

ICT developments impacting on older people's living conditions and environment

Abdelmonem, M. G., & Krawczyk, E. (2013). ICT developments impacting on older people's living conditions and environment. Belfast: European Commission-Value Ageing.

Document Version:

Publisher's PDF, also known as Version of record

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DELIVERABLE D3.6.1

WP3 Final Report on ICT developments impacting on older people's living conditions and environment



VALUE AGEING



Project funded by the European Commission-FP7
Marie Curie Industry-Academia Partnerships and Pathways Action

Grant Agreement 251686

Start date of the project: 1 October 2010

Duration: 48 months

2nd Reporting Period

Deliverable:	D3.6.1
Title:	Final Report of WP3
Due date:	30.09.2013
Actual submission date:	12.12.2013
Lead contractor for this deliverable:	QUB
Contact:	Mohamed Gamal Abdelmonem
Dissemination Level:	PU

VALUE AGEING
WP3
FINAL REPORT OF WP3



12th December 2013

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	i
PART A.....	1
1 Introduction to Final Report of WP3	1
1.1 Goals and objectives of the project.....	1
1.2 Goals and objectives of WP3	2
1.3 Structure of this Final Report	2
2 Review of WP3 Reports – Partnerships and Pathways	3
2.1 VA D3.1: Overall problem definition and WP implementation.....	3
2.1.1 Objectives and work carried out.....	3
2.1.2 Key findings.....	4
2.1.3 Transfer of Knowledge and Skills	4
2.2 D3.2: Report on Business Case Studies	4
2.2.1 Objectives and work carried out.....	4
2.2.2 Key findings.....	5
2.2.3 Transfer of Knowledge and Skills	9
2.3 D3.3: Ethical and Regulatory Issues Related to Social Web for Older Citizens	9
2.3.1 Objectives and work carried out.....	9
2.3.2 Key findings.....	10
2.3.3 Transfer of Knowledge and Skills	13
2.4 D3.4: The Ethical and Policy Implications of E-health and Telemedicine.....	13
2.4.1 Objectives and work carried out.....	13
2.4.2 Key findings.....	14
2.4.3 Transfer of Knowledge and Skills	16
2.5 D3.5: Human Issues Related to Housing Design for Elderly and Smart Homes	16
2.5.1 Objectives and work carried out.....	16
2.5.2 Key findings.....	17
2.5.3 Transfer of Knowledge and Skills	22
PART B.....	24
3 WP3 Final Report on ICT developments impacting on older people’s living conditions and environment.....	24
3.1 The extent of impact of ICT on older people’s living conditions and environment	24
3.1.1 Impact of ICT on cognitive functions	25
3.1.2 Impact of ICT on physical functions	26
3.1.3 Impact of ICT on social and emotional life and self-development	28
3.1.4 Adoption of ICT solutions by older people	29
3.1.5 Financial implications of ICT for older people’s living conditions.....	31
3.2 ICT as a resource for ageing well	31
3.2.1 The concept of ‘ageing well’	31
3.2.2 ICT as a resource for <i>ageing well</i>	33
3.3 Risks of isolation and confinement.....	36
3.4 Is the EC definition of <i>ageing well</i> ethically and politically tenable?	38
3.4.1 The EC standard Ageing Well definition: considering the parts	38
3.4.2 Reflections on the full EC definition.....	40

3.5	Policy and regulatory gaps.....	41
4	Conclusions and Recommendations.....	42
4.1	Conclusions.....	42
4.2	Final Recommendations	45
PART C	48
5	Validation of WP3 Final Report	48
5.1	Objectives and rationale of the validation process	48
5.2	Methodology and the implementation of the validation process	48
5.2.1	Elite Experts	48
	<i>Experts identification, selection criteria for interviewees and interviewees' profiles</i>	48
	<i>Validation methodology</i>	49
	<i>Data analysis</i>	50
5.2.2	Stakeholder Consultation	50
	<i>Experts identification, selection criteria for interviewees and interviewees' profiles</i>	50
	<i>Validation methodology</i>	51
	<i>Data analysis</i>	53
5.2.3	Public consultation.....	53
	<i>Data analysis</i>	56
REFERENCES	57

EXECUTIVE SUMMARY

- This report was prepared as part of the Value Ageing project (www.valueageing.eu), which aims to foster collaboration between commercial and non-commercial entities through a joint research venture. The project aims to deepen interdisciplinary research on the ethical, legal, social and human rights implications of ICT for ageing to effectively integrate and embed EU fundamental values in the development and deployment of new assistive technologies.
- Information Communication Technology (ICT) developments have a 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. This report explores the impact of ICT on older people's living conditions at home and in the community highlighting the main ethical and value related concerns that need to be addressed by policy makers, technology developers and other stakeholders influencing older peoples' living conditions.
- The impact of ICT developments relates to 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 varies significantly between different groups of older people, for instance, for older people living alone in remote rural areas there is basically no impact as there is little or no infrastructure compared to older people living in assisted living homes where the impact is significant as almost every aspect of their lives is impacted by ICT technology. The level 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.
- ICT technologies are an important resource for *ageing well* and *ageing in place* promoted by policy as key strategies for the challenges arising from ageing process. They play an important role in identifying, managing and embracing changes arising from the ageing process in all areas of a person's life, for instance: home (safety and security, memory and physical assistance, and telemedicine), mobility (navigation, activity management and alarms), community (social communication, online public and commercial services, and leisure and entertainment) and work (access and health and safety).
- The viability of ICT solutions for *ageing well* depends on their appeal, usability, reliability, accessibility and affordability. To make ICT appealing to older people, the devices and services need to be tuned to their needs and abilities and the benefits of such solutions clearly articulated. The ICT products and services should provide users with an intuitive experience, aesthetically pleasing design, high reliability, and feelings of confidence and being in control. The issue of reliability is particularly important for telemedicine technologies, where the trust in reliability of the devices and systems is essential for their adoption. Accessibility, especially in the relation to skills and access to hardware and software amongst the disadvantaged groups, and affordability are essential underlying factors.
- The main risks associated with the use of ICT technologies by elderly include: a potential to reduce human contact and therefore increase social isolation, risks of data privacy breaches and fraud, misappropriation of their health data, decrease in competency as a result of overreliance on technology, and unreliability of devices, such as telemedicine and alarms in situations of emergency. An important ethical concern is the digital exclusion arising from the lack of skills and access, and in some cases affordability.
- 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

reduce the risk of isolation by facilitating communication with relatives and friends as well as assisting in meeting new people through social networks, work and learning opportunities.

- If used inappropriately, they 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.
- Although, it is clear that the ICT technologies run the risk of producing or deepening social isolation, 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.
- The EU definition of ageing well focuses on ageing well at work, in the community and at home in an active way. Overall, it 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* in the three areas raise questions on whether the definition is likely to apply to all older people equally, or favour some groups over others. It is also not clear whether 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 role of technology in *ageing well* is also not clearly defined. 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*, however these values should also be included in the context of work and community.
- Looking into the future, it is likely that the extent of ICT impact on lives of older people will continuously increase 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 important than the problem 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 developed to facilitate *ageing well*.
- 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.

Key Recommendations

- **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, including older people themselves. 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.** People before they reach older age 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 on 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 incompetence. Older users should be 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.

PART A

1 Introduction to Final Report of WP3

The European Union has been observing the continued increase in the span of its citizens average age as well as the incremental percentage and representation of older people in society. This poses a range of social and economic challenges. Longer life expectancy brings about higher risks of age related conditions, both cognitive and physical, such as cardiovascular disease, diabetes, dementia, cognitive impairment and degenerative joint disease, and emotional, such as social isolation, loneliness and depression. A combination of both of these factors also creates additional economic pressures on the social welfare and health systems. It has been recognised that creating conditions for *ageing well* would facilitate older people in living independently longer and support their active involvement and contribution to society. Such conditions also have the potential to reduce health risks and consequently lead to lower costs of healthcare for elderly.

The physical and social environment as well as the individual living conditions are recognised as key factors enabling to maintain a person's mental and physical abilities and thus are determinants of health. Conducive living conditions can compensate for disabilities, while incompatible physical and care environment can exacerbate the impact of disability. Living conditions and physical environment are seen to have significant influence on older peoples' ability to maintain autonomy and independence as it has been recognised by WHO's *Health Cities* initiative (WHO, 2002).

The demographic change is taking place against the backdrop of rapidly evolving innovations in Information and Communication Technologies (ICT). Like in all other spheres of life, ICT has a large potential to influence and improve lives of older people and facilitate *ageing well* at home and as a part of community. It can assist the elderly in carrying out their daily activities, staying in touch with their social circles, monitoring their health and improving their security. However, like most other technologies, ICT can also have a negative impact, if their distribution and applications are not carefully considered and no necessary provisions are made to ensure the maximisation of benefits and reduction of disadvantages. Incorporating human values and respecting ethical considerations are particularly important in achieving this.

1.1 Goals and objectives of the project

The Value Ageing project goals are twofold. The project aims to foster collaboration between commercial and non-commercial entities through a joint research venture exploring the incorporation of Fundamental Values of the EU into ICT for Ageing. The Action aspires to create a suitable framework for intersectoral mobility and knowledge sharing between these entities to better address the social, ethical and value implications of ICT for Ageing. Such framework is intended to foster longer term collaboration between academia and industry.

By exploring how ICT technology is impacting older people, what values are communicated by its users, how technology related decisions are made at various decision-making levels, the Value Ageing project aims to provide insights into how different values can be incorporated into technology design and application to facilitate *ageing well*. This goal is being achieved through the collection of comprehensive data on the subject, development of specific metrics and creation of a database of best practices, and identification, evaluation and discussion of alternative policies. These objectives are being realised through a pathway approach – the use of multiple coordinated projects, which include:

- P1: ICT-developments impacting on dignity and non-discrimination of older citizens
- P2: ICT-developments impacting on freedom and autonomy of older citizens
- P3: ICT-developments impacting on older people's living conditions and environment
- P4: Corporate Social Responsibility (CSR) and ethical codes in ICT for ageing industry
- P5: Technology trends and emerging ELSHI scenarios
- P6: Best practices identification, analysis and collection
- P7: Governance issues and policy options

1.2 Goals and objectives of WP3

Work Package 3 examined, in particular, **ICT developments impacting on older people's living conditions and environment**. Its overall goal 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. These developments were considered from ethical, regulatory and policy perspectives. The objectives of the WP3 were realised through the following actions:

- A3.1: Overall problem definition and WP implementation plan (carried out by ESR from Vegan seconded to QUB)
- A3.2: Collection of business cases (carried out by ESR from Innova seconded to Netwell)
- A3.3: Ethical and regulatory issues related to social web for older citizens (carried out by ESR from QUB seconded to Vegan)
- A3.4: Ethical and policy implications of e-health and telemedicine (carried out by ESR from QUB seconded to Frontida)
- A3.5: Human issues related to housing design for older people (carried out by ESR from CSSC to Tecnalía).

Although, the focus of this WP is on the impact of ICT on living conditions and physical and social environment of older people, technologies considered in this context have direct and indirect implications for values such as dignity, equality, freedom, and autonomy, which are considered in WP1 and WP2. The recommendations arising from this WP also contribute to WP4 that aims to propose strategies for developing CSR in the ICT for Ageing Sector. Many of the trends identified in this WP have been also reflected in the scenarios developed in WP5. Additionally, the partners responsible for WP3 collaborated with WP7 partners on the development and agreeing of the *ageing well* definition.

1.3 Structure of this Final Report

This report presents the activities carried out in WP3, which included identification and examination of seven business case studies portraying state of the art ICT technologies assisting older people, analysis of ethical and regulatory issues related to social web for older citizens, investigation of the ethical and policy implications of e-health and telemedicine, and examination of human issues related to housing design for older people. These activities are discussed in Part A, Chapter 2, with regard to the work carried out, resources used, key findings and significance of the results for the final WP report. Drawing on the results of these activities, in Part B, the report seeks to address a range of central questions on the extent of impact of ICT on older people's living conditions and environment:

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

- To what extent could ICT become a resource to facilitate *ageing well* at home and in the community?
- To what extent do ICT technologies run the risk to produce isolation and confinement?
- To what extent is the EC standard definition of “ageing well” ethically and politically tenable?
- What are (if any) the main policy and regulatory gaps to be filled?

The results presented in the report have been validated through a three-tier consultation process: interviews with elite experts in the area of ICT and ageing, consultation with stakeholders and online consultation with the public. Interviews with five elite experts in the area of ICT and older people living conditions were conducted in the period between 11th and 20th June 2013. The experts represented a range of sectors: academia, private companies, policy makers and associations for elderly. Nine European stakeholders took part in the stakeholder consultation that took place between 6th June and 21st July 2013 by completing a written questionnaire (7) or through an interview (2). The stakeholders represented the following sectors:

- private users of ICT for ageing solutions (older people and carers),
- professional users of ICT for ageing solutions (medical professionals, mobility and housing services providers),
- suppliers of ICT for ageing solutions (research organisations and enterprises) and
- supporters of ICT for ageing solutions (policy-makers, insurance providers, employers, public administration, standards organisations, civil society organisations, media).

Finally, an online consultation has been carried out between 24th June and 22nd July 2013 targeting the following groups: academia, research, and think tanks; NGOs; citizens; enterprises; industry organisations/associations; public sector/administration and other.

A summary report presenting the main findings of WP3 has been developed and used for the validation process. The summary report updated with the recommendations from the validation process is enclosed in a separate document. The validation process itself is discussed in more detail in Chapter 5.

2 Review of WP3 Reports – Partnerships and Pathways

This section presents the main findings achieved in WP3 and used to address a range of central questions on the extent of impact of ICT on older people’s living conditions and environment listed in the previous section. Five thematic reports were produced for WP3. This section discusses their objectives and key findings as well as presents the main elements of the transfer of knowledge that took place between seconded researchers and host institutions during the production of these reports.

2.1 VA D3.1: Overall problem definition and WP implementation

2.1.1 Objectives and work carried out

The VA D3.1¹ aimed to provide the overview and problem definition for WP3, including the agreement on definitions that will guide the research. The work carried out involved review of literature in order to identify gaps in knowledge and detect potential case studies that could be included in the work package for D3.2. It also aimed to finalise the work plan for WP3, which included a risk assessment and a dissemination plan.

¹ http://www.valueageing.eu/wp-content/uploads/2011/11/D3.1_WP_3_QUB.pdf

2.1.2 Key findings

The report recognised the impact of living conditions and environment on older people's quality of life and the potential of ICT to make a positive contribution to this environment. It has also acknowledged that older people's capacity to benefit from services and resources and their ability to live with dignity and within their full rights as citizens is influenced by a range of factors of social, economic and geographical nature. This recognition focused some of the work in WP3 on identifying ways in which the traditional barriers to participation may be overcome.

The report set the overall goal of the WP3 as following: *"to carry out a comprehensive, interdisciplinary, and inter-sectoral analysis of the main ICT developments impacting on Older People's Living Conditions and Social Environment"*. It also identified key definitions for this WP:

- *Older person* as someone aged over 60 years (UN definition)
- *Living conditions and environment* as person's primary residence (own home, sheltered accommodation, residential accommodation).

