ACTIVE ADVICE
DECISION SUPPORT FOR INDEPENDENT LIVING

Decision Support Solutions for Independent Living using an Intelligent AAL Product and Service Cloud

D2.2 Stakeholder and Target Groups Report

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1 Introduction

Ambient/Active Assisted Living (AAL) solutions[1] target, influence or are influenced by different end-user groups, also termed as AAL stakeholders[2]. The term 'stakeholder' has numerous definitions and the debate over finding the one 'true' definition of the concept is not likely to end (Freeman et al., 2010). A somewhat broader definition of 'stakeholders' conceive those as "any group or individual who can affect or is affected by the achievement of the organization's objectives" (Freeman, 1984, p. 26). However, it was affirmed that by taking a wide view of what the term might mean "virtually anyone, or any organization – including groups who are only incidentally and very indirectly linked to the firm, or whose purposes are explicitly directly at odds with the firm" (p. 208) can be considered a stakeholder and, therefore, the concept loses its value (Freeman et al., 2010). By another hand, a narrower approach to the 'stakeholders' concept considers "those groups without whose support, the business would cease to be viable" (Freeman et al., 2010, p. 26). In the context of ActiveAdvice project, an adaptation of the definition proposed by the Ambient Assisted Living Association (2014) will be adopted. It should be noticed that the overall objective of the ActiveAdvice project is to raise public awareness on AAL solutions and provide comprehensive and comparable information for different stakeholder groups. Hence, the aim of ActiveAdvice is to set up a European-wide advisory and support platform that brings together the wide range of available AAL services, products, experts, users and related technologies. The ActiveAdvice platform should then be seen as an integrated communication tool targeted at bridging the gaps between AAL stakeholders by facilitating cooperation, information exchange, and ultimately e-commerce.

Thus, rephrasing the AAL Association (2014) definition of 'stakeholders', those are here understood as: "*All the parties looking for information related to ICT and Ageing well", and wanting to use the ActiveAdvice software solution and the advisory network to gain advice, and more knowledge on existing solutions and on research outcomes. "The stakeholders can be divided into several interrelated groups" – here considered the 'clients' (AAL2C), the 'businesses' (AAL2B) and the 'Governments' (AAL2G) – "each with their own needs and specific angle of approach towards the information"* (p.1).

The stakeholder theory (Freeman, 1984) is about the moral relationship with stakeholders of creating as much value as possible for them. Therefore, this deliverable aims to produce essential knowledge and constitute the foundation for the end-user inclusion and multi-stakeholder cooperation throughout the entire ActiveAdvice project life cycle. In this knowledge-base, we used a threefold approach to identify and collect the stakeholders and target-groups for the project: first, we carried out a narrative literature review to gather comprehensive information on the needs, requirements, motivations and deterrents for primary, secondary and tertiary users of AAL solutions (Chapter 4.1 Research on AAL stakeholders: interpretive qualitative synthesis of the literature). Hence, the document examines the research landscape on those topics regarding older adults, informal and

[1] The ActiveAdvice applies a wide AAL understanding and includes "innovations ranging from low-tech devices, such as walking canes to alarm systems to high-tech-solutions, such as fall detection systems or systems that automatically detect falls or monitor the health of the user" (for more information on this discussion, please see Deliverable2.1| Baseline report on AAL advice, decision and authorization, available at: http://project.activeadvice.eu/deliverables/deliverable-2-1-baseline-report/).
[2] The terms 'AAL stakeholders' or 'AAL end-user' is used in this deliverable indiscriminately.

formal caregivers and, at organizational level, companies in the business field of AAL and Governmental bodies defining policies and providing services in the field of health and care. Some of the key challenges arising for the acceptance of AAL technologies are explored, and noteworthy user requirements emerging from the evidence are identified. Moreover, we explore the relationships among these stakeholders by extracting communalities and disagreements of their views, according to the state of art on that matter. As the ultimate goal of ActiveAdvice is to build a community of interconnected and interacting entities around one active advising and decision-support network across Europe, we looked at discussions on the topic of collaborative stakeholder ecosystem. Information generated under this first approach is critical for supporting a user-centred design process regarding AAL solutions.

In a second approach, we resort to use case generation and analysis technique, in order to tackle end-user requirements and illustrate the decision-making processes regarding the selection and uptake of AAL products and services, in the scope of the ActiveAdvice software solution and the advisory network to be developed (Chapter 4.2 Use Case Exploration). Then, a triangulation of the literature findings, use case exploration, and consortium's experience and expertise in the AAL field resulted in the establishment and segmentation of the project end-users and target audience (Chapter 4.1.3).

Based on that, a third approach to stakeholder identification took place: a desktop research was carried out with the purpose of identifying, collecting and describing concrete stakeholders for the ActiveAdvice project (Chapter 4.3.2 ActiveAdvice stakeholder collection and description). There are many organizations either dealing with AAL products or involved in their development. In a study by Gabner and Conrad (2010), 676 organizations dealing with AAL products were identified among European member states. Therefore, the identification of potential stakeholders and the collection of relevant information about them will assist the consortium in the creation of a comprehensive list of individuals and organizations that have a stake in the ActiveAdvice project.

The document concludes by reflecting on the ActiveAdvice Expert and Advisory Board, as an implemented mechanism for stakeholder participation, exploring its potential role and contribution to the project's success.

2 Scope & link with other project deliverables

The task of identifying and collecting relevant stakeholders and target groups for ActiveAdvice project, as part of the work package 2 (WP2), is a foundation for the comprehensiveness of the information and resources administered within the Intelligent AAL Product & Service Cloud. The aim of identifying relevant stakeholders across Europe relies on their fundamental role in the analysis of end-user requirements throughout this WP2, and system validation in later ones, particularly in WP5 – implement: demonstration, validation, trainings, authorization; but also along the project lifetime. Moreover, this report on stakeholders and target groups serves the consortium as a foundation for other further project phases and respective actions – concept, development, implementation, and dissemination.

3 Methodology

The identification and collection of relevant stakeholders and target groups for ActiveAdvice project was based on a threefold approach: first, a narrative literature review was carried out. It aimed to explore the extent to which the scientific production refers to different stakeholders within the AAL domain, concerning their needs, requirements, interests and relationships. Second, a use case generation and analysis approach was used with the purpose of tackling end-user requirements and illustrating the decision-making processes regarding the selection of AAL products and services. Third, a desktop research was carried out in order to identify and characterize concrete stakeholders for the ActiveAdvice project for consortium partners. A detailed explanation of the methodological approach used in this deliverable is presented below.

3.1 Narrative literature review on AAL stakeholders

This document aims to provide an overview on what has been produced in literature about the topic of stakeholders in the field of AAL technologies. The aim was to understand to what extent scientific production refers to different stakeholders within the AAL domain; and what has been concluded about their needs, requirements, interests and relationships. A narrative, not systematic review, instead of a more reproducible type of review was carried out: we aimed to provide a comprehensive perspective, which could be burdensome when applying systematic methods and could be constrained by the narrow focus of a systematic review. Therefore, less explicit methods were the trade-off for broader coverage, and our results have essentially a qualitative meaning.

The narrative review was then organized in three steps: i. review planning, with the definition of research objectives, key-words and databases, as well as inclusion and exclusion criteria; ii. performing the review, by carrying out the paper collection and subsequent selection (applying the inclusion and exclusion criteria); and iii. review documentation, with the qualitative summarization of the search results.

A broad set of keywords and concepts were first identified to be searched for, based both on a preliminary screening of papers about the AAL and stakeholder topic, and also on the reviewers' knowledge and background on that issue[3]. In order to carry out the search, keywords were aggregated instead of using them separately. Some of the keywords were kept fixed in the complete set of queries, namely Ambient Assisted living, Active Assisted Living technology, Ambient Assistive, Telehealth and Telecare, combined with other keywords in the following way:

Ambient Assisted living **OR** Active Assisted Living technology **OR** Ambient Intelligent **OR** Telehealth **OR** Telecare **AND**

- **i.** Stakeholders;
- **ii.** Older adults **OR** elders **OR** senior;
- **iii.** Relatives **AND** caregivers;
- **iv.** Business;

[3] It should be noticed that by taken into account that there is no consensus on a precise definition of AAL, is possible that papers produced on this topic, especially the older ones, use other terms to address this issue.

v. Governments;

As can be seen, although the general term 'stakeholders' is searched, the following terms narrow the search to specific groups of stakeholders: older adults and their relatives and/or informal caregivers, business and governments. This approach/categorization assembles the AAL Programme (2016) definition of end-users, and the work of Nedopil, Schauber and Glende (2013). The use of these frameworks hold only the purpose of facilitating the literature analysis – i.e. this categorization does not have to correspond exactly to the one established in the ActiveAdvice proposal (DoW), and in target groups later pointed in this document. As stressed by Nedopil and colleagues, the categorization of end-users in primary, secondary or tertiary is not straightforward and depends on the AAL solution. Therefore, the AAL Programme (2016) clusters stakeholders/users in 'primary end-users' –older adults who use an AAL product or service; 'secondary end-users' – persons or organizations that use AAL solutions for the benefit of the primary users, such as relatives, informal and formal caregivers, companies and organizations accessing or using AAL solutions for the benefit of primary end-users – it should be noticed that for effects of analyses, enterprises in the business field of AAL will also include this group of secondary end-users; and 'tertiary end-users' – private or public organisations that are not directly in contact with AAL products and services, but who organise, pay or enable them, namely governmental bodies defining policies and providing services in the field of health and care.

The defined key-words were then searched in selected academic databases (e.g. Emerald Insight; Web of Science; EBSCOhost) and grey databases (Google Scholar). Publications by multilateral European and international organizations (e.g. European Commission, WHO) were also searched and considered when relevant, and the snowball method for literature finding was also used. The search was narrowed to publications no older than 2007, once this was considered to be the period when the AAL domain has gained maturity (Calvaresi et al., 2016). It also corresponds to the year of AAL Joint Association creation. Even taking into account the European focus of the ActiveAdvice project, the search was not limited to the European context, once important contributions could have been discarded if only considered researches carried in Europe. However, only papers published in English were searched and included in the review. Table 1 presents the search history, providing additional details on used databases, selected key-words and number of hits obtained. The search was carried out between November 20th and December 23rd.

Table 1: Search history for scientific papers: keywords, databases and number of hits

	Database/hits				
Keywords	**Pubmed Central**	**Web of Science**	**Science Direct**	**Emerald Insight**	**EBSCO host**
Ambient Assisted Living AND Stakeholders	132	27	586	183	28
Active Assisted Living technology AND Stakeholders	900	1	4319	5314	825
Ambient Intelligent AND Stakeholders	80	7	403	105	1
Telehealth AND Stakeholders	1259	69	378	57	232
Telecare AND Stakeholders	204	20	123	78	186
Ambient Assisted Living AND older adults*	694	63	1159	79	74
Active Assisted Living technology AND older adults	3446	8	5525	995	0
Ambient Intelligent AND older adults	195	16	229	29	5
Telehealth AND older adults	2934	148	561	46	337
Telecare AND older adults	463	54	164	101	204

Ambient Assisted Living AND relatives/caregivers	1818/211	29/66	5521/337	289/31	9/75
Active Assisted Living technology AND relatives/caregivers	9379/994	2/4	16288/1774	5525/323	0/2
Ambient Intelligent AND relatives/caregivers	398/120	16/21	3275/144	150/15	2/3
Telehealth AND relatives/caregivers	4322/1461	77/140	611/486	44/13	174/540
Telecare AND relatives/caregivers	553/281	25/44	224/157	63/12	200/357
Ambient Assisted Living AND business	247	14	963	426	33
Active Assisted Living technology AND business	1154	0	6554	10815	0
Ambient Intelligent AND business	182	16	988	228	14
Telehealth AND business	1402	66	431	66	1185
Telecare AND business	208	14	167	57	1342
Ambient Assisted Living AND Governments	537	5	1579	324	15
Active Assisted Living technology AND Governments	2242	3	8232	9026	2
Ambient Intelligent AND Governments	170	3	948	159	2
Telehealth AND Governments	2231	65	544	91	393
Telecare AND Governments	269	22	190	126	432

* 'Older adults' was, in all combinations, the expression with more hits in comparison with 'elders' or 'seniors'. Therefore, this was the considered search.

Each query produced a large list of results ordered automatically by pertinence;duplications were ignored. The papers were then pre-selected in a coarse-grained analysis made by the reviewer, according to her subjective view: in cases where the title/abstract of the paper was inconsistent with the performed query, the paper was discarded. The early analysis phase looked at the relevance of titles and abstracts regarding an inclusion criteria focused on users: the paper must provide concrete inputs on stakeholders needs, requirements, interests and relationships; papers simply discussing technological/technical aspects, thus not including any data about stakeholder groups, their needs, requirements and/or responses to the technologies were excluded; the stakeholders studied in the paper must be older adults, their relatives, informal or formal caregivers, product or service providers, enterprises operating in the AAL field, solution developers, policy and decision makers and public bodies. Considering this screening phase, papers were classified by priority level/relevance. Once suitable systematic reviews were considered in the analysis, papers analysed in those reviews were regarded as duplications and, therefore, eliminated. After the filtering phases, 79 papers were finally selected for further analysis: its contents were categorized by theme, using therefore the qualitative method of thematic coding. For each paper analysed the following information is available: topic/theme; keywords; country; title; author & year; and description/abstract (see Appendix 8.1 for papers selected for further analysis).

3.2 Use case scenarios generation and analysis

Use case scenarios were generated with the aim of illustrating the decision-making processes regarding the search and selection of AAL products and services. The purpose of this exercise was to gather end-users' requirements to feed the ActiveAdvice project. Booch (1999), several years after Jacobson (1986) coining 'use cases', defined it as a description of sequences of actions that a system performs yielding an observable result of value to an actor. A use case scenario describes a real-world example, a narrative, of how people or organizations, a user, interact with a system being designed to achieve a particular goal. It describes the steps, events, and actions occurring during the interaction. Based on use cases, the researchers will be able to derive software essential requirements from a group of end-users, enabling a focus on the clients' real needs (Wiegers, 1997).

For the purpose of this work on ActiveAdvice stakeholder identification and characterization, four use cases were initially generated: two of them are based on hypothetical scenarios and another two are built on exploratory interviews with stakeholders carried out in Portugal and the UK (additional interviews with stakeholders will be carried out later in the project, under the scope of Deliverable 2.3). “To-be” scenario descriptions based on the future use of ActiveAdvice software solution were formulated with a certain level of detail, indicating how someone could work with the user interface. From the four use cases derived, two concerned the requirements of primary users, i.e. older adults, while one use case targeted the secondary, and another the tertiary end-users. Use case scenarios and its inputs for the ActiveAdvice project can be consulted in section 4.2 Use Case Exploration.

