The impact of ICT on older people's living conditions and environment

Summary of the Final Report on Value Ageing WP3:

ICT Developments Impacting on Older People's Living Conditions and Environment

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1   Introduction

1.1   The purpose of the report

Well-designed ICT technologies have great potential to benefit older people by minimising some of the limitations that may be associated with ageing and improving their overall quality of life. By exploring the impact of ICT on older people's living conditions at home and in the community the main ethical and value related concerns can be identified and communicated to policy makers and technology developers to ensure that they are addressed in the technology development and implementation stages. This document presents a summary of the key results, outcomes and lessons from the Final Report developed for the VALUE AGEING Work Package 3 (WP3: ICT Developments Impacting on Older People's Living Condition and Environment). The full Final Report for WP3 provides a detailed account of all activities, outcomes and recommendations, while this summary aims to highlight the most important results and conclusions.

1.2   VALUE AGEING project and WP3

VALUE AGEING is EC FP7-funded Marie Curie Industry-Academia Partnerships and Pathways Action, which aims to foster collaboration between non-commercial and commercial entities on a joint research project about the incorporation of fundamental values in ICT for ageing. To achieve this objective, VALUE AGEING endeavours to deepen interdisciplinary research on the ethical, legal, social and human right implications of ICT for ageing, to effectively integrate and embed EU fundamental values in the development and deployment of new assistive technologies, while at the same time an opportune framework is set for researchers to receive exceptional and high-level specialisation, through continuous exchange of skills, competences, experiences and philosophies along the pathways of the project.

This report was produced on the basis of activities carried out in WP3. The overall goal of WP3 was to carry out comprehensive, interdisciplinary, and inter-sectoral analysis of the emerging social, demographic and epidemiological trends in ICT impacting on older people's living conditions and social environment, focusing on three technological application domains: home care and ambient living (including housing design and smart homes for elderly), social web for older citizens, and e-health and telemedicine. Four thematic reports were produced exploring business case studies; ethical and regulatory issues related to the social web for older citizens; ethical and policy implications of e-health and telemedicine; and human issues related to housing design for older people.

1.3   Key definitions and concepts

Living conditions and environment are considered to be a person's primary residence, be it their own home, sheltered accommodation or residential accommodation. In the report an **older person** is defined as someone who is over 60 years old. However, older people are not a homogeneous group and there are **significant differences between people classified as old** in terms of their age, physical and mental abilities, habits and values, levels of wealth and education, IT literacy and other. The recognition of these differences is crucial in defining the individual needs of older users that could be satisfied by ICT solutions.

2   The extent of impact of ICT on older people's living conditions and environment

The extent of ICT development impacting older people's living conditions at home and in the community can be considered from two perspectives: the extent of the adoption of ICT solutions by older people and the potential impact these solutions can have on people's lives, once adopted. Three different spheres of influence can be distinguished: cognitive function, physical function and social, cultural and emotional life. ICT solutions vary in terms of their impact, benefits and risks to older people's activities at home and in the wider community as well as in regard to their roles in the ageing process - they can help delay the effects of ageing, such as cognitive decline, assist in managing specific conditions, such as physical disability or dementia, or open up social, cultural and economic opportunities for older adults.

2.1   ICT and cognitive functions

The decline in cognitive functions due to ageing can create difficulties in daily living causing forgetfulness, decreased ability to perform certain activities and consequently lead to the loss of confidence, independence and decreased quality of life. It can also result in old age diseases, such as Alzheimer's disease or dementia. Maintaining cognitive health allows older people to live independently for longer, postponing, or in some cases, reducing the need for carers or being moved to residential care. ICT developments have a significant role to play in maintaining and improving cognitive abilities of older people (EC, 2010). Learning new skills, such as computer skills, requires cognitive effort, which in turn helps to stimulate cognitive abilities and functions. A range of computerised cognitive training exercises, such as Vital Mind or Lumosity[1], developed in recent years, are increasingly able to improve performance of the trained cognitive abilities (Ball, 2002; Willis, 2006) and create a higher sense of self-confidence and improve the quality of life. They also help to slow down the emergence of age related illnesses. Cognitive functions are also stimulated by web browsing, which activates key centres in the brain that control decision-making and complex reasoning (Small, 2009).

ICT solutions support older people who already experience the effects of decreased cognitive ability, such as forgetfulness. Through purposefully designed systems like HERMES[2], which provide users with assistance of prospective and retrospective memory and cognitive training. Another example is ScripTalk Station[3], which assists users in correct application of their medication. Everyday ICT devices, such as mobile phones, tablets or computers can also be set up to fulfil similar functions. However, the use of ICT applications needs to be carefully planned. There are some ICT solutions that could impact cognitive functions in a negative way if designed or applied inappropriately. An Ofcom report highlighted the risk of technology making people's abilities redundant by making people prematurely reliant on technology (Ofcom, 2010). One of the key risks associated with smart home technologies that are designed to 'do things for the user' is removing the user's need for thinking and decision-making (ActiveAge, 2010).

Safer walking technologies, including alarms and tracking devices are used to inform the carer that the user is outside the set boundary or track the movements of older user with memory problems

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[1] http://www.vitalmind-project.eu/; http://www.lumosity.com/
[2] http://www.fp7-hermes.eu/
[3] http://www.envisionamerica.com/products/scripability/scriptalk/

and particularly with 'wandering' tendencies. Although potentially beneficial for both, the user and the carer, the use of such technologies is feared to lead to the loss of civil liberties and privacy, as well as stigmatisation as such devices often have negative connotations. Issue of the user consent is also important in this context (Alzheimer's Society, 2013).