2.1.3 Transfer of Knowledge and Skills

The work in this phase was led by QUB in collaboration with an ESR seconded from Vegan. The researcher worked at QUB for three months. During the secondment period she was introduced to ZOTERO platform and the University Research Repository. She participated in meetings with local associations working with older people, as well as extended her knowledge of European projects and funding opportunities. The researcher actively identified new stakeholders that could be invited to participate in Vegan projects and Value Ageing and extended her network of contacts. Through the exchange, staff of QUB learnt about Vegan software solutions and thinking underlying it. Through the collaboration some possibilities for cooperation on future research funding calls were also identified.

2.2 D3.2: Report on Business Case Studies

2.2.1 Objectives and work carried out

The aim of the Deliverable D3.2² was to provide a technical overview of state of the art technology oriented to improve the lives of older people through communication, home care and ambient assisted living technology solutions. The review focused on seven innovative technologies which contribute in different ways to addressing various problems affecting older people and promote their independence and well-being. The case studies, drawn from a range of geographical areas and reflecting different policy targets, represent four different sectors: communication, movement, digital multi-utility and health. The communication sector includes technology solutions oriented to promote and facilitate communications with and amongst older people. The movement sector comprises of technologies that allow older people to move independently at home and outside, while keeping them physically active and reducing their safety concerns. The digital multi utility sector consists of technologies focusing on creating an assisted living environment enabling older people to live independently at home. Finally, the health sector encompasses technologies that facilitate senior citizens in managing their own health as well as chronic diseases. Short descriptions of the case studies are presented in Table 1.

² http://www.valueageing.eu/wp-content/uploads/2012/03/D3.2_FINAL.pdf

The case studies were identified through a literature review, internet searches, utilisation of the Value Ageing project network, and the eParticipation portal. Once identified, data on each case study was collated and analysed. The analyses of the case studies were performed using the framework for dignity and non-discrimination developed by Dr O’Hanlon and the VA team in NETWELL.

Table 1: Short descriptions of case studies examined in VA D3.2

<p>Communication case studies</p> <ul style="list-style-type: none"> • Vital Mind (VM) is an European STREP project coordinated by CogniFit Ltd. CF, Israel. The project aims to prevent regression of the cognitive skills in older people as well as to improve them by training. The project uses traditional medium of television to engage users in interactive mind fitness exercises. • Eldy is an e-Inclusion project coordinated by a non-profit organisation Eldy Onlus Association and aims to simplify the use of computers for people that never used them before.
<p>Movement case studies</p> <ul style="list-style-type: none"> • The Japan exoskeleton HAL-5 is a private project implemented by the Japanese company Cyberdine. HAL5 is wearable robot suit that aims to help older people as well as paralysed persons to walk and lift heavy objects. It works by transforming brain signals sensed through the skin into motion. • HIS Mambo2, developed by a private German company Falcom, is a portable plug and play device which aims to provide personal safety and security of older people by tracking and monitoring them through GPS technology and providing them with easy access to help in case of emergency through GSM/GPRS technologies.
<p>Digital multi-utility case studies</p> <ul style="list-style-type: none"> • The Great Northern Haven Smart Apartments project is a demonstration housing project in North East of Ireland funded through collaboration between private and public institutions, including Atlantic Philanthropies, Dundalk Town Council, The Health Service Executive (HSE) Dublin North-East and Dundalk Institute of Technology. The project consists of 16 two bedroom units equipped with a system of sensors and devices enabling project participants to live independently. The project is a demonstration of community-based models for independent living and ‘ageing in place’.
<p>Health case studies</p> <ul style="list-style-type: none"> • Health Buddy is an American technology produced by Health Hero Network and bought by Bosch in 2009. The technology, by establishing a remote connection between patients in their homes and their care providers, provides the user with specific medical measurement tools, enabling access to historical patient data and encouraging medication and lifestyle compliance through education. • The HIS InTouch system is a technology developed by a German company Health Insight Solutions GmbH that consist of a touch screen central unit connected wirelessly with several medical and environmental monitoring devices. It combines utilities of digital multi utility and tele-health.

2.2.2 Key findings

General

ICT has a large potential to influence positively lives of older people. However, in doing so, values and needs of older users need to be taken into account. For many older people, preserving **dignity** is as

important as preserving their health. Older people readily accept ICT solutions in their lives, but these need to be provided in a friendly and familiar way. Often, the form in which a given solution is presented is more important for its acceptability than the solution itself. For example, if a wearable technology is disguised as an item of personal jewellery while maintaining the same functionality as the device solely designed to meet technical requirements, it is far more likely to be acceptable to the end user. It is recommended that technologies should be closely incorporated in the objects of everyday life, which are familiar to older people and look normal. Another important need for older people is **independence**. The ICT solutions need to be designed in a way that will allow them to operate seamlessly and remotely when possible, while limiting visibility of the user's dependence on a given solution. They need to create a feeling of being in control. Finally, they need to make a significant contribution to achieving **quality of life** for their user. The challenge lies in estimating the potential impact of a device that is being designed on the final user's quality of life.

ICT solutions can have impact on three spheres of older people's lives: mental health, physical health and social interactions. All three spheres are equally important for *ageing well*. Cognitive effort is vital for helping a person to remain cognitively healthy and is also an important factor in slowing down the physical decline, consequently helping to maintain independence. Similarly, physical activity stimulated by exercises as well as non-exercise physical activity can be helpful in improving the physical functions, in turn helping to preserve independence. Older people are particularly vulnerable to suffer from depression, which are often caused by loneliness, exclusion and feeling of being redundant. Depression has strong effects on physical function, which may lead to the loss of independence and serious health conditions.

Findings specific to case studies

Vital Mind

Vital Mind technology combines cognitive psychological methods with ICT in order to enable older people to actively and autonomously participate in mind and physical fitness activities using their TV sets. The technology also facilitates interaction with other people through its applications: "family tree" and "paint". The cognitive and physical exercises can be performed by more than one user, therefore, facilitating a social interaction. The older people that have tested the technology expressed the following opinions:

- They found it enjoyable and funny and appreciated the availability of information about the progress. Some difficulties related to hearing oral instructions were expressed (the instructions were also visible on the screen).
- Participants recognised the importance of physical exercise aiding the cognitive training. Technology enabling them to do exercises in their own homes avoiding embarrassment doing the same exercises in public spaces was appreciated.
- Concerns around the possibility of sharing the photos created in the "family tree application" with friends and family were raised – technology did not seem to resolve this issue in an easy and accessible manner that would appeal to older people.
- "Paint" application was especially attractive to users, who were not computer literate. Those with computer experience had little interest in it.

Eldy

Eldy platform through the use of simple design, bigger letters and buttons, and evident colour contrasts enables older users with no or very limited computer skills to use computer for web surfing, email, chat, and TV. The evaluation of Eldy has shown that difficulties of older people to use computers are not simply related to an inadequate understanding of text and images, but also to unfamiliarity with some specific procedures that are commonly used in interface interaction. Using platforms like Eldy, not only facilitates

access to services and products offered by internet, but also indirectly, by facilitating access to internet, it stimulates cognitive functions. Scientists recognised that Internet searching triggers key centres in the brain responsible for decision-making and reasoning (Small, 2009).

Eldy is an example of a platform aiming to promote social inclusion by targeting parts of society, including older people, excluded from full access to internet due to the lack of necessary skills. With increasingly more services moving to internet based platforms (e-government, e-commerce, e-banking, e-welfare and e-health) lack of computer skills means that these services cannot be easily accessed and can lead to exclusion. The achievements of the Eldy project have been recognised by public administration in Italy, which has chosen it to facilitate access to its public websites.

The Eldy project demonstrates that, through simplification of abstract procedures often characteristic to ICT solutions and taking into consideration needs of different users, older and computer illiterate people can become technology users. It is recommended that ICT companies should focus their efforts on understanding the most effective hardware/software interface that would match the needs and requirements of the targeted users (older people).

HAL-5

The HAL-5 exoskeleton is used in hospitals and care centres. By allowing a wearer to carry out a variety of daily tasks, which otherwise would not be possible for them, it helps to maintain their physical independence. It can also have an important role in rehabilitation of older people, who may be recovering after a significant operation or a long hospital stay. This technology is also useful for carers and nurses, who may use it in care for older people. Further development of the technology may assist in re-establishing physical independence for older people who lost their mobility due to neural injuries or decline, improving their overall quality of life.

Although technologies like HAL-5 have a huge potential to improve older people's lives, there are factors that may limit its usefulness. Currently, the suit cannot be purchased but only rented. A minimum rental monthly cost is approximately €1000 (for one-leg version). Costs of this technology may lead to the exclusion of many people who need or would like to use it.

HIS Mambo 2

Approximately 28-35% of people over 65 years old fall every year and the frequency of falls increases with age and frailty level (WHO, 2007). Falls can lead to disability, decreased mobility due to physical injuries, and loss of independence. People, who experience a fall, usually go through a period of Post-fall Syndrome during which they often develop fear of falling which can lead to reduced activity in order to prevent falls. Such fear can result in the loss of confidence, hesitancy to perform certain activities and ultimately compromise one's mobility and independence. Older people often hide falls due to negative stereotyping, embarrassment about the loss of control and fear of losing control and being moved to a care institution. In case of more severe falls, the time in which help can be gotten is crucial in preventing further complications.

Devices, such as HIS Mambo 2, allow senior user to call for help at any time they feel threatened and in case of a fall, the device automatically will trigger an alarm, so help can be received quickly. The device can give users a confidence to continue living independently in their own home knowing that there is a support system in place in case of emergency. It enables timely response to an emergency situation, which

consequently can prevent further physical complications, such as pneumonia, as well as reduce the mental trauma that may occur if person is left lying on the floor for a long period of time.

Great Northern Haven Smart Apartments

The case study represents a community based model of care for elderly. Assistive technologies are the key to provide care in such a model while allowing for independent living. They allow the older user to have more control over their home and surrounding environment and to monitor any health issues a person may experience. While assistive technologies could be used in individual homes (providing that these are adaptable for such technologies), the community based model provides better basis for social interaction between the residents that would not be possible to the same extent for people living in their own individual homes.

Experiences gained during the project, which duration has been extended due to its success, clearly show that only by involving older people in the design process and real-life testing of the facilities allowing for regular feedback it is possible to get a clear understanding of their experiences, needs and requirements. The project proved that the model is able to provide a more efficient health care service that is less expensive both for individuals and public institutions.

Health Buddy

Tele-health has a huge potential to increase survival rate and decrease number of Emergency Department (ED) visits and the number and length of hospitalisations. For example, the research conducted by Health Buddy Team has shown that in Roanoke Chowan Community Health Centre, forty of in-home patients using Health Buddy system got 69% reduction in ED visits in six months (Britton, 2008); 791 patients with chronic disease monitored by the Veteran Health Administration achieved 40% reduction in ED visits in one year (Meyers, 2002); 188 heart failure patients of the Tufts Medical Centre got a 72% reduction in hospitalisation in 90 days and 63% decrease for other cardiovascular conditions (Brookes, 2005).

Health Buddy provides not only a monitoring system to measure patient's condition, but also it guides a user towards self-management of the disease and appropriate behaviour changes. It allows people to stay at home, if their condition allows for it, rather than to be moved to a hospital or a nursing home. This supports the feeling of independence and having control over one's live. The telehealth systems reduce a need for travel and risks associated with it.

The systems, like Health Buddy, need to recognise that each person is a complex system that requires personalised approach to self-management, support and monitoring. They also need to focus on managing risks rather than effects. The ICT solution is integrated with a network of health care services supported by community and other services.

HIS Intouch System

By combining the telehealth function with assistive living technologies the solution not only allows the user to benefit from telehealth services, but also helps to create a more secure environment. This can help the user to maintain the self-esteem and confidence, which are also crucial for taking active part in social life. The system has a capacity to assist user in their daily tasks by issuing reminders about medication times and other regular activities.

2.2.3 Transfer of Knowledge and Skills

The report was prepared by Netwell with the assistance of the seconded researcher from Innova. The researcher is an electronic engineer specialising in informatics and linear systems modelling and controllers design. During his secondment, he acquired new knowledge, skills and experience, specifically:

- An improved level of spoken English through continuous conversations with colleagues, volunteers and friends.
- Knowledge about innovative technologies, such as “the Cave” and devices installed in the “Northern Heaven Smart Apartments”.
- Knowledge of methods facilitating the involvement of older volunteers in the design loop of new technologies.
- Experience of techniques used to introduce innovation to older people respecting their dignity, independence and quality of life.
- Better understanding and practical experience of interviewing techniques used to interview older people, including issues such as interview time management, length of a survey, and questionnaire design.

He took part in the discussions with Netwell and Casala technicians regarding the development and testing of new technologies developed at these centres. He contributed to the development of solutions to problems encountered in these processes. He shared information about the situation of older people in Italy with the staff and volunteers in Netwell as well as any new knowledge he acquired during his secondment.

The researcher’s secondment at Netwell has also facilitated development of stronger links between the two companies with a view of future collaboration in the areas of specialisations shared by the two organisations.

2.3 D3.3: Ethical and Regulatory Issues Related to Social Web for Older Citizens

2.3.1 Objectives and work carried out

IT technology and social networks are becoming increasingly more popular amongst older people. In recent years there has been increase of 80% in older people signing up for Facebook. Internet stimulates the cultural curiosity of elderly. It also helps to improve their cognitive performance and brain functions by stimulating their attention span, memory and perception. By providing new opportunities to explore the world it helps to keep them young at heart. However, compared to other age groups relatively few older people use social networks and other services offered by internet. One of the reasons given for this situation is the lack of social network platform that meets older people needs in regard to usability.

The aim of Deliverable D3.3³ was to investigate the regulatory and ethical issues related to social networks for older people. For the purpose of this report, social network was defined in VA D3.3 as *“online community that allows people, through a built-up profile, to meet, communicate, keep in touch, share pictures and videos with other community members with whom a connection is shared. The social network structure includes having a profile, friends, and groups. Some social networks also allow users to personalise their profile using widgets or to create their own blog entries”*.

³ http://www.valueageing.eu/wp-content/uploads/2012/03/D3.3_FINAL.pdf

Five social networks purposefully targeting older people were identified. These were then analysed in regard to their main functionalities and characteristics related to privacy policy and terms of use. Then the main regulatory matters were considered as well as the related ethical issues, such as respect for autonomy, non-maleficence, safe content and users' protection, beneficence and justice. Finally, a set of recommendations for achieving e-Inclusion were drawn.

The social networks and community sites analysed in the report include:

- EONS – www.eons.com
- THE GROWING BOLDER – www.growingbolder.com
- GROWNUPS – www.grownups.co.nz
- FACEBOOK – www.facebook.com
- ELDY – www.eldy.eu
- SAGA ZONE – www.sagazone.co.uk

2.3.2 Key findings

Regulatory environment

There is no doubt that online social networks and other internet based services can improve the quality of life and emotional well-being of older adults. However, for the technology to realise its full potential for older people and other disadvantaged groups, issues of accessibility, primarily related to skills, need to be tackled. European policy addresses this topic through a number of policy areas: e-inclusion, active ageing, e-accessibility, e-government, independent living, and social networks.

European policy recognises that e-inclusion is an important issue in a wider strive for social inclusion and that older people constitute a significant portion of those who are e-excluded, and who, in the longer term, may become socially excluded. Despite many efforts to tackle e-exclusion (eEurope 2002 Action Plan and “e-inclusion, be part of it!” campaign (European Commission, 2007)) it has been acknowledged that many barriers for older people to engage with ICT still remain. With e-inclusion clearly considered as one of the tools necessary to achieve social cohesion, e-inclusion policies are likely to affect social web for older people going into the future.