3.3 ActiveAdvice stakeholder identification and gathering

Together, the narrative literature review and the use case scenarios generation and analysis, naturally integrated with the consortium experience and expertise on the topic, resulted in the definition of ActiveAdvice end-users and target audience as well as in its segmentation. Moreover, those steps enlighten about the end-users’ characteristics, needs, requirements, interests and relationships. After establishing those groups of end-users, and in order to go further in identifying concrete stakeholders for ActiveAdvice project, a baseline collection of organizations operating in each partner country and fitting in the three pillars of end-users – AAL2C (Clients), AAL2B (Business) and AAL2G (Governments) – was carried out. In this line, non-profit organisations, end-user organisations, businesses and governmental institutions, charities and associations with local affiliations were identified, listed and described. The results were entered in a matrix, containing a description of each organization identified: the document included over 320 organisations located in Austria, Belgium, the Netherlands, Switzerland, Portugal and UK; a sample of organisations was gathered at local level in UK, for Cumbria region; in Switzerland, for the German speaking part, and in the Portuguese case for the Porto region. It should be noticed that an extension and enrichment of the stakeholders list during the project lifetime is expected (see Appendix Stakeholder list for ActiveAdvice partner countries.88).

4 Results and discussion

This chapter summarizes the main results of the ‘Stakeholder and Target Groups Report’ as a foundational document for the ActiveAdvice project. It starts by providing an interpretative qualitative synthesis of the literature produced on AAL stakeholders, their needs and requirements (see. 4.1 Research on AAL stakeholders: interpretive qualitative synthesis of the literature); next follows the presentation and discussion of use cases generated, with lessons learned for the ActiveAdvice project (see 4.2 Use Case Exploration). With inputs from the previous two stages, ActiveAdvice end-users and target audiences are then defined and segmented, and their needs and requirements are discussed according to what is documented in the literature (see 4.3.1 ActiveAdvice end-users and target audience identification & segmentation). Finally, for each ActiveAdvice consortium country, concrete stakeholders are gathered/listed and characterized under the previously established framework for end-users.

4.1 Research on AAL stakeholders: interpretive qualitative synthesis of the literature

"No stakeholder stands alone in the process of value creation.
The stakes of each stakeholder group are multifaceted and inherently connected to each other."
Freeman et al., 2010, p. 27

As a consequence of political, economic, and social challenges resulting from the current unprecedented phenomenon of population ageing, many countries have been investing in the deinstitutionalization of older adults, by promoting policies that enable those adults to live longer in their homes, ageing healthy and maintaining independent lifestyles (AAL Programme, 2014; Vasunilashorn et al., 2012). Frequently, policies designed with this purpose focus on the use of technology, often Information and Communication Technology (ICT), as an instrument for supporting ageing in a community (Peek et al., 2016). Nevertheless, several constraints have been found in the implementation of these technologies, namely those associated with low adhesion by end-users and lack of a user-centric vision (e.g. Doyle et al., 2013; Michel & Franco, 2014; Peek et al., 2014; Wilson at al., 2014), absence of interoperability between systems (e.g. Balta-Ozkan et al., 2013; Ehrenhard, Kijl & Nieuwenhuis, 2014; Perumal et al., 2011), business sustainability problems (e.g. Ehrenhard, et al., 2014) and limited evidence on interactions between technology and society, on technologies impact and cost-effectiveness (e.g. Balta-Ozkan et al., 2013; Graybill, McMeekin & Wildman, 2014).

For this scenario regarding AAL also contributes the need for involvement of multiple stakeholders, with heterogeneous competencies, interests, and needs, being frequently observed a failure in managing their involvement. A close participation of end-users is challenging and can be less successful when the user population is varied (Leonardi et al., 2008; Queirós et al., 2014), thus requiring researchers to find successful strategies to motivate users and foment trust. Inclusively, a new field of study concerned with this kind of topic was installed – the 'gerontechnology' field – as an interdisciplinary academic and professional field joining the sciences of aging and engineering, and focusing on innovations integrating user/usage-centred concepts (Michel & Franco, 2014).

Usually, older adults are considered to be AAL stakeholders as primary end-users; furthermore, informal and formal caregivers; care organizations and institutes; technology developers and suppliers; and policy makers are regarded (Calvaresi et al., 2016; Ehrenhard, et al., 2014; Nedopil, et al., 2013; Peek et al., 2016; Reeder et al., 2014). It has been assumed that a successful implementation of technological interventions depends on the understanding of common and divergent perspectives of different stakeholder groups, once not always an alignment of concerns, motivations or goals exists (Clark & McGee Lennon, 2011; Freeman, 1984; Murray et al., 2011). In a study about telehealth and telecare based on discourse analysis, Greenhalgh and colleagues (2012) found four different and conflicting stakeholders' discourses: the modernist (technology-focused); humanist (person-centred); political economy (critical, cautious) and change management discourse (recognizing complicatedness rather than conflict).

Freeman's stakeholder theory (1984) has developed the thesis that organizations hold a moral relationship with stakeholder groups others than shareholders, and that a business purpose is to create as much value as possible for stakeholders. Once this theory can be used to address business-society

relations under a business ethics and/or strategic management approach (Bjørkquist, Ramsdal & Ramsdal, 2015), guidelines and principles for responsible business were launched latter under this reasoning (e.g. Caux Round Table 2009)[4]. In order to succeed and be sustainable over time, businesses (here, the project) must keep the interests of several stakeholders (e.g. customers, suppliers, governments) aligned and going in the same direction. This is suggested by Frooman (1999) who states that stakeholders' management can be seen as handling potential conflicts, stemming from diverging interests. Interactions between one stakeholder and a firm have the power of influencing the relationships between other stakeholders and that firm, as following illustrated by Rowley (1997): "Firms do not simply respond to each stakeholder individually; they respond, rather, to the interaction of multiple influences from the entire stakeholder set. Thus, explanations of how organizations respond to their stakeholders require an analysis of the complex array of multiple and interdependent relationships existing in stakeholder environments" (p. 890). Several authors have focused on the intrinsic conflict between stakeholders, but less have been looking for joint interests (Freeman et al., 2010). Seeing stakeholders' mutual interests rather than their opposite ones is challenging, since it is not always straightforward to find and accommodate all stakeholders' interests without trading off one against another (ibidem). Freeman and colleagues (2010) also note that while other authors have claimed that all stakeholders are equally important, they postulate that those are not equally important at all points of time, even if they all have equal rights in defending their interests. In fact, a recurring issue in the literature for stakeholders' theory has been – besides the one on how to understand who stakeholders are – how to prioritize stakeholders, and how to define who has more legitimacy on the process. With these purposes, the use of a demographic approach has been privileged in comparison to a structural approach: while the former focus lies on identifying stakeholders' attributes (e.g. location, size, interest, basic strengths and weaknesses), the latter focuses on the relational setting, the relationships, where the organization exists (e.g. network of stakeholders, information asymmetry; Froman & Murrell, 2005). Therefore, little is known about how the relational setting can constrain and shape stakeholders' behaviour (ibidem). The same statement seems to apply to the AAL field, since a systematic review give account that besides the scarcity of studies on stakeholders convergent and divergent perspectives, those studies don't provide a complete understanding of stakeholders positions and relations (Peek et al., 2016). Bygholm and Kanstrup (2015) concluded, from another literature review, that it is necessary to "clarify the role of AAL stakeholders" being "a central challenge to engage stakeholders in AAL research and development" (p. 91).

For ActiveAdvice, taking a stakeholder approach can contribute to the identification of groups of actors who have a legitimate stake in the process of introducing (especially) the software solution and the advisory network to be developed. Moreover, it should result in better choices in the design process and system development. It can elucidate about the interdependencies between technology, people and their sociocultural environment (Van Gemert-Pijnen et al., 2011). Ideally, stakeholders should be aware of these complex relationships, thus contributing for the responsiveness of each stakeholder

[4] Guidelines where, for example, the principle 1 approaches the issue "Respect Stakeholders beyond Shareholders".

about the expected effects for other stakeholders. This can possibly broaden stakeholders' perspectives and lead to a more successful implementation of AAL technologies in general.

In the following sections, the findings from the literature analysis will be reported by first, summarizing who are the main users identified in the published literature within the AAL domain, and how they are addressed in the ecosystem of AAL stakeholders (see 4.1.1 AAL stakeholder ecosystem). Next, we narrow the analysis by carrying out an interpretive qualitative synthesis of the literature produced about the AAL stakeholders' needs, interests and requirements, particularly concerning older adults (see 4.1.2 Older adults as AAL primary end-users); the persons or organizations using AAL solutions for the benefit of the primary end-users – the relatives and informal caregivers, formal caregivers, as well as enterprises in the business field of AAL (see 4.1.3 Secondary end-users); and Governmental bodies defining policies and providing services in the health field (see 4.1.4 Tertiary end-users). Finally, common and divergent perspectives among the abovementioned stakeholders are explored (see 4.1.5 AAL stakeholders: convergent and divergent perspectives)

4.1.1 AAL stakeholder ecosystem

An ecosystem can be defined as a system, or a group of interconnected elements, formed by the interaction of a community of organisms with their environment (AfriSam, n.d.). Applied to the field of AAL, the concept of collaborative 'ecosystem' can be used to describe a community of interconnected and interacting entities, with the purpose of providing care and assistance to older adults, who are also crucial members of this complex socio-technical ecosystem (Camarinha-Matos et al., 2015).

In fact, older adults have been identified as the main stakeholders and primary users of AAL technologies (e.g. Bygholm & Kanstrup, 2015; Fuchsberger, 2008; Marschollek et al., 2007; Peek et al., 2016; Van Hoof et al., 2011), with vulnerable people, people with disabilities, people with long-term ill, individuals with cognitive impairments, or people living at home with care needs being identified as additional primary users (e.g. Bygholm & Kanstrup, 2015; Calvaresi et al., 2016; Clark & McGee-Lennon, 2011). Other stakeholders groups involved in AAL, with heterogeneous competencies, interests, and needs, are frequently pointed in the literature including: relatives and informal caregivers such as friends and neighbours (e.g. Bygholm & Kanstrup, 2015; Begley, 2010; Calvaresi et al., 2016; Clark & McGee-Lennon, 2011; Damodaran & Olphert, 2010; Delbreil & Zvobgo, 2013); formal caregivers, health operators, healthcare professionals, medical specialists including general practitioners, community nurses, occupational therapists, physiotherapists, consultants, among others (e.g. Calvaresi et al., 2016; Cunha et al., 2013; Clark & McGee-Lennon, 2011; Kriegel et al., 2013; Peek et al., 2016; Reginatto, 2012); care organizations and institutes, service providers, including social care professionals (e.g. Clark & McGee-Lennon, 2011; Sponselee et al., 2007); national governments, local authorities and councils, decision and policy makers, government officials (e.g. Bygholm & Kanstrup, 2015; Finn & Wright, 2011; Van Gemert-Pijnen et al., 2011); companies producing or supplying the devices, methods or infrastructures required for AAL technologies (e.g. Calvaresi et al., 2016; Clark & McGee-Lennon, 2011; Peek et al., 2016); technology designers and developers, engineers and researchers (e.g. Bygholm & Kanstrup, 2015; Finn & Wright, 2011; Sponselee et al., 2007); insurance companies (e.g. Sponselee et al., 2007; Van Gemert-Pijnen et al., 2011); voluntary groups such as

charities and church groups (e.g. Clark & McGee-Lennon, 2011), and media (e.g. Finn & Wright, 2011). It should be noticed that other groups of stakeholders can be a combination of such categories (Calvaresi et al., 2016), all with different needs, expectations and goals regarding technology and information. In a European study developed by Gabner and Conrad (2010), the authors identified fifteen categories of stakeholders for the AAL domain: building and housing Industry; Consulting; Government; Local or Regional Authorities; Hardware/Software/Device Providers; Service Providers; Providers of AAL products or services; Healthcare Providers; Medical Institutions/Hospitals; Industry; Insurance; NGOs; Universities; Non-university Research Organizations; and Safety. Although very comprehensive, this broader categorization can easily cause overlap for organizations working in several domains, as stated by the authors themselves (Ibidem). As explained above (cf. section 3.1), the clustering of this multitude of stakeholders or end-users is not always consistent in the literature, because it is influenced by the AAL solution in analysis (Nedopil et al., 2013). For example, while Nedopil and colleagues (2013) separate older adults from their relatives and informal caregivers with the second ones being considered 'secondary end-users' and the former 'primary end-users', Moschetti and colleagues (2013) cluster those individuals together in the group of 'primary stakeholders/end-users'.

By integrating a diversity of actors with different value systems, AAL ecosystems form a hybrid value chain (Budinich, Reott, & Schmidt 2007). In fact, the collaborative ecosystem rationale provides a promising framework to orient new conceptual and technological developments (Camarinha-Matos & Afsarmanesh, 2011). Nevertheless, in practice, it has been found in a recent systematic literature review that solutions have been taken 'patients' (including older adults) and 'physicians' much more into account when compared to others stakeholders, thus neglecting the entire AAL ecosystem (Calvaresi et al., 2016). A growing number of studies have emphasized the importance of a paradigm shift towards a participatory development of AAL technologies, which opens the design process to various stakeholders, making it a collaborative effort (e.g. Gudowsky & Sotoudeh, 2015; Olphert et al., 2009). While this is not the mainstream approach, there is a risk of developing technologies and service delivery models that are unable of meeting users' requirements, and of adapting as these requirements change. In fact, a recent systematic literature review concluded that existing AAL solutions seem to be designed with basis on the available technology rather than built on stakeholders' needs, attributes, consequences and values (Calvaresi et al., 2016). This reflects a more 'traditional' techno-centric approach, opposed to a socio-technical one, with the last mirroring the 'ecosystem' conception. Several authors addressed this concern by proposing frameworks designed for a successful development of user-centred systems, capable of accommodating the changing needs of older adults and of diminishing the abandonment rate of assistive technologies. The notion of user-centred design means that users' opinions are crucial, since the exploration of initial requirements until the assessment of products and services, both in the lab and real life contexts (Leonardi et al., 2008).

Olphert and colleagues (2009) propose the application of four theoretical approaches for the design of digital assistive technologies: the socio-technical theory (Cherns, 1976) where technical and social components co-operate and co-evolve; the participatory approach to design, where older adults' participate and engage in the decision-making process; the inclusive design, which recognizes the need

for including stakeholders with diverse needs (such as older adults from different contexts, designers, decision and policy makers, business actors); and the information ecologies, where stakeholders' contexts are taken into account and they have the opportunity of sharing knowledge and take decisions.[5] An integrated approach to the design of digital assistive technologies should then result in the development of a culture of participation and engagement, where older adults are involved in all stages of the design process and not only in its use and evaluation (Fuchsberger, 2008; Olphert et al., 2009). Therefore, this culture should promote a better understanding of users' needs, stimulate learning and capacity building between users and designers, produce a faster diffusion of more user-centred and user-relevant technologies and, as a consequence, lead to an enhanced sustainability of assistive technologies (ibidem). In resemblance to Olphert and colleagues (2009), several other authors called for participatory approaches crossing all phases of AAL technology development – from ideation to operationalization – in order to promote higher levels of stakeholders' influence and empowerment (e.g. Lindsay et al, 2007; Queirós et al., 2014; Van Gemert-Pijnen et al., 2011). This is, in fact, the central aspect of the 'living lab methodology', as an example of a methodology where stakeholders are permanently involved in all stages of the development process, since the idealization of concepts until the systems and services validation and assessment (Colomer et al., 2014; Queirós et al., 2004; Teixeira et al., 2011). As stated by Queirós and colleagues (2016), "the LUL [Living Usability Lab] aims to improve translational research and to promote the development, integration, validation and evaluation of new user interaction technologies related with Ambient Assisted Living (AAL) systems and services" (p. 410). In another approach, Peek and colleagues (2016) proposed the application of the Normalization Process Theory (NPT; May & Finch, 2009) to the development of assistive technologies, where four main components compete for its success: coherence, i.e. meaningfulness for stakeholders; cognitive participation, i.e. engagement and commitment by stakeholders; collective action; and reflexive monitoring, i.e. formal and informal assessment of the interventions cost-benefits.

