value but it does not, however, outweigh everything else on the list.

It might be thought that of the six values, safety is supreme, trumping even autonomy. But this seems to be a mistake. Not every threat to safety, even when realized, produces major injury, and when the worst that the exercise of autonomy produces is minor harm to the agent, autonomy might win out over safety. Admittedly, the meaning of 'major harm' and 'minor harm' varies over a life-course so that falls tolerable at 45 years of age and classifiable as minor then would not be classifiable as minor at 90, but the threshold has to be quite high if the elderly person's autonomy is not to be in danger of being entirely undermined by a too conservative safety regime. In other words, autonomy, not safety, should normally be the ruling value in carebot design.

For example, if an elderly person prefers being bruised for a week to staying seated or using a walker, not interfering with a decision to get up and be active seems to be consistent with the discretion usually allowed to middle-aged and younger adults with respect to their health and safety, even when minor harm results. Allowing the elderly person the same discretion might mean designing a carebot so that its prompts to use a walking frame etc can be disabled (and perhaps later re-enabled) by the user.

Because privacy promotes autonomy, carebots should not normally be able to report information about users to outsiders or anyone into the elderly person's home without permission. On the other hand, acting on some of this information itself without reporting to outsiders might be valuable. Thus, if the carebot has or is connected to flood sensors in a smart home, there is no reason why it or the smart home cannot trigger a cut in the water supply and then ask the user what they next want done. This is in keeping with autonomy. Cutting the water supply and asking an outsider for subsequent instructions would undermine user autonomy unless the user was incapacitated.

Social connectedness is desirable, other things being equal, because of its potential benefits to physical and mental health. But the 'other things being equal' is important: it is possible for social connectedness to empower busybodies, without any benefit to the user. Instead of social connectedness full stop, *chosen* social connectedness with *chosen* people seems desirable, with the user deciding, as most adults routinely do, whom to include and whom *not* to include in their social circle. A user who disliked all eligible social connections might intelligibly choose isolation, but, given the reach of social networks afforded by the World Wide Web, the number of eligible social connections is likely to be much larger than the number of people the user has good reasons or any reasons for shunning.

Enablement might also be in tension with autonomy, since enablement may require individuals to do things for themselves that they might prefer were done for them, or that they might prefer not to do at all. Robotic devices are being developed to help with physical rehabilitation following stroke, accident or amputation. Physiotherapy of this kind often requires patients to be coaxed, persuaded and even bullied into repeating movements by physiotherapists, who may themselves move or position the patients in ways that although initially uncomfortable are necessary for rehabilitation. Returning someone to a state of greater independence is certainly compatible with autonomy; the question is whether it is compatible with autonomy for a carebot to coerce someone to adhere to regimes that will return them to greater independence.

The answer to this question may lie in what was agreed with the elderly person at the time a rehabilitation device or robot with enabling capabilities was provided. In the case of single-purpose device, there would be no objections to removing a state-funded device that was lying unused or not being used properly. Carebots pose a different challenge because they are designed to be multi-functioning and these other functions would also be lost if they were removed. Enablement functions are not quite the same as those providing potential social interaction. Disliking social interaction and preferring isolation is an issue of taste. Working against a carebot programmed to maintain independence is not simply an expression of

taste, but a kind of resistance to independence . At the same time, the robot and its developers would not be working with the autonomy of the elderly users if the robot refused to do things that the elderly person could reasonably do for herself, or which it might be good for her to do for herself. Indeed, we can envisage something of a spectrum of severity of outcome here. At one extreme might be a user's refusal to co-operate with the robot in maintaining his or her mobility. At the other extreme might be automatic robot compliance with all user requests, even the request to be thrown off the balcony. Between the extremes might be cases where the robot enables the user to eat, or drink or smoke excessively. In this respect choices about the programming of carebots reflect the ethical issues raised more generally in health promotion and public health, where what people want is not necessarily what is good for them, and satisfying their desires can be in tension with health interests.

One of the challenges for the ethical framework in ACCOMPANY is that the Care-O-bot® is can play a variety of roles (companion, helper and enabler), each of which is subject to different norms in human-to-human service provision.

