

14 The role of Ambient Intelligence in the Social Integration of the Elderly

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Abstract. Society is facing the challenge of demographic changes resulting in a larger proportion of older people. ICTs, may potentially mitigate some of the difficulties created by an ageing society. It can help people not only to live longer, but can also give them more years of health and independence. AmI has the potential to keep these future generations of -digitally literate- elderly people socially linked to networks of relatives, carers and friends. Service incorporating AmI applications may help promote independent living (smart houses, adapted transportation systems, etc) and AmI-based assistive technologies (including detection of changes in behavioural patterns) may help people to live autonomously for longer and more safely. The enhanced communication services will promote new ways of socialising, countering the perceived trend for ICTs to lead to an increased personalisation of services, and therefore to a society ever more prone to individualism. This chapter describes how AmI technologies could provide an ageing population with new opportunities for sociability. This is illustrated through a plausible scenario referred to here as ‘sunny retirement’.

Contents

14.1	Introduction: Ambient Intelligence and the Demographic Transition in Europe.....	268
14.2	Measuring social capital.....	269
14.3	Active Ageing.....	270
14.4	Disabilities.....	271
14.5	AmI and end-of-life care.....	272
14.6	Individualism.....	273
14.7	Robots and AmI.....	273
14.8	Scenario.....	274
14.9	Conclusions.....	281
14.10	Acknowledgements.....	282
	References.....	282

14.1 Introduction: Ambient Intelligence and the Demographic Transition in Europe

The progressive ageing of society already apparent in Europe is likely to become even more pronounced over the next two decades. These demographic changes represent a major challenge for governments and for society as a whole, and are compounded by a series of other pressures (e.g. budgetary restraint, the rising cost of medical technologies, etc.) that will force change upon the health and social care systems. Projections based on current trends indicate both a larger proportion of retired people in society and larger numbers of the extremely elderly (octogenarians and older). This will be accompanied by a higher incidence of chronic age-related diseases and the consequent dependency problems.

More research is likely to be conducted focusing on the concerns of the aged. Increasing mental agility and decreasing age-related memory loss, treating and preventing cancers and cardiovascular diseases, for instance, are likely to receive greater attention.



Figure 14.1 Healthy and independent ageing

ICTs can potentially enable the elderly to remain socially linked to networks of relatives, caregivers and friends. Thus, although they are already making new lifestyles possible, it is widely believed that a new era of ICT-driven social change is only just beginning. One current trend, for instance, is in the marked increase in the number of ‘weak ties’¹ made possible by the Internet. This is already benefiting many sections of the population, and to some extent contradicts previous assumptions that ICTs would cause an impoverishment of social relationships and a loosening of the bonds of community and civil society. Virtual communities that have grown up around disease support groups are an example of such an effect. Over the next decade or so, as the so-called baby-boomers retire, they are expected to boost the demand for various services in wealthy western countries (such as health, leisure, transport, home delivery, etc). At the same time health,

¹ Sociologists usually refer to *strong ties* as connections with emotionally close persons, such as close family and friends, whilst *weak ties* are established with emotionally distant persons, e.g. acquaintances or those connections developed online. The importance of weak ties has already been stressed by Granovetter in 1982 in his article “The strength of Weak Ties”, as they enable people to seek out new resources. In an ambient intelligence paradigm, an unparalleled number of social ties could be created for people needing social support resources, such as the elderly.

an absolute priority for Europeans, is very likely to remain so due to the continued and rapid ageing of European society.

“Ambient Intelligence”² (AmI) represents a new technological paradigm based on technologies that in some instances may represent disruptive innovations. This paradigm shift – in society as well as computing – will go hand in hand with “human-centred computing”, where the emphasis is on user-friendliness, efficient and distributed service support, user-empowerment, and support for human interactions [1]. AmI may lead to new forms of connectivity and collective interest building, something that may be highly beneficial in enabling social groups struggling on limited resources to achieve their specific goals. Thus, future generations of elderly people may benefit from applications dramatically different from those available today. This may be the case of the elderly using advanced, user friendly, secure and privacy-enhanced ICT-based services for health-care and for disease prevention and, importantly, their lives can be enriched by new forms of self-care and inter-care (i.e. care provided by the elderly themselves), while the potential for sociability will allow them new, selectively chosen social relationships and therefore life-enhancing resources. Ambient Intelligence can provide a range of opportunities to support an ageing population: enabling the containment of the overall costs of care; remote monitoring of activity and physical well being (including smart clothing); adaptive interfaces for people with physical disabilities; and a responsive and proactive environment (rather than simply a collection of devices) which enables easy communication with healthcare professionals, friends, family and the wider community³. Services that promote independent living (smart houses, adapted transportation systems, etc) and assistive technologies (including detection of changes in behavioural patterns), based on AmI-like ICT solutions, can help people to live independently for longer and in greater safety. The deployment of AmI applications in these circumstances counters the assumption that their deployment leads to a society even more prone to individualism⁴.