In a review about eHealth frameworks and their approach to stakeholders, Van Gemert-Pijnen and colleagues (2011) concluded that those frameworks vary in terms of including single (e.g. decision makers) or multiple groups (e.g. developers, health care providers, purchasers, consumers, and policy makers) of stakeholders. Moreover, they differ by emphasising a user-centred design approach that takes mainly into account the (primary) end-users needs; or by arguing for a multi-perspective view and for a comprehensive overall approach that involves different stakeholders (Van Gemert-Pijnen et al., 2011). The author (ibidem) concluded by arguing for a holistic approach in the development of eHealth technologies, in order to favour the uptake and impact of eHealth technologies, in resemblance to what was defended by other authors before (Dansky et al., 2008; Yusof et al., 2008).

In fact, even though that in theory the approaches for systems and services development typically take into account the involvement of all stakeholders, in practice it is usually the experts who dominate the decision-making process regarding the conception, design and development, with end-users being involved only in an advanced stage (Queirós et al., 2014). This means that systems' conceptualization

[5] The authors discuss the concept of 'locality' within the information ecologies, as a concept that contextualizes the design process, giving the opportunity to the different stakeholders of taking decisions and sharing knowledge in contexts where they play and active role (Damodaran & Olphert, 2006 cited in Olphert et al., 2009).

is not built into users' experiences or mental models (ibidem). Even considering that, as concluded by Calvaresi and colleagues (2016), older adults are the end-users most stressed in the literature, it does not necessarily mean that the state of art is satisfactory in terms of their involvement in technology development. In fact, it was noticed that only a few papers on the AAL topic refer the older adults' involvement in the development, results validation and evaluation phases, thus suggesting that usability and accessibility issues are underexplored in the AAL domain (Queirós et al., 2014). Naturally, involving older adults or individuals with disabilities carries considerable challenges, since methods to obtain requirements and evaluation data from these users are not straightforward.

In sum, the scientific literature in the AAL field is prolific in calls for greater collaboration and co-ordination among stakeholders in order to overcome or minimize the digital divide currently separating many older adults from mainstream European society. While stakeholders have been aware of this digital divide for a long time, a limited understanding of older people's technology-related needs still prevails and it is related with a scarce collaboration and co-ordination among stakeholders in order to meet those needs (Wright, 2010). At European level, concerns were expressed about the lack of suitable collaboration and co-operation among stakeholders towards active ageing and e-inclusion needs of older adults (European Union Committee of the Regions, 2011). Procter and colleagues (2014) studies have been revealing that ageing in place is only socially and collaboratively accomplished or 'co-produced' by the efforts of all stakeholders. This call for multi-stakeholder partnerships comes from academic stakeholders and other major interested parties in the AAL field, such as the industry and Civil Society Organizations (CSO), as well as from Governments. In fact, several policy documents, European Commission (EC) communications and research reports were published in that matter (Finn & Wright, 2011; Wright, 2010). The i2020 (2007) e-inclusion sub-group stated that ICT for the ageing market "is characterised by a high degree of fragmentation, compounded by transparency, regulatory and technical barriers" (p. 2). In a research by Peek and colleagues (2016), all the inquired stakeholders felt that they need to change attitudes and policies towards a more collaborative approach, bridging the gap between technologies and individuals, and taking time to evaluate the outcomes. In this equation, raising awareness and knowledge about AAL technologies near all stakeholders seems to be an important action to take in the near future, with several studies pointing for this need (e.g. Clark & McGee-Lennon, 2011; Reginatto; 2012). Clark and McGee-Lennon (2011) identified barriers to the uptake of assistive technology in the UK, namely at individual, societal and organizational levels. As concluded by Peek and colleagues "when planning and initiating projects concerned with technological solutions for aging in place, it is advisable to take into account that stakeholders may have a limited understanding of the scope of available technologies, and that stakeholders may differ in their awareness of available technologies" (p. 2). For example, studies have shown that older adults are not aware about the existing technologies that have the potential of improving their lives (Peek et al., 2016). The concept of ambient assisted living itself is not understand by end-users as it is generally defined, being documented that users' concept of technology is less exclusive by including devices that are not ICT based (e.g. home adaptations; Peek et al., 2016).

Therefore, the literature is prolific in calls for delivering awareness and training to all stakeholders about the opportunities and challenges in the AAL field (Agbakoba et al., 2015; Nieboer et al., 2014; Olphert et al., 2009). Among the mechanisms used to improve multi-stakeholder cooperation on matter of ageing and ICT, Finn and Wright (2011) identified ten of those and compared their adequacy: forums; platforms; networks; associations; social networks; consortiums; clusters; international conferences and fairs; federations and public-private partnerships. The authors concluded that those mechanisms are not adequate to foster e-inclusion, co-operation, co-ordination and collaboration among different types of stakeholders, even thought that some organizational types are better than others in particular tasks, or for the involvement of specific types of stakeholders (ibidem). For example, public-private partnerships have shown to be particularly useful to address end-users' needs, develop standards and provide product testing (Finn & Wright, 2011). In this line, Carveth and Kretchmer (2002) postulate four main solutions for overcoming the digital divide, those being the marketplace, governmental action, philanthropy/community/civil society action, and public-private partnerships.

From the exposed above, one can conclude that the participation of all stakeholders, with a special focus on older adults as primary end-users, is recognized as crucial to reflect on the values, motivations and goals of AAL technologies to be developed. As stressed by Leonardi and colleagues (2008), stakeholders should not be treated as mere "servants" of the technology development. Naturally, those stakeholders hold different backgrounds and experiences, which requires further research to understand the needs of all the above-mentioned stakeholders and how divergent or congruent those needs might be. Therefore, a planned and systematic stakeholder engagement must be promoted as a foundation for raising stakeholders' awareness, gathering requirements, building a participative process around development and making informed decisions, and building consensus around the stakeholders' needs and requirements on AAL technologies.

4.1.2 Older adults as AAL primary end-users

Holzinger and colleagues (2011) state that it must be kept in mind that older adults are the most prominent stakeholders for ICT developments in AAL. Among older adults' needs that can benefit from ICT solutions are: living independent lives at home for as long as possible, and enjoy life outside the home as far as any physical and cognitive impairments allow; enjoying rewarding and active lives; achieving accessible products and services; getting training in ICT use; increase quality of life, autonomy and safety; improve social contact and healthcare; overcome ageist discrimination, loneliness, isolation; and guarantee the preservation of their dignity (Damodaran & Olphert, 2010; Martin et al., 2013; Wright, 2010). Therefore, key challenges arising for the uptake of AAL technologies and older adults' requirements on that matter are largely explored in the literature.

4.1.2.1 Ageing and ICT use

The analysis of older adults' attitudes towards technology is one of the most relevant issues on the study of AAL technologies. Although it is recognized that older adults are usually less inclined to embrace new technology than younger ones, it is not true that age alone predicts technology

acceptance and use. Older adults are frequently depicted as 'technophobic' by other stakeholders, with this generalized and biased perspective being associated with under or misprescription/recommendation of assistive technologies for these users by health or social professionals, for example (Clark & McGee-Lennon, 2011; Nedopil et al., 2013; Sponselee et al., 2007). However, not only this 'technophobic' image fails to be applied to all older adults (Sponselee et al., 2007) as it somehow put the blame on those adults – classified as 'resisting' or 'unengaged' – for non-adherence to technologies (Greenhalgh et al., 2012). In this line, Selwyn (2004) argues that it is not the case of trying to change older adults' attitudes and behaviours; rather, it is more a case of trying to change ICT to make it more suitable to older adults. In fact, it has been largely stated that if technological solutions are considered beneficial, older adults will be motivated to use it (e.g. Ryu et al., 2009; Sponselee et al., 2007).

Therefore, technology acceptance and its use depends on the intersection of multiple factors related with both technology features (e.g. design, practical use) and users' characteristics (e.g. age, gender, physical, mental and cognitive skills, expectations, biographical experience; Nedopil et al., 2013; Sousa et al., 2011). For example, research on gender and technology use, despite scarce, has been consistently showing that older women tend to report more fear of using technology, even thought that, when compared with older men, they seem to be more likely to search for health information online (Koch, 2010; Leitner, Mitrea & Fercher, 2013). A study of Leitner and colleagues (2013) also showed that female participants tend to be more critical than men about the technology characteristics. Regarding age, some studies have found that younger seniors perceive themselves as more proficient users of technology than older seniors (e.g. Bjørkquist et al., 2015). It has to be noticed, however, that cultural factors on technology acceptance seem to have been disregarded, as illustrated by a Korean study showing that sleep monitoring can be rejected by end-users due the belief that dying during sleep brings good luck (Steggell et al., 2010).

Research on technology acceptance is dominated by two theoretical approaches: the Technology Acceptance Model (TAM; Davis, 1989) and the Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al., 2003). Regarding the TAM model, the variables having a major weight in individuals' intention to use a technology were the perceived usefulness (PU) and the perceived ease of use (PEOU), even if intention to use can or cannot predict the actually technology use (Peek et l., 2014). By its turn, the UTAUT adds two additional variables to the equation – social influence and facilitating conditions – together with four moderating factors – gender, age, experience and voluntariness of use – which together seems to largely explain the intention to use technology (Venkatesh et al., 2003). However, Peek and colleagues (2014) note, in a systematic review, that other studies found that factors associated with technology acceptance may vary over time and differ along technology implementation stages. This suggests that research investments need to be made regarding a better understanding of technology acceptance by older adults (ibidem). In this line, Weegh and Kampel (2015) concluded that older adults' acceptance of AAL is influenced by multiple criteria such as perceived usefulness; perceived ease of use (in resemblance with TAM and UTAUT models); control and security; financial ability and willingness to use technology; privacy versus

independence/safety; user involvement; human replacement; awareness; reputation/ alignment to current lifestyle; government/ politics/ legal aspects; and experience criteria.

According to Eurostat data (2015) on information and communication technologies (ICT), more than one third (38%) of older adults (aged 65 to 74 years) living in the EU-28 used internet at least once a week in 2014, with 76% of those using it on a daily basis. Compared with a decade earlier, when only 7% of older adults was using the internet at least once a week, this demonstrates a significant growing proportion of these adults going online (Eurostat, 2015). However, it should be noted that an uneven distribution of internet use is found between northern and western EU Member States on one hand, and southern and eastern EU Member States on the other. Nevertheless, data suggests that once older adults feel comfortable enough to use technology, they tend to use the internet actively, in resemblance to younger generations (ibidem). For example, communication by email is similarly important for internet users in all age groups. Very differently from the younger generation is the participation in social networks, with only 10% (EU-28) of adults aged 65-74 years old using those networks in 2014 (Eurostat, 2015)[6]. Popular activities among older internet users (55-74 years old) are reading news online and searching for information about health (60%), as well as consulting 'wikis' (Eurostat, 2014). Similar results were found in previous studies, with searching for health information being the activity most performed online by older adults, followed by others like sending emails or photos (Marschollek et al., 2007). Online purchases were reported to occur in 23% of older adults using internet (ibidem), what suggests only a moderate trust in such activity. Wright and colleagues (2007) stressed that one of the most important inhibitors to the acceptance of internet for commercial interactions has been the absence of trust in the underlying cyber infrastructures. Therefore, internet, when used by this group, seems to be regarded as a source of information and knowledge. Figure 1 shows the use of internet for access to information and for learning purposes, by age group and for the EU-28, concerning 2013 data.

[6] Compared with a share of 46% of individuals of the total population using social networks.

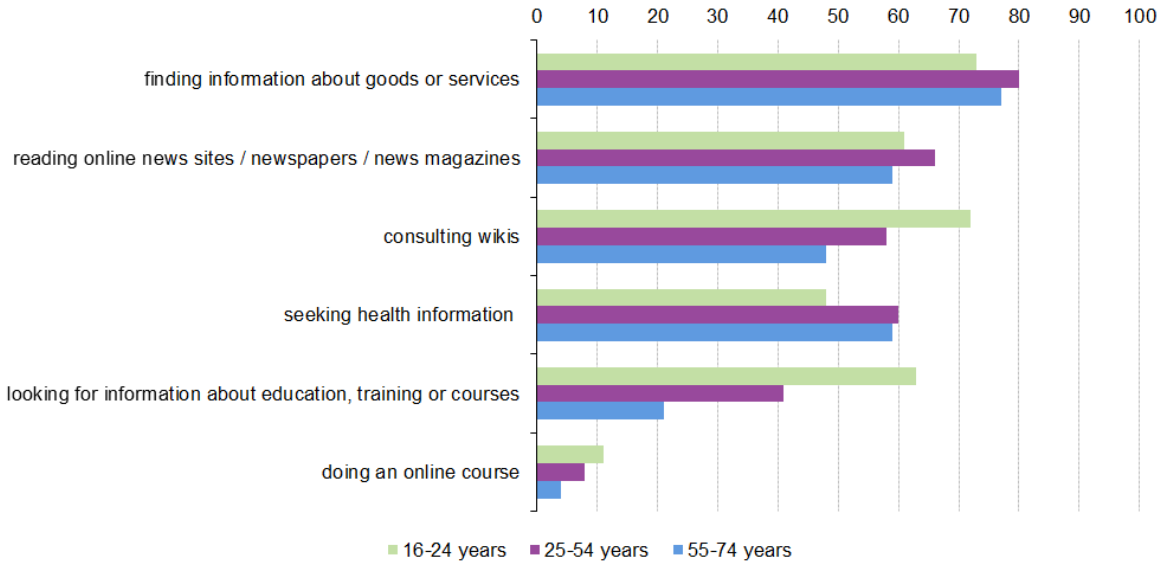

Figure 1: Use of the internet for access to information and learning purposes, by age group and for the EU-28; 2013 data. Source: Eurostat (isoc_bde15cua)

As can be seen in the figure above, it is noteworthy that 'seeking health information' and 'finding information about goods and services' are the only activities performed online more often by older adults (55-74 years) than by younger individuals (16-24 years).