2.2   ICT and physical functions

Effects of physical decline associated with ageing can be delayed through adoption of healthy lifestyles involving physical exercise, appropriate dietary changes and reduction of risk factors, such as smoking or excessive weight. ICT developments have an evident role to play in preventing deterioration of physical abilities of older people by improving them and reducing risks of physical harm. They also support older people with limited physical abilities or disability. Developments in ICT solutions have offered more effective support to older people to participate in physical exercises through a range of different solutions, such as specifically designed Vital Mind, or mass produced game consoles like Wii and X Box Kinect (Social Care Institute for Excellence, 2012). Such applications allow for training exercises to be carried out at home and with friends if desired, and while doing so, the users receive instant feedback on their physical performance, which facilitates self-monitoring. Some systems, such as PAMAP[4], also allow the information to be recorded and analysed by medical professionals. Using fall alarm technologies, such as HIS Mambo[5], allows preventing complications, for example pneumonia, that may arise as a result of long period of immobility after the fall. E-health and telemedicine solutions, such as Health Buddy, HIS Intouch System[6], or Neurokeeper EEG Headset[7] are used to monitor the state of health of a user and alert medical professionals in case of negative change allowing for intervention to prevent further deterioration and in many cases, hospitalisation. They also empower a user to become more involved in the control and management of their own health by adjusting their behaviour.

ICT devices, such as exoskeleton CYBERDINE HAL-5[8], are used to support mobility needs of older people with long-term disabilities or in need of rehabilitation. They allow people who suffered stroke or spinal cord injury to walk again. They are likely to be used in the future as a support for workers performing strenuous physical tasks for long periods of time as a preventive measure. Sensors, remote controls and other smart home devices are also increasingly used to assist older people with limited physical functions in managing and controlling their daily activities. They enable residents to manage their environment remotely and have greater control of the access points to the house.

ICT technologies have a potential to help blind or visually impaired users to navigate to and from a specific point (ALICE[9]), enable older users to confidently and safely use public transport (ASSISTANT[10]), assist older people with memory problems in returning to a familiar location (CONFIDENCE[11]), support elderly people with age-related sensory or cognitive impairments in their

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daily activities away from home (E-MOSION[12]), or facilitate safe and secure mobility of seniors with mild cognitive impairments (MYGUARDIAN[13]).

Despite visible benefits there are also potential risks associated with unwarranted application of ICT solutions. With an increased uptake of telemedicine solutions, people's homes can gradually change from a place of rest and relaxation into a health centre potentially leading to over-sensitivity around their health causing anxiety and stress. Another potentially negative effect of such transformation could be a change in long-established behaviour to 'listen to one's body' in favour of relying on quantitative data. Another risk is associated with people who have no or very limited skills and understanding of ICT, who through changes in the healthcare model may find themselves surrounded by technology that they do not understand or trust leading to a feeling of confinement. The use of remote controls and other smart home solutions by people with good physical abilities can have negative impact on their general physical health, as it can reduce the need for small movements leading to lesser physical activity and consequently quicker physical decline (Value Ageing, 2012).

2.3   ICT and social and emotional life and self-development

Older people are particularly exposed to depression, which is often caused by loneliness, exclusion, feeling of being redundant and can lead to hastened physical decline and the loss of independence and serious health conditions (Pennix, 1998; Callahan, 2005; Everson-Rose, 2005). Emotional well-being is therefore paramount for slowing down of the physical decline and facilitating *ageing well*.

ICT solutions have become more fundamental in everyday lives and now influence living conditions of older people by facilitating an interaction with family, friends and new acquaintances on daily basis, often virtually bringing them into one room. The rapid development of social media in recent years has provided older users with additional space to engage in discussions on forums and chat rooms and pursue their hobbies and interests. Consequently this can improve their quality of life as it expands their social interaction and connections beyond the limited physical presence. The positive impact of these opportunities is, however, offset by low levels of computer literacy amongst older people as well as the vulnerability of the older people towards e-accessibility and e-security issues. Projects, such as Eldy[14], attempt to address these issues by producing easy to use, intuitive platforms that enable older users to use email, surf the web, chat and establish virtual presence.

Safety and security, important aspects of emotional well-being, have become central to a number of ICT technologies allowing users to call for help in emergency situations as well as detect falls. Such technologies enable older people to feel more secure and lead independent lives, both at home and in the community. Companion robots, for example, assist elderly with daily physical activities as well as provide social interaction, especially for people living in isolated and sparsely populated areas. Mental commitment robots, such as Paro[15], alleviate some of the symptoms of Alzheimer's disease by helping to reduce stress levels and incite mood shift (AIST, 2013). Newer companion robots have also additional functions, i.e. patient monitoring, falls detection, medication reminders, or video and voice communication (Rose, 2005). Although benefits of companion robots can be significant,

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[12] http://www.aal-europe.eu/projects/e-mosion/
[13] http://www.aal-europe.eu/projects/myguardian/
[14] http://www.eldy.eu/
[15] http://gizmodo.com/379052/paro-the-5000-therapeutic-seal-now-available-in-america; http://www.aist.go.jp/aist_e/latest_research/2006/20060213/20060213.html

reliance only on a machine for social interaction may discourage a person's enthusiasm to interact with the external world, decrease self-respect and cause feelings of embarrassment.

Due to their flexibility and potential to minimise physical distance, ICT solutions create many new opportunities for people in areas of work, education, entertainment and leisure, where such opportunities may not have existed before. By increasing older and disabled people's access to work and education they facilitate the increase in financial independence and improvement in self-esteem (Ofcom, 2010) while at the same time allow the society to recognise the value of older people as human capital.

E-health and telemedicine, although very beneficial from a physical and psychological point of view, pose risks for emotional well-being. Replacing face-to-face contact between an elderly patient and their medical professional by a remote connection can result in deepened social isolation and feeling of exclusion and disconnection.

While there is no doubt that ICT solutions have a very positive and in many cases transformative impact on older people's living conditions, most of risks associated with their application appear to be related to their impact on the emotional and social sphere. More research exploring the impact of ICT on older people's emotional and social life is required to better understand this matter and ensure that risks associated with it are minimised.