14.2 Measuring social capital

One of the transformations likely to be brought about by the ageing of society is the reorganisation of social ties within the context of expanding cohorts of aged citizens. In conjunction with the widespread deployment of ambient intelligence this trend could lead to a reshaping of civil society characterised by new forms of communication and solidarity.

Trends in family structures (e.g. declining birth rates, tendency towards families with fewer members, like single-parent or without children rather than extended families, etc.) have already resulted lack of informal caregivers (i.e. informal support from families, friends and neighbours), and this is likely to continue in the future. These trends run in parallel with the current debate on the evolution of civil society as Ambient Intelligence takes shape. This debate, which has risen in the context of discussions on social capital, is commonly characterised as centring on the ‘empowerment vs. balkanisation’ of civil society. On one view, it is assumed that ICTs will empower civil society, giving new

² “People will be surrounded by intelligent intuitive interfaces embedded in everyday objects around us and an environment recognizing and responding to the presence of individuals in an invisible way” (ISTAG’s vision, 1999)

³ ISTAG, <http://www.codis.lu/ist/istag.htm>

⁴ Individualism refers to the trend opposed to sociability. Hence, less sociability would mean more individualism. Traditionally opposed to holism and collectivism, individualism emerges in modern information societies as a philosophy of life stressing the priority of the needs of the individual needs over those of the group, a preference for loose social relationships, and a desire to be relatively independent of others’ influence (<http://www.socialpolicy.ca>).

impetus to attempts at building a community, establishing relationships between people, and helping provide the basis for a 'glocal' (i.e. simultaneously global and local) civil society. The alternative view, however, is that ICTs will lead to an impoverishment of social relations and to an overall decline in civil society, as characterised by Putnam's notion of people 'bowling alone' [2].

The AmI paradigm could favour the first scenario, by supplementing and strengthening civil society's social capital⁵ (civic involvement), including the new forms of sociability and care delivery, thus leading to more and better social support. In fact, social networks⁶ and social support are closely related. Putnam [3] argues that social networks involve, almost by definition, mutual obligations or social support since they are of little value as mere contacts. The potential for building social networks (understood as the defining structural element of a community), based on ambient intelligence technologies, will come to the fore in the ageing society, since social support will be a high priority for many individuals. In the case of elderly groups, health status firmly depends on such social support. The question as to why some people or communities live healthier lives than others is a more complex issue than it might seem at first glance and requires an examination of the various interrelated factors that determine the health of both individuals and populations. These factors include biology and genetics, physical environments, education, income, gender, social environments, etc. and it is clearly recognised that the determinants of health are not only individual (conversely, nor are they solely environmental or community related). While emphasising the social dimensions of life and how it is lived in specific places and by different groups is a major advantage of taking the social capital notion for evaluation, it appears to be that the more social capital there is in a community, the better that community is for everyone's health [4]. Measuring social capital can therefore help in understanding the strengths and weaknesses of introducing AmI in particular contexts, such as among groups of elderly people, and thus learn if AmI technologies, therefore, could mitigate some of the problems likely to be faced by an ageing society.

14.3 Active Ageing

'Active ageing' is the term adopted by the World Health Organisation to express the process of achieving a vision where ageing, if it is to be a positive experience, needs to be accompanied by continuous opportunities for health, participation and security in order to enhance people's quality of life as they age. The word 'active' refers to continuing participation in social, economic, cultural, spiritual and civic affairs, not just the ability to be physically active or to participate in the labour force. Older people who retire from work and those who are ill or live with disabilities can remain active contributors to their families, peers, communities and nations^{7,8}. But what seems likely is that people will retire

⁵ Social capital expresses the characteristics of the social environment in which people live that can contribute or detract from the health of a community. Generally, the more social capital there is in a community, the better that community is for everyone. Five elements tend to make up the social capital of a community: social relationships, social networks, social norms and values, trust, and resources, [4].

⁶ In the literature, there has recently been a shift from the concept of geographic area to social networks in the definition of community ([7] and [8]), this suggests that networks have replaced locality as the basis for sociability and common identity.

⁷ <http://www.who.int/hpr/ageing/ActiveAgeingPolicyFrame.pdf>

⁸ The promotion of 'active ageing' is also a political priority at European level for 2004: see Commission sets priorities for catching up with Lisbon agenda at http://europa.eu.int/rapid/start/cgi/guesten.ksh?p_action.getfile=gf&doc=IP/04/74|0|RAPID&lg=EN&type=PDF ("Promoting active ageing by encouraging older workers to remain in the workforce, particularly by

later and will be more active after retirement, despite the fact that this is the exact reverse of the trend over the last three decades. If retirement is postponed, then some ageing people may find it difficult to cope with the demands of a changing working life in the information society [5]. Trends in e-working (teleworking from home, and also remote and multi-locational work in general), offers examples of some difficulties that already arise, as for instance, many teleworkers nowadays seem to use the time saved by not commuting (and more) to do more work. On the other hand, the clear trend towards homes becoming a prime working environment in the ambient intelligence landscape (i.e. the ISTAG FP6 vision of an "ambient intelligence landscape for seamless delivery of services and applications in Europe") could enable many older workers to enjoy the convenience and flexibility this allows, and it could facilitate a smooth transition towards their definitive or partial retirement. In addition, for active citizens looking after old people, teleworking can help them reconcile their work and care activities.