4.1.2.2 Barriers and facilitators to technology uptake by older adults

A substantial body of research has studied aspects related to the use and acceptance of ICT, and assistive technologies, by older adults. Factors such as trust and technology costs; usability, psychological/cognitive accessibility barriers and compliance with individual needs; social context, capacity building and personal experience with technology usage were largely highlighted (e.g. Finn & Wright, 2011; Flick, 2012 cited in Nedopil et al., 2013; Kray et al, 2007; Lansley, 2001; Lindsay et al, 2007; Olphert et al., 2009). Therefore, some of the overarching themes emerged from the literature that approaches the attitudes and perceptions of the older adults about AAL solutions in the ICT area include the ones following summarized, in a non-exhaustive report.

- *Interest in/need of technologies:* Whether older adults are or not willing to use and accept technologies depends on their perceived need of those solutions (Peek et al., 2014). AAL technologies tend to be recognized by older adults as needed, but frequently for a hypothetical other older person, rather than for themselves (ibidem). In fact, a general lack of interest and motivation on technologies' use by older adults was found to be one of the barriers to their acceptance (Morris & Brading, 2007; Novitzky et al., 2015). In a Finish study (cited in Nedopil et al., 2013), older adults mentioned the lack of interest or need as the most prominent motive for not using personal computer, prevailing over other factors such as technology costs or lack of training. Some older adults associate internet use to work and would prefer not to continue using it after retirement (Lewin et al., 2010). It was also described that some older adults can avoid technology use by fearing to become dependent on it (Peek et al., 2016). Moreover, it was noticed

that older adults accomplishing successfully their daily activities without ICT don't recognize a need of introducing it in their routines, even if experiencing impairments (Aloulou et al., 2013; Finn & Wright, 2011; Peek et al., 2014). In fact, Peek and colleagues (2014) have found in a systematic literature review that older adults' negative subjective health status positively influences his/her need for technologies. Additionally, Niehaves and Plattfaut (2010) found that the most important predictor of older adults' ICT use is their expectations about the benefits of such solutions.

- *ICT skills and self-efficacy:* Rejection of technology was associated with older adults' poor ICT skills and lack of self-trust in their technological abilities, as well as with a fear of being unable to handle technology due to scarce experience (e.g. Bandura, 2007; Cunha et al., 2013; Doyle et al., 2013; Finn & Wright, 2011; Fuchsberge, 2008; Morris & Brading, 2007; Sanders et al., 2012). This was referred by Sponselee and colleagues (2007) as a 'self-preservation' mechanism for older adults, with lack of familiarity with ICT solutions and its benefits being an important barrier to its adoption (Doyle et al., 2013; Reginatto, 2012). It was observed that older adults can, on the one hand, fear the technology itself and, on the other hand, fear the learning process (Lewin et al., 2010). As mentioned above, gender also seems to have influence in the perceived skills and fear of using technology (Koch, 2010; Leitner, Mitrea & Fercher, 2013). It is documented, however, a recognition by older adults that these barriers will tend to decrease in future generations of older adults more familiarized with technological developments (Reginatto, 2012). Moreover, it has been reported that older adults would like to access information and training regarding the use of technology (Bjørkquist et al., 2015; Novitzky et al., 2015).
- *Physical and cognitive impairments & perceived health and self-care status:* Health problems with higher probabilities of occurring in older adults, such as hearing, visual, dexterity and motor skills or cognitive impairments, were identified as a barrier for technology use and acceptance, being also closely related to technical and design aspects (e.g. Doyle et al., 2013; Marschollek et al., 2007; Morris & Brading, 2007; Finn & Wright, 2011). Regarding the use of AAL technologies and personal concerns about the health status, several studies have shown that older adults tend to feel less concerned, more optimistic, and more involved in their health management when using those technologies, recognizing as well an alleviation of concerns for their relatives/informal caregivers (e.g. Damant et al., 2013; Damodaran & Olphert, 2010). On the other hand, the use of assistive technologies was found to be related to older adults' fear of feeling/perceiving themselves as being older or sicker than before, thus threatening a good self-image and an identity of positive ageing and self-sufficiency (Morris & Brading, 2007; Sanders et al., 2012; Siegel et al., 2014a; Lewin et al., 2010). For example, Sanders and colleagues (2012), in a study about telehealth and telecare interventions, concluded that older adults perceive a greater focus and anxiety about their own health status as a psychological effect of being monitored. This is consistent with previous research demonstrating that people frequently prefer to distance themselves from negative stereotypes of ageing and sickness (Sanders et al., 2004). That is also closely related with technology design, which shall not be stigmatizing by exposing older adults as

disabled or weak, by being intrusive and having a 'medical' appearance (Chernbumroonga et al., 2013; Damodaran & Wendy, 2010; Doyle et al., 2013; Novitzky et al., 2015; Reginatto, 2012).

- *Technology affordability:* Poverty is one of the main contributors to the digital divide, with computer and internet technology being too expensive for several older adults to purchase and maintain (e.g. Fox, 2011; Marschollek et al., 2007; Morris & Brading, 2007; Finn & Wright, 2011). Moreover, technology can be perceived as an additional overhead in the care provision budgets and older people may not have the resources to afford it, while its benefits are usually unknown to end-users (Clark & McGee-Lennon, 2011; Cunha et al., 2013; Doyle et al., 2013; Esposito et al., 2014; Hunting et al., 2015; Nordgren, 2013; Peek et al., 2014; Reginatto, 2012). In an Irish study on telehealth, older adults argued that a government subsidy covering at least part of the service would be important for a major adhesion (Reginatto, 2012). The issue of 'willingness to pay for', is largely discussed in the literature, being documented that if technology is positively used and judged, the costs are weighted differently, and users may be willing to pay (Bjørkquist et al., 2015; Cunha et al., 2013; Lambooij & Hummel, 2013; Sponselee et al., 2007). For example, services in the scope of health monitoring were seen by older adults as cost saving by reducing hospital admissions (Damodaran & Olphert, 2010).
- *Security, confidentiality and privacy:* Several studies have shown that older adults tend to have concerns about security and privacy in ICT and AAL technologies use (Damodaran & Olphert, 2010; Morris & Brading, 2007; Nordgren, 2013; Olphert et al., 2009; Peek et al., 2014; Wright, 2010). Lack of trust in ICT use and fears regarding access to personal data by others seems to prevent older adults from carrying out online transactions (Olphert et al., 2009). Moreover, health and well-being data are particularly sensitive with regards to digital communication, with strong ethical concerns on who has access and own the data, namely, but not only, in the field of home care technology (Clark & McGee-Lennon, 2011; Damodaran & Olphert, 2010; Reginatto, 2012). However, other authors concluded differently about how end-users see privacy in the scope of ambient assisted living technologies (e.g. Van Hoof et al., 2011; Sanders et al., 2012). For example, Van Hoof and colleagues (2011), in a study involving older adults who live in their homes, concluded that privacy is not a major issue concerning new ambient intelligence technologies, since the potential alternative, the institutionalization, is considered to be much more privacy-threatening. Also, a study on telehealth found that clients don't see any obstacle in sharing health data with the medical doctor, nurse or competent telehealth centre, while opinions were divided concerning the share of this data with relatives or insurance companies (Reginatto, 2012). It was also reinforced that in this matter, fully informed consent of end-users is a prerequisite for a transparent and informed collection and data use (e.g. who will have access to data, use purposes; Colomer et al., 2014; Damodaran & Olphert, 2010; Novitzky et al., 2015).
- *Trust in technological solutions:* Older adults' trust in technology or a device can have a role in reducing the complexity and uncertainty when products or processes are not clear and understandable and play an important part in the success of intelligent assistance systems (Lee & See, 2004). Even thought that trust in AAL still is scarcely studied, a research by Steinke and colleagues (2012) concluded that factors significantly influencing trust on those technologies are:

expected reliability, perceived ease of use, and perceived usefulness of AAL. Concerning reliability, Marschollek and colleagues (2007) found that one obstacle for getting health information online by older adults is the perception that information available online has low quality, can be biased or misleading, is frequently not run professionally, don't include peer-reviewed materials by independent actors, and the selection of the most reliable and suitable information is constrained by information overload on health issues. It is documented as well that older adults can doubt on institutions delivering AAL products or services, namely regarding their real resources for crises response, the use of personal data and the proper maintenance of devices (Damodaran & Olphert, 2010). Also, the importance of information transparency for improving trust has been stressed (Kriegel et al., 2013). Naturally, personality differences and perceptions have a mediating role between technologies intrinsic characteristics and users' trust (Steinke et al., 2012). Even taking into account personality differences, it was noticed that older adults are in a life stage where the trend is to value their remaining time highly; therefore, they can experience low tolerance to irrelevant issues, failure or disappointment (Nedopil et al., 2013).

- *Social interaction:* Usability evaluations have shown that solution's uptake can be hindered by (fear of) losing social interaction and face-to-face contact (Damodaran & Olphert, 2010; Novitzky et al., 2015; Olphert et al., 2009; Siegel et al., 2014a). In fact, the concern that technology introduction in the care process can aggravate older adults' loneliness was described to be shared by caregivers (Sponselee et al., 2007) and healthcare professionals (Reginatto, 2012; Siegel et al., 2014a). Since loneliness has been identified as a major problem for older adults, there is a risk that technologies such as telecare and telehealth result in reduced visits from care professionals and relatives (since relatives may feel confident that the older adult is being looked after), which is perceived as undesirable (Nordgren, 2013; Siegel, Hochgatterer & Dorner, 2014). Taking another perspective into account, internet applications and networks (e.g. skype), as well as other technological solutions for assisted living, can be used to reduce loneliness and facilitate contact with relatives and friends (Damant et al., 2013; Nordgren, 2013). However, other studies concluded that these solutions do not always reduce the feelings of loneliness (van Hoof et al. 2011). Even if the value of social contact and its balance with independence vary between older adults, the first is increasingly relevant when a person becomes dependent on care (Nordgren, 2013). It has been reported that if technologies are seen as facilitators of new social interactions rather than replacing previous human interactions, this fear of losing social contact can be at least partially minimized (Lewin et al., 2010).
- *Technology barriers:* As previously discussed, there are many challenges in designing, developing, implementing and evaluating independent living technologies for older adults (Doyle et al., 2013). In fact, technology usability issues may significantly hinder AAL adoption, as verified for example by Reginatto (2012) for the case of telehealth. Since a technology overall utility seems to be judged according to its ability to increase older adults' quality of life, ease of use appears to contribute to the perception of that overall utility (Nordgren, 2013). Therefore, it was suggested that in designing ICT-based health information services for older adults, the use of adapted contents must be guaranteed; presented in an intuitive, easy to use platform, adjusted to

individual preferences; with inputs from multidisciplinary teams; and as much integrated as possible (Aloulou et al., 2013; Marschollek et al., 2007; Nedopil et al., 2013). Lack of personalization, customization and adaptation were identified as factors that affect technology use (Clark, McGee-Lennon, 2011; Hepworth et al., 2003; Novitzky et al., 2015). It is consistently documented that older adults don´t use technologies that miss a correspondence with their lifestyles and preferences, since those would become time consuming and frustrating (Van Gemert-Pijnen et al., 2011; Procter et al., 2014; Reginatto, 2012). Moreover, generally speaking, solutions that are unobtrusive are preferred by users, and their accuracy (e.g. few false alarms) is a valued feature (Nedopil et al., 2013; Peek et al., 2014). As discussed in the previous chapter, the most frequently pointed reason for the existence of technology barriers, of usability problems, is the adoption of a technology-driven rather than a user-driven approach, resulting in "high tech-with-a-low impact" solutions (Van Gemert-Pijnen et al., 2011). In this line, Doyle and colleagues (2013) proposed two simple guidelines for the technology design: 'design for continuity' – by diminishing the disruptive nature of new technology – and 'design for understanding and learning'.

Even if AAL technology is technically mature to provide the desired functionality, variables affecting access to technology still are not fully known (Leitner et al., 2013). The broad literature produced on the topic of technology for older adults have concluded that many of those solutions are 'one-size-fits-all' and do not consider the diversity of abilities, preferences and contexts in individual users (e.g. Clark & McGee-Lennon, 2011; Marschollek et al., 2007; Peek et al., 2016). Thus, often the specific needs of this group are not met. Kleinberger and colleagues (2007) argue that a system must meet three major requirements in order to accomplish the proposed goal of assisting older adults and vulnerable people: high acceptance, adaptation, and high usability. In this sense, we can talk of the 'adaptive level' notion, meaning that solutions should cope with individual requirements (Fuchsberger, 2008). It must be kept in mind the changing and evolving nature of these needs or factors for older adults' uptake of AAL solutions. Physiological, cognitive and social changes that take place between and within generations of older adults contribute for this scenario (Olphert et al., 2009).

4.1.3 Secondary end-users

Older adults should not be considered the only users of AAL technology. The informal support network around them – which includes relatives, friends, neighbours, and others – plays a big part in the decision-making process regarding the search and acquisition of AAL products and services targeting the improvement of older adults' quality of life, but also, as a consequence, their own (Koch, 2010; Reeder et al., 2014). Professional/formal caregivers, medical doctors and other health and care professionals are also affected by the use of AAL solutions and can influence the adoption of those solutions by older adults (Schartinger et al., 2015). A systematic literature review by Peek and colleagues (2016) concluded that social influence on older adults about whether or not to use technologies is mainly exercised by their children and other members of close family, friends and professional caregivers. As stressed above, secondary end-users for AAL technologies were described by Nedopil and colleagues (2013) to be persons, such as the older adult's relatives and/or informal

caregivers; or organizations and companies that use or access AAL solutions for the benefit of primary end-users. As mentioned before, in the scope of this analysis, enterprises in the business field of AAL will also be considered in this group. Therefore, follows an exploration of the literature produced on the barriers and requirements of i. informal and formal caregivers; and, at organizational level, ii. of companies in the business field of AAL.

4.1.3.1 Relatives and informal caregivers

Informal caregivers provide typically unpaid support to older adults, managing a broad range of tasks linked to the activities of daily living (ADL; e.g. bathing, cleaning the house, cooking) and also to instrumental activities of daily living (IADL; e.g. shopping, paperwork). In addition, those caregivers often provide support in the healthcare domain (e.g. medication control; Reinhard et al., 2008), even thought that caring responsibilities have been associated with the care recipient's health status (Organisation for Economic Co-operation and Development, 2011). Across the OECD countries, more than one in ten adults is involved in the informal caregiving of relatives or friends, and close to one in three adults aged over 50 provides care (OECD, 2011). Therefore, some older adults are themselves caregivers, taking care of their parents, children's children, neighbours or friends (Nedopil et al., 2013).