2.4   Adoption of ICT solutions by older people

According to Eurostat (Seybert, 2011) 25% of people aged 16 to 74 in the EU had never used the internet. In 2012[16], individuals aged between 55 and 64, 40% never used the internet and amongst those aged between 65 and 74 it was 63%. In terms of computer skills, 16% of individuals aged 55 to 64 could perform 1-2 computer related activities while in the group aged 65 to 74, only 12% could perform 1-2 computer related activities. The involvement in social networks amongst older people is also low – in the USA only 7% of those aged 65 and over has a profile on an online social network (Senior Journal , 2009). Given the current low level of use of computers and internet amongst older people, the extent of the impact of ICT technologies on their living conditions is set to be low. Yet, as the number of older people using ICT technologies is continuously growing ICT will influence their living conditions in the future to a much greater extent.

2% of people aged 75 and over use the WiiFit as a way to keep fit while in the group of over 50 year olds that percentage doubled[17]. Also, in the same group one in ten people use electronic brain-training games to maintain mental fitness (SAGA, 2011). The uptake of other ICT technologies, such as telemedicine and smart home solutions, amongst older people is even smaller, although it is set to rise more rapidly as these solutions become more embedded in the care systems for elderly people.

The factors underlying the level of adoption of ICT technologies amongst older people are related to older adults' computer skills and the availability of training to enhance such skills. Research has suggested that the presence of children or grandchildren may assist and encourage the adoption of technology and provide access to hardware and broadband, which may be influenced by financial constraints or service availability. For some solutions more personal factors may be at play, e.g.

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[16] Data taken from the online Eurostat database, accessed on 6th March 2013.
[17] Saga is an online resource for older adults in the UK. The findings may not be representative as the sample was chosen from the users of Saga portal, which implies certain exposure to ICT technologies amongst interviewees.

having a need for technological solutions, willingness to learn necessary skills, previous experience with technology or acceptability of ICT solutions. Personal values and attitudes are often linked to the lack of confidence in one's ability to learn, negative experiences, privacy concerns or lack of a clear understanding of the benefits as well as the disadvantages.

Carers, both formal and informal, may also influence the level of adoption of ICT solutions. In situations where older person has diminished capacity but informed consent is needed, they often become decision-makers responsible for the adoption of technological solutions. Often carers teach older people the required ICT skills as well as become advocates for the adoption of ICT solutions. In some situations they may also create barriers for the technology adoption. Carers are also potential beneficiaries of ICT solutions. Such solutions may reduce pressure on the care giver or assist them in some tasks, become a source of information related to giving care of specific condition of the person cared for, provide tools for care coordination and facilitate access to personal support or social engagement with other carers (EC, 2011).

2.5   Financial implications of ICT for older people's living conditions

ICT solutions have an important role to play in extending the time older people can live independently, and therefore significantly decreasing the financial burden on them, their families or state. By keeping their mind active through cognitive training exercises an older person can postpone the need for a carer or a nursing home, and consequently save the expenses ranging from €120 to €1000 per week (Value Ageing, 2011). Even greater savings can be made with telemedicine - analysis of three programs using telemedicine solutions to manage patients affected by heart failure resulted in a decrease in hospitalisations and emergency room visits and the reduction of average annual costs from $11,459 to $3,263 (Darkins, 2008).

However, purchasing ICT solutions also constitutes a cost that for some older people, especially those with low incomes, may be prohibitive. For example, the cost of HIS Mambo 2 (a fall alarm device) is €616, excluding small costs of maintenance and the costs related to GSM service. The price of companion robots can reach as much as $5000 as in the case of Paro, a mental commitment robot. Also, as there is no mass market for Smart Home technology, for example in the UK, prices for both new built and retro-fitted integrated intelligent home technologies are high (Pragnell, Spence, & Moore, 2000). The smart home installations are at least approx. €4000 more expensive than traditional installations (Smart Home EU, 2009).

As governments recognise the important role of ICT solutions in facilitating *ageing well* they are likely to increase their financial support for innovation processes in this area. The question arises whether such funding benefits all older people, or perhaps is used to benefit only small sections of that age group. It is easy to imagine situations in which only certain sectors of society benefit from ICT developments, such as smart homes, assistive robots or anti fall devices, while at the same time such solutions have no impact on the older people with low incomes due to high price tags attached to many of the devices and systems or limited usability for their needs. This issue impacts social justice as governments and public bodies have a duty to use their resources for the benefit of all citizens, and especially those in vulnerable positions.

3   ICT as a resource for ageing well

3.1   The concept of 'ageing well'

The use of ICT to improve human living conditions should always be derived by a well-defined need and clear objectives. Hence, the role ICT plays in improving the lives of the ageing population needs to be analysed with reference to the notion and meaning of *ageing well*. Despite the increasing emphasis on *ageing well* in the context of policy discussions and formulation, an operational definition of *ageing well* has not been agreed so far (Value Ageing, 2013). In the academic literature and various policy documents ageing is being referred to in terms of: successful ageing, productive ageing, active ageing, healthy ageing, and finally, ageing well. Some authors see *ageing well* as synonymous with *successful ageing* (Fernandez-Ballesteros, 2010) or *healthy ageing* (Li-Weng Hung, 2010).

Kendig & Browning (2011) define *ageing well* as "*continued independence with good self-rated health and psychological well-being*". The Action Plan on Ageing Well in the Information Society (European Commission, 2007) defines *ageing well* in relation to three particular contexts:

- Ageing well at work, as "*staying active and productive for longer while experiencing better quality of work and work-life balance*".
- Ageing well in the community, as "*staying socially active and creative, improving quality of life and decreasing social isolation*".
- Ageing well at home, as "*enjoying a healthier and higher quality of daily life for longer, assisted by technology, while maintaining a high degree of independence, autonomy and dignity*".