14.4 Disabilities

*“As long as we regard our disabilities as tragedies, we will be pitied.
As long as we feel ashamed of who we are, our lives will be regarded as useless.
As long as we remain silent, we will be told by others what to do”*
Adolf Ratzka, Chair of the Independent Living Institute, 2003
(<http://www.independentliving.org>)



Figure 14.2 Bamboo, symbol of strength through resilience

However much technology is able to mitigate them, age-related disabilities will continue to be associated with the final years of life. Although one can only speculate as to the stage in people's lives at which their health status can be expected to decline inexorably due to the ageing process –although this can be expected to start later and to be shorter-, current trends suggest that life spans will tend to increase, and that people will remain active and in good health for longer. Moreover, assistive technologies can help the elderly cope with the dependency inherent in ageing⁹. ICT-based assistive technologies can alleviate the burden of dependency by allowing people to live partially –or even totally- autonomously at home or in an assisted environment. Some examples already meriting the attention of researchers in the ICT industry include behavioural pattern monitoring systems, in which behaviour patterns of elderly subjects are monitored and any changes detected are reported to caregivers. Systems of this kind would allow anomalies that signal something is wrong to be spotted early. In a simple system being developed by Honeywell

abolishing financial incentives for early retirement. At the same time, the Member States should embark on the modernization of their health care systems, to make them more efficient and financially viable”)

⁹ By ‘dependency’ we mean here the conditions where a person needs assistance from others in order to live autonomously. Dependency ratios, differently, are demographic variables usually expressing proportions between people before retirement (currently 65 on average) and afterwards. In the EU this proportion was about 4:1 in the sixties, and will become 2:1 in 2040.

Laboratories, images of a person's daily activities are analysed by software and caregivers alerted in the event of an unexpected deviation from the pattern: "Motion in the bathroom and the opening of a pillbox, for example, would tell the computer that the person is taking medication. Activity in the kitchen would indicate the person is eating or drinking. Lack of these signals at certain times, or decreased activity overall, would suggest something is wrong; the computer would then make a telephone call with a simple reminder such as "take your pills" [6].

Research to analyse changes in behavioural patterns over time to provide early warning of age-related diseases (such as Alzheimer's or Parkinson's disease) is already being undertaken and it is foreseen that within a decade software efficient enough to spot early Parkinson's symptoms will be commercially available. However, once again, this raises concerns about the emergence of a 'surveillance society'. Other examples of existing assistive technologies appear to be traditional devices improved with ICT components and software. One such example is that of modern earphones¹⁰ which, either worn externally or embedded in the ear, are able to perform functions that go beyond to the traditional function of amplifying sound for the hard of hearing. These devices are potentially a mini-hub of wireless communications within a "body-area network", offering configurable capabilities and the ability to filter out noise or enhance the sound received from selected sources. The issue of interfaces is of particular relevance for their assistive potential.

Haptic interfaces, focusing on the sense of touch, have the potential to help the visually or kinetically impaired interact. Interestingly, there is a link with cyborgism¹¹ here, since the same devices could be used by people without particular hearing disabilities simply in order to enhance their normal capabilities. This leads to a debate, beyond the scope of this chapter, on the frontier between assistive technologies and cyborgism, with the ethical implications to which this may give rise.

14.5 AmI and end-of-life care

*"The dignity we seek in dying must be found in
the dignity with which we have lived our lives"*
Sherwin B. Nuland

In parallel with extending life spans is the growing proportion of people who die in hospital. This has been pointed to by sociologists as an indicator of the attempt to get death away from our lives in a culture that choose to ignore death or to deny it. As a result the medical, personal, emotional, and spiritual needs of the seriously ill are in some cases neglected, especially when the illness is lengthy, is incurable and the individual is old.

Even mourning tends to be glossed over in an attempt to reinforce this denial of death. Ambient Intelligence could represent an opportunity to bring death closer to life, not because of its potentialities to create more *humanised* services for the terminally ill—

¹⁰ <http://www.phonak.com>

¹¹ Technologies aimed at improving peoples bodies beyond their natural capacities, enhancement technologies, making *improvements upon what nature has provided*, what the psychiatrist Peter Kramer referred to as *Better than well*. Viagra, Botox and Prozac are recent examples of drugs that can be used with such aims. Some experiments are attempting to link the human nervous system to a computer, what puts forward individuality for serious questioning and, when the computer is part of a network, allows autonomy to be seriously compromised (See *Identity and Privacy Issues raised by Biomedical Implants*, in the special issue of the IPTS Report on Identity and Privacy, 2002, number 67, available at <http://www.jrc.es/home/report/english/articles/vol67/welcome.htm>, where the author, Kevin Warwick, who received himself an implant linking directly his nervous system and a computer and thence to the Internet, discusses relevant implications).

although this is a real possibility too- but mainly through its new capabilities for producing socialisation during the an individual's final years. As added value, if the elderly enjoy AmI-enabled socialisation, they are likely to find more opportunities for care, given the way it can enrich their network of ties (both in terms of number and, if the technologies are sufficiently intelligent, the quality of their relationships).