The European policy makers recognised the divide between ICT skills of younger and older workers as a fundamental problem area and through the active ageing policy have been trying to reinforce the employability of ageing workers through training. With time, active ageing was broadened to include quality of life and social inclusion. As part of the *i2010 – A European Information Society for growth and employment* document (European Commission, 2005) the EC launched “Ageing Well in the Information Society” action plan aimed at coordinating research programmes in ICT for ageing. Developing ICT skills of older people for work purposes will also benefit them in private life and during retirement. The policy emphasis on active ageing will continue into the future and it is likely to have positive influence on older people's capacity to engage with social networks.

E-accessibility initiatives focus on making ICT easy to use for those who may encounter difficulties in using such technologies, i.e. older persons. Accessibility problems are considered to be one of the main barriers affecting participation of the excluded groups. The European policy recognises a wide range of ICT solutions that need to be made accessible to all in society – these include computers, phones, TVs, online government, online shopping, call centres, and self-service terminals (ex. automatic tellers and ticket

machines). The UN report recommends “*design of computer technology and print and audio materials that take into account the changes in the physical abilities and the visual capacity of older citizens*” (United Nations, 2002). Such changes can be encouraged by fostering accessibility requirements in public procurement, accessibility certification, and better use of existing regulations, i.e. these related to standards.

The e-government policies do not have a direct impact on communication channels for older people. However, indirectly by pursuing objectives of achieving digital literacy for all citizens in order to enable them to take full advantage of the services offered by e-government, they can contribute to the development of the skills needed to engage with social networks amongst older people.

Policy and regulatory frameworks related to social networks are likely to have the strongest impact on social web for older people. EC aims to ensure that all Europeans can enjoy social networking and communication technologies without worrying about the threats to their privacy and being exposed to inappropriate content. The European Charter of Fundamental Rights set out certain shared values which can be adopted as ethical guidelines. Although there are no specific guidelines for services for older people, the general resolutions and declarations can easily be adapted to suit the needs of older people. EC recognises the importance of these tools for seniors, at the same time it acknowledges that older people are considered to show much more responsible behaviour while using social networking and communication services.

Ethical considerations

E-inclusion policy objectives are inherently ethically focused. If a person is not able to be a part of the information society this means that they are denied access to all benefits it brings, including those related to social web, and can become socially excluded. Social exclusion can be perceived as an age-related digital divide or as promotion of technologies that can be accessed only by certain groups of older people. Delivery of e-inclusion policy objectives is likely to impact on the social web for senior citizens and their rights to human dignity, autonomy and personal identity, and privacy. The ethical issues that should be considered in this context include: respect for autonomy, non-maleficence, beneficence, justice, privacy and data protection.

Article 25 of the EU Charter (European Commission, 2000) provides an explicit reference to the right of older people to be independent: *The Union recognises and respects the rights of the elderly to lead a life of dignity and independence and to participate in social and cultural life*. ICT can facilitate a wider participation of older people and people with disabilities in community life and, therefore, enable them to reach certain degree of autonomy. Social networks by providing a user with total freedom in choosing their friends and people to interact with reassure users’ rights to autonomy and freedom of choice.

Non-maleficence relates to avoiding harm. This can mean harm through discrimination, including age discrimination. Most of social networks provide a set of rules for the users that forbid inappropriate behaviours, such as slurring, attacks, and distribution and publication of offensive material, while at the same time promote free expression of thoughts without a fear of being discriminated. The rules vary between different networks in terms of their extent and details.

Harm can also be caused by content. Many social networking sites include forums and other information exchange tools that often are used to discuss medical issues, such as diseases and their treatment, which if used inappropriately can cause harm. Another danger relates to meeting people befriended online in real

life. Some websites, such as EONS, warn their users against substituting any medical advice from the website with an advice from a healthcare professional, as well as having full trust that person met online have been truthful in disclosing their real identity.

Harm can also relate to potential negative effects of certain technologies on older people. Social networks are designed to help people connect with their family and friends, and there is little doubt that they can have a role to play in reducing isolation and feelings of loneliness among older people. However, alongside some telecare technologies may also have a negative impact, potentially replacing real world social contact leading to *increased* levels of social isolation and loneliness, and raising serious ethical issues in the process. The use of companion robots, although very beneficial in some situations, may reduce a person's willingness to interact with outside world and lead to diminishing self-respect and feelings of embarrassment.

Issues of beneficence and justice are both related to accessibility. Universal access implies that every person should have an opportunity to use ICT. Yet, as most of the social websites have been designed with young people as their target audience, needs of older people, such as larger font, have usually been neglected. Some, although not all, social networking sites for elderly have adhered to the design needs of older people in respect to the font, colours and simplicity of the navigation. Another impediment to access can be the affordability to purchase hardware needed to use ICT technologies and social networking sites.

Privacy and data protection of all users are the issues that have been most discussed in the context of social networking sites. All websites analysed in the report had some information on the privacy settings and how the data provided by users on the social networking site is used by the site and third parties. However, the sites vary in the detail and clarity of the information provided. The misuse of data provided by other users, the site itself or third parties, as well as through a loss of data (i.e. through hacking activities) may lead to a sense of loss of privacy and result in negative emotional responses.

Recommendations

The analysis of various social networking sites, developed specifically for older adults, in regard to their approach to a range of ethical issues that have an important impact on *ageing well*, led to the following recommendations:

- Seniors, like any other novice users, should be educated in regard to the potential risks associated with the use of internet and social networking sites. To reduce the risk of decreasing social contact as a result of the move towards more virtual communities, people who facilitate that interaction/training should also emphasise the benefits of combining virtual and real life social interactions for overall wellbeing.
- To protect dignity, social networking sites should provide internal rules for collaboration ensuring respect among users and correct behaviours that should be approved by seniors signing up to the site.
- To facilitate accessibility, seniors should be provided with option of affordable, preferably free of charge, training on general computer skills and the correct use of social networking tools.
- To guarantee equality and fairness in terms of social justice, it is advocated that social networking sites should be free to use and low price hardware devices should be made available to seniors to facilitate their access to internet.

- Usability needs to be ensured by a design that incorporates needs of older people, such as a need for large icons and font colours contrasts, and a simple way to retrieve contents. It is advisable to involve older people in the entire process of the project development.
- To ensure safety of users, social networking sites should provide specific rules that have to be accepted and respected by all members, including reporting violation of such rules.
- Privacy and data protection policy should be written in a clear and easy to understand manner to encourage seniors to read it. It should also be easy to find on a website.
- Seniors should be able to easily understand which parts of their profile are private and which are public.
- To reduce the risk of users' data being abused and compromised, social networking sites should provide seniors with a clear and prominent notice and obtain their consent before any information beyond agreed privacy setting is shared.
- Overall, there is a need for a user-centred research aimed at validating the ethical and regulatory issues raised and identifying any future concerns.

2.3.3 Transfer of Knowledge and Skills

The report was prepared by Vegan Solutions with the assistance of the seconded researcher from QUB. The researcher was a PhD student developing a tool to assess the efficacy of brain-training games as a potential treatment for cognitive decline or dementia. During his secondment at Vegan he acquired new knowledge in area of new business models, experienced a new culture, developed an ability to digest and dissect large volumes of literature, experienced European funding mechanisms and extended his professional network. The researcher found particularly valuable his observations of the business operations on day-to-day basis and strategies employed to promote growth and development. Together with the Vegan team, an expanded understanding of the regulatory and ethical issues affecting the social web for seniors was developed.

2.4 D3.4: The Ethical and Policy Implications of E-health and Telemedicine

2.4.1 Objectives and work carried out

Healthcare is one the main areas where ICT offers many new possibilities. ICT is likely to facilitate a shift from the traditional model of healthcare delivery, where healthcare professionals provide care for patients with different needs in a range of specialist locations, to a more pervasive system which, by using ICT solutions, provides patients with a range of health self-management tools and reduces a need for face-to-face contact with health professionals. Such healthcare model is predicted to play an important role in reducing health costs, which increase significantly in ageing societies.

The main aim of the Deliverable D3.4⁴ is to identify and analyse key ethical and regulatory issues emerging in the debate on e-health and telemedicine. E-health can be defined as *“the use of information and communication technologies (ICT) for health. Examples include treating patients, conducting research, educating the health workforce, tracking diseases and monitoring public health”* (WHO, 2013), while telemedicine is considered to be a branch of e-health and can be described as *“a branch of e-health that uses communications networks for delivery of healthcare services and medical education from one*

⁴ http://www.valueageing.eu/wp-content/uploads/2012/10/D3.4_Report_on_ethical_and_policy_implications_of_e_health_and_telemedicine.pdf

geographical location to another” (Sood, et al., 2007). Both e-health and telemedicine offer much promise for promoting health and well-being of older people. However, a technology-centred healthcare also raises a considerable number of ethical concerns around privacy, accessibility, confinement and consent, and regulatory issues that need to address online professional practice, data protection, quality assurance and online research. The work in this part of WP3 involved investigation of these topics.

2.4.2 Key findings

Ethical considerations

The right to privacy is fundamental for autonomy. There are many technical tools that enhance user privacy, such as encryption technologies, anonymisers and opt-in functions. However, privacy is not protected only by technical means but it is also affected by e-health operators’ behaviour. Many e-health operators use information collected about users in different ways. Some share it with other parties that may not be bound by the same ethical codes as health professionals and be driven by different motivations in using the data, for example, commercial interests may be more important to them than the best interest of patients. With the shift towards cloud-computing privacy concerns are likely to increase, especially around the control of data stored on hardware owned by a third party.

The cases of mistreatment of digital medical records in recent years have created a degree of mistrust in this area. If appropriate safeguards are not put in place, this may result in the fear of privacy infringement and lesser willingness for people to adopt e-health solutions. Developing and incorporating genuine privacy policies into e-health is crucial for its potential to be realised. Such policies should be highly prominent, easy to understand and brief. They should also provide clear information and choice about the control of data by the user. All implemented policies must be supported by a robust inspection and regulation regime to provide the user with confidence in their effectiveness.

Another key element of personal autonomy is consent. In regard to e-health and ageing consent is usually linked to services provision and data processing, which brings together elements of contract and consumer law and data protection. The practical issues around managing consent can be particularly important for older people:

- How to ensure that people have been truly informed?
- How to ensure that people are not compelled to give consent in order to gain access to an essential service?
- How to ensure that real choice exists within a multifaceted service, so people can choose some components without being obliged to choose others or incur penalty?
- How to accommodate the needs of people with impairment, for example visual or hearing, in the process of giving the consent?
- Similarly, how to accommodate needs of people who lack the capacity to consent for themselves?

In the traditional healthcare setting, the informed consent model shares decision-making between a healthcare professional and a patient. New challenges are posed for online consent due to the remote interface between service provider and user, without ability to directly ask questions or clarifications and developing a good understanding of the consent being given. In case of older people, some of these issues are further complicated by the lack of ability of older people with diminished mental capacity to give consent by themselves and relying on others to do so.

Similarly like in the case of social networking sites, digital divide is a barrier for the uptake of e-health and telemedicine. Older people who have ICT skills and access to hardware are more likely to adopt e-health solutions. The risks associated with that include exclusion of some people from the ICT driven healthcare, as well as confinement of people, who have been encouraged to use ICT enabled care and support but have limited knowledge and confidence in these solutions. The risk of confinement means that *“a person will have no choice but to spend their old age entangled in a web of unfamiliar technology”* (Value Ageing, 2012).

Another ethical concern is related to the move towards community based care and deployment of remote monitoring and assessment technologies. There is a fear that people’s homes will gradually evolve into private health centres taking away the primary function of home as a place for relaxation. Another fear relates to the loss of innate ability to listen to own body in favour of quantitative health data. More research is required to understand the real effects of community based care.

Regulatory issues

One of the main challenges for the regulation of technology is the time lag between the development of new legislation and procedures and the development of new technologies. Hence, there is a special onus on developers of e-health solutions to give due care and attention to ethical issues their solutions may affect.

E-health in its development and deployment brings together professionals from diverse sectors including health, technology and commerce. Medical professionals are bound by the clearly defined code of ethics, while other professionals involved in the provision of e-health, such as technological and commercial, do not necessarily share the same ethical codes. This poses the risk that interests of the end user, especially in the e-commerce situations, may not be placed in the centre. E-health solutions also create a new playing field for the medical profession. Certain level of anonymity offered by e-health and telemedicine solutions can be attractive for those medical professionals who do not wish to adhere to the ethical codes or people who have no medical credentials but may wish to pose as medical professionals, consequently creating a risk to patients in the form of, for example, poor quality of information or advice. The most significant risks exist in the area of health information provision via electronic means. Therefore, it is advocated that accountability existing in the healthcare delivery should be extended to provision of healthcare information. This should also be supported by the development of examples of best practice.

A large aspect of e-health is related to users looking for web-based health information, especially on specific symptoms or diseases they may have, as well as general dietary and well-being information. This has many positive effects for empowering people to manage their health, but it also poses risks for users if information is not accurate, consistent or complete. The challenge lies in developing tools that would facilitate the assessment of online healthcare quality providing for the diversity of e-health services. This also extends to the procurement of pharmaceuticals online.

The right to data protection, along with privacy, is fundamental to the legal understanding of personal autonomy. Personal data should be treated in a way that adheres to values of consent, fairness, proportionality and minimisation. The creation and management of electronic health records is a significant aspect of e-health. Global standards need to be developed for the management of these records, in order to assist healthcare professionals in having access to complete and truthful patients’ data while at the same time protect patients’ rights to privacy. Another aspect related to privacy and data protection is online research conducted on internet and involving qualitative healthcare data. The access to such data is open at the discretion of institutional review boards, yet the ethical implications of exploiting its availability remain debateable. It is recommended that research protocols for studying online communities should be

developed with an active input of the members of such communities and consideration of issues, such as intrusiveness and perceived privacy, vulnerability and potential harm, informed consent and confidentiality.

Recommendations

The analysis of ethical and regulatory issues related to e-health and telemedicine led to a number of recommendations:

- To address ICT exclusion it is necessary to equip all members of society with adequate access to, knowledge about and skills in using digital media. Emphasis should be placed on knowledge and skills that will enable users to protect their rights in respect to fundamental values.
- Special efforts need to be put in place to develop ICT skills for the group that is most likely to be excluded: older people with low education levels as they are perhaps most at risk within the evolving healthcare landscape.
- In order to facilitate e-health technologies, the way in which internet, ICT devices, applications and services interact needs to be standardised and supported with appropriate guidance and shared legislation.
- 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, the potential of a person's home becoming their health clinic, risks associated with quality of online professional practice and electronic health resources, and regulation of online research with view of protecting the privacy of contributions.

2.4.3 Transfer of Knowledge and Skills

The report was prepared by Frontida Zois with the assistance of the seconded researcher from QUB. During the preparation of the report the seconded researcher was guided by supervisor from Frontida Zois in regard to the use of the framework for dignity and equality that was developed in WP1.

2.5 D3.5: Human Issues Related to Housing Design for Elderly and Smart Homes

2.5.1 Objectives and work carried out

Home is a central element that needs to be considered in the context of older people's living conditions. ICT solutions and design of housing have an important role to play in shaping living environment at home and creating conducive conditions for *ageing well*. The main aim of the Deliverable D3.5⁵ was to identify key social and psychological implications related to smart homes and housing design for the elderly arising from current and emerging trends in this area and provide recommendations and policy options regarding housing and smart homes for older people with various levels of cognitive abilities and physical independence.