Usually *ageing well* is discussed in regard to concepts underlying it. Harding (2012) states that *ageing well* can be described by looking at inter-relationships between health, quality of life, age, adaptability and resilience. In Harding's view, ageing well is a process of identifying and managing potential and likely change. Li-Wen Hung et al. (2010) analysed 34 studies exploring the concepts of *successful* and *healthy ageing* or *ageing well*. Analysis of these studies, representing academic and older people perspectives, identified twelve key domains for healthy or successful ageing or ageing well: physical function, mental function, social function, independence, happiness and wellbeing, life satisfaction, longevity, family, adaptation, financial security, personal growth and spirituality. Older people's perceptions of successful ageing included many more domains and were more comprehensive in contrast to the academic views. Academics and researchers mainly focused on domains, such as physical function, mental function, social function and longevity, while most studies with older people indicated the importance of physical function, independence, social function, happiness and wellbeing, life satisfaction, mental function, family and adaptation.

The review of the *ageing well* concept from perspectives of different stakeholders confirms the views of Fernández-Ballestros et al. (2008), who argue that *ageing well* must be considered as an interdisciplinary subject of inquiry and a multidimensional concept. Building on this review it is concluded that the definition of *ageing well* should capture the following notions:

- Ageing is a process that results in a range of changes that need to be managed and adapted to in order for ageing to be a positive experience.
- Ageing affects all aspects of a person's life, including related values and subjective areas such as happiness, family or spirituality, therefore, they need to be clearly articulated and referred too.

- Ageing has a spatial context that relates to ageing in place, be it in one's home, the community, or a place that a person strongly identifies with.

Taking the above notions into account and with a view of using this definition to consider ICT as a resource for *ageing well*, the following definition, which was developed by the Value Ageing project partners through collaboration between different packages, is proposed for the use in the project documents:

"Ageing well is an on-going process that enables an individual to successfully manage and embrace changes resulting from ageing, either by oneself or with the support of others and/or technology, and which impact all areas of one's life. Specific areas should include but not be restricted to: physical, mental and social functions, well-being and quality of life, independence, dignity, safety, active engagement in society including economic and cultural participation, financial security, living conditions and family life, personal growth, and spirituality."

3.2 ICT as a resource for *ageing well*

ICT technologies are a rich resource for identifying, managing and embracing changes arising from the ageing process. The development of the internet provides access to large quantities of information, an essential resource for *ageing well*, and facilitates direct knowledge exchange between people. According to Eurostat, in 2011, 56% people aged between 55 and 74 used the internet to search for health related information, be it in relation to specific conditions or injuries, dietary advice, or general information on improving health and well-being. While the benefits are clear, risks exist in relation to information accuracy, consistency and completeness, as well as data privacy in the context of information exchange.

The Internet is also an important source of information on other aspects of ageing, such as various services available to older people and their carers[18]. Many seniors use it to access public services and carry out commercial activities. In this context, risks of privacy breaches and fraud are important to consider. Although older people show more responsible behaviour in the virtual world in comparison to their younger counterparts (Maaß, 2011) raising awareness and educating new and existing older users on how to maintain safety online is imperative, especially in regard to protecting their privacy and dealing with malware and fraud risks. Negative experiences can become a barrier in engaging with technology and lead to a fear of perceived threats of being online which could stop older users from fully benefiting from the internet as a resource (Milner, 2012).

Internet based communication technologies, except facilitating social interactions, can also assist older people in re-entering spheres of work and education more easily. Full retirement or significantly reduced working hours significantly alter older people's daily routines, financial situation or perception of oneself in a broader society. Staying active for longer through maintaining work activities and relationships and embarking on new paths, such as education courses, usually contributes positively to a person's well-being, life satisfaction, personal growth and potentially their financial situation. ICT is also a resource for leisure and entertainment, both through the internet as well as specifically designed devices, such as Vital Mind.

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[18] Examples include: http://www.ageuk.org.uk/; http://www.senior.pl/;

Although the internet is an important and versatile resource for *ageing well*, the low level of accessibility to the internet amongst older people is a significant barrier in its full utilisation. This is set to change in the future as the number of older people using the internet grows continuously.

The earlier discussion of ICT as a resource for *ageing well* shows clear positive impact of ICT devices, solutions and systems on many aspects of the ageing process: *physical*, *cognitive* and *social functions*, *well-being* and *quality of life*, *independence, dignity, active engagement in society, safety, economic participation*, and *living conditions and family life*. Perhaps, this role is somewhat less clear for other aspects, such as *personal growth* and *spirituality*, as these are often unique to a person. It is likely though that the improvements in other areas arising from the use of ICT can positively impact the less tangible spheres of one's life, while the negative experiences of engagement with technology can have an adverse influence.

To attest the potential of ICT as a resource for *ageing well*, the following attributes of ICT are considered:

- **'Appeal'**. Older people are considered to be much more discerning in regard to the way they view and use technology. The successful adoption of ICT is therefore strongly reliant on how effectively it is tuned to people's needs and abilities, and how well its benefits are communicated to older individuals (Kearney, 2012). Designers and technology developers need to ensure that older adults are not treated as a separate group of technology users, as that would reinforce ageist stereotypes, but recognise that many older users do not consider themselves old (Bendixen, 2012) and that there are many types of 'older people' whose needs cannot be met by 'one solution fits all' approach. Solutions should not only be functional but also aesthetically appealing.
- **Usability** is one of the key features impacting the extent to which ICT can become a resource for *ageing well*. Poorly designed technology is likely to create a lot of anxiety and frustration, weaken the willingness to explore and lead to restricted usage (Hosking, 2012), especially amongst users who may have very low confidence in their own ability (Huppert, 2012). To satisfy usability needs of older users, ICT devices and systems should provide an intuitive experience, employ a simple and meaningful language and fill them with confidence that they are in control. Foremost, they need to be highly relevant to their needs, so older adults will be willing to enter a learning path, often perceived by them as steep.
- **Accessibility** is related to access to necessary hardware, software and other devices as well as skills necessary to use them. Many older people lack the necessary skills to use ICT. Addressing the IT skills deficit should not only focus on technical skills needed to use computers and internet effectively, but should also include practical training on data security and privacy management. Additionally, there are many older people who would like to use the internet and are not afraid to use it, but they are not able to afford it (Milner, 2012). The proportions between the two groups are likely to change in the future – as the current technology users become 'older adults' the accessibility problem is likely to become more related to affordability than skills, especially with the lower pensions predicted for the future. Wider internet participation among the ageing population and individuals from disadvantaged backgrounds should be addressed by two-pronged empowerment: easy and free access to ICT equipment and a supportive network of people, who may be formal and informal carers, professionals working with the elderly, volunteers and relatives (ibid).
- The issue of technology **reliability** in this context is related to the perception of its reliability amongst older adults and need for contingency procedures in case of actual technology failure. A critical barrier that needs to be broken down is the fear of breaking devices, especially expensive items like computers (Wolff, 2012). Older peoples' resistance to change and a frequent assumption that to use computers one has to first fully understand how they work