In most cases, no artefact, no video or holographic representations can replace the physical presence of one's family and loved ones, but they can nevertheless enrich the environment towards the end of life care in a context where the family is spread across the globe, whether death eventually takes place in a hospital or home setting. In our increasingly globalised world it is hard to predict how easy it will be to get physically closer in those final moments.

14.6 Individualism

Individualism is an increasingly important characteristic of societies in the developed world¹² and the vast majority of individuals in these societies are presented with an increasing range of opportunities to fulfil their individual aspirations. M. Castells termed this trend as the *rise of network individualism* [7], in which individuals build their networks on and off-line on the basis of values, interests, and projects. Many of the related analyses have focused on the Internet as the predominant tool for networking, with ongoing discussions mainly on its effects on communities [8]¹³. However, these analyses have mainly focused on (more or less) digitally included groups, the elderly being exactly one of the groups that are traditionally excluded from the information society.

Clearly sociability, understood as the individual's ability and need to engage in an appropriate range of social relationships and activities¹⁴, whether in their traditional or new forms (e.g. Internet/virtual communities) is a basic human need, and is, undoubtedly, an important factor in quality of life. Furthermore, a lack of, or inadequate sociability can even produce public concern when extreme cases surface. A sad, but illustrative, example is that of the heat wave that struck various parts of Europe in August 2003. What was in fact well known, if not widely acknowledged, became all too evident, namely that ever increasing numbers of elderly people are isolated, particularly in big cities. Only when large numbers of them died was society forced to wake up to the fact.

14.7 Robots and AmI

The question, "What kinds of relationships is it appropriate to have with machines?" has been explored in science fiction and in technophilosophy. But the sight of children and the elderly exchanging tenderness with robotic pets brings science fiction into everyday life and technophilosophy down to earth. In the end, the

¹² The Futures project (<http://futures.jrc.es>) discussed in-depth how individualism, together with diversity, mobility, choice, opportunity and risk, are describing a constant mutation of lifestyles in the EU -*Mosaic Living* or *Mosaic Society*-. The European integration and the enlargement of the European Union will add further components to the diversity of future lifestyles –e.g. the European citizenship, and the important number of northern citizens living their retirement at South- and subsequent patterns of social relationships in a context of inter-cultural cohabitation.

¹³ Wellman et al. [8], summarized proposals by analysts regarding three basic ways in which the Internet may affect community, namely decreasing, transforming and supplementing community.

¹⁴ Another common meaning of 'sociability' is as a personality trait (extroversion-introversion), and we note that examining the relation AmI-sociability (trait), and how can the former affect the latter can also be a relevant subject to study, albeit out of our scope (undesired subjective experiences, like fear, anxiety and panic, may be the countervailing effects in this case).

question is not just whether our children will come to love their toy robots more than their parents, but what will loving itself come to mean?

Sherry Turkle

<http://futurepositive.synearth.net/2002/11/13>

Robots may help to alleviate persistent problems that the elderly sometimes face due to their physical limitations. The main applications of robots will be to help handle physical objects in the home while performing activities of daily living. Robots could carry out tasks when actively commanded by users (voice or gesture commands, like carrying objects, managing laundry, doing the dishes or preparing a meal) or passively in the ambient space ('deciding' what is to be done, such as surface cleaning). Cognitive systems, affective computing, multimodal dialogue and artificial intelligence will become main components in robotics.

For people with certain types of physical disability, robotic walkers could help them get in and out of bed, have a shower and moving around. This kind of support could allow people to live more independently, and without a full-time assistant, increasing overall independence and permitting a greater degree of personal privacy.

Assistive robots may also find therapy-related applications. For example, in rehabilitation a robot could provide adjustable levels of guidance and assistance to make the right movements. Moreover, unlike human physiotherapy, the robot has the precision and patience to guide a patient through exactly the same movement thousands of times.

Another approach centres on computerised "care pets" supporting health while providing company and socialization. These pets can record their masters' vital signs and monitor response times to spoken questions, for instance, and raising alarms if those responses are abnormally long. Robots will not require so much upkeep as real pets and could support social stimulation in common places by attracting attention, or providing entertainment through specific games.