The preparation of the report included a literature review on smart homes: what they are, what makes them smart, what is their purpose, how suitable they are for older people and how can they contribute to *ageing well*. It also involved identification and classification of different technologies according to their function and the needs they are designed to fulfil. This was carried out together with an examination of a

⁵ http://www.valueageing.eu/wp-content/uploads/2013/05/07AGE03_D3.5_FINAL.pdf

range of smart home related projects around the world. The review focused on providing an overview of social and psychological implications of current and potential future smart home devices and services, rather than technologies themselves.

Through interviews, site visits, staff discussions and a workshop, the topic of quality of life and human factors in housing design and smart homes were explored. Special attention was given to issues such as acceptability and the end user's perception of smart home technology. Additionally, a review of existing norms, regulations and EC relevant policies and codes of practice was conducted. This review was underlined by a notion that a smart home is not a series of discrete technologies in a common space, but an environment of integrated devices and services.

In summary, the activities carried out included:

- literature review,
- exchange of knowledge between ESR and Tecnalia's Health and Sustainable Construction Divisions,
- interviews with relevant stakeholders, as well as coordinators or responsible researchers of national and EU projects,
- tour of Tecnalia's home labs and the working smart home prototype "Kubik",
- organisation of a workshop.

2.5.2 Key findings

Factors affecting supports for ageing at home

The relationship between the home environment and health is significant, especially amongst older adults. Well-being experienced at home is an important contributor to the overall well-being and independence of older adults (Rioux, 2005; Oswald, et. al. 2007). Ageing at home is highly desired by older people as it represents independence and allows them to have control over their day-to-day routine. It also has important psychological and emotional benefits. ICT and other physical supports are important tools in facilitating ageing at home and improving person's quality of life. There are a number of factors that need to be considered while assessing the viability of supports for ageing at home, such as physical adaptation of housing or introduction of ICT based smart home devices. Among them are:

- type of the building (physical structure),
- physical location of the building,
- ownership of the building,
- social connections (family, caregivers, regular visitors),
- inhabitation of the home by other people than the older resident in question,
- neighbourhood factors.

While the physical or ownership factors can be easily assessed, home is more than bricks and mortar, it is "the sum total of all meaningful social connections belonging to the residents" (VA D3.5, p:9). Consequently, while considering the suitability of solutions supporting ageing in place, one must look beyond making the environment accessible and also consider how the physical changes will affect the psychological and social needs of the resident, ensuring that their overall well-being is not compromised but improved.

The assessment of solutions, ICT based or other, also needs to be closely aligned to the particular needs expressed by the elderly people. The literature distinguishes needs in two principal categories: Activities of

Daily Living (ADLs), which include hygiene, continence, dressing, eating, toilet, and transferring (changing position), and Instrumental Activities of Daily Living (IADLs), which include finding and using resources, driving or arranging travel, preparing meals, shopping, housework, managing medication and managing finances. Although many older adults, who live independently at home, can perform most of these activities, some of them may require assistance of their family and friends. In case, where an older person is impaired physically and/or cognitively, fulfilment of such tasks may have significant physical, psychological and emotional impact on the carer. Therefore, the needs of the carers should also be addressed and assistance provided for their tasks.

The concept of smart home

The adoption of home to make it suitable for ageing in place requires removing barriers, which can be related to structural design and the interior design, and putting in place supports that will make daily activities of an older person easier, depending on their individual needs. Home adaptations vary in regard to the complexity of work required and the costs.

Smart home is not a single device but it incorporates a range of ICT based devices and different types of technologies as well as it is connected to different external support services. It involves the introduction of networked devices into the house or “the integration of technology and services through home networking for a better quality of living” (Bierhoff, et al., 2005). The concept of smart home is not static, as the capabilities of the technology are always expanding. Smart homes can be classified from a functional perspective, as demonstrated by Aldrich’s (2003) five hierarchical classes:

- Homes which contain intelligent objects, such as single, standalone applications and objects which function in an intelligent manner.
- Homes which contain intelligent, communicating objects, such as appliances and objects which function intelligently in their own right and which also exchange information between one another to increase functionality.
- Connected homes, which have internal and external networks, allowing for interactive and remote control of systems, as well as access to services and information, both within and outside the home.
- Learning homes, where patterns of activity in the homes are recorded and the data gathered is used to anticipate user’s needs to direct technology appropriately.
- Attentive homes, in which the activity and location of people and objects within homes are constantly registered, and such information is used to control technology in anticipation of the occupant’s needs.

Smart home technologies can perform a wide range of functions and integrate many different devices, as illustrated in Figure 1.

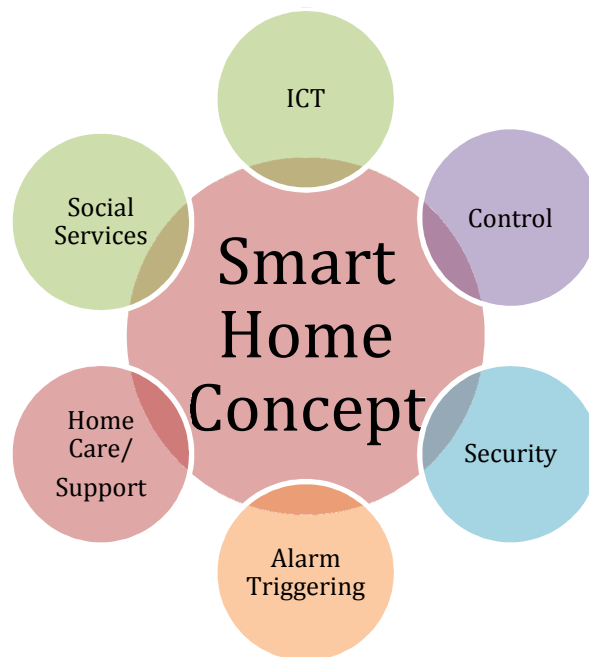


Figure 1: Functions of smart home technologies. Source: VA D3.5.

ICT function in the context of smart home relates to those devices that enable the direct, controlled access to the outside world. **Control function** provides the resident with an ability to change the environment through the use of switches and panels for lights and heating. **Security function** refers to securing the home from intrusion and potential hazards. **Alarm triggering function**, besides security function, includes devices such as wearable alarms or location sensors, which may alarm the resident or their carers. **Home care or support function** relate to devices and services for home care designed for elderly or vulnerable people. Finally, **social services function** focuses on services that can encourage independence and enable ageing in place, but without compromising opportunities for human interaction.

Smart homes are designed to address needs based around three main areas: comfort, leisure and healthcare (Chan, Esteve, Escriba, & Campo, 2008). Although all three of these areas are relevant to older people, the biggest relevance of smart homes lies in their potential to address their healthcare needs.

Regulatory aspects related to smart homes

There are a number of regulatory frameworks and policy documents that relate to smart homes technologies. As smart home technologies gather large quantities of private user data, which may become available to external observers **EU privacy directives and regulations** are particularly important for the future development of smart homes. Also, given the role of smart homes in promoting ageing in place and the prominent role of ICT technologies in the development of smart homes, policies related to **eInclusion** and **eAccessibility** are also of great relevance to smart home development. Other relevant policy and regulatory documents include:

- *European Charter of Fundamental Rights* (2000)
- *Riga Declaration* (2006)
- *Strategic framework: i2010 – A European Information Society for growth and employment* (2005)
- *The Ageing Well in the Information Society Action Plan* (2007)
- *The Digital Agenda for Europe: A Europe 2020 Initiative* (2010).

The development of smart homes is also subject to industry standards and norms, such as those developed by CENELEC (European Committee for Electro-technical Standardisation), CEN (European Committee for Standardisation) ETSI (European Telecommunication Standards Institute) and ISO (International Standards Organisation). As smart home devices are often also healthcare devices EU regulations on the collection and processing of medical data must be also applied. Although there is no specific European regulation on personal data as this is defined by individual Member States, the issue has been raised by the European Health Telematics Association (EHTEL) in the *Patient's Charter for eHealth Information Systems* (2008).

Psychological and social implications of smart homes and housing design for elderly

The psychological and social implications of smart home design for older people vary greatly between countries, regions and individuals. These implications are centred around issues of social isolation, sense of identity, privacy, control, frustration and abandonment, which in turn influence the acceptability of measures to support ageing in place.

Addressing **social isolation** is one of the key challenges for implementing “successful ageing” in place. ICT technologies show a lot of promise in this area. The modern communication technologies allow for real time communication with visual as well as auditory feedback to the users. ICT solutions can be used to connect family and friends, but to do so they must be available and accessible to all. Such solutions also need to be considered as a way to extend and not replace human contact. Fears have been expressed that “new communication tools may become a substitute for face-to-face contact and thereby make social isolation worse.” (SENIOR, 2009).

The home reflects person's individual experiences and personality and its surrounding neighbourhood has strong **sense of identity** to them. It is important that any modifications to the home, be it of physical or technological nature, have a minimal impact on the sense of identity. Familiarity with the location and its characteristics enable those who are frail to navigate spaces that would normally require greater effort and to be able to perform tasks, otherwise outside of their capabilities, when performed within their own home (Mihailidis, Boger, Czarnuch, Nagdee, & Hoey, 2012). Providing and strengthening the sense of identity within the home also helps to reinforce the distinction between public and private spaces, which is crucial for encouraging a sense of identity in users (De Matteis, 2010). Although AAL technologies are physically almost invisible, the psychological and emotional impact may be more important for the acceptability by older users. Some older adults find passive devices, such as sensor unacceptable as they change the perception of home by the residents. AAL technology can interfere with an individual's space, especially in regard to what is private and public space. The space considered as private may cease to be private as others can have access to data that allows them to know what is happening at home, leading to breaking down the privacy of the home. Therefore, it is crucial that smart home technologies and home modifications do not erode the sense of identity and privacy of the home.

The monitoring function of AAL has important implications for the **privacy** of the residents. It is crucially important to ensure that the privacy and autonomy of the resident is respected. Excessive or intrusive monitoring equipment can be seen as surveillance rather than support for ageing in place. Also improper handling of medical or user data can expose the user to unsolicited contact and may cause potential harm (De Hert & Mantovani, 2010). Such breaches can cause users to lose trust in the technology, which then is likely to be rejected or abandoned.

One of the key benefits of smart home technologies is that it can act independently of the user input and trigger alarm if necessary. However, this may have a significant psychological impact on the resident. The issue of **control** and the level of control made available to the user is one of the key determinants for the acceptability of smart home technology and it is strongly connected to the issues of privacy and personal space. The challenge lies in finding a balance between allowing the resident sufficient control over the home and allowing technology to provide an actual benefit to the overall quality of life. It has been recommended that AAL technologies should strive to increase the independence of older adults, while maintaining their autonomy by prompting the user input rather than completing the tasks independently of the user.

At present, the level of adoption of the smart home technologies is rather low, yet even if the technology has been adopted by a user, they may still abandon it. One of the key reasons for abandonment is frustration. Frustration occurs when the device or service do not fit well with user's needs. If the user is unable to adapt the device to their individual needs, either due to inflexible design or poor training, they may get frustrated and abandon the device or use it less frequently. If the user cannot actively stop using the device, it is likely to lead to frustration and result in the reduced comfort levels of the user in their own home.

The factors discussed above influence the acceptability of the smart home technologies by the users. They interplay with cognitive style, personality, demographic and user-situational factors identified as most relevant for determining acceptability by Alavi and Joachimsthaler (1992). Carefully assessing the needs and matching them to the capabilities of technology can result in the higher acceptance rate. Self-awareness and self-perception of user's own needs can affect they approach to assistive technology. Users who recognise the utility and the effectiveness of the proposed solution are more likely to use it. Another barrier for acceptability is a feeling that the proposed technology emphasises or makes more visible their needs to the degree that its potential benefits are secondary. While considering the adoption of AAL technologies it is necessary to respect user's freedom of choice, their autonomy and privacy as well as to safeguard their self-esteem and dignity, while emphasising safety.

Conclusions and recommendations

The report reached the following conclusions:

- Ageing in place is about supporting people. Solutions used to support ageing in place should focus on the person and their associated needs, rather than elderly as a group.
- The user must always be at the centre of the design process. The tools should be designed around their needs rather than fitting the need to the tool.
- The needs of the individuals that are being addressed are likely to differ greatly across different individuals. Proposed solutions to support ageing in place should be adaptable to different situations and the changing needs of the user.
- Any adaptation of a house or its environment incorporating smart home features should attempt to retain or reinforce the "homelike" qualities, which are essential for maintaining and increasing the level of comfort of older people and their acceptability of changes introduced to support their needs.
- There is a balance between providing required levels of care and respecting the privacy and autonomy of the individual, regardless of age. In cases where increased level of monitoring is needed, such as residents suffering from cognitive impairment, residents' dignity and privacy must be always respected. Access to personal data should be limited strictly to those who require it, and resident should always be able to check who accessed it and why.

- The main non-user related barriers for the adoption of smart home technologies are compatibility and interoperability. Standards and cooperation should be promoted to ensure that the resulting technologies produced in different regions and by different operators are compatible with other devices and flexible in how they are applied.
- While the need to adapt physical devices to users' needs is important, social and cultural differences must also be taken into consideration during the assessment of feasibility of a given solution to support ageing in place. This applies to devices as well as the applications of standards and models of care. Particular attention should be given to the role of family in the lives of older people.
- Control of the technology must be within users' power as much as possible. Users shall be able to turn on or off the technology as desired. People with severe cognitive impairment may require that such control will be placed in the hands of the carers. However, this should be evaluated on case by case basis.
- The suitability of different approaches for ageing in place is closely linked to the needs of the elderly persons. Both ICT and physical assistive devices have advantages and disadvantages that need to be clearly understood before they are used to support ageing in place. In particular, ICT should not be seen as *the* solution, but should be considered as one of many potential ways to address particular user's needs.
- Supporting ageing in place means identifying and addressing the needs not only of the resident, but also the entire home environment, including physical, social and emotional elements.
- "We should always be aware of other needs that could be or should be addressed" (VA D3.5: p. 48).

The report has also identified a range of policy recommendations for the design and development of housing design and smart homes for older people:

- Identify the values that should be embedded in the housing design and smart homes.
- Develop methodology to apply those values, and understand their implications.
- Identify stakeholders and facilitate communication between them.
- Encourage the dissemination of knowledge.
- Identify barriers to the development of proposed solutions, and develop measures to address them.
- Remain flexible and evaluate the solutions implemented on regular basis.

2.5.3 Transfer of Knowledge and Skills

The report was prepared by the seconded researcher from CSSC, with the assistance of Tecnalia staff. During his secondment period the researcher took part in the following activities:

- Visits to other Tecnalia centres to see their Homelabs and speak with researchers about their work and current projects related to supporting ageing in place through ICT and telecare.
- Interviews with experts in developing measures to support ageing in place, ethical issues related to emerging technologies, and with experience of working with older people and smart home technologies.
- Workshop with presentations from representatives of internal Tecnalia departments and external institutions. Also a dissemination action which was attended by people unconnected to the VALUE AGEING Project and involved a presentation based around the work carried out as part of D3.5.
- Attended a workshop in April, hosted by a neighbouring institute and visited the APTES institute in May to discuss their work and the VALUE AGEING project.