combined with past experiences with unreliable technology may create a strong push against technology. Older people concerns about reliability of technology are even more pronounced in the case of telemedicine. Although it applies to all users, it is most profound amongst the older people who are likely to be frail and have less ability in managing their condition (D'Ambrosio, Reimer, & Prat, 2007). To improve this perception as well as to address potential failures contingency procedures need to be developed and communicated to the users for situations when device itself breaks down or supply of power or communication networks are interrupted.

- In regard to **affordability**, to make the internet provision more affordable for those older adults who wish to use it as well as those who would try it if the cost was more permissive, establishing low usage internet packages may become a viable option in addressing this barrier. A more difficult issue to tackle is providing access to cheap internet in remote areas or sparsely populated rural areas. Also, more inclusive design of mass produced ICT devices could make them more attractive to older users. Other issues of importance are: the distribution of costs associated with new healthcare and smart home technologies – who pays for what and in what proportions; and financing models for the purchase of expensive solutions, such as companion robots, exoskeletons or smart home features, for people that would significantly benefit from them.

4   Risks of isolation and confinement

Communication technologies significantly reduce the risk of isolation by facilitating contact with family, friends, colleagues and others. Mobility and security solutions support older people's participation in community, and leisure and social activities, while community based care centres for elderly create conditions for interactions with other residents. Also, the use of companion robots in isolated and sparsely populated areas can help to alleviate some of the social isolation effects.

Despite the visible benefits, the application of ICT technologies may also lead to further social isolation and confinement. Isolation may develop or increase as an effect of deployment of specific technologies, e.g. telehealth solutions may reduce the need for human interaction, or technology failing to meet certain requirements, e.g. overwhelming presence of technology may lead to confinement. The technology applications and systems need to be trusted, accepted, wanted, accessible and suit the users' needs. If these pre-requisites are not met people may become increasingly isolated because they fail to use the services, e.g. online public services, and because other methods of access to service may diminish, such as face-to-face services (Ofcom, 2010). Lack of access can also contribute to increased social isolation, especially, in cases where most people in one's social network have moved to the virtual environment.

Telehealth and telecare raise most concerns in regard to their potential for producing isolation. Installation of health monitoring devices at home and facility to substitute face-to-face consultations with remote consultations may lead to a reduction in human contact and increased isolation as well as the change in patient-medical professional relationship (Hanson & Percival, 2006; Ofcom, 2010; Zwijsen, Niemeije, & Hertogh, 2011). The role of human contact cannot be underestimated both in terms of emotional impact on the person as well as the role informal carers and the community have in spotting the difference in the mental and physical appearances of the person that may not be picked up by technology. The Social Care Institute for Excellence (European Commission, 2006) recommends that telecare must not be seen as an alternative to direct social care or informal support, but rather a way to meet low-level needs.

Telehealth and telecare, and other ICT solutions may also have impact on social behaviour of older people and their interaction with the outside world. A growing culture of fear to leave one's home due to perceived dangers in society may be further encouraged (Ofcom, 2010) as telehealth and other communication and online services enable a lifestyle where one does not need to leave their home to satisfy their needs, resulting in decreasing opportunities for human contact and potentially contributing to a voluntary confinement. People may also become over-dependent on health monitoring devices at home giving them a feeling of safety, which may lead to a reluctance to go out and leave the safety of their home behind (ibid).

Another risk for producing isolation is related to the role of carers in older peoples' lives. Formal and informal carers require a good understanding of the assisted living technologies, especially their usefulness and impact on the main user, as well as confidence in the dependability of systems and services. This is especially important for people with particular needs, such as dementia. Neglecting the needs of carers and alienating them with the use of smart home systems, for example by creating access barriers, can trigger more isolation for residents with particular needs (European Commission, 2006). Another issue that may be affected by the adoption of technology is personal responsibility. Research is required to address the question whether technology adoption alters the feeling of personal responsibility amongst the users and their carers.

From another perspective, the concern that telecare technology may increase social isolation may simply be futile. Currently, many older people are already somewhat isolated, and the introduction of new technology is unlikely to worsen their isolation, yet, it may improve their social connectedness (Ofcom, 2010).

The concern that telehealth solutions will decrease the level of human contact needs to be addressed not only at the design stage of technology and services associated with it, but even more importantly so, in its implementation. Gaining trust, acceptance, willingness and good understanding of accessibility and usability of such technology is very important for its users, their carers and other associated professionals.

Ultimately, ICT needs to be seen as a tool that connects people, provides alternatives or supports existing relations and not a technology that replaces personal relations. Therefore, any policy promoting the use of ICT for ageing should be underlined by this principle.

5 Is the EC definition of ageing well ethically and politically tenable?

The Action Plan on Ageing Well in the Information Society (European Commission, 2007) defines *ageing well* in relation to three particular contexts:

- Ageing well at work, as "*staying active and productive for longer while experiencing better quality of work and work-life balance*".
- Ageing well in the community, as "*staying socially active and creative, improving quality of life and decreasing social isolation*".
- Ageing well at home, as "*enjoying a healthier and higher quality of daily life for longer, assisted by technology, while maintaining a high degree of independence, autonomy and dignity*".