To take companionship first, we can assume that the Care-O-bot® is not designed to simulate a family member but rather to counteract the experience of being always or mostly alone. The Care-O-bot® might therefore play a role similar to that of a paid companion in late 18th and early 19th century England. The companion was paid to provide constant company, usually for single people, and shared their employer's home. This was a role that struck a balance between friend and servant. The companion could be a confidante, but unlike the friend was an employee who had very little autonomy and could be called upon to help with 'light' duties – such as helping with sewing or playing sport. As in the case of the Care-O-bot®, the relationship was one-sided, with the feelings, wishes and whims of the employer (or elderly user in the Care-O-bot® case) having most of the weight and those of the companion having little or none. However, it was considered unseemly to be unduly rude to or rough with the companion – which corresponds with the concerns for 'respectful' interaction being worked on in by the Siena partner in ACCOMPANY.

A helper may be a servant, professional or volunteer, and these three roles will now be considered in turn. Servants are paid to carry out their employer's bidding, usually without question. Care-O-bot® does not fit well with the traditional role of the servant as it is intended to perform tasks that users are physically unable, rather than unwilling, to do for themselves. On the other hand, to place Care-O-bot® in the servant role suggests, appropriately enough, that the elderly user is controlling the robot rather than the robot controlling the elderly user. It also suggests that the robot should be discreet, keeping household matters private.

To the extent that it is designed for the frail and those with physical impairments, the Care-O-bot® could be associated with caring roles filled by nurses, healthcare assistants and doctors, especially when they are equipped with interfaces for telehealth interventions. Human carers are not necessarily obedient servants. On the contrary, they are likely to have their own ideas about the extent to which they are willing to help, what constitutes help and what form it should take. So there may be a tension between placing Care-O-bot® in the caring role and placing it in a servant role. In one the elderly person is the boss, and in

the other the elderly person sometimes needs to accommodate the carer. Informal, voluntary care such as that which might be provided by a friend, incorporates both the care element and that of companionship. It reinforces the idea that whilst the robot is present at the invitation of the elderly user, it should not be exploited or ordered about. It is also more of a relationship between equals even though the elderly users retains the upper hand and the robot has only limited capacity to withdraw from unsympathetic behaviour or tone.

'Enabler' suggests superiority over the enabled: the enabler is the one with the knowledge, skills, abilities and powers to enable. This may also raise questions about who is deferred to when elderly and elderly-enabler are in conflict. There is a corresponding tension between enabling and autonomy.

When autonomy conflicts with other values that govern the possible roles of Care-O-bot®, which should prevail? A way of summarizing much of the foregoing is by saying that autonomy should. Autonomy can make sense as the organizing value of the ethical framework for the design of carebots. Being the organizing value, autonomy also constrains additions to the value framework: added values have to be consistent with autonomy or else have some independent moral grounding. Should further values be added to those already introduced?

One source of further values is the interests of carers connected to the elderly person. So far carers connect with the ethical framework in two ways: as possible social connections of the elderly person and as people who might need to be turned to in case of emergency. In other words, carers enter the ethical framework developed so far through its values of safety and social connectedness in turn constrained by the value of keeping the elderly person autonomous for as long as possible. This may not be the right way for carers to enter the framework. It might be thought that by putting elderly persons and their choices at the centre of things, the framework denies the dependence of elderly people on carers and is in any case too individualistic. For example, the framework recognises threats to the autonomy of elderly people from carers but not the sheer hard work and sometimes sacrifice of the carers of the elderly. Perhaps the framework needs to reduce the value of autonomy in the elderly person the more other people have *their* choices reduced by their caring role. Concretely, this might mean that the ability of the elderly person to judge and take risks that might lead to injury and greater dependence might be restricted the more dependent they are on others. It might also justify more monitoring and more reporting to carers.

We are not persuaded that autonomous elderly persons necessarily overburden carers, even when they are dependent. But it helps to remind ourselves that we are not concerned with the general question of the best way of being fair to carers. We are only concerned with the way that carers' interests should be represented in a framework for the design of carebots. Since carebots of the kind being developed in the ACCOMPANY project assume only moderate physical disability and complete mental competence in the elderly people who would be living with the Care-O-bot®, the question of trade-offs between autonomy and *high*-dependence does not arise. That does not mean that there are no difficult questions about what carers have a right to know about in the lives of elderly people and what decisions of

elderly people they have a right to veto, but in general the burden of proof will be on carers rather than the other way round.

A further issue is monetary cost. Until the price of Care-O-bot® is much lower than it is now, the presumption in favour of lower tech and cheap assistive technology must remain strong.