The researcher acquired the following skills during his placement at Tecnalia:

- Administrative and networking skills developed through contacting potential interviewees and workshop participants, scheduling interviews, disseminating relevant information and following up on contacts made to continue discussions or pursue new areas for collaboration.

- Critical analysis skills developed through the analysis of data from multiple sources and writing and presentation skills needed for producing the report VA D3.5.

PART B

3 WP3 Final Report on ICT developments impacting on older people's living conditions and environment

Well-designed ICT technologies have a great potential to benefit older people by minimising some of the limitations that may be associated with ageing, such as decreasing mobility or social isolation, and improving their overall quality of life. This chapter aims to explore the impact of ICT and issues associated with ageing on older people's living conditions at home and in the community and identify the main ethical and value related concerns that need to be addressed by policy makers and technology developers. It starts with the consideration of general impact of ICT solutions and how they influence different aspects of older people's lives in different spatial contexts. Then ICT as a resource for ageing well is being explored and the risks associated with ICT technologies are examined, giving particular attention to the issue of social isolation. The chapter concludes with the discussion on the extent to which the EC standard definition of 'ageing well' is ethically and politically tenable and identification of main policy and regulatory gaps to be addressed.

In this chapter the definition of older person follows the UN definition: 'older person is someone who is over 60 years old' while living conditions and environment is considered to be a person's primary residence, be it their own home, sheltered accommodation or residential accommodation. According to the definition older person is someone who is over 60 years old, yet 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. The meaning of being old is explored in more detail in VA D7.1. For this report, the recognition of these differences is crucial in defining the individual needs of older users that could be satisfied by ICT solutions.

The PART B of the report was developed using data collected in the five thematic reports discussed in PART A and author's desktop review of relevant academic literature, policy documents and reports and public debates on issues addressed in this report.

3.1 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 who have adopted them or may adopt them in the future. While considering the impact of ICT on an older person's living conditions and environment, it is necessary to consider such impact on different functions and aspects of a person's life that takes place in these conditions. Three different spheres of influence can be distinguished: cognitive function, physical function and social, cultural and emotional life. Different ICT solutions will vary in terms of their impact, benefits and risks for different spheres of person's life, usually influencing more than one sphere. They also may affect differently the space older people's lives take place in - only home or home and a wider community. ICT solutions can also play different roles for various phases of the ageing process: they can help to 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.

This section of the report examines the impact of ICT development on different aspects of a person's life, within different spatial contexts and different phases of ageing, the extent of adoption of ICT technologies and associated financial aspects.

3.1.1 Impact of ICT on cognitive functions

The basic cognitive functions that are most affected by ageing are attention and memory. Amongst other cognitive functions that may decline with age are: perception, mainly due to deteriorating sensory capacities, language processing and decision-making. The decline in cognitive functions can create difficulties in daily lives causing forgetfulness, decreased ability to perform certain activities, like driving, and consequently lead to the loss of confidence, independence and decreased quality of life. Cognitive decline can also result in old age diseases, such as Alzheimer's disease or dementia. Maintaining cognitive health allows older people to live independently longer, postponing or in some cases reducing the need for carers or being moved to residential care.

It has been recognised that cognitive effort and exercise can help a person to maintain their cognitive abilities. Studies investigating the lifestyles of people who maintain a 'sharp mind' well into old age have found that hobbies requiring learning of new activities or other active mental involvement, such as chess, bridge, crosswords, reading books, or playing musical instruments, helped them to preserve cognitive functions (Anstey, 1999; Hultsch, Hertzog, Small & Dixon, 1999; Verghese, Lipton, Hall & Derby, 2003). In another study that examined the effects of cognitive training interventions amongst over 2800 individuals aged between 65 and 94 using memory training, reasoning training or speed of processing training, it was found that cognitive training intervention can improve targeted cognitive abilities up to 2 years after training (Ball, 2002).

ICT developments can have significant role to play in maintaining and improving cognitive abilities of older people. Simply learning new skills, such as computer skills, requires cognitive effort, which in turn helps to maintain cognitive abilities and functions. A range of computerised cognitive training exercises, such as mentioned earlier Vital Mind or Lumosity, that were developed in recent years, are increasingly able to improve performance of the trained cognitive abilities and create a higher sense of self-confidence and a better perceived quality of life. They also help to slow down the emergence of age related illnesses. For example, in a study conducted by the ACTIVE group that followed more than 2500 users (65 or older) for a period of five years, users that undertook a few weeks long decontextualized computerised training programme focusing on memory, speed of processing and reasoning, were able to significantly improve not only their daily living activities, but also gained a stronger sense of independence (Willis, 2006).

Cognitive functions can also be exercised by web browsing. A study exploring the possible impact of Internet browsing on brain activation patterns found that for middle-aged and older adults with well-developed computer skills, the internet browsing activates key centres in the brain that control decision-making and complex reasoning. The impact of web browsing activity amongst adults with low or no computer skills was lesser and more comparable to the effects of reading on the brain (Small, 2009). The findings demonstrate that an active web searching activity can stimulate and possibly improve cognitive functions.

Although in most cases impact of ICT on cognitive functions is positive, there are some ICT solutions that may reduce cognitive functions 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). Although this has not been confirmed by research one can suspect that overreliance on technology can also have negative impact on a user's cognitive abilities by decreasing the stimulation of memory function.

ICT solutions also aid older people who already experience the effects of decreased cognitive ability, such as forgetfulness. An example of such solution is HERMES system⁶ developed by an EC funded project, which aims to deliver cognitive care for people experiencing mild problems with memory. The HERMES system, built on the interaction between a mobile phone and a computer, aims to provide users with assistance with prospective memory (remembering to remember or remember to perform an intended action), retrospective memory (remembering the past) and cognitive training (exercises to train the brain to not forget important things). Another example is ScripTalk Station⁷, which assists users in correct application of their medication. Simple ICT devices, such as mobile phones, tablets or computers can also be set up to fulfil similar functions, like setting alarms for appointments, tasks to be carried out or reminders for important dates (anniversaries, birthdays etc.).

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 people with memory problems and particularly with 'wandering' tendencies. Although such technologies are potentially beneficial for both the user and the carer, the use of such solutions 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).

3.1.2 Impact of ICT on physical functions

The effects of physical decline associated with ageing include the reduction in movement and manual abilities; higher likelihood of developing chronic diseases, such as diabetes and cardiovascular; higher risks of sustaining injuries and contracting infectious diseases; and reduction of sensory abilities, i.e. failing hearing and vision. The physical effects of 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. Many studies have proved that physical functions can be maintained by participation in regular moderate and/or strenuous exercises (Frontera, 1988; Seeman, 1995; Stuck, 1998). Positive impact on physical ability can also be observed by an increase in Non-Exercise Physical Activity (NEPA), which includes all forms of physical activity and movements that are not intended as exercise, but have positive effects on health, e.g. cleaning, dusting, walking around the house and garden, adjusting blinds etc.

Similarly like in the case of cognitive functions, ICT developments have a significant role to play in maintaining and improving physical abilities of older people. These roles can be seen as preservation, prevention or risk reduction, and support.

ICT solutions, such as earlier discussed Vital Mind, support participation in physical exercises by allowing users to choose from a range of different exercises (from repetitive to fun), carry them out at home and with friends if desired, and while doing so to receive feedback and monitor their physical performance. Although Vital Mind is a purposefully built system, other systems available on the mass market, e.g. game console Wii or X Box Kinect may be used for similar exercises (Social Care Institute for Excellence, 2012).

⁶ <http://www.fp7-hermes.eu/>

⁷ <http://www.envisionamerica.com/products/scripability/scriptalk/>

Some systems, like PAMAP⁸, also allow the information to be recorded and analysed by medical professionals. This helps to preserve physical abilities of older people and maintain their independence.

In a case of a fall using technologies, like HIS Mambo2⁹, can prevent other complications that may arise as a result of long period of immobility after the fall, such as muscle cell breakdown, dehydration, pressures sores, hypothermia, and pneumonia. ICT technologies have a potential to help blind or visually impaired users to navigate to and from a specific point (ALICE¹⁰), enable older users to confidently and safely use public transport (ASSISTANT¹¹), assist older people with memory problems in returning to a familiar location (CONFIDENCE¹²), support elderly people with age-related sensory or cognitive impairments in their daily activities away from home (E-MOSION¹³), or facilitate safe and secure mobility of seniors with mild cognitive impairments (MYGUARDIAN¹⁴).

E-health and telemedicine solutions, such as Health Buddy¹⁵, HIS Intouch System¹⁶ or Neurokeeper EEG Headset¹⁷, can be 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 may also empower and facilitate the user in taking control and management of their own health and adjusting their behaviour towards healthy choices.

Although benefits of e-health and telemedicine are undeniable, there are some risks associated with their application. With an increased penetration of telemedicine solutions, people's homes could 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 potential negative effect of such transformation could be a change in a 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. Finally, there is also an increased risk of social isolation, which is explored in more detail in sections 3.1.3 and 3.3.

ICT solutions are used to support mobility needs of older people with long-term disabilities or in need of rehabilitation. HAL-5, the exoskeleton described in Part A, Section 2.2, is an example of technology that can help people who suffered stroke or spinal cord injury to walk again. Except the obvious physical assistance such technology can provide, it can also assist in maintaining sufficient levels of physical activity for other parts of the body not affected by disability as well as stimulate the cognitive functions by allowing the user to maintain a certain degree of independence. The HAL suit can also be used by individuals carrying out heavy lifting and other strenuous physical work repetitively reducing the risk of physical damage and disability at older age, hence facilitating their future *ageing well*. Sensors, remote controls and other smart home devices also assist older people with limited physical functions in managing and controlling their daily activities. They enable residents to manage remotely their environment and have greater control of the

⁸ <http://www.pamap.org/>

⁹ <http://www.falcom.de/products/safe-security/mambo2-b6/>

¹⁰ <http://www.aal-europe.eu/projects/alice-2/>

¹¹ <http://www.aal-europe.eu/projects/assistant/>

¹² <http://www.aal-europe.eu/projects/confidence/>

¹³ <http://www.aal-europe.eu/projects/e-mosion/>

¹⁴ <http://www.aal-europe.eu/projects/myguardian/>

¹⁵ http://www.bosch-telehealth.com/en/us/products/health_buddy/health_buddy.html

¹⁶ <http://www.health-insight.de/joomla/en/his-intouch.html>

¹⁷ <http://www.medgadget.com/2013/01/neurokeeper-eeg-headset-spots-signs-strokes-in-brainwave-signatures.html>

access points to the house. However, use of such 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.

3.1.3 Impact of ICT on 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 loss, be it a loss of family members or friends, position in society or independence. Beekman et al. (1995) detected that 12-15% of elderly people suffered from minor depression or showed significant clinical depressive symptoms, while 2% suffered from major depression. Many studies (Pennix, 1998; Callahan, 2005; Everson-Rose, 2005) observed that depression had negative effects on physical functions leading to hastened physical decline independent of other health factors (e.g. overall health status, socio-demographic factors, life style), and consequently the loss of independence and serious health conditions. Emotional well-being is therefore paramount for slowing down of the physical decline and facilitating *ageing well*.

Emotional well-being is closely linked to social life and relationships in one's life. Strong social network is key, but also the amount of time spent socialising matters (Rath, 2010). Communication technologies have transformed the way people socialise, build and maintain relationships and communicate with each other. They also have a great potential to further influence living conditions of older people by facilitating an interaction with family, friends and new acquaintances. Social web solutions, such as Eldy and other social networking sites for elderly listed in Part A, Section 2.2 and 2.3, allow older users to keep in touch with their friends and family, engage in discussions on forums and chat rooms and pursue their hobbies and interests, and consequently improve their quality of life by extending the social interaction. Although the benefits of social networking and other internet facilitated interactions are undeniable, the positive impact on older people's living conditions is offset by low levels of computer and internet usage amongst older people and accessibility issues. Majority of older people lack necessary skills to use computer and fully benefit from the range of service the internet offers, be it social networking sites, e-commerce or e-government services. Additionally, many websites and services, even those directed at older users, do not take into account the needs of older people related to visual and hearing requirements and simplicity of use.

Important aspect of emotional well-being is a feeling of safety and security. There are number of ICT technologies, such as discussed earlier HIS Mambo 2 (Part A, Section 2.2), which allow users to call for help in emergency situations as well as detect falls. Such solutions allow older people to feel more secure and at ease in their own homes, and consequently allow them to lead independent lives. Feeling of safety and security can also be created by assisted living and smart home technologies, both at home and in the community based centres, such as the Great Northern Heaven Smart Apartments in Dundalk, Ireland, discussed in Part A, Section 2.2. The residents of the centre emphasised how important feeling safe was for them and that the technology has given them that feeling of safety, both in regard to getting help in case of a fall as well as in a case of intruders (MacFarlane, 2012).

ICT developments include also companion robots, which can not only assist elderly with daily physical activities, but also provide social interaction. Companion robots are seen as especially useful for people living in isolated and sparsely populated areas that may be exposed to the risk of social isolation and

depression. Mental commitment robots, such as Paro¹⁸, 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 there are many benefits of such technology, 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 a feelings of embarrassment.

Due to their flexibility and potential to minimise the 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 physical and psychological point of view, can pose risks for the emotional well-being. Replacing a face-to-face contact of an elderly patient with their medical professional with a remote connection can lead to an increase in isolation. For older people living alone, a visit to a medical practice or medical care personnel visiting them at home is often an opportunity for one of few social interactions they may have. Substituting the face to face meeting can lead to further isolation and feeling of exclusion and disconnect.

While there is no doubt that ICT solutions can have a very positive and in many cases transformative impact on older people's living conditions, most of risks associated with their application seem to be related to their impact on the emotional and social sphere. Perhaps, this is related to a fully unexplored interaction between people and machines or simply lack of research that would shed some light on these issues. Certainly more research that would explore the impact of ICT on older people emotional and social sphere is required to better understand this matter.

3.1.4 Adoption of ICT solutions by older people

As it can be seen from the previous three sections, the range of ICT solutions, products and services that can be used by older people and that affect their living conditions and environment is vast. One of the ways to consider the extent of their impact is to attempt to assess the level of their adoption by older people. As it would be very difficult to do that for all solutions, this section will focus on the groups of solutions, such as those related to computer and internet use, telecare and telemedicine provision or devices helping to improve physical and cognitive functions.

According to Eurostat (Seybert, 2011) one in four people aged 16 to 74 in the EU had never used the internet. In 2012¹⁹, amongst individuals, aged between 55 and 64, 40% never used internet, while amongst those, aged between 65 and 74, this number was even higher – 63%. Half of individuals aged 55 to 64 that have used internet use it at least once a week; while only 30% those aged 65 to 74 use it with the same frequency. In terms of computer skills, 16% of individuals aged 55 to 64 could perform 1-2 computer related activities and only 12% 5-6 computer related activities. For the groups aged 65 to 74, only 12%

¹⁸ <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

¹⁹ Data taken from the online Eurostat database, accessed on 6th March 2013.

could perform 1-2 computer related activities and 5% of the same group 5-6 activities. The involvement in social networks amongst older people is also low – in the United States only 7% of those aged 65 and over has a profile on online social network (Senior Journal , 2009). Given the current low level of use of computers and internet amongst older people the extent of impact ICT technologies can have on their living conditions is likely to be low. However, the number of older people using ICT technologies and the range of solutions they use is continuously growing, for example the percentage of older people (aged between 65 and 74) increased from 22% in 2007 to 37% in 2012²⁰, it is therefore likely that ICT technologies will influence older people’s living conditions in the future to much greater extent.