Robots in peer-to-peer human-robot interactions, were described by Fong et al. [9] in their survey of socially interactive robots as exhibiting 'human characteristics', such as 'expressing and/or perceiving emotions', communicating with high-level dialogue, and establishing/maintaining social relationships amongst others social competencies. They argued that social robots will assist in health care, rehabilitation, and therapy. But can human-robot relationships ever be an alternative option to human-human relationship for the elderly? For this to happen, merely developing techniques to allow robots participating in certain tasks will not suffice, even if ambient intelligence is present. In Turkle's words [10] "immersion in programmed worlds and relationships with digital creatures and robotic pets puts us in reassuring microworlds where the rules are clear. But never have we so needed the ability to think, so to speak, "ambivalently",...". When the sociability deficit can potentially be at its most intense during the final years of life, the related issue of the moral equivalence of people and machines raised. The Japanese, who have the world largest research programme on robotics, seem to have made their choice already.

14.8 Scenario

The scenario¹⁵ below attempts to illustrate how AmI technology could provide new opportunities for social support and thereby also increase the social capital of senior

¹⁵ Words of caution are worth to note while using scenarios. Scenarios describing possible futures, in general but also in relation to AmI, tend to portray ideal type users in a perfect world, seeming that only those that "succeed" in life are portrayed, often portraying 'ideal type user groups' and ignoring struggles, uncertainties and irregularities that are characteristic for everyday life as well. As a consequence, the technological aspects tend to be presented in an unproblematic manner [1].

communities. The scenario is based on the assumption that the AmI technological paradigm will be deployed (user-centric technologies, friendliness, unobtrusiveness, etc.), and that a certain level of interoperability of EU social and health care systems exists (for instance, as regards citizens' electronic healthcare records, very likely including genetic data).

14.8.1 Sunny retirement

2020. Pekka, 75, single, has decided to make a change in his life: he has opted for a 'sunny retirement' in southern Europe. He has severe breathing difficulties, and is looking for a beneficial place for his allergies. Leaving Oulu, Finland, will not prevent him from remaining in touch with his Finnish relatives and friends, or his doctor.

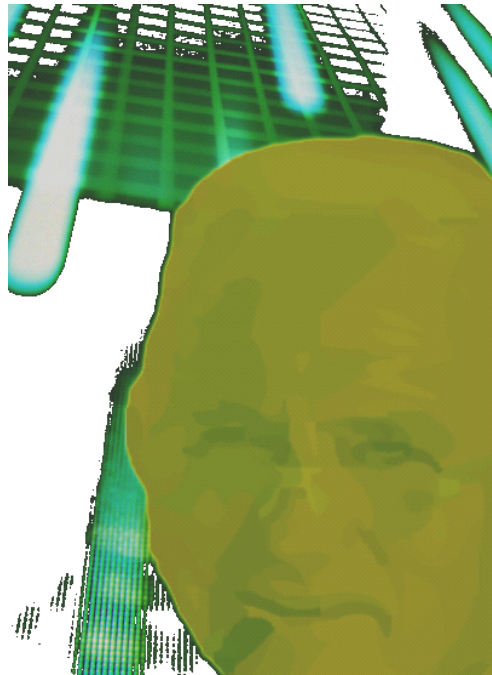


Figure 14.3 Pekka

The increasingly widespread trend to opt for a retirement in the sun seems set to continue over the medium term. Indeed, the 'sunny retirement' scenario described here is more than plausible as it is already happening. Many European retirees have already taken advantage of the freedom of mobility the EU allows to move south in search of milder climates, and this trend may well increase yet further in the future. Newcomers to host regions (typically retirees from northern Europe settling in Mediterranean areas) are confronted with a variety of lifestyle challenges and concerns about leaving behind their support system of family and friends built up over the course of a lifetime as well as their social and health-care facilities. In addition, in some areas specific property developments aimed at the retired are available. These retirement villages, however, are often affordable only to better-off pensioners and their ability to foster integration in the host community is somewhat debatable as they could even lead to a kind of ghetto-isation of new minority groups. It may suffice to think of the language issue to get an idea of the potential barriers to integration. It also might suffice to think of languages to guess the AmI potentialities for

facilitating social integration, like automatic speech translation facilities in post or bank offices, frequently used services and other venues where socialisation may be initiated¹⁶.

The current disparities in terms of information society development (the case of a Finnish retired citizen is taken for this reason, Finland is one of the leaders in terms of the information society) could of itself create considerable disruption in lifestyles, and hence reluctance to adopt 'sunny retirement' individual plans. Simply the lack of enhanced ICT services for guided transportation for elderly and disabled citizens, quite widespread in Scandinavian countries, can be perceived as an unacceptable loss of quality of life that even the delights of the sun cannot make up for.

It is worth noting that, traditionally, family caregivers (most of whom are women) have been a fundamental support in the care for the elder citizens in the European societies. But, while many trends are shared, there are marked cultural differences between countries.

Indeed, and reflecting this diversity, family policies vary dramatically across Europe¹⁷. For instance, in the case of care for the elderly/disabled, in the Scandinavian countries, the public obligation is explicit and support is aimed at the individual and not the family. It should come as no surprise that, with the growing number of Scandinavian retirees moving to southern Europe, this may influence regional policies in the south as well -these new settlers might well increase demand for customised care, such as eHealth services like telemedicine and telecare services offered either by local or remote providers-

In addition, future 'sunny retirement' entails the development of more civil society involvement, but also, and significantly, more political involvement from expatriates. This political involvement is now a reality at municipal level in some sunny corners (e.g. certain Mediterranean islands) with local representatives who are nationals of other European states.