In this section, the different parts of the definition and its ethical and political tenability are considered.

5.1   The EC Ageing Well definition: considering the parts

The *ageing well at work* part of the definition places the emphasis on *older people staying active and productive* for longer in the work context. In recent years, most European countries have recognised that they need to offset the impact of the decreasing number of people in the productive age by extending the retirement age. Although, this is considered as necessary for the longer term future, it is not agreed on by all stakeholders. In the current economic climate, where the unemployment levels amongst young people are very high[19], this may be perceived by some as a way to keep older people working longer at the expense of the young. In fact, some politicians see early retirements as the way forward to address the problem of youth unemployment (Reuters, 2013). Although unemployment amongst older people in countries with high young people unemployment is usually higher than average (IZA, 2013), encouraging older people to stay active at work for longer and financing measures to facilitate that in a situation where resources are needed to tackle youth unemployment may create tensions. Framing and the communication of policies in this area need to promote intergenerational collaboration and views of older people as human capital that can bring different types of benefits to the society complementary to the capabilities of the younger people.

Many older people welcome an opportunity to work past their retirement age, yet being forced to work longer by legislation is not a welcomed development for many others, especially in countries where the average life expectancy is not much higher than the retirement age. The resistance towards increased retirement age relates to different factors – some people may feel they have worked all their life and deserve to enjoy their retired life for longer. Other concerns relate to the state of health of retirees, many of whom have already poor health at the time of retirement and they feel that working longer can shorten their life further, in some cases never allowing them to retire at all (Guz, 2010).

Another side of *ageing well at work* is about **equipping people** to stay working longer and in the conditions that are suitable for them. Unemployment is often higher amongst older people compared to other age groups (excluding young people) and older people, once unemployed, encounter more difficulties in finding a new job (GOV UK, 2013). Older people who engage with ICT and learn skills in this area are likely to have higher chances of gaining new employment if made redundant or increase general employment opportunities that may not be otherwise available to them. Many older people face significantly reduced incomes when they retire, ICT skills may enable them to generate additional income. This usually requires new work patterns and flexibility on behalf of employers to address the needs of their older employees (De Hert & Mantovani, 2010). Ability to stay active longer has also important social and personal benefits that can significantly contribute to person's well-being by extending social interaction and achieving personal satisfaction often linked to their professional life. Promoting a view of older people as human capital rather than a burden on society whether in the context of their paid work or voluntary activities is also important for their social participation. These aspects of *ageing well at work* are very positive and hence are highly tenable from an ethical point of view.

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[19] According to Eurostat, in the EU 23.7% of people aged under 25 remained unemployed in 2012 (http://www.bbc.co.uk/news/business-21180371). Highest youth unemployment at 55% was recorded in Spain and Greece.

The issues around **ageing well in the community,** defined as *staying socially active and creative, improving quality of life and decreasing social isolation,* are certainly less controversial if compared to *ageing well at work*, however, not free of risks. Information is one of the key enablers for ageing well in the community as it facilitates access to public and commercial services and is increasingly important for social participation (De Hert & Mantovani, 2010). The sources of information are being increasingly transferred to the virtual world creating the divide between those who can easily access it and those who cannot. One of the main risks associated with this transfer is that people, due to the lack of skills or access to devices, are likely to be left behind, deepening their exclusion. Reducing costs of the public services provision, at the heart of which lies the utilisation of ICT, is one of the key drivers for decision-makers, consequently there may be a temptation to reduce the extent of access to services through traditional, more expensive means, i.e. face to face services. This is likely to limit the access to information and services amongst older people and other vulnerable groups. Although this issue has been recognised and is being addressed through policy at the European levels, the tight budget pressures on the ground may compromise the implementation of the policy. The question that arises is whether this part of the definition applies to all older adults, or it favours those with ICT access and skills.

Ageing well in the community also requires a certain level of physical and soft infrastructure to enable it, such as easily accessible public transport or social care. ICT solutions can be adapted to improve or create new infrastructure provisions; however, at certain cost. In some instances, costs to provide necessary infrastructure may be very high, for example, for older people living in remote and less developed areas. This may create certain tensions at the political level, especially in times of economic downturn when resources are scarce and there are many competing agendas at play.

Ageing well at home is defined as *enjoying a healthier and higher quality of daily life for longer, assisted by technology, while maintaining a high degree of independence, autonomy and dignity*. The aim underlying the living independently at home notion is to provide social and health care to older people, while keeping these services financially sustainable, and potentially reducing costs. The delivery of efficient health care and independent living services is a social responsibility, which is certainly ethically tenable. It is also an opportunity to raise productivity, which is welcomed at a political level. Technological solutions can be integrated in formal and informal care, thus supporting the general need for social care (De Hert & Mantovani, 2010). The phrasing of the definition places certain emphasis on achieving healthier and higher quality of life with the assistance of technology. Following that, what are the implications for people who do not wish to adopt technologies for that purpose, for example they prefer to use traditional health care services? Will they be excluded in the longer term?

This part of the definition also places emphasis on values of independence, autonomy and dignity, which is certainly very tenable from the ethical point of view as it accentuates the importance of these values for older people.

5.2   Reflections on the full definition

Overall, at the first glance, the definition of *ageing well* appears to be ethically and politically tenable. Yet, after the deeper consideration of its parts and the whole definition, a number of questions/concerns arise that may impact the extent of its ethical and political tenability:

- Is the order in which ageing well is described – first at work, then in the community and at home – accidental or does it consciously or unconsciously reflect the priorities of politicians and decision-makers focused on keeping people working for longer?
- Would older people who cannot be or do not wish to *stay active and productive longer* and/or *socially active and creative* be marginalised as they do not fit with the standard definition of *ageing well*? The pressure on older people to stay active and productive may lead to stigmatisation of older people who are frail and/or less able.
- What is the actual relationship between ICT technology and the traditional ways of supporting *ageing well*? Is *ageing well* without technology still possible in this context? The definition refers to the specific role of technology only in the context of *ageing well at home*; however, its role is also important for the other two aspects.
- The tone of the definition seems to favour more active and capable older people, which suggests that the needs of older frail people are not fully reflected in this definition.
- The definition has a very aspirational undertone, yet does it reflect aspirations of all older people or perhaps mirrors ideals of some social groups more than others?