According to a survey conducted by Saga²¹, an online resource for older adults in the UK, 2% of people aged 75 and over use WiiFit as a way to keep fit, while in the group over 50 year olds that percentage doubles. Increasingly more older adults admit to use WiiFit for exercises than to do bowling and it is a number comparable to those who jog. 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 amongst older people is even smaller, although it is set to rise more rapidly. For example, in the United States a study estimated that by 2012 3.4 million seniors (almost 10% of US population over 65 years old) will be using networked sensor applications to monitor and improve their health (Senior Journal, 2007). There is no data available for Europe on the number of people using telemedicine solutions; however, the market for telemedicine in Europe has not developed yet on a large scale. This is set to change in coming years – by 2015 the European telecare market is expected to be worth more than five billion euro a year (European Commission, 2013).

There are many factors underlying the level of adoption of ICT technologies amongst older people. These can be related to older adults’ computer skills and the availability of training to enhance such skills, presence of children or grandchildren that may assist in adoption of technology, access to hardware and broadband provision, which in turn may be influenced by financial constraints or service availability (many remote rural areas have no access to broadband infrastructure). In case of some solutions more personal factors may be at play, such as 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 (“it’s for young people, not for me”), negative experiences (“it’s not safe, the neighbour’s online account was robbed”), privacy concerns (“I don’t anyone one to monitor me”) or lack of 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

²⁰ Eurostat statistics: <http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do>.

²¹ The findings may not be representative for all older adults as interviewees sample was chosen from the users of the Saga website, which implies the persons interviewed already have certain exposure to ICT technologies.

care coordination and facilitate access to personal support or social engagement with other carers (EC, 2011).

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

The extent of the impact of ICT developments on older people's living conditions cannot be fully considered without giving some attention to its financial implications. 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. For example, by keeping their mind active an older person using Vital Mind system 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, for example analysis of three programs using Health Buddy 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 A, 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, discussed in more detail in section Part A, Section 2.2, 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 build 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).

Another financial aspect of this is related to funding of the innovation for the ICT development. 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 them or limited usability for their needs (e.g. people who cannot afford to heat their homes are unlikely to see a need for smart home solutions). This issue impacts social justice as governments and public bodies have a duty to use their resources for benefit of all citizens, and especially those in vulnerable positions.

3.2 ICT as a resource for ageing well

3.2.1 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 to improve the lives of the ageing population needs to be analysed with reference to the notion and meaning of ageing well. There is an increasing emphasis being placed on *ageing well* in the context of policy discussions and formulation, yet an operational definition of *ageing well* has not been agreed so far (VA D7.1). In the 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. These concepts are discussed in detail in the project deliverable VA D7.1. Some authors see *ageing well* as synonymous with *successful ageing* (Fernandez-Ballesteros, 2010) or *healthy ageing* (Li-Weng Hung, 2010). In this section, the notion of *ageing well* is explored with a view of developing a better understanding of the concept and proposing a definition that can be then used to consider ICT as a resource for *ageing well*.

There are very few definitions of *ageing well* available in the literature. 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. For him, ageing well is a process of identifying and managing potential and likely change. Ship (1997) discusses ageing well as comprised of a number of elements related to different aspects of one’s life:

- well-being, i.e. physical, mental-emotional, social and spiritual,
- empowerment, i.e. ability to make decisions about one’s life,
- awareness and access to information about existing programs and services, and to medical, social and other support services,
- ageing in place with respect and dignity and for as long as possible,
- supportive social environment enabling continued community involvement and participation, and
- supportive economic and infrastructural environment, which includes financial security, adequate and affordable housing and accessible and affordable transportation.

Li-Wen Hung et al. (2010) analysed 34 studies exploring the concepts of *successful* and *healthy ageing* or *ageing well*. Although, these concepts show particular similarities, they use different terms to describe concepts that could be also named as *ageing well*. Among 34 studies, 25 of them used the term *successful ageing*, five – *healthy ageing*, two - *active ageing*, one - *ageing well* and one – *robust ageing*. Analysis of these studies led to the identification of twelve key domains for healthy ageing (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. Twenty three of these studies have shown definitions developed by academics and another eleven reflected older people’s ideas about *ageing well*. In contrast with the academic views, older people’s perceptions of successful ageing included many more domains and were more comprehensive. 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.

A number of studies that have examined how older adults define, perceive and describe *ageing well* or *successful ageing*, a term often used for *ageing positively* are reviewed here. Ryff (1989) concluded that

successful ageing requires positive relationships, sense of humour, enjoying life and accepting change. Knight and Ricciardelli (2003) identified adapting to new situations, compensating for losses and selecting activities according to capabilities as criteria for successful ageing. In Bowling's study (2007) the most frequently cited criteria for successful ageing were: health and independent functioning, psychological factors (cognitive, emotional and motivational), social role and activity, financial and living circumstances, and social relationships. In Reichardt et al. (2007) study, 33 elements of successful ageing were identified and the four most important were: attitude/adaptation, security/stability, health/wellness and engagement/stimulation. In Hsu (2006) study carried out in Taiwan, the most highly rated criteria for *ageing well* were: physical health, independence, living without chronic disease, living with family, and receiving emotional care.

The review of *ageing well* concept from perspectives of academics and researchers, policy makers and older people, confirms 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 the review of different concepts underlying the *ageing well* notion 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 person's life, including values related 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 one's home, 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 being 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."

3.2.2 ICT as a resource for *ageing well*

A resource is a source or supply from which benefits can be produced. In this section, viability of and the extent to which ICT can be a resource for *ageing well* is examined. As *ageing well* is an on-going process that enables an individual to successfully manage and embrace changes resulting from ageing, ICT technologies can become a resource, for identifying, managing and embracing such changes. Information is one of the essential elements in doing so successfully. The development of internet has opened up access to large quantities of information at person's fingertips and enabled direct knowledge exchange between people. Internet has also become a popular learning tool for many. For example, amongst internet users aged between 55 and 74, 71% of them used internet to find out or learn things (Milligan, 2011). Many older people use internet for acquiring health related information, be it in relation to specific conditions or injuries, dietary advice, or general information on improving health and well-being. In 2011, according to Eurostat, 56% of individuals aged between 55 and 74, who used internet within last three months,

searched for health related information. Health related topics are also popular on blogs and forums being part of social networks targeting older people. Although internet is an important tool for developing a greater knowledge on ageing and strategies for managing the changes resulting from ageing, especially in relation to health, an issue of information accuracy, consistency and completeness cannot be overlooked. For Internet to be a resource for ageing well its users need to be aware of information quality issues. Procedures and website rankings should be developed to assist users in choosing reliable, high quality sources.

The Internet is an important tool in providing information not only about health issues but also about other aspects of ageing, such as information on various services available to older people and their carers²². Many seniors use it to access public services and carry out commercial activities, such as shopping, online banking and so on. 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 behave safely online is imperative, especially in regard to protecting their privacy and dealing with malware and fraud risks. Negative experiences, except causing specific damage be it financial or emotional, can become a barrier in engaging with technology and lead to a fear of the perceived threats of being online which could stop older users from fully benefiting from the internet as a resource (Milner, 2012).

The low level of accessibility to internet amongst older people, either due to lack of skills or access to devices or broadband, is a barrier in fully utilising internet as a resource at present. However, with the number of older people using computers and internet growing continuously it is likely to become a more significant resource in the future.

Information is one type of resource for *ageing well* that is made easily and instantly available to older people through the use of internet. Internet based communication technologies, such as VoIP telephony, video-conferencing and shared work tools, are another important resource that can be utilised to successfully manage the ageing process. Except the already discussed (part B, section 3.1.4) roles of ICT in facilitating social interactions with friends and family and developing new relationships, they can also assist older people in re-entering spheres of work and education more easily by supporting their remote presence, allowing access to shared information and connecting with colleagues. For many people full retirement or significantly reduced working time means large adjustments to their daily routines, often financial situation as well as how they view themselves within a broader society. Staying active longer through maintaining work activities and relationships and embarking on new paths, such as education courses, is likely to contribute positively to person's well-being, life satisfaction, personal growth and potentially their financial situation. ICT can also be a resource for leisure and entertainment, both through internet as well as specifically designed devices, such as already discussed Vital Mind (Part A, Section 2.2).

The 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 (as already demonstrated in sections 3.1-3.3). Perhaps the role of ICT is somewhat less clear when considering a person's satisfaction with life, personal growth and spirituality, as these are often unique to a person, but it is easy enough to imagine how improvements in other areas arising from the use of ICT can positively impact the less tangible spheres of life, and at the same time how

²² Examples include: <http://www.ageuk.org.uk/>; <http://www.senior.pl/>;

negative experiences of engagement with technology can have adverse influence on these spheres of one's life.

In the context of a resource for *ageing well* ICT services and solutions can be divided into two groups: products and services purposefully geared at older adults (e.g. memory aids, fall detectors, wandering alarms etc.) and mass produced products that are used by older people (e.g. internet, mobile phones, computers, telecare etc.). While, in the case of the first group, it can be assumed²³ that sufficient consideration has been given to issues of usability, accessibility, reliability and affordability from the perspective of users during the design and application stage, the literature shows this is rarely the case for the mass produced products when it comes to consideration of older people needs (Mieczakowski & Clarkson, 2012). It is therefore important to examine issues of appeal (why people would use ICT), usability, accessibility, reliability, and affordability while considering ICT as a resource for *ageing well*.

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 connected to how effectively it is tuned to people's needs and abilities, and how well its benefits are communicated to older individuals (Kearney, 2012). Governments, media and designers have an important role in creating an '**appeal**' of ICT technologies for older people. One of the most important aspects is ensuring that they are not treating older adults as a separate group in relation to technology users and by doing so 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' (see VA D7.1) whose needs cannot be met by "one solution fits all" approach. Additionally, solutions should not only be functional but also aesthetically pleasing.

Usability is one of the key features that will impact the extent to what 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 a restricted usage (Hosking, 2012), especially amongst users who may have very low confidence in their own ability (Huppert, 2012) and are less willing to take risks (many older users adhere very closely to instructions and are unlikely to experiment with technology to the same degree as young people would). To ensure that ICT technology can be more widely used by older users it should provide users with an intuitive experience, employ a simple and meaningful language and fill them with confidence that they are in control. Foremost, it needs to be highly relevant to their needs, so older adults will be willing to embark on a learning path that is often perceived by them as steep.

Accessibility to ICT technology has been already discussed in this report in the context of e-exclusion and as one of the key issues related to justice (section 2.3). It has also been mentioned that accessibility relates to access to necessary hardware, software and other devices and skills necessary to use them. While it is perceived that many older people lack the necessary skills to use ICT (addressing this need is the primary focus of policy and government strategy), 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 people who would like to use 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 going into 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 levels predicted for the future. Milner (2012) believes that wider internet participation among the ageing population and individuals from disadvantaged backgrounds is about two-pronged

²³ Although this may well be a false assumption.

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.

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. According to Wolff (2012) “one critical barrier that needs to be broken down for more targeted use of technology by older populations in the future, however, is the fear of breaking devices, especially expensive items like computers”. As people age their resistance to change grows. This combined with an assumption that to use computers one has to first fully understand how they work combined with the past exposure to breakable and 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 – would such devices perform when they are most needed? Although this concern can be raised by all users, it is most profound amongst the older people who are likely to be frail and have less resilience in managing their condition (e.g. living alone or having physical limitations) (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.

Some issues related to **affordability** have been already discussed previously in section 3.1.5 and in the context of accessibility in this section. In order 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 could become a viable option in addressing this barrier. This should be accompanied by an awareness campaign on how usage of internet could save costs on products and services that could offset the costs of internet provision. A more difficult issue to tackle is providing access to cheap internet in remote areas, such as Greek islands or sparsely populated rural areas, for example in Western Ireland. A more inclusive design of ICT devices could also make cheap mass produced ICT products 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.

3.3 Risks of isolation and confinement

Communication technologies have a great potential to reduce the risk of isolation by facilitating contact with family, friends, colleagues and others. The use of communication tools and services has also potential to increase older people's access to work and learning creating additional opportunities for social interaction. 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. Finally, use of companion robots in isolated and sparsely populated areas can also help to alleviate some of the social isolation effects.

However, to ensure that these benefits are realised it is necessary to consider potential risks and negative impacts arising from the application of these technologies that may lead to further social isolation and confinement. Isolation may develop or increase as an effect of deployment of specific technologies or technology failing to meet certain requirements. In order to make positive impact on older people's lives

the technology and its application need to be trusted, accepted, wanted, accessible and usable. 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). Also lack of access, either related to skills or devices, can contribute to increased social isolation, especially, in cases where people in one's social network have moved significantly to the virtual environment.

The technology raising most concerns in regard to its potential for producing isolation is telehealth and telecare. Installation of health monitoring devices at home and facility to substitute face-to-face consultations with remote consultations can lead to reduction in human contact and increased isolation (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 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. It also recognises that human ability to monitor changes in person's well-being is much greater than that of telemonitoring systems.

Another aspect of telehealth and telecare, as well as other communication technologies, is its impact on social behaviour of older people and their interaction with 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, hence reducing the opportunity for human contact and potentially contributing to a voluntary confinement. Another danger relates to people becoming 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 people's lives. Formal and informal carers require 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 particularly important for people with special 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 special 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 very isolated, and introduction of new technology is unlikely to worsen their isolation, however, there is a good chance to 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.

3.4 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. As a first step, the three elements of the definition are examined separately as they cover different aspects of an older person’s life that are impacted by different influences, be it of economic, social, political or personal nature. This examination is performed with a view of drawing conclusions on its ethical and political tenability for the definition as a whole.

3.4.1 The EC standard 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, the impact of ageing population on labour market and public finances has dominated the debates across Europe, particularly in countries with rapidly ageing populations, such as Eastern and Central Europe nations. Most European countries, such as Poland, UK, Germany, France, and Spain, have recognised that they need to offset the impact of the decreasing number of people in the productive age, and undertook steps to extend the retirement age. Although, this seems a necessary step in 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, reaching unprecedented levels of approx. 55% in Spain and Greece²⁴, 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 – on 22nd April 2013, German Chancellor Angela Merkel suggested that the European Union should finance early retirement schemes as a way of combating high youth unemployment (Reuters, 2013) as it has been done in Germany. Although unemployment amongst older people in countries with high youth unemployment is usually also higher than average (IZA, 2013), encouraging older people to stay active longer at work and financing measures to facilitate that in a situation where resources are required to tackle youth unemployment may not be very palatable for many politicians. Framing and the communication of policies in this area need to promote intergenerational collaboration and view of older people as human capital that can bring different types of benefits to the society complementary to the capabilities of the younger people.