Caregivers are more likely to be female but the caregivers' gender distribution tends to change according to age, with relatively more males of 75 years old or above performing this role (OECD, 2011). Data derived from the Eurofound's 2012 European Quality of Life Survey gives count that in the EU member states, 7.4% of women were involved in daily caring for their older or disabled relatives. This percentage is unevenly distributed across European countries, with some Nordic countries presenting a very low percentage (e.g. the Netherlands and Germany) while some South and Eastern European countries present a high percentage (e.g. Romania, Lithuania, Spain, Portugal). Nevertheless, there is no clear geographical distribution, with countries like Greece presenting a lower percentage of women involved in daily caring. Caregivers are more likely to be children or spouses of the older adults being cared (OEDC, 2011). It has been demonstrated that caring for an older relative may produce antagonistic feelings for the informal caregiver: On the one hand, the caregiver may see the caregiving process as a source of satisfaction, fulfilment and personal growth; but on the other hand, the provision of care is usually stressful and caregivers can experience negative effects linked to an increased sense of burden (Stephens et al., 2001). In fact, intensive caring has been associated with a negative impact on mental health (Begley, 2010; OECD, 2011). This also results from a diversity of issues informal caregivers struggle with, some examples being the concerns with older adults' security and well-being; feelings of guilt when the care receiver is institutionalized; need for health information and practical advice on support strategies as well as on support products and services (Nedopil et al., 2013). Concerns of this nature can benefit from the resource to AAL solutions to alleviate caregivers stress, improve their quality of life and ultimately increase the quality of care provided (Costa et al., 2014).

The literature does not provide a lot of information, neither about the informal caregivers' current use of technologies to support their caring activities, nor about their requirements (Reeder et al., 2014). A study from Cunha and colleagues (2013) with Portuguese caregivers (n= 268) shows that almost half

of them (49%) already use technology to support their caregiving activities. Moreover, the majority of caregivers recognized technology's usefulness for facilitating those activities and improving their well-being (ibidem). This perception of technology's benefits was also concluded by other studies (Begley, 2010; Price et al., 2008; Peek et al., 2014; Wild et al., 2008). Regarding internet use, the mentioned study found that searching for products and services targeted at improving older adults' quality of life is one of the activities carried by caregivers, with most of them (58.2%) trusting in information available online (Cunha et al., 2013). Moreover, research has shown that family members and informal caregivers can play a significant role in the effective use of technology by older adults (Novitzky et al., 2015; Peek et al., 2016). However, evidence from the published literature shows that despite the generally positive reaction to AAL technologies if recognized its benefits, there are obstacles to consider. We looked at these barriers and facilitators under the topics listed below.

- *Monitoring as a tool for peace of mind:* Telecare in the form of monitoring (e.g. movement detectors) seems to be particularly valued by informal caregivers in the scope of AAL technologies, once it informs about the older adults' daily behaviours and allows informal caregivers to have peace of mind (Begley, 2010; Bjørkquist et al., 2015; Damodaran & Olphert, 2010; Peruzzini & Germani, 2014; Reeder et al., 2014). Moreover, these solutions can offer to the caregiver the possibility of remaining in a paid job and guarantee family's financial stability (Begley, 2010).
- *Caregiver – care receiver relationships and social interaction:* It was documented that AAL technologies, if mirrored in an effective improvement of older adult's quality of life, can have a positive impact on the relationship that caregivers maintain with care receivers (Begley, 2010). This is linked with a decrease on the caring burden and associated stress (Begley, 2010; Cunha et al., 2013). Nevertheless, caregivers tend to see technologies as complementary solutions and never as means to replace their caring roles (Begley, 2010; Sponselee, et al., 2007). In this line, and in resemblance to what was found for older adults and formal caregivers perceived barriers, informal caregivers fear that technology use can reduce their relatives/care receiver's social interaction (Begley, 2010; Novitzky et al., 2015; Sponselee et al., 2007).
- *ICT skills and self-efficacy:* In resemblance to older adults, informal caregivers are also frequently described as having 'technophobia', which is partially explained by the human contact that usually characterizes caregiving tasks and by the fear that technology introduction could disrupt the caregiving nature (Sponselee et al., 2007).
- *Technology costs and funding*: One of the motivations for informal caregivers to avoid institutionalization and recur to AAL products and services is, besides promoting older adult's well-being, to retain wealth within the family, since getting a relative in a nursing home or similar facility is usually expensive (Lewin et al., 2010). However, in resemblance to the above discussed regarding older adults, lack of financial availability to invest in the acquisition of AAL technologies in perceived as a barrier by informal caregivers, even though they can be willing to suffer great financial pressures to ensure the best solutions for their relatives (and when it involves technologies, in purchasing it; Cunha et al., 2013; Reeder et al., 2014). Moreover, caregivers tend to consider that governments should pay for those services provided to older adults, but some

evidence show that they are willing to pay it by their own, especially if they live far away (Damodaran & Olphert, 2010; Lewin et al., 2010).

- *Autonomy and consent:* It has been shown that informal caregivers hold concerns about the older adults' informed consent and respect in the implementation of products and provision of services (Lewin et al., 2010). The issue that technologies mustn't be implemented 'for the older adult's good', without their fully consent is highlighted in the literature (e.g. Colomer et al., 2014; Damodaran & Olphert, 2010).
- *Awareness and information about AAL:* Some studies show that caregivers perceive a lack of relevant information available on AAL technologies and its benefits, or its availability only when a point of crises is reached (Begley, 2010; Lewin et al., 2010; Reginatto, 2012).

From the above exposed, one can conclude that older adults' relatives and informal caregivers can embrace AAL technologies if their benefits are recognized for reducing older adults' dependence and improving the quality of care provided. However, technology uptake by these end-users depends on the assurance that ethical, relational, financial and learning conditions are reunited.

4.1.3.2 Professional caregivers

Even thought that older adults' relatives are a crucial source of care provision, it is frequently necessary to recruit additional and specialized help from the scope of professional care. Formal or professional care is typically performed by trained, qualified individuals – doctors, gerontologists, social workers, nurses, psychologists, educators, among others – who offer specialized services to the care receiver. Thus, the resource to professional caregivers is more likely to occur when caring requires medical skills and for older adults with higher levels of dependence, as well as for older adults without permanent informal care, most probably single and male (Nedopil et al.,2013). According to Cunha and colleagues (2013), formal caregivers can be divided into two categories, the first including professionals such as nurses, medical doctors, therapists and social workers; and the second comprising direct-care workers (e.g. home health aides, homemakers). In resemblance to informal caregivers, also professional ones face significant challenges such as high workload and burnout; many bureaucratic duties with less time for personal contact; human resource limitations and need to manage a lot of clients; need to maintain interested parties informed and conflicts with care receivers, their relatives or co-workers/chiefs, among others issues (Nedopil et al.,2013). In this line, professional caregivers can also benefit from AAL technologies to assist them in their daily tasks and by being part of the resources older adults possess to be more autonomous. In fact, it was noticed that the need for technologies to assist care receivers has been increasing, even if in combination with professional assistance (Cunha et al., 2013). In resemblance to informal caregivers, professional ones can have the power of mediating older adults' access to ICT, either by suggesting/prescribing it, or by helping older adults in the transition to technological solutions. Therefore, the requirements of those professionals have to be taken into account, and it should be noticed that, as expected, many of the concerns and requirements have common points with the ones from informal caregivers. Follows an exploration of themes emerged from the literature on this issue.

- *The 'nature' of care provision:* It is documented that caregivers can see technology as driving to a loss of quality in care provided, since it can reduce personal contact and negatively affect what is experienced as 'caring' (Novitzky et al., 2015; Sponselee, et al., 2007). Technology use can reduce the time spent in direct contact with clients, which was perceived as damaging the quality of care (Novitzky et al., 2015). Moreover, in resemblance to older adults' concerns, also professional caregivers have shown to fear that older adults can become even lonelier when technology in introduced into the care process (Esposito et al., 2014; Sponselee, et al., 2007). It was also stressed that potential caregivers' reluctance in using technologies might be linked to a disruption in their caring routines or habits (Sponselee, et al., 2007). Medical personnel can also refuse to use AAL solutions due to fear of lose power regarding the caring and health process (Bjørkquist et al., 2015; Gruber, Wolf & Reiher, 2009). Moreover, loss of face-to-face contact with telehealth adoption was considered by healthcare providers to negatively impact their decision-making process and increase the risks of medical errors and raise liability issues (Hofmann, 2012; Reginatto, 2012). Moreover, it carries new challenges with regards to communication with care receivers (e.g. voice intonation), since face-to-face prompts are absent (Baraket et al., 2013). In that case, good support and clear guidance is seen by caregivers as fundamental for providing care at a distance (ibidem).
- *Working practices and workflow:* Insufficient attention has been paid to integration of technology into pre-existing working practices and workflow of care professionals. Nevertheless, some studies have shown that professional caregivers recognize benefits of AAL technologies in several dimensions such as helping with mobility and prevention of staff's injuries, or memory and management aids for direct-care workers; easy management and integration of patient's information; increased multidisciplinary collaboration; and improved counselling to patients, for healthcare staff (Aloulou et al., 2013; Bjørkquist et al., 2015; Cunha et al., 2013; Esposito et al., 2014; Reeder et al., 2014; Siegel et al., 2014a). On the other hand, care professionals can perceive technologies as disrupting working practices and leading to additional time spent and extra work (e.g. false alarms; learning and explaining the use of technology; managing generated data; Cunha et al., 2013; Clark & McGee-Lennon, 2011; Hunting et al., 2015; Peek et al., 2016; Sponselee, et al., 2007). Regarding telehealth, a study shows that healthcare providers hold concerns regarding its incorporation in their work, since this requires to significantly adapt their practices and there is lack of time to interpret the information generated by the system (Reginatto, 2012).
- *ICT skills and self-efficacy:* It is documented that lack of professionals' ICT skills influence technology uptake since it can be connected to feelings of incapability as well as decreased work motivation and distress (Barakat et al., 2013; Cunha et al., 2013; Sponselee, et al., 2007; Gruber, Wolf & Reiher, 2009). Some studies found that gender can be an important variable concerning technology acceptance by care staff, with females perceiving themselves as unskilled in that matter (Jansson, Mortberg, & Berg, 2007), in resemblance to what was observed in older adults (Koch, 2010; Leitner, Mitrea & Fercher, 2013). Moreover, care professionals tend to perceive older adults as unable or not willing to use new technology, which is a barrier for not prescribing/recommending those solutions (Bjørkquist et al., 2015; Clark & McGee-Lennon, 2011;

Hunting et al., 2015; Koch, 2010). Moreover, it is documented professional caregivers, particularly medical personnel, lack motivation to use ICT technologies due to their conception of care as a face-to-face service (Novitzky et al., 2015; Sponselee, et al., 2007). However, professionals have shown to be willing to try utilization of ICT systems as part of their professional skills (Cunha et al., 2013; Sponselee, et al., 2007).

- *Training and support:* It has been identified a lack of proper training and guidance for professional caregivers when technologies are introduced in the care process (Barakat et al., 2013; Begley, 2010; Bjørkquist et al., 2015; Sponselee, et al., 2007). According to their own point of view, training for professional caregivers should include basic skills for using technology and hardware; to collect, store and display information; to interpret and analyse the data; as well as on communication skills and confidentiality issues (Barakat et al., 2013). It was also perceived a lack of support for prescribing the most suitable technologies regarding older adults' needs and life circumstances (Clark & McGee-Lennon, 2011).
- *Trust and conflicts among involved parts:* A study of telehealth uptake found that trust issues among different stakeholders can be an obstacle: medical professionals tend to doubt of patients' ability in monitoring their readings, as well in the accuracy of medical devices and security connections; even if when compared to manually collected data, the first is admitted to be more reliable (Reginatto, 2012). Moreover, healthcare providers fear the information delivered by other service providers to older adults, which is an obstacle to, for example, telecare acceptance (ibidem).
- *Need for evidence on ICT based interventions:* The perceived lack of robust evidence supporting the effectiveness and return on investment of AAL technologies (e.g. large randomized controlled trials), was found to deter a wider adoption of those technologies by the medical community (Wahlste et al., 2015; Reginatto, 2012). In fact, a literature review regarding the use of assistive technologies for increasing independence, showed that "once the evaluation moves from the laboratory significant practical and methodological problems emerge" (Fleming & Sum, 2014, p. 30).
- *Ethical considerations:* In resemblance to the discussed above regarding older adults, also professional caregivers have shown concerns that technology use could result in an aggravation of their clients' privacy loss (once receiving care already carries some degree of privacy loss; Sponselee, et al., 2007). Missing security in personal data transmission is a major concern for professional caregivers, particularly healthcare providers, for example in the implementation of telehealth services (Barakat et al., 2013; Bjørkquist et al., 2015; Cunha et al., 2013; Gruber, Wolf & Reiher, 2009; Reginatto, 2012).
- *Financial barriers:* It was found that healthcare providers can reject the implementation of AAL technologies, for example telemonitoring systems, due to their change management cost (Gruber, Wolf & Reiher, 2009). Establishing the required infrastructure, provide training to staff, among other procedures, hold usually high costs, with public funding constraints being also typically associated (Cunha et al., 2013; Reginatto, 2012). Allocation of resources on AAL

technologies has been one of the concerns most raised by medical doctors, once it could mean disinvestment in other care dimensions (Novitzky et al., 2015).

- *Technical barriers*: Healthcare providers have identified technical barriers in the implementation of AAL technologies, mostly on telehealth, which include lack of available equipment (Cunha et al., 2013; Reginatto, 2012); limited access to broadband and device incompatibility, system crashes, as well as lack of system integration within the healthcare sector (Aloulou et al., 2013; Reginatto, 2012). In this line, Aloulou and colleagues (2013), in a study with dementia patients and their professional caregivers, argue that ambient systems are prone to crashes due to the reliance on several wireless communication protocols and therefore a 'designing for failure' approach must be taken, i.e. crashes are inevitable and should be considered in the design and implementation phases.

The above exposes a broad set of barriers for technology uptake by professional caregivers that must be considered in order to avoid low prescription of AAL technologies and innovation resistance. Deterrents associated with ethical issues and medical liability; lack of evidence about the cost-effectiveness of the interventions; and technology perceived interference in the care 'nature' and work practices, are among the most relevant issues for this stakeholders group.

4.1.3.3 Enterprises in the business field of AAL

Companies producing or supplying the devices, methods or infrastructures required for AAL technologies are among the most mentioned stakeholders in this field (e.g. Calvaresi et al., 2016; Peek et al., 2016; Clark & McGee-Lennon, 2011). A study by Gabner and Conrad (2010) focusing in the identification of organizations dealing with AAL products or doing research in this field in the EU-27 Member States, found that the research sector alone covers a great part (37%, to be more precise) of all the organizations found, being followed by the service providers. Nevertheless, literature produced about these stakeholders' needs, attitudes and expectations towards AAL technology and its uptake by primary end-users is scarce and far from the research scene for primary end-users. It was noticed that organizations in the AAL business field not always define themselves as such, despite their focus on that kind of solutions, what brings additional challenges to the identification and study of these stakeholders' requirements (Gabner & Conrad, 2010). In the following interpretative synthesis of the literature found on that topic, a broad sense will be applied to business stakeholders, by including manufacturers, service providers, producers, suppliers/wholesalers, retailers, and by including organizations providing ICT/AAL solutions through research and development. Therefore, inputs from the literature about the views of technology developers, designers and engineers will also be explored in the thematic areas exposed below.