In the light of these concerns, it is difficult to recognise it as fully ethically and politically tenable. Especially as it may create a perceived negative impact on issues of social justice and has the potential to create political frictions around the *ageing well* at work concept.

6   Policy and regulatory gaps

The most pressing barrier for the adoption of ICT by older people is accessibility. This has been recognised and is being addressed by European policy through a number of policy areas: e-inclusion, active ageing, e-accessibility, e-government, independent living and social networks. The examination of the ICT developments in the context of older people's living conditions and environment led to the identification of a number of policy and regulatory gaps:

- **ICT accessibility for older people and those with disability**. Although the issue of accessibility of ICT solutions for older people and those with disability is gaining visibility, **stronger regulation** is required to support this issue.
- **Affordability of basic ICT infrastructure as a barrier for accessibility**. The policy focuses on the barriers for e-accessibility related mainly to skills, access to hardware, software and design. Much lesser emphasis seems to be given to issues of affordability of the basic infrastructure – broadband and computer hardware and software. However, this is an important issue for older people, especially those living alone on low incomes and those living in remote locations (broadband in such locations may be prohibitively expensive). Regulatory and policy provisions are required to address this issue as it is likely to become more profound in the future as pensions are likely to be lower than currently.
- **Online health information regulation**. Health information is one of the main types of information sought online by older users. While there are many reputable sources of health related information online that maintain high level of quality and reliability, there are also many sources that could be described as "questionable". While it is deemed impossible to control creation of content, a rating system for health information websites should be encouraged, implemented and communicated to users to equip them with ways to discern reputable sources from dubious.
- **Use of health information published online**. Many older, as well as younger, users share private information about their health issues on public websites, which can be accessed and utilised by researchers and commercial entities. A code of practice/regulation needs to be developed to address privacy concerns for such situations.

- **Carers and ICT solutions**. Carers are important part of an elderly person's ecosystem, providing care in a formal or informal capacity. Although their role is mentioned in some aspects of ICT and ageing, often their role is not given due consideration. While the educational policies target elderly, they rarely acknowledge and incorporate carers. Yet, their roles may include helping older people to learn skills, ensure that devices are used correctly, give consent and monitor their well-being in parallel to the ICT systems. Education of carers in regard to ICT issues should also become part of ICT for ageing strategy.

7   Conclusions and Recommendations

7.1   Conclusions

There is no doubt that ICT developments have vast potential to greatly improve older people's living conditions and environment. To fulfil that potential the use of ICT should always be derived from a well-defined need and clear objectives and be aligned to values of its users. The main conclusions for the questions posed in this document on the extent of impact of ICT on older people's living conditions and environment along with issues related to *ageing well* in this context are presented below.

To what extent is ICT development impacting older people's living conditions at home and in the community?

The ICT developments have potential to impact all areas of an older person's life, be it their physical and cognitive abilities or social, cultural and emotional life. Currently, the extent of such impact in reality varies significantly between different groups of older people, from basically no impact for most very old people living alone in remote rural areas with no or very poor ICT infrastructure to very significant for people living, for example, in assisted living homes where almost every aspect of their life is impacted by ICT technology. The extent of the impact is strongly linked to a person's age, education level, occupation, geographical location, class, skills and personal attitudes to learning and technology.

The policy-makers focus significant efforts on people affected by social exclusion due to a lack of skills or access to infrastructure, yet, to ensure that ICT development will have the desired role in older people's lives, stakeholders need also to address concerns related to affordability and having a feeling of control over technology use – in terms of how, when and to what extent.

To what extent could ICT become a resource to facilitate *ageing well* at home and in the community?

In this report *ageing well* was defined as *"an on-going process that enables an individual to successfully manage and embrace changes resulting from ageing, either by oneself or with the support of others and/or technology, and which impact all areas of one's life. Specific areas should include but not be restricted to: physical, mental and social functions, well-being and quality of life, independence, dignity, safety, active engagement in society including economic and cultural participation, financial security, living conditions and family life, personal growth, and spirituality."* In the context of this definition ICT solutions are an important resource in the process of identifying, managing and embracing such changes. Similarly like in the case of the impact of ICT developments on older people's living conditions, the extent to which ICT could become a resource for *ageing well* varies for different groups of older people and different types of ICT solutions.

The viability and extent to which ICT could become a resource for ageing well is closely linked to appeal, usability, reliability, accessibility and affordability of ICT solutions. To make ICT appealing to older people, the devices and services need to be tuned to their needs and abilities and also the benefits of such solutions clearly articulated. The ICT products and services should provide users with an intuitive experience, aesthetically pleasing design, feelings of confidence and being in control. Poorly designed technology is likely to undermine the readiness to explore new technologies leading to restricted use or no use at all. Similar effects can arise from the perception of technology reliability amongst older adults. For many of them the lack of understanding of how ICT devices work combined with the past exposure to breakable and unreliable technology may create significant resistance impacting upon adoption levels. This issue is particularly important for telemedicine technologies, where the trust in reliability of the devices and systems is essential for their adoption. Accessibility is placed high on the agenda of policy-makers, especially in the relation to skills and access to hardware and software amongst the disadvantaged groups, yet affordability, although closely linked to it, is somewhat less prominent, but none the less as important.

To what extent do ICT technologies run the risk to produce isolation and confinement?