²⁴ 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>)

While an opportunity for working past their retirement age is an attractive proposition for many older people, especially professionals who often stay active and productive past their retirement anyway, being forced to work longer by legislation is not a welcomed development for many older people, especially in countries where the average life expectancy is not much higher than the retirement age. For example, in Poland the male life expectancy is 72 (WHO, 2012), while the retirement age for men is 65, and four in ten adults never reach retirement age²⁵. Current retirement age reform in Poland plans to increase the retirement age for men to 67 by 2020 and for women to the same age by 2040 (current retirement age for women is 60). The resistance²⁶ towards increased retirement age is related to different factors – some people may feel they have worked all their life and deserve to enjoy their retired life for longer, hence it may be related to a feeling of justice. Other concerns, especially in the Eastern Europe countries, relate to the state of health of people when they retire. Many retirees 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), especially in the traditional industries where competition is very high. Older people, once unemployed, encounter more difficulties in finding a new job²⁷. Furthermore, older workers in the knowledge intense jobs need to learn new technology-related skills and cope with the ongoing technological change (De Hert & Mantovani, 2010). Encouraging older people to engage with ICT and learn skills in this area can help them to gain new employment if made redundant. It can also increase general employment opportunities that may not be available to them otherwise. In the situation where many older people face significantly reduced incomes due to pension's crisis in some countries and/or lack of personal savings, ability to generate additional income is very important for *ageing well*. However, this often requires new work patterns and flexibility on behalf of employers to address a better work-life balance and lifelong learning 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 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.

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 becomes more and more 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, who due to the lack of skills or access to devices,

²⁵ <http://biznes.onet.pl/krotkie-jest-zycie-staruszka,18563,5471334,1,news-detal>

²⁶ Over 82% of people in Poland are against the increase in the retirement age (<http://wpolityce.pl/wydarzenia/29655-cbos-ponad-80-proc-badanych-przeciw-podniesieniu-wieku-emerytalnego>). Large protests have been held in France Bulgaria and Spain against it.

²⁷ For example, in the UK over 45% of unemployed people aged over 50 have been unemployed for 12 months or more compared with around 30% of Jobseeker's Allowance claimants aged 18 or over (<https://www.gov.uk/government/policies/helping-people-to-find-and-stay-in-work/supporting-pages/helping-older-people-who-want-to-find-or-stay-in-work>).

will 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 and national 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 as defined above requires also 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, this comes attached with a cost. In some instances, such costs may be very high to provide necessary infrastructure, for example for older people living in remote and less developed areas. This may create certain level of tensions at the political level, especially in times of economic downturn when resources are scarce and 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 care 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. Yet, what are the implications for people who do not wish to adopt technologies for that purpose, for example they opt for using 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.

3.4.2 Reflections on the full EC definition

Overall, the definition of *ageing well* appears to be ethically and politically tenable. Yet, after the deeper consideration of its parts (above) and entirety, 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 finally 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 not able to do not choose to stay active.
- What is the actual relationship between 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 of that definition.

- 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 see the definition as fully ethically and politically tenable. Especially as it may create a perceived negative impact on issues of social justice and has a potential to create political frictions around ageing well at work concept.

3.5 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 and 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, especially as it is likely to become more profound in the future as pensions in many countries 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 (as well as other age groups). 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 at least “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 from questionable sources.
- **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 aspect in relation to 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 (e.g. telecare systems), give consent and monitor their well-being in parallel to the ICT systems. Hence, education of carers in regard to ICT issues should also become part of the policy provisions.

4 Conclusions and Recommendations

4.1 Conclusions

There is no doubt that ICT developments have a vast potential to greatly improve older people's living conditions and environment. However, 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. This report examined the extent of impact of ICT developments on older people's living conditions and environment with special consideration given to ICT becoming a resource for *ageing well* and risks of isolation associated with ICT technologies. The standard definition of *ageing well* was also explored in regard to its ethical and political tenability and a number of policy and regulatory gaps were identified. The main conclusions reached for each question posed in the report accompanied by some future perspectives 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 a 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 of very old people living alone in remote rural areas with no or poor ICT infrastructure to very significant extent for people living, for example in assisted living homes, such as the ones described earlier in section 2.2, where almost every aspect of their life is impacted by ICT technology. The extent of 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 lack of skills or access to infrastructure, yet, to ensure that ICT development will have the desired role in older people's lives, the key stakeholders (governments, regulators, technology designers and providers) need also to address the concerns, currently somewhat less pressing, related to affordability and having feeling of control over the 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."* As *ageing well* is an on-going process that enables an individual to successfully manage and embrace changes resulting from ageing, ICT solutions, especially internet and its various applications, can be 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 and environment, the extent to which ICT can 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 can be a resource for *ageing well* is closely linked to **appeal, usability, reliability, accessibility** and **affordability** of ICT solutions. Older people are much more critical in the way they view and use technology compared to their younger counterparts. To make ICT appealing to them the devices and services need to be tuned to their needs and abilities and the benefits of such solutions clearly articulated. The ICT products and services should also provide users with an intuitive experience, aesthetically pleasing design and a feeling of confidence and being in control. Poorly designed technology is likely to create a lot of anxiety and frustration and consequently weaken the readiness to explore new technologies and lead to a lack of or a restricted usage. Similar effects can result from the perception of technology reliability amongst older adults. For many older adults the lack of understanding of how ICT devices work, e.g. computers, combined with the past exposure to breakable and unreliable technology may create significant resistance impacting the adoption levels. The issue of perceived technology reliability is particularly important for telemedicine and telecare technologies, as many older users are likely to be frail and have less resilience in managing their condition; therefore, the trust in reliability of the devices and the systems they are part of is a key element for the adoption of such technologies.

Accessibility and affordability are another two important closely related issues underlying the extent to which ICT could become a resource for *ageing well*. While 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, affordability, although closely linked to it, is somewhat less prominent, but none the less as important. Going into the future, it is likely that increasingly more older people will have the necessary skills, but they may not be in a position to afford the ICT solutions, especially in countries with low pensions. Currently, many older people, who are not considered disadvantaged by official statistics, suffer from fuel poverty and are not able to afford required medication or, in extreme cases, food.

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 great potential to reduce the risk of isolation as they can facilitate communication with relatives and friends as well as assist in meeting new people, for example through social networks or 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 ensure that these risks will not materialise it is necessary to view ICT technologies as part of a holistic care system for elderly combining technology with a network of professional and informal carers with clearly defined roles and understanding of the entire system.

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

The EC standard definition of “ageing well” describes ageing well in work, community and home context. 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 definition fits well with the 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 and some political leaders advocate early retirements as a potential solution to the youth unemployment problem. 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 not differencing between different aspects of people’s lives, clarifying 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’ (people from strongly disadvantaged backgrounds where exclusion is a generational problem), lack of skills (due to lack of opportunities to learn, not being able or not willing to learn), affordability issues or conscious choices of opting out. Particularly, the issue of affordability may become more important than the problem 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.

4.2 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 and decision-makers, designers, technology providers, service operators and other stakeholders. The recommendations were grouped into two categories: essential general recommendations and more specific recommendations.

ESSENTIAL GENERAL RECOMMENDATIONS

- **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 and regulation.** The adoption of ICT solutions to support ageing well needs to be integrated and closely aligned with overall ageing policies developed by nations 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.
- **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.
- **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 on 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.

SPECIFIC RECOMMENDATIONS

- **Policy.** In order to facilitate e-health technologies, the way in which internet, ICT devices, applications and services interact needs to be standardised and supported with appropriate guidance and shared legislation.
- **Regulation and communication.** To ensure that internet can be a viable source of information on various aspects related to ageing, especially health information, an information quality assessment system needs to be developed, implemented and communicated to older people to assist them in finding an easy access to high quality information from reliable sources.
- **Implementation of services.** Introduction of any assisted living technology service, such as telemedicine, should take into account not only the costs of the devices and service, but also additional costs that may have to be borne by the user, e.g. internet connection.
- **Implementation of services.** In order to facilitate access to internet for older users who cannot afford standard broadband packages but would like to use it various forms of support (such as subsidies²⁸ or special tariffs for elderly) should be considered.
- **Technology services provision and web regulation.** To protect dignity, social networking sites should provide internal rules for collaboration ensuring respect among users and correct behaviours that should be approved by seniors signing up to the site.
- **Technology services provision.** To guarantee equality and fairness in terms of social justice, it is advocated that social networking sites should be free to use and low price hardware devices should be made available to seniors to facilitate their access to internet.
- **Technology services provision.** To ensure safety of users, social networking sites should provide specific rules that have to be accepted and respected by all members, including reporting violation of such rules.
- **Data protection.** To reduce the risk of users' data being abused and compromised, social networking sites should provide seniors with a clear and prominent notice and obtain their consent before any information beyond agreed privacy setting is shared.
- **Data protection.** Privacy and data protection policy should be written in a clear and easy to understand manner to encourage seniors to read it. It should also be easy to find on a website. Seniors should be able to easily understand which parts of their profile are private and which are public.
- **Education.** Seniors, like any other novice users, should be educated in regard to the potential risks associated with the use of internet and social networking sites. To reduce the risk of decreasing social contact as a result of the move towards more virtual communities, people who facilitate that interaction/training should also emphasise the benefits of combining virtual and real life social interactions for overall wellbeing.
- **Education.** Special efforts need to be put in place to develop ICT skills for the group that is most likely to be excluded: older people with low education levels as they are perhaps most at risk within the evolving healthcare landscape.
- **Design.** Public websites should always provide elderly users with an option to view it in a manner that would assist them with any visual or hearing difficulties they may have, while at the same time avoiding stereotyping and compromising their dignity.
- **Research.** The risk of ICT solutions for creating over-reliance on technology should also be further investigated to ensure that the use of technology has no negative effects on cognitive functions.

²⁸ In many countries older people receive subsidies for electricity and transport, why not for internet? Similarly, special low usage, low price tariffs can be introduced by broadband providers to satisfy, usually small internet needs of elderly.

- Overall, there is a need for a user-centred research aimed at validating the ethical and regulatory issues raised and identifying any future concerns.

PART C

5 Validation of WP3 Final Report

The results of the analysis presented in detail in reports D3.2, D3.3, D3.4 and D3.5 and collated in this final work package report were validated through a consultation process with three groups of stakeholders: elite experts, stakeholders and the public. The details of the validation process are presented below.

5.1 Objectives and rationale of the validation process

The validation process aimed to provide feedback from elite experts, stakeholders and the public on the content of the report, its scientific quality and applicability to the key stakeholders in the area of ICT and older people's living conditions. Detailed objectives of the validation process are listed below:

- To evaluate scientific quality of the report.
- To ensure that all relevant issues are addressed in the report.
- To detect a potential bias in the representation of data and its discussion.
- To discern views and attitudes of the respondents in regard to the content of the report.
- To identify how the report could be further improved to ensure its usability and applicability to the relevant stakeholders.

5.2 Methodology and the implementation of the validation process

5.2.1 Elite Experts

Experts identification, selection criteria for interviewees and interviewees' profiles

Following the recommendations set out in the VALUE AGEING project proposal, **five interviews** with European experts in the area ICT and older people living conditions and social environment were conducted as part of the validation process.

The experts, who were expected to represent high level of seniority in their organisation or field, were identified using the following criteria of selection:

- a. Field of expertise (older people living conditions, ICT and ageing, older people and social communication technologies, older people and movement sector, older people and ehealth, housing design for older people)
- b. Sector (academia, private company, policy maker, association for elderly)
- c. Geographical representation (country and European region)
- d. Gender

Ten experts were identified and prioritised. The first five experts were contacted on 24th April 2013 with an email invitation to take part in the validation process. Three of them declined to take part in the interview. Another three from the original list of ten were contacted next and accepted the invitation. The list of interviewees and their background are presented in Table 2.

Table 2: List of the elite experts interviewed

Name	Organisation	Sector	Field of expertise	Geographical information	Gender
Dr Heidrun Mollenkopf	Heidelberg University; German National Association of Senior Citizens Organisations; AGE Universal Accessibility and Independent Living Expert Group	Academia/ Association for Elderly	Sociologist and gerontologist; Technology and ageing, the outdoor mobility of older people; the interplay among personal, societal, technical, and environmental conditions with regard to maintaining autonomy and social participation and, quality of life in old age	Germany	F
Ad van Berlo	Smart Homes Foundation	Industry/ NGO	Smart homes, assisted living technologies	The Netherlands	M
Prof. Rocio Fernandez-Ballesteros	Emeritus Professor	Academia	Ageing well	Spain	F
Mario Romao	Intel, Global Public Policy Team	Industry	E-health, E-inclusion, health care technologies for older people	Belgium	M
Prof. Cathy Craig	Queens University Belfast	Academia	Older adults training, software and games development for older adults	United Kingdom	F

The interviews were held on the following dates:

- Prof. Rocio Fernandez-Ballesteros: 11th June 2013
- Ad van Berlo: 12th June 2013
- Dr Heidrun Mollenkopf: 17th June 2013
- Mario Romao: 19th June 2013
- Prof. Cathy Craig: 20th June 2013

Validation methodology

The interviews were carried out over the phone or skype with the exception of Professor Cathy Craig (face-to-face interview). They were recorded and transcribed. Transcripts of the interviews are available from the researcher. All interviewees consented to their interviews being recorded prior to the commencement of the interview.

A set of open-ended questions was developed for the interviews. The following questions were posed:

A. Overall impression of the document

1. What is your overall evaluation of the scientific quality of this report?

(Please consider the following criteria: most relevant literature, progression of new ideas with supportive sources, depth of analysis)

2. Does the report fully address all the main issues in relation to ICT and older people living conditions and environment?

(Please consider the following issues: the extent of impact of ICT on older people's living conditions; ICT as a resource for ageing well; the risks of ICT in relation to isolation; and ethical and political tenability of EC standard definition of 'ageing well').

3. Is the report in any way biased by the VALUE AGEING author's individual opinions and/or arising from WP3 experiences?

B. Open-ended Questions

1. In your opinion, what were the most important ethical challenges related to the impact of ICT on older people's living conditions and environment identified and addressed in this report? What new knowledge areas and issues were proposed in this report, if any?

2. Are there any issues relevant to the topic of the report and the VALUE AGEING project missing from the report or underrepresented?

3. In your view, how useful is this report in changing perceptions amongst decision-makers and influencing policy formulation in regard to ICT for ageing, especially in regard to addressing the ethical and values driven concerns? Is it clear and informative enough to communicate its main ideas and influence policy makers and stakeholders?

4. What is your view of the 'ageing well' definition and its ethical and political tenability? Are there any aspects of the definition analysis underrepresented or omitted in the report?

5. Where would you position this report within the current research and policy development landscape on the topic of ICT and ageing?

6. Do you have any additional comments or suggestions?

Data analysis

Analysis of the data started with the researcher familiarising herself with the data, then individual sections of texts describing various issues relevant to the validation process were identified. In the next step, the data was coded and codes developed were compared in regard to similarities and differences (agreements and disagreements in relation to the document being consulted). A range of suggestions for changes in the report were developed and incorporated into the report.

5.2.2 Stakeholder Consultation

Experts identification, selection criteria for interviewees and interviewees' profiles

Following the recommendations set out in the VALUE AGEING project proposal, **eight to ten responses** from European stakeholders in the area ICT and older people living conditions and social environment were sought as part of the validation process.