5 Initial ideas for the evaluation of the potential framework (months 13-24)

We have proposed six values that should guide the development of carebots in general and Care-O-bot® in some of the relevant values. These are:

- autonomy – being able to set goals in life and choose means;
- independence – being able to implement one's goals without the permission, assistance or material resources of others;
- enablement – having or having access to means of realizing goals and choices;
- safety – being able readily to avoid pain or harm;
- privacy – being able to pursue and realize one's goals and implement one's choices unobserved;
- social connectedness – having regular contact with friends and loved ones and safe access to strangers one can choose to meet.

We have noted that it is difficult to suggest a definitive order of priority for these values when they are in tension.. We also observed earlier that:

we have been guided by a list of ethical issues raised by philosophers and technologists who have reflected on the capabilities of robots designed or used for elderly care and the needs of elderly people as they present themselves in ordinary experience. But perhaps the common sense of philosophers and technologists is a bad guide to the needs or preferences of the elderly.

A more authoritative guide to the preferences of those who are elderly are the elderly themselves. One area for potential user input is the extent to which these values assert themselves as having priority when potential users discuss scenarios designed to place them in tension. Moreover, it is unlikely that the values can be presented to potential users abstractly as they will not be used to thinking abstractly and have little familiarity with the functions of the ACCOMPANY Care-O-bot®. Discussion is more likely to yield results than interviews, as the participants will be able to react to the views of others. Accordingly, we suggest the data is collected in focus groups of potential users (who ideally have already had some experience of the ACCOMPANY Care-O-bot®). These focus groups should have between 6-8 participants. We need to discuss whether they should include carers or just potential users. We suggest the groups consider all of the following scenarios, which should be circulated in advance to elicit more considered views.

Scenario 1

Marie, who is 78 years old, has lived alone since her husband died ten years ago. She has ulcers on her leg, the dressings for which are changed by a nurse once a week. It is important for the healing of these ulcers that she moves around as much as possible to encourage circulation to her legs and avoid further swelling. Her Care-O-bot® knows that she should be encouraged to move about, and suggests several times a day that she walks with it to look out of the window at either the garden or the street below. Marie is reluctant to get up from her chair because she is afraid of falling and walking is uncomfortable. She also uses the Care-O-bot® to get drinks for her from the kitchen, even though the nurse has suggested that she should go to the kitchen with the Care-O-bot® but let it carry the drinks back to her chair for her. Also the Care-O-bot® can only bring bottles of water to her and the nurse suggests that she would feel warmer if she made herself hot drinks. The Care-O-bot® reminds her to take her antibiotics and to keep her leg up on a stool when she returns to her chair after, for example, going to the toilet. She is grateful for the reminders about the antibiotics but feels irritated about the reminders to elevate her leg as she hardly ever forgets to do this but she likes to get comfortable first. She sometimes put her leg down so that her cat can sit on her lap more comfortably. Her ulcers are slow to heal but when the nurse asks if Marie is moving around more she always says that she is, even though she ignores the prompts to come to the window and doesn't go to the kitchen with the robot.

Potential prompts following general discussion

1. Should the Care-O-bot® be programmed to put more pressure on Marie to come to the window, or perhaps to turn off her television until she complies?
2. Should the Care-O-bot® be programmed to intervene when Marie puts her leg down for the comfort of the cat?
3. Should the Care-O-bot® be programmed to refuse to get drinks for Marie unless she has already come to the kitchen with it?
4. Should the nurse be able to ask for data from the robot about how often Marie is actually moving?

Scenario 2

Frank is 89 years old and generally frail. He lives alone and needs assistance from a Care-O-bot® to live independently. He prefers the Care-O-bot® to having the neighbours or carers helping him because he thinks they are inclined to be intrusive and interfering. He uses his Care-O-bot® interface to talk about fishing with a friend he has known since childhood. Neither of them can go fishing anymore, but they enjoy talking about when they did and discussing items in a fishing magazine that they both subscribe to. They talk about once a month. Frank really looks forward to these conversations and they put him in a good mood for days afterwards. He becomes quite miserable if his friend is in hospital and unable to talk to him. Frank's daughter has suggested that the Care-O-bot® should be used to encourage Frank join a virtual fishing forum on the internet. She is worried that he only has one friend who is older and poorly and may die leaving Frank with no one else to talk to about fishing. Frank says that he is too old to be making new friends.