Social isolation is one of the main concerns for older people, producing not only negative emotional effects, but in some cases also leading to depression and accelerated physical decline. ICT technologies have a capacity to reduce the risk of isolation by facilitating communication with relatives and friends as well as assisting in meeting new people through social networks and work and learning opportunities. They also have a potential to deepen social isolation and lead to exclusion. The loss of confidence in one's cognitive abilities and reduced willingness to engage with the outside world combined with an often exaggerated perception of dangers outside the home can lead to the development of a fear of going out. The adoption of ICT technologies may decrease the need to go out leading to reduced opportunities for social interaction. This concern is strongly associated with telemedicine and telecare technologies. By satisfying most medical needs through home based solutions, older people's opportunity for interaction with the outside world may be further diminished.

It is clear that the ICT technologies run the risk of producing or deepening social isolation, yet it is difficult to assess the extent of that risk. This is mainly due to the low level of adoption of such technologies at present. The fact remains that the risk of isolation exists regardless of technology adoption.

To what extent is the EC standard definition of "ageing well" ethically and politically tenable?

Overall, the definition can be deemed as ethically and politically tenable, as it paints a positive picture of *ageing well*. However, the formulation of normative statements used to describe *ageing well* at work, community and home, raise questions whether the definition is likely to apply to all older people equally, or favour some groups over others. It is also not clear in defining the role of technology in *ageing well*. The differentiation between three spheres of life also raises questions about the policy-makers priorities (*ageing well at work* being listed first). The *ageing well at work* part of the *ageing well* definition fits well with policy changes on the retirement age in most European countries, yet, it may not be very politically tenable at present, as many European countries are struggling with high youth unemployment levels. What is important and highly ethically tenable is the reference to values, such as independence, autonomy and dignity, in the context of *ageing well at home*.

A more neutral definition that does not differentiate between different aspects of people's lives and clarifies the role of technology could be more tenable, both ethically and politically.

Considerations for the future

Although this report does not address the future impacts of ICT on older people's living conditions and environment directly, a number of future perspectives have been drawn. In regard to the extent of the impact of ICT on lives of older people, it is likely to continuously increase in the future as more people attain ICT skills, new devices and solutions penetrate additional spheres of human activity, and new services, such as telehealth, become available on a mass scale. It is also likely that there will be groups of older people for whom the impact of such technologies will still be minimal. Such groups are likely to be affected by 'generational exclusion', lack of skills, affordability issues or conscious choices of opting out. Particularly, the issue of affordability may become more problematic than the lack of skills, as in the future, it is likely that many older people will have the necessary skills, but they may not be able to afford the ICT solutions. Currently, many older people, who are not considered disadvantaged by official statistics, already suffer poverty.

The profiles of older people are constantly changing, and the potential negative role of ICT technologies in creating social isolation may be counterbalanced by other ICT developments facilitating communication. Nonetheless, the risk that some ICT solutions combined with communication devices may significantly reduce the need to leave one's home creating other negative effects on one's life, be it physical, cognitive or emotional, is likely to remain. To ensure that these risks will not materialise it is necessary to view ICT technologies as part of a holistic care system for the elderly combining technology with a network of professional and informal carers with clearly defined roles and understanding of the entire system.

ICT solutions for ageing well need to be integrated closely within general ageing policies, particularly in areas of health and social care, to ensure that its development is closely aligned to the overall needs of the ageing society and their potential to support older people is fully realised.

7.2 Final Recommendations

The analysis of the impact of ICT on older people's living conditions and environment led to the identification of a set of recommendations for policy-makers, designers, technology providers, service operators and other stakeholders. Full set of recommendations is included in the final WP3 report. Here, the key recommendations are presented with indication to which groups they predominantly apply.

- **Policy.** Any new policy, regulation or law should respect people's freedom to choose to opt in or opt out from any technology based services, be it telemedicine or local governance services, without their fundamental rights being compromised.
- **Policy**. Just and transparent financial models should be developed for the adoption of fit for purpose ICT solutions that would ensure fair cost distribution between the users, providers and any other third parties involved.
- **Policy and regulation**. The adoption of ICT solutions to support ageing well needs to be integrated and closely aligned with overall ageing policies developed by nation states as part of their general health, social care and digital inclusion policies and programmes. Such policies should be created in collaboration with all actors and stakeholders influencing the "ecosystem" of an older person. Such policies should promote better coordination between health and social

care and implementation of ICT solutions should be strongly positioned within reorganised care structures.

- **Users/Law.** Younger people should be encouraged to consider their preferences for their later years in regard to the use of supporting services and technologies and record them in the form of "living wills". Such solutions, especially if legally valid, would help to fulfil older adults' wishes in cases where they develop dementia or Alzheimer's disease and their decision-making capacity is compromised.

- **Training**. To facilitate accessibility, seniors should be provided with the option of affordable, preferably free of charge, training of general computer skills and the correct use of social networking tools. Roles of different stakeholders, such as carers and employers, in the ICT training should be explored, defined and facilitated.

- **Design**. Usability needs to be ensured by design that incorporates diverse range of needs of heterogeneous older population, provides aesthetically pleasing and intuitive solutions that encourage an older user rather than promote a feeling of inadequacy. Older users should be a part of the design process in all its stages following the co-creation and co-design approaches.

- **Design**. The product design should be focused on promotion of design for all rather than niche solutions. The design phase of mass produced ICT products should consider how these products could be easily and cheaply adopted as products for older users.

- **Research**. Many of the ethical and regulatory issues associated with e-health and telemedicine are well documented, particularly privacy and data protection, informed consent, equity and accessibility. Further research is needed to consider less recognised implications, such as the risk of confinement, social isolation, the potential of a person's home becoming their health clinic, risks associated with quality of online professional practice and electronic health resources, regulation of online research with a view of protecting the privacy of contributions, and impact of ICT technology adoption on the user relationships and potential changes to personal responsibility.

- **Research**. To maximise the positive impact of ICT on ageing, a better understanding of the interaction between people and technology is required, therefore, research funding should be made available to investigate that interaction in real life situations where various ICT technologies are employed.

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