14.8.2 Choosing a destination

When he decided to look for a house, the estate agent was able to locate the most appropriate property according to his weather preferences, his specific allergies and his purchasing power. Pekka carefully examined the options before him. The flat in Seville looked very suitable. The city had always had a particular charm for him and he fondly recollected a holiday spent there many years ago. He invited some friends to come and see the promotional video, admire the views, swap opinions on the neighbourhood, and admire the 3D representation of the apartment. One bedroom, one bathroom and a big living room with a kitchenette...it would be ample, he thought, and it is fully equipped with up-to-date communications and media facilities. His personal accounting system presented him with an idea of what he could afford and, after mulling it over for a while, he booked the apartment that very day.

Location systems¹⁸, which might be expected to act as a springboard for breakthroughs in a number of areas, including healthcare, may also play a role in the continuous assessment of environmental conditions. Systems of this type can be implemented to

¹⁶ Signing Avatars using deaf-mute language for post-offices in the UK are being tested in the project TESSA (<http://www.visicast.co.uk/index.htm>). Prototypes are also being tested for real time translation (speech-to-speech) and PDA versions are announced for English-Mandarin Chinese (selected because so many people speak them and also for their extremes of differences in linguistic parameters, including 'prosody', the meaning giving by inflection. Adaptation to European languages will then be feasible (Technology Review, Dec 2003).

¹⁷ See the Demographics and Social Trends panel of the Futures project (<http://futures.jrc.es>)

¹⁸ Galileo, GPS, combination of both with terrestrial systems...

provide precise location-related data on environmental characteristics of the earth's surface. An individual, simply by looking at his handheld device (or alerted when carrying an assistive devices) could find out about environmental conditions at a given set of coordinates and the potential implications for his or her health. The case of detectable allergens for asthma prevention is an illustrative example. Data gathered in this way for a given position can be analysed statistically and used to describe features of the location in question. A similar approach may be used to describe the characteristics of real estate on the property market. If detection of this kind (which may also be used to monitor noise, measurable pollution and other factors in air quality as well as allergens) becomes a public health issue for governments, powerful mechanisms are likely to be put in place that will not only have an impact on public health but will become conditioning factors for individuals' mobility, since they could determine where particular individuals could safely work or live. Real estate is an important market where these systems could have a big impact. Together with price, category, etc. the health and environmental information provided by services of this kind could become important factors people consider when choosing a home (whether to buy or rent), particularly retired Europeans choosing a possible home from a distance and conscious of their particular health needs.

14.8.3 Peers around

Pekka eventually plucked up the courage to activate the peer seeking service¹⁹, though he thought his decision was a bit ironic given his reluctance to use services of this kind. However, he finally felt vulnerable enough to seek some protection. It was a fortunate decision as his meeting with Manuel on a bus proved. After some brief hesitation, the latter greeted Pekka and asked how he was. They engaged in a rudimentary conversation with the help of a translation facility. They happened to be living in the same area – not really surprising, given they both have the same type of allergies. They agreed to meet one of these days. Two days after Pekka got up at the usual time. It was cloudy, but Pekka and Manuel were proposed to get in touch because the weather's forecast was for a sunny day and they both have walking among their leisure activities. They arranged to go for a walk.

Very closely related to the issue of interoperability and connectivity are the many ethical concerns that will have to be addressed, possibly upsetting the delicate balance between privacy and security, and leading to a degree of privacy being sacrificed. In fact, many people have pointed out that privacy in the AmI landscape may become a luxury for well-off minority, while the majority will have to make do with having to transmit information (without filtering) between their objects and the world. For instance, detailed activity records, necessary to follow up health status and provide preventive care, would constitute a serious privacy risk for many people using some kind of monitoring. Without taking it to the extreme, intelligent fridges ordering groceries, a well-trying example of what a smart house component can do for people (whether with restricted mobility or not) is an easy source of information for commercial profiling. Indeed, “the vision of ambient intelligence has the potential to create an invisible and comprehensive surveillance network, covering an unprecedented share of our public and private life” [11]. Many discussions on privacy

¹⁹ Self-supporting groups around health issues can activate online services that allow them to ‘discretely’ recognise each other in daily life via personal devices. Useful in the case of chronic diseases while travelling and, properly profiled, brings a kind of connivance. New *netiquettes* are used around this discreet recognition process.

in Ambient Intelligence are taking place in different forums, concerned with the multiple facets of privacy protection laws and moral norms.

14.8.4 Care-mates

Some time later, Pekka and Manuel have become care-mate members of their neighbourhood net. Care-mates are advised in the event of something going wrong for the other during the night (e.g. if one gets up and doesn't go back to bed²⁰). The network of care-mates offers proactive assistance in these cases and other services like accompanying members to the healthcare centre.