Potential prompts following general discussion

1. Should the daughter be able to change the programming of the Care-O-bot® without Frank's permission so that the Care-O-bot® tries to get Frank to engage with the on-line fishing forum?
2. If so, how persistent should the Care-O-bot® in getting Frank to engage with the fishing forum?
3. If not, if I told you Frank really enjoyed the fishing forum and got his friend involved too, would this make it right that his daughter interfered?

Scenario 3

Nina who is 70 years old had a stroke two years ago but has now recovered the use of her arm though one side of her face droops slightly. She is self-conscious about this, but it does not affect her physical functioning. She is supported at home by a Care-O-bot®. Since having the stroke she has become quite irritable and impatient. She often shouts at her daughter when she visits and complains angrily about her condition. Her daughter finds this very upsetting and has come to dread her visits. Nina has been so rude and demanding that two cleaners have already refused to work for her anymore. She is usually polite with her friends. Her Care-O-bot® has been programmed so that it will not do things for her if she asks sharply or in a demanding tone. It encourages her to say please and thank you and will withdraw help until she does so. Nina finds this infuriating and insists that the Care-O-bot® is reprogrammed to do what she asks no matter how she asks for help.

Potential prompts following general discussion

1. Does it matter if Nina is rude to the robot? Why?
2. Is it OK to use the robot, which Nina needs to live alone, to try to alter her behaviour? Isn't it up to her if she alienates her family and carers?
3. Should Nina be allowed to change to programming so that she doesn't have to be polite to the robot?

Scenario 4

Louis, who is 75 years old, is determined to continue to live in his own home, which is in a small town in which two of his sons live. He is regularly visited by his daughters-in-law, who bring him food, help with his cleaning and do his laundry. Louis was left with some weakness in one of his legs as a result of an accident in his 40's. He is becoming frail and is finding it increasingly difficult to get up from his chair and walk with his sticks. Louis is supported at home by a Care-O-bot®. The Care-O-bot® is programmed to help support him when he gets up from his chair and can be summoned to help if he falls. Louis has discovered that he can use the interface on the Care-O-bot® to visit online gambling sites and enjoys playing poker in the evening. He also uses the interface to give his doctor his blood pressure

measurements, and sometimes his medication is adjusted as a result of the measurements he gives. Louis falls over about once a week on average. On the whole he is able to get up again with the help of the Care-O-bot®, but he recently was on the floor for several hours unable to get up and developed a bladder infection from lying in the cold unable to reach the toilet. He was in bed for several days as a result. This placed an additional burden on his daughters-in-law, who took turns to stay with him during the day until he was well enough to live alone. It was during this time that his daughters-in-law realised that he used the Care-O-bot® to play poker on line. They are very unhappy about this as he often loses money. They want access to the poker site to be blocked. They have taken away his sticks so that he has to use his walking frame, which means that he is less likely to fall. They want the Care-O-bot® to be programmed so that it alerts them as soon as he falls. Louis insists that it is up to him what he does with his own money and says that he doesn't want them to come rushing around every time he falls because he can usually get himself up.

Prompts to be used after general discussion

1. Do you agree with Louis that it is up to him whether or not he plays poker? Would it make a difference if his savings are dwindling? Or if he is getting into debt?
2. Do you think that the robot should be programmed not to let Louis play on the poker site at the request of his daughters-in-law?
3. Do you think it was right that his daughters-in-law took his sticks off him so that he had to use the walking frame that makes walking safer?
4. Do you agree that the robot should be programmed to call his daughters-in-law if he falls? Why? (Press on whether the fact that if he is injured they have to care for him makes a difference)
5. Do you think that there is a difference between the daughters-in-law wanting to know about falls and them wanting to have access to the blood pressure results? Should they also be told if he doesn't send his results in regularly, for instance?
6. In general, what things should be private to Louis, and what things are his daughters-in-law entitled to know?

General notes

1. We have tried to use names for the elderly users that will cut across the four countries collecting data from users. The names can be changed if this is thought appropriate so long as the data is clearly assigned to the same scenario numbers.
2. It is desirable to get the participants to give reason for their responses where they can. Wherever possible try to get them to suggest what underlying values they are appealing to. This will require some active facilitation but we have used this very successfully on several other projects as UB.
3. Participants may draw on values that are not on our list and it would be valuable for them to explain what these are – it's not important that they put names to these values – it's fine for them to be described.
4. It is desirable for participants to address any apparent differences in their responses to the different scenarios. Draw out where possible what this says about how different

values are prioritised in different scenarios and why, and draw attention to any inconsistencies asking the participants to discuss these.

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