33 stakeholders at European level were identified from the following stakeholder groups:

- a. Private users of ICT for ageing solutions (older people and carers)
- b. Professional users of ICT for ageing solutions (medical professionals, mobility and housing services providers)
- c. Suppliers of ICT for ageing solutions (research organisations and enterprises)
- d. Supporters of ICT for ageing solutions (policy-makers, insurance providers, employers, public administration, standards organisations, civil society organisations, media)

The stakeholders, who were expected to represent high level of seniority in their organisation or field, were identified using the following criteria of selection:

- a. Stakeholder type (as per stakeholder groups listed above)
- b. Level of influence (decision-making power and direct/indirect influence)
- c. Breadth and depth of expert knowledge (general or specialised/niche knowledge)
- d. Geographical representation (country and European region)
- e. Gender

The 33 stakeholders identified were prioritised and contacted with an email invitation to take part in the validation process in the period between 1st May and 6th June 2013. The final number of respondents was nine. The list of stakeholder respondents and their background are presented in Table 3.

Table 3: The list of stakeholder respondents

Name	Organisation	Sector	Geographical information	Gender
Julia Wadoux	AGE Platform Europe	Private users of ICT for ageing solutions (older people and carers)	Belgium	F
Evelyn Hoy	Commissioner for Older People for Northern Ireland	Private users of ICT for ageing solutions (older people and carers)	UK	F
Dr Mario Drobics	Austria Institute of Technology	Suppliers of ICT for ageing solutions (research organisations and enterprises)	Austria	M
Maite Cobo Abeytua	Instituto Tecnológico de Castilla y León	Suppliers of ICT for ageing solutions (research organisations and enterprises)	Spain	F
Felip Miralles	Barcelona Digital Technology Centre	Suppliers of ICT for ageing solutions (research organisations and enterprises)	Spain	M
Dr Giovanni Lamura	Italian National Institute of Health and Science on Aging	Private users of ICT for ageing solutions (older people and carers)	Italy	M
Minna Isomursu	VTT, Technical Research Centre of Finland	Suppliers of ICT for ageing solutions (research organisations and enterprises)	Finland	F
Marcel Gielen	Mextal BV	Suppliers of ICT for ageing solutions (research organisations and enterprises)	The Netherlands	M
Nick Guldemand	TU Delft	Suppliers of ICT for ageing solutions (research organisations and enterprises)	The Netherlands	M

Validation methodology

The consultation was carried out through a written questionnaire (7 respondents) or a phone or face to face interview (1 each). The respondents filled in the questionnaire and returned it by email. Two interviews were recorded and transcribed. The transcripts and completed questionnaires are available from the researcher. Both interviewees consented to their interviews being recorded prior to the commencement of the interview.

A written questionnaire was developed and was used for both the written and oral responses. Questions from the questionnaire are listed below.

Stakeholder Questionnaire

A. Overall impression of the document

1. What is your overall evaluation of the scientific quality of this report?

(Please consider the following criteria: most relevant literature, progression of new ideas with supportive sources, depth of analysis)

- Very unsatisfied* *Unsatisfied* *Neutral* *Satisfied* *Very satisfied*

Comments:

.....
.....

2. Does the report, in your view, fully address all the main issues in relation to ICT and older people living conditions and environment?

(Please consider the following issues: the extent of impact of ICT on older people’s living conditions; ICT as a resource for ageing well; the risks of ICT in relation to isolation; and ethical and political tenability of EC standard definition of ‘ageing well’²⁹).

- Extremely comprehensive* *Moderately comprehensive* *Fairly comprehensive*
 Missing important issues *Not at all*

Comments:

.....
.....

3. Is the report in any way biased by the VALUE AGEING author’s individual opinions and/or arising from WP3 experiences?

- Extremely biased* *Somewhat biased* *Not at all biased*

Comments:

.....
.....

B. Open-ended Questions

1. In your opinion, what were the most important ethical challenges related to the impact of ICT on older people’s living conditions and environment identified and addressed in this report? What new knowledge areas and issues were proposed in this report, if any?

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2. Were there any issues relevant to the topic of the report and the VALUE AGEING project missing from the report or underrepresented? If so, which?

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.....
.....

²⁹Standard EC definition of ageing well:

- 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”.

3. In your view, how useful is this report in changing perceptions amongst decision-makers and influencing policy formulation on ICT for ageing, especially in regard to addressing the ethical and values driven concerns? How useful is this report for you as a stakeholder? Is it informative and clear in the communication of its main messages?

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.....
.....

4. What is your view of the standard 'ageing well' definition and its ethical and political tenability? Are there any aspects of the definition analysis underrepresented or omitted in the report?

.....
.....
.....

5. As a stakeholder in the area of ageing and ICT you may have very specific concerns or issues related to the impact of ICT on older people's living conditions and environment. What are they? And were these addressed to your satisfaction in the report? Are there any issues you would like investigated further in the future?

.....
.....
.....

6. What are the barriers for the full utilisation of ICT by older people, which this report may have overlooked? What are other issues of consideration that could make this report more influential to inform policy, practice and ICT industry?

.....
.....
.....

7. Do you have any additional comments or suggestions?

Data analysis

Analysis of the data started with the researcher familiarising herself with the data, then individual sections of texts from the open ended questions were identified. In the next step, the data was coded and codes developed were compared in regard to similarities and differences (agreements and disagreements in relation to the document being consulted). A range of suggestions for changes in the report were developed and incorporated into the report.

5.2.3 Public consultation

Target group

In WP3, public consultation aimed to actively seek opinions of interested or affected groups on the results obtained in this WP. To ensure that these groups were consulted as widely as possible, groups of interest were identified characterised by having an interest or a stake and/or are affected by the issue of ICT and ageing. The following general sectors were targeted:

- Academia, research, and think tanks
- NGOs
- Citizens
- Enterprises
- Industry organisations/associations
- Public sector/administration

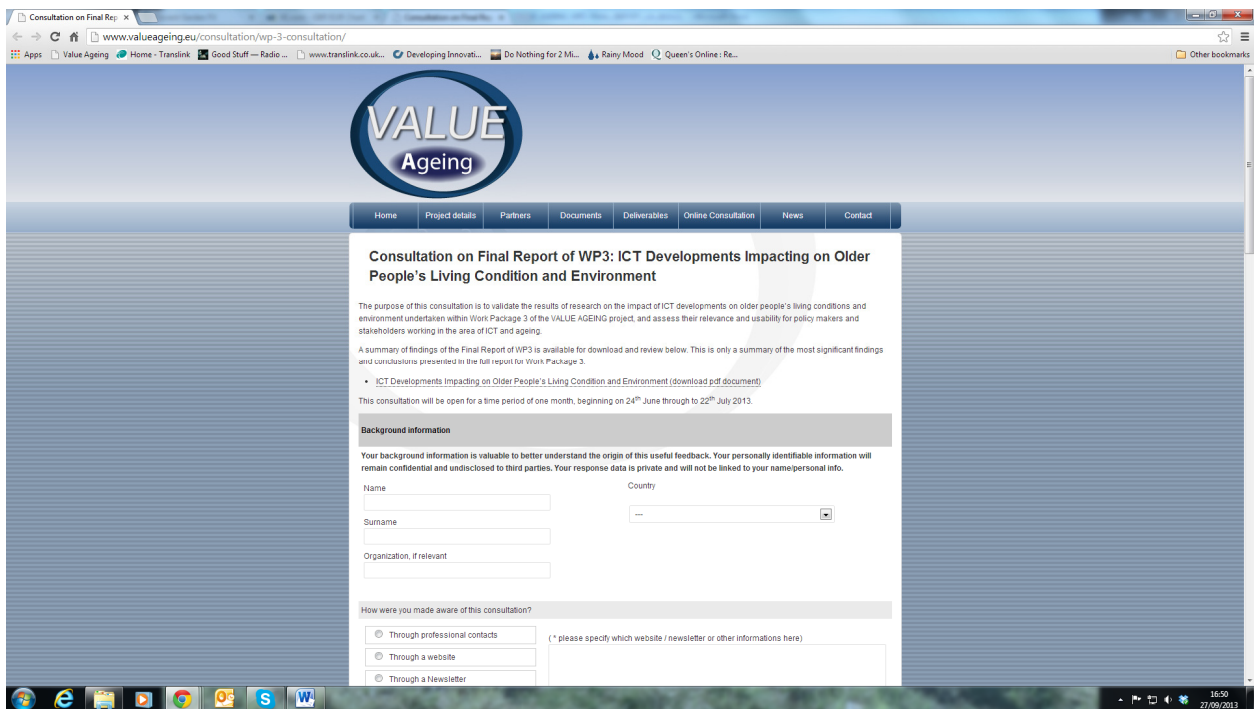
- Other

As part of the identification process a database of organisations and individuals was created. The final number of entries was 112. For each database entry, the following information was provided:

- Name of the organisation
- Sector
- Reason for interest in this area
- Geographical representation
- Contact details (name of a person, email address)

Validation process

The validation of the report was conducted through an online questionnaire posted on the Value Ageing website: <http://www.valueageing.eu/consultation/>. The individuals listed in the database were invited to take part in the consultation process and directed to the web link. The initial email invitation was sent out on 24th June. After that date three reminders were sent out on weekly basis, last one on 19th July, and three days before the closing date. Additionally, individual emails were sent to organisations, like AGE Platform, asking them to promote the consultation process through their newsletters. The final number of responses was five. Print screens of the online questionnaire are presented below in Figure 2.



Consultation on Final Rep: x

www.valueageing.eu/consultation/wp-3-consultation/

Apps Value Ageing Home - Translink Good Stuff - Radio ... www.translink.co.uk... Developing Innovat... Do Nothing for 2 Mi... Rainy Mood Queen's Online: Re... Other bookmarks

How were you made aware of this consultation?

Through professional contacts (* please specify which website / newsletter or other informations here)
 Through a website
 Through a Newsletter
 Other

Under which capacity are you taking part in this consultation?

EU or MS policy maker
 Local and regional policy maker
 NGO
 Academia / research / think tank
 Large corporation
 Industry organisation / association
 European citizen
 User (private)
 User (professional, e.g. practitioner, care giver) (please specify other informations here)
 Other. Please specify below:

Email (optional field, provide a valid email address if you wish to remain informed of the project's future steps and activities. Contact will be limited and your email address will remain confidential):

Consultation Questionnaire

Overall impression of the document:

1. What is your overall evaluation of the scientific quality of this report? (Please consider the following criteria: most relevant literature, progression of new ideas with supportive sources, depth of analysis)

Very unsatisfied
 Unsatisfied
 Neutral
 Satisfied
 Very satisfied

Comments:

2. Does the report fully address all the main issues in relation to ICT and older people living conditions and environment? (Please consider the following issues: the extent of impact of ICT on older people's living conditions; ICT as a resource for ageing well; the risks of ICT in relation to isolation; and ethical and political tenability of EC standard definition of ageing well)

Consultation on Final Rep: x

www.valueageing.eu/consultation/wp-3-consultation/

Apps Value Ageing Home - Translink Good Stuff - Radio ... www.translink.co.uk... Developing Innovat... Do Nothing for 2 Mi... Rainy Mood Queen's Online: Re... Other bookmarks

2. Does the report fully address all the main issues in relation to ICT and older people living conditions and environment? (Please consider the following issues: the extent of impact of ICT on older people's living conditions; ICT as a resource for ageing well; the risks of ICT in relation to isolation; and ethical and political tenability of EC standard definition of ageing well)

1 - Extremely comprehensive
 2 - Moderately comprehensive
 3 - Fairly comprehensive
 4 - Missing important issues
 5 - Not at all

Comments:

3. Is the report in any way biased by the VALUE AGEING authors' opinions and/or arising from WP3 experiences?

Extremely biased
 Somewhat biased
 Not at all biased

Comments:

Open-ended Questions:
(Please limit answers for each question to 800 characters)

1. In your opinion, what were the most important ethical challenges related to the impact of ICT on older people's living conditions and environment identified and addressed in this report? What new knowledge areas and issues were proposed in this report, if any?

2. Are there any issues relevant to the topic of the report and the VALUE AGEING project missing from the report or underrepresented?

3. In your view, how useful is this report in changing perceptions amongst decision-makers and influencing policy formulation in regard to ICT for ageing, especially in regard to addressing the ethical and values driven concerns? Is it clear and informative enough to communicate its main ideas and influence policy makers and stakeholders?

4. What is your view of the 'ageing well' definition and its ethical and political tenability? Are there any aspects of the definition analysis underrepresented or omitted in the report?

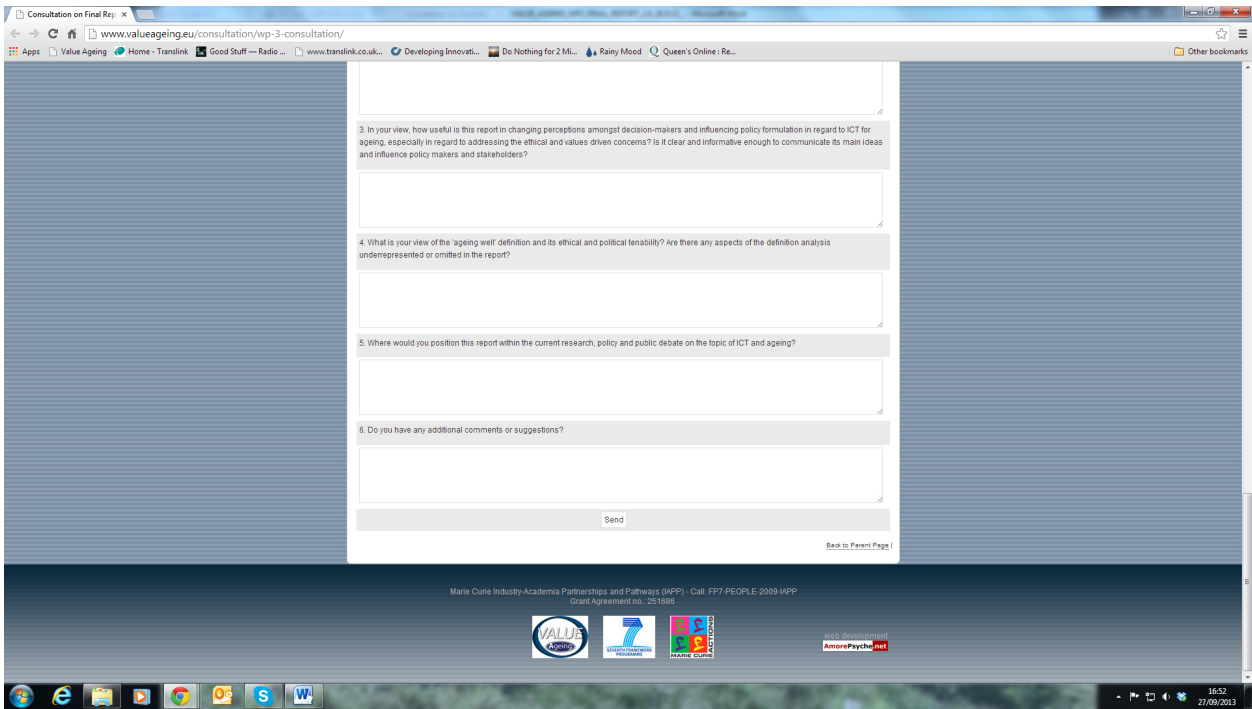


Figure 2: Print-screens of the online questionnaire used for validation of WP3 results

Data analysis

Similarly to the consultation with the experts and stakeholders, analysis of the data started with the researcher familiarising herself with the data, then individual sections of texts from the open ended questions were identified. In the next step, the data was coded and codes developed were compared in regard to similarities and differences (agreements and disagreements in relation to the document being consulted). A range of suggestions for changes in the report were developed and incorporated into the report.

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