- *Sustainable and clear business models:* It has been largely stated that societal challenges regarding ageing bring business opportunities in the ICT field, depicted as the so-called 'silver market' segment (Delbreil & Zvobgo, 2013; Greenhalgh et al., 2012; Morris et al., 2010; Koch et al., 2010). However, among the most pointed market interferences to a broad implementation of AAL is the lack of sustainable business models as the foundation for cooperation between different key interveners in this area – technology developers, service providers, manufacturers, housing

industry, among others (e.g. Ehrenhard, et al., 2014; Gruber, Wolf, & Reiher, 2009; Wichert et al., 2010). Instead, the current scene still is dominated by singular solutions, which implies high costs (e.g. related with the expertise required for development and installation) and a low cost-effectiveness. The 'administrative burden' is one of the barriers pointed by the industry in this field (Finn & Wright, 2011). This scenario was stressed by a study in the smart homes field, concluding that small businesses in this area currently look for accomplishing their goals in isolation rather than in collaboration (Nikayin & De Reuver, n.d., cit. in Ehrenhard et al., 2014). In this line, a successful solutions' market launch is hindered by the fact that clients cannot afford covering those high costs, and even if those could be co-payed by insurance companies, the government and the older adults themselves, it probably would not be sustainable for the society as a whole (Wichert et al., 2010). Therefore, in order to address the current market challenges, efforts have been made in the recent years for thinking monolithic approaches where providers and companies can integrate their products into an existing platform (ibidem). This elicits the need of AAL business stakeholders of building a community – an AAL 'Business ecosystem'[7] composed by users and developers – where products and services are developed based on a common platform (Ehrenhard, et al., 2014; Graça & Camarinha-Matos, 2015; Li, 2009; Wichert et al., 2010). That ecosystem would allow collaboration between organizations to offer integrated and better services, and to gain competitive advantage (Graça & Camarinha-Matos, 2015).

- *Costs and gains of a user-centred approach to design:* As already explored in this paper, the literature on the AAL field put a great focus in the topic of user-centred approach, incentivizing technology designers to include older and disable people in all phases of technology research and development (e.g. Greenhalgh et al., 2015; Novitzky et al., 2015; Sponselee et al., 2007; Wilson et al., 2015). As stressed by Balta-Ozkan and colleagues (2013) about the smart home market, the adoption of a user-centred design can guide to a market transformation from the current 'technology push' to a 'market pull'. Barakat and colleagues (2013) have noticed that while technologists and engineers have been genuinely concerned in developing technological solutions to address health and social care problems, much of the research done so far is limited in terms of 'real-world' correspondence. Not only those (primary) users must be involved in the process but also secondary and tertiary users, with research showing that, for example, the views of healthcare providers are insufficiently considered by technology designers, resulting in systems that are not in tune to providers' workflow (Reginatto, 2012). Abascal and Azevedo (2007) stressed that many designers simply are not aware that they can design for a broader population by avoiding certain features that put additional challenges to accessibility by certain users. Therefore, designs end up being based in the mental model, abilities and preferences of the designer and the alternative for other stakeholders is to rely on the designer knowledge and promises, which can result in high and unrealistic expectations (Sponselee et al. 2007). It was noticed that the typically found age gap between designers and users/older adults, as well as different mind-sets regarding technology features (e.g. ease of use) pose additional difficulties to

[7] The concept of 'Business Ecosystem', first introduced by Moore (1996), describes "an economic community supported by a foundation of interacting organizations and individuals – the organisms of the business world. This economic community produces goods and services of value to customers, who themselves are members of the ecosystem (…) [where all actors] coevolve their capabilities and roles".

the technology design (Wallace et al. 2010). Designers tend to make assumptions about older adults' requirements, which do not correspond to the true requirements; hence the user-centred approach gains additional relevance (ibidem). However, this approach to the design brings higher costs, additional work, demands greater attention and domain of additional work methodologies, all required for designers, thus turning the R&D process more demanding (Abascal & Azevedo 2007; Novitzky et al., 2015; Sponselee et al. 2007; Wallace et al. 2010).

- *Better understanding of older adults' ICT needs:* In line with the contents explored in the previous point, it is documented that industry needs socio-economic research in order to understand older adults' needs and reach new market opportunities in this segment (Sponselee et al. 2007; Wright, 2010). One of the gaps pointed for this lack of knowledge about older adults' needs and their characteristics is the frequently absent gerontological expertise among teams designing AAL solutions, for example telehealth (Reginatto, 2012). In a study of Balta-Ozkana and colleagues (2013) about smart homes, one participant described the market as "a young industry trying to understand what it is that actually is of interest to a customer" (p. 372).
- *Evidence on return on investment and consumer trust:* As already stressed with regards to professional caregivers, there is a lack of robust evidence supporting AAL technology-based interventions, with enterprises in the business field of AAL having to struggle for demonstrating to the client the return on investment of these solutions (Reginatto, 2012). This factor contributes for jeopardizing trust in AAL innovations, as illustrated by the literature pointing that professional caregivers, particularly medical personnel, consider this lack of evidence as an impediment for technology adoption (Reginatto, 2012). Therefore, we are talking about a low perceived customer value (Gruber, Wolf, & Reiher, 2009). In the smart home field, it was noticed the lack of suitable frameworks to validate the technology installation and to manage its assessment, also attributed to the fact that skills required for those tasks rely mostly outside the commercial environment (e.g. in academia; Al-Shaqi et al., 2016). Therefore, the need for research and investment is pointed by the industry in this field (Wright, 2010). In this line, Greenhalgh and colleagues (2015) argue that technology designers and service providers must shift the focus from the mere technology development, installation and monitoring to a dynamic focus on performance, therefore supporting technologies-in-use.
- *Ethical guidance and market regulation:* Other factors strongly putting at risk the consumer trust in AAL technologies are the already discussed issues of privacy, transparency, access to data and reliability (e.g. Ehrenhard et al., 2014; Gruber, Wolf, & Reiher, 2009; Reginatto, 2012; Wilson et al., 2015). It was recommended that the industry must enhance transparency towards consumers about system procedures, in order to reduce consumer distrust (Wright, et al., 2007). McKenna and colleagues (2012) stressed that data privacy must be dealt with standards or 'privacy friendly' techniques, therefore ethical guidance and definition of best practices are needed for the industry (Finn & Wright, 2011). It was argued that regulation is required to frame those issues and prevent market failures; and observed that, for example, data protection laws in Europe are becoming stricter in order to protect citizens (Falcó, Vaquerizo, & Artigas, 2014; Fransman, 2010; Van Gemert-Pijnen et al., 2011; Gruber, Wolf, & Reiher, 2009). However, in a study about smart homes

relying on experts views, Balta-Ozkan and colleagues (2013) concluded that "a too tightly regulated market was felt by experts potentially to kill a whole industry" (p. 372). The industry's need of having reductions in regulatory hurdles was also mentioned in other works, an issue that could benefit from harmonized legislation in the EU (Finn & Wright, 2011; Wright, 2010). Although, Wright and colleagues (2007) argue that industry "should expend less effort on fighting new regulations and more effort on involving stakeholders in the assessment and management of risks to privacy, identity, trust, security and inclusiveness" (p. 263).

- *Funding & reimbursement:* The development of the AAL business field hold interdependencies with policies (e.g. incentives, funding) and regulations, because those are a concern for business stakeholders (Balta-Ozkana, et al., 2013). Governments have a significant role in supporting AAL adoption trough defining regulation, funding and participating in R&D projects, and participating in the commercialization of products and services (Ehrenhard et al., 2014). Also, health insurance companies have a part in the diffusion of AAL technologies if providing reimbursement mechanisms (Gruber, Wolf, & Reiher, 2009). The literature has been shown that inadequate reimbursement can slow down innovation (Van Gemert-Pijnen et al., 2011; Reginatto, 2012). This is linked to the fact that technology costs can be too high to be funded entirely by the final clients, while caregivers tend to consider that funding mechanisms for these technologies must be installed by the governments (Damodaran & Olphert, 2010; Lewin et al., 2010). Although, in order to support the development of those initiatives, public and also private investors need to trust and recognize the return on investment, as previously discussed.
- *Clients' awareness on AAL technologies:* Lack of general public awareness about AAL technologies and their potential benefits is identified by business stakeholders as one obstacle to introduce and succeed with this products and services in the market (Balta-Ozkana, et al., 2013). Therefore, it was stated that benefits of AAL technologies must be explicitly stated and demonstrated to the potential clients and via widespread campaigns (*ibidem*).
- *Technology affordability for adherence:* Peek and colleagues (2016) have shown that technologists consider older adults' inclination to pay as critical, therefore holding concerns about the costs of technologies they sell. This obstacle was also noticed concerning other stakeholders and regarding changing costs due to modifications in the procedures for providing healthcare (Gruber, Wolf & Reiher, 2009). Therefore, as stressed above, a sustainable cost model is needed for advanced and widely disseminated AAL products and services (Marschollek et al., 2007).

Among the multiple challenges faced by business stakeholders, the failure of developing sustainable business models and collaborative businesses ecosystems are not only the most prominent but can also be regarded as the source of many other above mentioned issues.

4.1.4 Tertiary end-users

In the European context, the third most expressive group among all organizations dealing with AAL products was found to be composed by political institutions, as a result of adding local and regional authorities with government organizations (Gabner & Conrad, 2010). As already discussed, regarding the demographic change phenomena, Governments face several challenges they need to address and

that can benefit from AAL solutions. Therefore, it was observed that the national governments function as main drivers for developments within the ICT area for enabling independent living (ibidem). These results show the governments' role as funding institutions for a great part of national and European research projects, as well as in supporting and funding the provision of care services for older adults. However, in spite of some political discourses stating that agreements between policy-makers and industry would allow a broad implementation of assistive technologies, that reality hasn't materialized yet (Greenhalgh et al., 2016).

In the scope of this literature analysis and by applying the ActiveAdvice framework, Governmental bodies defining policies and providing services in the field of health and care will be considered as tertiary end-users. In this line, in the following we will give an exploration of the literature produced on the barriers, expectations and requirements of this stakeholders group. Once again, it should be noticed that much less studies have been produced about this end-user in comparison with the literature available on older adults, as primary end-users. In fact, this was noticed by Reeder and colleagues (2014) in a systematic literature review under the Smart Homes topic, where only one study included policy-makers as stakeholders, which described the need for providing them with information on AAL with impacts on the decision-making process. Follows a synthesis of some findings organized by themes emerged.

- *Ageing and digital divide:* As part of the national governments' mission is the facilitation of access to services by older adults so that these citizens can actively participate in the community and, consequently, enhance their quality of life (WHO, 2007). Governments are interested in having healthy and active citizens contributing to the welfare of the community, which results in obvious economic advantages for a certain country. Moreover, it has been largely acknowledged the governments' interest and goal is promoting equal rights and opportunities of accessibility to the information society and its ambient intelligence environment, overcoming the digital divide recognized for older adults (Wright et al., 2007; Wright, 2010).
- *Evidence base for cost-effective interventions*: Due to the increase of life expectancy, the current private and public systems of healthcare are inefficient and insufficient to fit citizens' needs, especially the ones of older and disabled people. Therefore, policy makers are requested to create new policies and adopt new strategies to restructure the healthcare systems in an inclusive, fair and sustainable way (Karanikolos et al., 2013). They need to know which interventions are the most cost-effective in order to cover older adults' needs without jeopardizing the system sustainability. A study by Lambooij and Hummel (2013) about stakeholders' preferred innovations in the health field illustrates that reasoning, by demonstrating that policy-makers hold an inclination for digital hospital portals and self-tests much more than other stakeholders, who in turn scored these innovations lowly. These findings show that innovations targeted at improving self-management and healthcare efficiency tend to be valued by policy-makers, as stakeholders who typically pay for the innovations (ibidem). An economic angle for policy making has been used to argue in favour of AAL technologies (Novitzky et al., 2015). However, as already discussed,

evidence on cost-effectiveness of AAL solutions is still scarce, colliding with a healthcare decision-making that is supposed to be based on multiple criteria and evidence. In a study by Wahlste and colleagues (2015), where multiple stakeholders elected the most important criteria for reimbursement decision-making on health technology, the 'quality of the evidence' was more important for policy-makers than for other stakeholders, emphasizing that a technology needs to demonstrate the claimed benefits in a clear and sustained way. In this line, governmental support of comprehensive solution evaluations was highlighted as a required facilitator to the effective implementation of AAL solutions, such as tele-homecare (Hunting et al., 2015). Tensions between government funding and evaluation frameworks were pointed out, arguing that evaluations based on the decision-making process in the technology field have been mainly concerned with meeting short term outcomes rather than providing comprehensive assessments (idibem).

- *Research support to decision-making*: Policy-makers have stressed not only the need for evidence about the cost-effectiveness of ICT in promoting older adults' healthier and independent living, but expressed additional concerns regarding research needs. In particular, policy-makers seem to welcome studies focused on measuring the interventions' benefits, providing interventions' benchmarks, providing examples of best practices, as well as developing socio-economic research on privacy, data protection and consent, crime and abuse (Finn & Wright, 2011; Wright, 2010).
- *Ethical challenges and regulation*: Ethical issues associated with ICT, including privacy, anonymity, data protection, manipulation and control, informed consent, intellectual property rights, and the associated topic of removing regulatory barriers, are among the most debated themes on AAL technologies involving decision-makers. It is accepted that among the Governments responsibilities towards their citizens are the ones of protecting their rights in the information society and promoting privacy-enhancing mechanisms (Wright et al., 2007). Therefore, government legislation is required addressing data protection and liability issues, among other ethical issues, since it is unclear how data protection legislation applies to solutions such as telehealth (Reginatto, 2012; Wright et al., 2007). Even though that in the procurement of ICT products or services Governments should emphasize critical issues such as security and trustworthiness, it has been argued, mainly by industry stakeholders, that regulation must keep up with the technical innovations without making it difficult for the implementation of new health and social care tools (Balta-Ozkan et al., 2013).
- *Citizens' awareness:* It has been stated that Governments are motivated and need to invest in awareness campaigns focusing on AAL solutions in order to demonstrate its benefits but also to explain about their security and privacy risks (Wright et al., 2007; Reginatto, 2012). Moreover, Wright and colleagues (2007) argue that any campaign in this matter aimed at informing the public must be judged by independent evaluators; and Reginatto (2012) defends that neutral up-to-date information on this topic must be provided to end-users via the creation of a government approved website. This strategy can also serve the decision-makers interest of encouraging stakeholders to use e-government available services in the healthcare field (Finn & Wright, 2011).

- *Managing collaborations:* It has been argued that for policy-makers a significant challenge in the AAL field lies in designing strategies that could be effective in supporting adaptive evolution by other stakeholders and, at the same time, providing strategic direction (Greenhalgh et al., 2016).