Pekka, having become a bit hard of hearing over the years, carries an internal earphone²¹. He finds his hearing aid very convenient to get information when travelling on public transport, though sometimes his friends tease him about looking so absent.

The applications of ambient intelligence technologies for remote monitoring (and for health in general) deserve special attention as the well being of the user may be highly dependent on the technology applied. Performance, dependability, robustness and durability issues are of crucial interest, much more so than in the case of games, communications or work applications. To be truly useful and actually used, the technology must fit both the user's and caregiver's needs [12]. Independent living services will vitally rely on those technological issues, which cannot be taken for granted when health and life are at stake.

Discussions about privacy have immediately raised 'big-brother' concerns and this has to some extent inhibited the industry from innovating in this area. Concerns about the 'spy' in the house are something of a conditioned reflex whenever a new monitoring system is announced. Apart from the empowerment and utility functions of privacy (e.g. information privacy, protection against nuisance), shared by ordinary citizens, the case of AmI might deserve particular attention in and elderly with respect to privacy its function of dignity.

Dignity, being worthy of esteem or respect, is a human right that can be easily violated in the case of vulnerable groups. Ageing with dignity [13] is a common concern on the part of aged persons in our societies (a lack of personal, emotional and spiritual resources for the elderly, particularly for the seriously ill, is not uncommon) and understandingly threats to privacy are of especial sensitiveness for those traditionally suffering from abuse in many parts of the world. "Dignity not only entails being free from unsubstantiated suspicion ... but also focuses on the *equilibrium* of information available between two people...", [11].

From this perspective, preserving privacy while using AmI technologies with monitoring and searching abilities will require filtering and the ability to disconnect the system intelligently.

14.8.5 Seniors e-Club

Since his decision to move, he has done his utmost to integrate himself into his host society. Experience has shown him that this should be a 'golden rule' of

²⁰ Behaviour pattern changes are used for these care giving activities.

²¹ As described above, assistive devices of this type, embedded or external, are designed to adapt themselves to the ambient acoustic conditions –e.g. they can filter out background noise-. Such devices could be exploited to enable wireless –or body- communication with other external or body devices, like handheld devices performing automatic translation or wrist emergency devices.

sunny retirement. The Seniors e-Club²² is a good way to relate with other Finns and local people (fortunately, the translation system helps while he learns a bit the language). Occasionally, he also chats or plays cards from home. This was a frequent social resource in the beginning, but now he prefers to go to the Club and meet people face to face. The club is such a nice place to eat with friends... And the restaurant there offers personalised menus according to particular diets and tastes. The menu suggests the available complements²³ with food that looks excellent and taste even better. In the evenings, his favourite activity is to participate in thematic chats, where he often watches a movie. From home, he does it with one or two friends from the Finnish e-club. In the evenings, he often chats from home with one or two friends from the Finnish e-club.

By definition AmI implies computers will disappear from the user's consciousness and recede into the background, and people's acceptance of their presence on these terms remains an open question. Bohn et al. [11] noted that widespread public acceptance of ambient intelligence rests on issues of an almost philosophical nature, such as the fundamental nature of smart objects or our changing relationship with our environment.

One major potential determinant of the acceptance of AmI is precisely its potential support social relationships (conversely, rejection will happen when they are inhibited). In the case of retirees living abroad, where social relationships can be vital for their quality of life, this seems to be clear. A sense of being overwhelmed by the technology and a sense of "technology-fatigue" are likely to set in otherwise. Additionally, and importantly, the right to keep away from technology –even with the consequences this may have for relationships in the worst cases–, will be part of any such acceptance.

14.8.6 e-Family life

When Pekka gets up on Sunday, the photo frame usually displays a new picture of his granddaughter that his son has just sent him. He video-chats with his sister and son while having breakfast. Pekka's niece joins them. While he is eating his biscuits, his granddaughter enters the conversation. She wants to show them some drawings she made at school and all of them talk for a while. The little girl has a holographic display²⁴ and she is staring at the biscuits. Pekka promises to cook some and send her a box. He can buy from home what he needs and comfortably and cook safely.²⁵

²² A Seniors e-Club should be seen as a virtual meeting point and a starting point for social activities where seniors are actively involved. Physical Seniors Clubs, "Foyers", will evolve offering communications facilities, so that seniors can get together virtually from home.

²³ Tracking of edible products is an emerging practice (with RFID labels), now for logistic purposes only, while at the same time consumer protection regulations tend to impose exhaustive listing of ingredients, composition, transgenic origin, etc. with public health objectives. This may in the future make it easier for allergy sufferers to avoid products that trigger their allergies. Again, crossing personal health data with external products for such prevention functions will raise concerns on personal data capture or disclosure.

²⁴ Holographic display can create a degree of anxiety (the inability to touch the object can result in frustration). However, children enjoy it very much –besides its representation functions, they find it playful-. Seniors usually have preference for 2-D representations.