In the scope of AAL, the governmental institutions are the main stakeholders regarding the provision of required funds, infrastructures or even legal framework for a successful implementation of these technologies. Therefore, it is not surprising that ethical concerns, as well as worries related with cost-effectiveness evidence are among the most identified issues for these stakeholders.

4.1.5 AAL stakeholders: convergent and divergent perspectives

As observed in the discussion above, different stakeholders hold perceptual differences and communalities regarding AAL technologies for ageing in place, healthier and with quality of life, for which comprehension is crucial for the promotion of a real collaborative ecosystem of stakeholders. Although, as stressed by Peek and colleagues (2016), empirical studies providing inputs about the convergent and divergent perspectives of stakeholders involved in implementing AAL technologies are scarce. In this topic, the viewpoints of those stakeholders will be briefly summarized regarding some themes emerged from the analysis, in a discussion far from being exhaustive.

- *The relative value of privacy:* In a study by Bjørkquist and colleagues (2015), ethical issues regarding telecare and telehealth were a strong concern, while those where scarcely considered by older adults themselves. Informal and formal caregivers' fears regarding the effect of technology on older adults' privacy were described in the literature, while several studies have shown that older adults in need of care can be willing to lose some privacy as a trade-off for more autonomy and quality of life (Van Hoof et al., 2011; Sanders et al., 2012; Sponselee et al., 2007). The same kind of considerations were made by Sponselee and colleagues (2007) concerning the acceptance of more obtrusive devices, with older adults showing to be less reluctant than expected, and in comparison with caregivers, in using these devices. Also, Reginatto (2012) found that technology providers and service providers tend to disregard confidentiality issues as a major barrier for telehealth adoption, once adequate regulation and awareness raising are seen as easy solutions for this issue.
- *Willingness to pay for technologies:* In a study by Peek and colleagues (2016), care professionals and technologists were the ones who expressed more concerns with technology affordability and funding, while older adults only briefly showed concerns about technology cost, and managers looked at technology affordability from a cost-benefit perspective. Despite the existence of conflicting evidence on this topic, the most suitable conclusion seems to be that while multiple stakeholders (e.g. formal and informal caregivers) have been demonstrating concerns about older adults' willingness to pay for AAL technology (e.g. telecare, telehealth), the older adults themselves have shown inclination to pay only in the case they can afford it and if they recognize intervention's need and effectiveness (Bjørkquist et al., 2015; Peek et al., 2016). Thus, for older adults the recognition of benefits that equals the costs seems to be more crucial than the costs alone.

- *Monitoring systems – safety or overprotection/over control?* Some research has concluded that informal caregivers tend to be very interested in using technology for monitoring closely the older adults' health, while older adults have shown to feel less enthusiastic about such monitoring (e.g. Damodaran & Olphert, 2010; Nedopil et al., 2013). Overprotection by caregivers has been reported in the literature as being understood by older adults as some form of paternalism (Novitzky et al., 2015). Zaad and Allouch (2008) referred to this phenomenon as a 'compassionate interference', where older adults want to have more direct control over ICT devices and the caregivers prevent them to do it with protection (and good) intentions.
- *Most valued technologies and their features:* What seems to be a common point among all stakeholders is the major concern with the position of older adults, as primary end-users, regarding the implementation of AAL technologies (Peek et al., 2016). This suggests an approach to technologies and their features that aligns with the trend of older adults' engagement and empowerment. Also, as Nedopil and colleagues (2013) stressed about the favourite AAL application scenarios of primary and secondary end-users, one can see that those end-users share the preference for solutions that support on administrative and everyday activities. It has been noticed that older adults' caregivers tend to prefer technology for safety and security, while older adults themselves tend to feel more attracted by care technology (Sponselee et al., 2007). Moreover, Bjørkquist and colleagues (2015) showed that while older adults and their informal caregivers value aspects such as technology convenience and flexibility, the healthcare professionals and decision-makers value more the technical an organizational design features of the systems. Also, technology designers have shown to believe that while caregivers are more interested in technologies able to decrease their work volume and increase quality of care, older adults are more influenced by usability effects (Sponselee et al., 2007). Greenhalgh and colleagues (2012) also stress that different staff in organizations frame technology in different ways, with engineers viewing technologies as tools for a particular task and managers viewing it as instruments for achieving business goals.
- *Satisfaction with AAL technologies:* The needs and satisfaction of older adults and caregivers with AAL technologies are not always in accordance (Novitzky et al., 2015). For example, one large study (Levin & Kane, 2006) focused on comparing older adults' and informal caregivers' satisfaction with assisted living environments has demonstrated that caregivers were consistently less satisfied. Explanations for this result included the same motive elicited for older adults' tolerance for privacy lost: the fact that the alternative, for example living in a nursing home, would be perceived as worst (ibidem). On another hand, Peek and colleagues (2016) concluded that while the majority of stakeholders they inquired (care professionals; managers; technologists; policy makers and advisors) agreed that technology provides several benefits for older adults, the older adults themselves didn't recognized such benefits, considering that people can become dependent on technology, an idea already exposed in other studies (Portet et al.,2011).
- *The 'technophobia' presumption:* As stressed above, the preconception by other stakeholders (e.g. formal caregivers) that older adults are 'technophobic' has shown to impede technology prescription/recommendation and efforts in introducing it to older adults (Clark & McGee-

Lennon, 2011; Nedopil et al., 2013; Sponselee et al., 2007). A study by Reginatto (2012) concluded that while several stakeholders perceive a lack of technology skills as a barrier for telehealth adoption, at the same time they recognize the potential in the right conditions; the inquired healthcare providers were the less optimistic actors about older adults using telehealth.

- *Young men designing technology for older women*[8]*:* While both older adults and caregivers have been considered 'technophobic', technology designers are usually 'technophiles' (Wallace et al. 2010). Therefore, mismatched expectations of users and engineers are documented, with some technological applications being perceived by developers as beneficial for older adults, and not perceived this way by older adults themselves (Novitzky et al., 2015). It was stressed, as discussed above, that while the designer may look mainly at functionality, the user is interested in lower level effects like usability of technology and effect on user's environment (Sponselee et al. 2007). Issues such as the ageing gap between technology designers and older adults using the technology can contribute for communication and mind-set difficulties in ICT introduction (Sponselee et al. 2007; Wallace et al. 2010). In this line, issues such as the balance of power between the designer and the user in the R&D process were discussed in the literature, with calls for attention on the damaging effects of power inequalities in this process (Novitzky et al., 2015).
- *Stakeholders' role and mutual trust:* In a qualitative study by Reginatto (2012), telehealth service providers considered that medical professionals tend to see their work as an invasion of the medical domain, while medical professional have shown reluctance about other service providers making suggestions on their work. Also, service providers have argued that medical professionals use lack of training as an argument ('an excuse') for not engaging with technologies such as telehealth (ibidem).

From the above exposed, one can conclude that the perceptual worlds of the AAL different stakeholders have divergent points, mainly due to differences in their background and experiences, needs and expectations. These divergent points lead to different interpretations on how AAL technologies can be useful in supporting independent living, healthier lifestyles and quality of life of older adults, and therefore need to be addressed in the development of new solutions, bearing in mind that several connection points also link those stakeholders.

4.2 Use Case Exploration

In the following, use case scenarios are presented with the purpose of illustrating the decision-making processes regarding the search and selection of AAL products and services, focusing on advice services and information provision for people in special living and caring situations. From the four use cases explored, the first two are based on hypothetical scenarios while the remaining two are built on exploratory interviews with stakeholders carried in Portugal and UK. "To-be" scenario descriptions based on the future use of ActiveAdvice software solution were formulated with a certain level of

[8] Sponselee and colleagues (2007) describe that during a symposium Verweij and colleagues (2007) referred to technology developers as "young males have to design technology for old females", in the scope of discussions about (a lack of) user-centered design.

detail, indicating how end-users would use the platform in order to support their decision-making process. In the first two cases, the process is explored from the point of view of primary users, i.e. older adults, and their caregivers and/or relatives; while the third and fourth use cases provide insights for the perspectives of secondary and tertiary end-users. Lessons learned from each use case are shortly summarized below.

4.2.1 Use Case 1: More Safety through Telecare Service

The following "use case" illustrates what it takes to find a product/service that supports an older adult living alone. This is an example of a decision-making process around the purchase of a telecare service (pendant alarm) for an 82 year old woman (named “Mum” here) who lives alone in the UK. Table 2 provides information about the time line, actors involved and steps taken in use case 1.

Table 2: Decision Making Process: Looking for a Pendant Alarm

Actors	Process - Steps	Time
Daughter	Encouraged mum to get a pendant alarm	January 2016
Mum	Speak to occupational therapists	February 2016
Occupational Therapist	Advice to use “Medicare” – council service, but this has a long waiting list	February 2016
Council Website	Use “Age UK” service or “Magenta” (local housing association)	March 2016
Son	Searched “Wirral Telecare” on google looking for subsidized / free council service (nothing available)	March 2016
Son	Looked for pendant alarm that resembled jewelry that had been seen at an AAL exhibition	March 2016
Son	Looked up “Age UK” and phoned them	March 2016
Son	Appointment made with a representative to visit mum	April 2016
Age UK sales representative, Mum & Daughter	Representative visited house and demonstrated the system	April 2016
Mum	Not sure due to call center in Devon, key holder identification, did not like salesperson, monthly charge	April 2016
Son	Searched council website again – no real section on telecare, even though the service is provided	
Son	E-mailed “Magenta”, other local provider, no response	May 2016
Son	Searched telecare on google following a link from Tunstall website	May 2016
Son	Reviewed packages from Telecare24	May 2016
Son	Reviewed packages from Boots – more expensive than Telecare24, not sure about falls monitoring, no picture of pendant	May 2016
Son	Checked forums on financial website. Nothing for telecare but personal alarms showed some results. Most of the equipment / services were low cost and required some local set up so required some skilled ICT knowledge. The forums focused on traditional tech like large button phones rather than pendant alarms. It was felt that this would put off people who were looking for a standard solution as it seemed to be relatively technical people trying to do something as cheaply as possible, rather than looking at the reliability and responsiveness of the system. www.moneysavingtexpert.co.uk	Jun-16
Son	Checked DLF website and considered visit to look at systems in local branch http://www.dlf.org.uk/content/about-us http://www.livingmadeeasy.org.uk/contacts_edc.php	Jun-16
Son	Looked at comparison website with lots of suppliers found on google - narrowed down to Merseyside but showed mainly National providers that covered the area. http://www.housingcare.org/service/list/s-24-telecare/l-451-merseyside.aspx	Jun-16
Son	Checked Local Authority website. No mention of telecare being available. Son rang the Adult Social Care line and they processed the referral then made an appointment. www.wirral.gov.uk	Jun-16
Local Authority	Visit to mum to explain options and process	Jun-16
Daughter	Explanation of key safe, impact on local neighbours	Jun-16
Local Authority	Key safe installed by Local Authority	Jul-16
Local Authority	Pendant alarm System installed	Aug-16

As we can see, the purchasing process of an AAL product takes too long and was resolved only via a telephone enquiry, as there was no information on the Local Authority Website. It was necessary to involve a lot of actors in this process, namely daughter, son, mum, occupational therapist, Council Website and Age UK sales representative. The son needed to search in various websites to compare the different AAL products characteristics and did not always find the desired information. This process could be very time consuming and ineffective. There is lots of information available from commercial providers but the public-sector provider has no web based information.

The son eventually found that the local authority could provide the service by telephoning them.

Key points are:

1. A local authority Occupational Therapist had originally given the wrong information, suggesting there was a long waiting list for pendant alarms which lead to the family not contacting the local authority for months.
2. The local authority backend system was most popular because:
   a) There was greater reassurance that it would be a quality service as it had been procured by the local council.
   b) It was installed and supported locally.
   c) They responded quickly to the request.
3. Discussing which neighbours and family members should be contacted by the telecare call centre in case of an emergency were more complex than anticipated. The mum was concerned that the neighbours would not want the responsibility of visiting the house during an emergency, even though this was not the case.

The non-technical issues consumed more time and energy than the technical choices in this example.

We foresee that the ActiveAdvice applications will make this process easier and less time consuming for all the actors.

4.2.2 Use Case 2: Health Care Monitoring

Use case 2 addresses the following scenario: “George is 81 years old and lives alone, as his wife had passed away some years ago. A month ago, he had a heart attack and has high blood pressure. His son lives far away and is worried about the situation of the father. George needs to measure his blood pressure each day, but he doesn’t have any options to go to the hospital by himself. George’s son used the ActiveAdvice application and found a solution for his problem: a device that measures the blood pressure at home with an easy-to-use electronic device that automatically saves the results in a system that is wirelessly connected to the internet. Using such a device enables doctors or healthcare professionals to analyse those results directly from a hospital or clinic enabling them to verify if the patient has an adequate blood pressure level and to act accordingly to his needs.”

Here we have an example of how AAL solutions can be important for the entire AAL2C stakeholder group, as well as how ActiveAdvice environment could help them to achieve their individual goals.

The awareness of the possible resources of AAL solutions to independent living is low among old people and their relatives. When relatives look for a solution, they normally do some research on the internet, but frequently the results found are incomprehensive, limited and do not give a description of the AAL products available. In the case described above, using the ActiveAdvice applications the relatives not only can find a product that fits the needs expressed, but also learn where they can buy it as well as what is necessary to know about its installation and use. Furthermore, they have access to feedbacks from other users and can upload reviews about their own experiences with the product or a service.

4.2.3 Use Case 3: AAL Services in Institutional Contexts

"South Lakes Housing" (SLH) is a housing association which South Lakeland District Council (SLDC) helped set up. It is the main provider of affordable rented housing in South Lakeland, Cumbria, UK, which covers 600 square miles including the towns of Kendal, Windermere, Grange-over-Sands and Ulverston. SLH also provides affordable homes in parts of the Lake District and Yorkshire Dales National Parks. Its vision "is to become one of the country's top performing housing associations with a reputation for delivering its promises, for developing high quality new homes and for expanding and adapting services to meet changing demands"[9]. Currently it has 420 tenants in sheltered accommodation, supported by grants from government/local authority and they have access to communal areas, warden support and activities as part of their package of support. The South Lake Housing has currently relationships with Tunstall and Centrapulse which provide telecare services to the residents.

They have plans for the future, some of them in the field of AAL. They will offer advice on social services, telecare, cleaning, meal assistance and social support which will be paid by residents through their charges added to their rent. Also, they will offer some telecare lifeline services from Tunstall plus another provider that also has falls alarms.

A meeting was held to realize if there is a possible interest in the ActiveAdvice (AA) and know how we could work with SHL, as well as to understand the views of consumers and business stakeholders and the barriers and opportunities (see Table 3).