²⁵ Shopping for groceries online is becoming an ordinary practice after some years of trust-building. Assisted cooking for elderly, including warning of fire or hazards, visual guiding of receipts steps and intelligent interruptions in case of momentary feeling of faintness are available in smart houses for the elderly, that can also be equipped with subtle mechanisms for comfort (like small variations of ambient temperature depending on activity levels).

Some authors suggest [1] that the “killer application” of the AmI may yet prove to be that which enables enhanced nurturing and socialisation of a virtual family. In the case of ‘sunny retirement’, retired elderly people living abroad could be enabled with AmI technologies to keep their family ties and/or making new ones. But if those elderly people are prime candidates for their particular needs of family links, the challenges to create e-family life where monitoring and surveillance is needed, can easily create new opportunities for so-called “border crossings” between what is public and private. Gary Marx, who identified four borders, argued that crossing any of these borders usually results in people’s feeling that their privacy has been invaded²⁶. Family members communicating online, for instance, could find out much more from each other because no profiling will be required in principle to communicate within the family. Information that could be deliberately hidden between members would now appear disclosed to other members of the family thereby facilitating a “border-crossing”. Elderly people might likely see a strong requirement to remain at their home and feeling that they are at home in privacy, i.e. that other family members are not intrusive just because they can by electronic means, and allow them to watch just in case of need. Furthermore, and elderly people –and public in general- could be demanding to switch off everything, as a means to fulfil their fundamental right to be unreachable, alone or in private with spouse or others or simply feel out of technology just as one might want to leave the phone off the hook and be accompanied only by the pet.

14.8.7 Contributing to community while remaining active

Pekka has had an enjoyable working life, especially during his recent years. Just when he had gained so much experience, professional skills and reputation that his retirement date seemed all too sudden. He used to work with mentally retarded kids, as a teacher in a primary school, and he has spent so many hours in social and teaching work that his retirement was felt as real loss in his professional environment and community. Now in Seville, he still gets calls from colleagues requesting professional advice. His former school is more than happy in granting him access to online information services and, on a volunteer basis, he participates in debates on teaching methods.

Furthermore, he is so experienced that gets some difficult cases for consultation, what leads him to some thorny feeling with respect to his professional status. In fact, with virtual reality and holographic representations, he can act as efficiently as if he were physically in Finland. However, he is not paid the same way...

ICTs can contribute to active ageing for retired people living abroad and willing to contribute to society. The loss of social capital is today a high price that society pays every time a citizen is forced to take retirement, with a clear loss of accrued knowledge and skills. An ageing society will not be able to afford such a loss. What this will also mean is that a balance will have to be struck allowing people to rest after passing their retirement age while at the same time allowing them to actively participate in socially productive activities (volunteer work, paid labour and care giving activities). Probably additional new

²⁶ Those categories are natural borders (e.g. walls, facial expressions...); social borders (e.g. social norms indicating expectations about confidentiality and privacy); spatial and/or temporal borders (conveying only different parts of our identity to different people); and ephemeral or transitory borders (e.g. information that go lost or are forgotten) (adapted from Punie, [1]).

forms of incentives will have to be thought up. But the advantages are not unilaterally for others, there is also increasing evidence that active living reduces the likelihood of premature death and that it also prolongs high quality survival up to the time of death.

Applications like those aiming at re-creating a work environment at home could contribute to stimulate active ageing while smoothly supporting relaxing conditions. Being useful to society is also being useful to oneself.

14.9 Conclusions

By way of a conclusion, the table below summarises social, economic and ethical implications or of the scenario:

Table 14.1 Implications of ‘sunny retirement’

	Social implications	Economic implications	Ethical implications
Choosing destination	Less ghetto-isation of newcomers More common relocation of local population	Rise in prices New factors for real estate market Insurance costs depending on co-ordinates of living place	More health divides More evident stigmatisation to employers’ eyes
Peers-around	Increased social capital, greater networks of social ties More targeted and Interest-based relationship (network individualism)	“Pay per filtering” business models (languages, profiling, devices...)	Privacy can become a luxury for well-off citizens only (data protection extremely difficult)
Care-mates	Increased social capital, inter-care Could replace professional care-givers to a more than desired extent	Savings for health and social care systems. Pay-per-care new business models for the active retired	Privacy can become a luxury for well-off citizens only (data protection extremely difficult)
e-Family	Promotion of ties keeping, even in cases of greater geographical dispersion Prevent social inclusion and allow easy health monitoring Risk of more lassitude to physically attend the elderly members	Savings for health and social care systems Transport costs saving	Border-crossing risks
Seniors e-Club	Increased social capital Risk of staying at home too much	Innovative business models for existing senior clubs or new virtual ones.	Risks of replacement of physical places by virtual ones, and therefore risks of exclusion in the event of a digital divide
Contributing to community while remaining active	Increased social capital Better health status of large part of the population	Savings for health and social care systems Economically productive activity Threat felt by non retired professionals	Remuneration vs. volunteer work. Old workers competing with young ones. Social rights protection to be re-thought

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