Table 3: Some points discussed in the meeting with SHL

Views ActiveAdvice - SLH	Views for consumers	Views of Business stakeholders	Barriers	Opportunities
Already have agreements in place with Tunstall & Centrapulse - who run a call centre. These deals are already very competitive on price negotiated with SLH.	Attractive for consumers, particularly those who are well off who do not want to deal with social services.	Tunstall has a strong position in the telecare market in the UK with Housing Associations and Local Authorities.	Public sector seeing their clients & citizens as "consumers" and wanting to own the relationship to "sell" them services.	Organizations looking at different ways to deliver services.
Not interested in training team to be advisors.	For those self-financing their care services it could be useful as a resource.	They do not sell directly to consumers on a self-funded model but through Boots and other 3rd parties.	ActiveAdvice is potentially competing as it offers advice to citizens about alternative providers to	Becoming more responsive to consumers and looking at ways to add value.

[9] Website: www.southlakeshousing.co.uk

			those proposed by public sector organizations	
See that ActiveAdvice could compete with their independent living officers by promoting alternative technologies and services.	Owner occupiers may be interested, not just tenants of housing associations.	They also have "white label" equipment so other suppliers also use it.	Negative reviews of suppliers selected by public sector organisations could be challenging for those organizations (e.g. "why are you giving me Y when X is much better according to Active Advice?")	Group of consumers of AAL services are stigmatized by using public sector provided services, independently provided services may be more popular.
They may want to advertise on it to promote their independent living service		Long relationships with public sector organizations such as local councils and housing associations – how would ActiveAdvice provide additional value to them? They already have contracts / sales teams working with the public sector.	Existing AAL technology solutions adopted by public sector partners are trusted and entrenched. Advising on other technologies is risky for staff. They do not know the service and may displace business for existing partners of the public sector organization.	Smaller companies may engage as they see it as a way to put pressure on larger providers.
They see that putting their information on the site is not attractive – they do not want to give away their knowledge.			Tunstall may not want to engage or would do it on the basis that they would have some control.	

4.2.4 Use Case 4: AAL2B

Intellicare is an enterprise, placed in Coimbra, Portugal, that offers integrated long distance monitoring solutions, in areas such Health and Wellness. It has different goals: i. Improve the quality of life of its customers; ii. Assist active ageing; iii. Promote health literacy.

To achieve its goals, Intellicare recognizes the central role of the measuring devices and ICT, since these are the "heart" of its business activity. Intellicare wants to provide security and well-being to the senior population and caregivers, enhancing the quality of life of both. It has a range of solutions for older people, like the "OneCare Safe", "OneCare Sensing" and "OneCare Dori". "OneCare Safe" is a solution for older people, people with dementia or special needs, so they can live alone as long as possible. "OneCare Sensing" is a monitoring device of blood pressure, weight and heart rate at home. "OneCare Dori" is a device that helps older people to take their medicines by giving information in real-time to them and their caregivers.

We did an online meeting to understand if Intellicare may be interested in the ActiveAdvice project. So, the enterprise is always open to new projects, having already participated in some in AAL context:

- AAL4ALL
- Giraff Plus
- Sounds4Health
- WiCardioRes

Intellicare is constantly looking for innovation in order to satisfy the growing and demanding needs of the consumers, and is always available to work in partnership for the development of products and services that better respond to the aging challenges. They think that the project can be very useful, particularly regarding to an oriented search of information about AAL. They are completely available to contribute with information about AAL products/services and think that it may be attractive to put information about them on the site, see it as an opportunity to improve the business. At this moment, they are the only providers of Vivago products (an enterprise that also commercialize AAL products and is placed in Finland) and ActiveAdvice can be a way to spread this partnership. They showed some curiosity about training a team to be advisors, considering that such training can be an advantage for understanding the needs of the old people and the AAL market. Training could overcome the failures that exist on the market. However, they want more information about such training: who is authorized to be an Advisor and how the training will be done. They consider that ActiveAdvice may be a barrier by offering information to citizens about other products that can be more attractive, especially regarding to the price.

The four use cases explored above provided some clues on how different stakeholders would accept and use the ActiveAdvice platform in order to support their decision-making process. First, all use cases seem to suggest that the ActiveAdvice application would be attractive for consumers: currently, searching and purchasing an AAL product seem to be time consuming, to involve a lot of actors and still, not very effective. A main reason for this is the fact that information on AAL products is disperse. Therefore, all use cases suggest ActiveAdvice platform usefulness for an oriented search of information and for increasing awareness on AAL solutions.
On the other hand, the use cases suggest that the ActiveAdvice project must carefully consider the business acceptance of the platform: while businesses can see the ActiveAdvice platform as an opportunity to improve the business (e.g. by including information about the business on the platform), those can also see the platform as a competitor (as stressed in Use Case 3, the platform could compete with independent living officers by promoting alternative technologies and services). Moreover, perspectives about the ActiveAdvice training to become advisors can be not consensual: while some businesses representatives can see such training as an advantage for understanding the needs of the old people and the AAL market, others can have no interest either in receive training, as in sharing their knowledge in the platform.

4.3 Stakeholders Identification

The narrative literature review, together with the use case scenarios analysis, resulted in a foundation for the definition of ActiveAdvice groups of end-users and the target audience, as well as for its segmentation in sub-groups. This chapter presents and discusses those groups regarding their main features, needs, and requirements, exploring how ActiveAdvice can contribute to meet those needs. Next, in order to go further in identifying concrete stakeholders for the ActiveAdvice project, we present and discuss the results from a baseline collection of organizations operating in each partner country and fitting in the three pillars of end-users here defined.

4.3.1 ActiveAdvice end-users and target audience identification & segmentation

As we could conclude from the literature review carried in Chapter 4.1, there are several and diverse interrelated groups of stakeholders in the domain of AAL technologies, each one with their own specific 'agendas'. There isn't a unique proposal for clustering those interested groups. However, concerning end-users, the most widely used classification currently is the one of primary, secondary and tertiary end-users adopted by the AAL Programme. Nevertheless, as stressed by Nedopil and colleagues (2013), the allocation of stakeholders in those groups of primary, secondary or tertiary users depends on the AAL solution being discussed controversially. Taking that in consideration, the primary, secondary and tertiary end-users defined for the ActiveAdvice solution hold convergent and divergent points with that categorization. We started our stakeholders' categorization by defining three broad categories:

i. **ActiveAdvice primary end-users**: here designated as 'Customers' (AAL2C), this group include older adults wanting to use or already using AAL solutions at home. Relatives and/or informal caregivers potentially using the ActiveAdvice solution to find information on AAL solutions & providers are also included in this group, in resemblance to the approach of Moschetti and colleagues (2013).
ii. **ActiveAdvice secondary end-users**: here designated as 'Businesses' (AAL2B), this group encompasses enterprises willing to enter or already in the business field of AAL, interested in enhancing their existing products and services.
iii. **ActiveAdvice tertiary end-users**: here designated as 'Governments' (AAL2G), covering governmental bodies defining policies and providing services in the field of health and care.

These stakeholder categories are rather broad and need to be further segmented in order to identify niches with specific needs; take those needs into account in the design and development process in order to deliver relevant benefits rather than 'one-size-fits-all' solutions for all end-users; and deliver more targeted and effective dissemination messages about the project. The segmentation process resulted in nine end-user sub-groups explained below.[10]

4.3.1.1 AAL2C

As concluded by the literature review previously discussed (see chapter 4.1), older adults are the most prominent stakeholders for ICT developments in AAL (Holzinger et al. 2011). Without establishing any kind of deterministic relationship, it is well recognized and documented that older adults accumulate risk factors and are at greater risk than the average population for experiencing chronic diseases, falls, strokes and heart attacks, and to face a decrease in motor, sensory and cognitive abilities (e.g. WHO, 2007; WHO, 2011). As a consequence, older adults are at risk of losing their independence and facing a decrease in their quality of life. Therefore, in order to avoid or postpone institutionalization and live longer in their homes, older adults can be interested and in need for AAL products and services. The ActiveAdvice solution respond to that need by giving access to comprehensive AAL products, services

[10] It should be noticed that each stakeholder group could naturally be broken down into more specific subgroups with even more idiosyncratic needs. However, we decided for more inclusive segments of end-users.

and solution information, as well as to support in the decision-making process and making choices about the solutions that better suit older adults' needs. However, older adults don't form and homogeneous group. Those are rather characterized by their diversity in terms of multiple variables such as age, sex, degree of impairment, income, education and culture, among many others (Gabner & Conrad, 2010).

For segmentation purposes, if taken in consideration the variable 'age', it could be sub-divided according to the basic differentiation between third and fourth ages, as stressed by Laslett (1991) in his stage model. In fact, proposals to distinguish a third from a fourth age in the human life course came from the 1980s, with the recognition of an increased life expectancy, and of the population over 60, in the western societies. Taking this scenario into account, the definition of those sub-groups appears as an attempt to specify factors associated with the older population heterogeneity, even with the purpose of better understanding intervention needs. According to Laslett's (1991) framework, the third age corresponds to the 'young old' individuals, with ages ranging from 60 to 80 years old, and describes a phase of healthy, active and autonomous lifestyle, not very different from the one lived before the retirement. On the other hand, the author describes the forth age, corresponding to the 'oldest old' and beginning around the 80 years old, and associated with health deterioration, disability and autonomy loss. Therefore, the need for care is frequently associated with this life stage and institutionalization might be weighted as a strong possibility to address those needs. Compared with the third age, this stage is characterized by loss of functionality and dependency. Although approximated chronological ages are given under this framework, it should be noticed that the boundaries between the third and fourth ages continues under discussion and is dynamic, depending on factors such as general life expectancy (Nedopil et al., 2013). For example, demographers have identified in alternative the age 85 as the border for having 'membership' in the group of the oldest old, once population over 85 hold a unique set of demographic features (e.g. higher levels of comorbidity and institutionalization, greater use of medical and care services; Suzman, Willis, & Manton, 1992). This discussion is actually not surprising since age classification has been varying over time and between countries, reflecting aspects such as social class differences, functional ability linked to the workforce, political and economic situation (WHO, 2002). Even thought that chronological age is a widely-accepted variable to define older adults in most developed countries, with people over 65 years old being, as a convention, referred as 'elder', it is also admitted that this criterion is somewhat arbitrary (WHO, 2002). The question relies on the fact that ageing is not uniform across the population due to differences in genetics, lifestyle, and health (Levine, 2013). As defended by Gorman (2000), other socially constructed meanings of age are better able to define old age, such as the roles assigned to older people. Therefore, chronological age is somewhat arbitrary to define old adults and fails to address the heterogeneity observed among older adults.

Another approach used to differentiate between older adults' subgroups focus on the age ranges that correlate with specific life course events, as suggest in a model developed for the German population and discussed by Nedopil and colleagues (2013). Phases 7, 8 and 9, and the correspondent issues people deal during those phases, are regarded as especially important for AAL developments:

i. Phase 7 is assumed to take place, in the western societies, roughly from the age 50 to 59 years. It is related to the preparation for exiting work and planning the retirement. Among the life course events in this phase is highlighted the fact that children start leaving home, and those individuals may have to assume the role of caregivers for their own parents. Changes in the living environment – moving to a new home or adapting the current – often take place in this stage.
ii. Phase 8 takes place roughly from 60 to 74 years. The focus of this stage is enjoyment and activity, since older adults retire and there is a reorganization of their time, usually for leisure purposes. Travel, culture, learning or volunteer related activities tend to be more performed at this stage.
iii. Phase 9 starts, roughly, from 75 years old. In this phase, in case the older adults remains healthy, the conveniences of the former phase will be extended and mechanisms for compensating limitations related to ageing and health issues tend to be put in place. On the other hand, when disease and loss of autonomy takes place in older adults' lives, support and care from others becomes very relevant (Nedopil et al., 2013).

Even thought that the above described model provides valuable inputs on ageing and life stages, namely by offering a basic notion of the different target groups for AAL solutions and their needs (Nedopil et al., 2013), it must be kept in mind that the ageing process does not always follow the described sequence, which is the case for older adults in early phases being in need for support due to loss of autonomy. In this line, a study by Freund and Smith (1997) about the self-definition in old age (i.e. older adults defining old age) concludes that as people get older their self-definition of old age became increasingly related to health status. By taking this and similar studies into account, it makes sense to consider older adults' health status and functionality when thinking about a segmentation for this group, since different motivations are involved when looking for AAL products or services: while ill and dependent older adults will look for help with day-to-day activities in order to compensate the functionality lost; healthy and autonomous older adults can use AAL solutions in a preventive way and to ensure a continued well-being (Wright, 2011). It must be kept in mind that a shared motivation in both cases must be to extend the time they live in their preferred environment, at home or in the community, in accordance with the AAL programme (2016) understanding of ambient assisted living.

In fact, the number of older adults who express a preference to remain in their home is substantially increasing and the amount of gerontological literature, literature on technology as well as ageing in place, has increased in accordance (Doyle et al., 2013; Vasunilashorn et al., 2012). In a qualitative study carried out by Hoof and colleagues (2011) with older adults who live in their house and hold complex demands for care, the most common motives found to use ambient intelligence technologies were: to support ageing-in-place and postpone institutionalization, with the majority of participants showing a strong aversion against it; to improve the sense of safety and security, especially regarding fall prevention, fire detection and burglary; and to complement other home adaptations already done. Among the motivations to live longer at home are the older adults' attachment to their possessions, memories brought by the place and neighbours, as well as fear of being separated from their spouse or lose privacy in case of institutionalization. In the same research, the participants set requirements

to the technology, both regarding the operation – where the topic of false alarms was the most mentioned –, and design – where a good design and integration of the technologies was considered to be indispensable, and an unobtrusive installation was valued (Hoof et al., 2011). All in all, those participants as well as their relatives agreed that ambient intelligence technologies contribute to a sense of safety at home, while feeling safe at home is an important indicator for living in the community (Hoof et al., 2011). Another interesting conclusion from this research was the preference expressed by older adults for low tech solutions in comparison with high tech ones, with only one participant expressing a positive attitude towards new technologies, namely regarding the use of personal computer and internet (Hoof et al., 2011).

As discussed in chapter 4.1, even if older adults are usually less inclined to embrace new technology than younger people, it is not absolute true that using those technologies is the exception rather than the rule: if benefits of using the technological solutions are clearly presented, then older adults tend to me motivated to use it (Ryu et al., 2009). Technology acceptance and use depends on the intersection of multiple factors related with both technology features (e.g. design, practical use) and users' characteristics (e.g. age, gender, physical, mental and cognitive skills, biographical experience; Nedopil et al., 2013; Sousa et al., n.d.). Therefore, when segmenting older adults in sub-groups of clients, the basic use of technology is obviously an essential factor to take into account. While some older adults may be digitally literate, others are not, and among those last some may have interest in accessing computers and internet while others may have can reject this contact for multiple reasons (Wright, 2010).

By considering all the above-mentioned, inputs from the literature produced both on the broad field of ageing and on the specific field of AAL, the following proposal for older adults' (clients) segmentation is considered and interlinks the factors of i. chronological age; ii. life course events; iii. health and functionality status; iv. relationship with ICT, particularly regarding interned use; and v. AAL related needs and desires. Two sub-groups/profiles of older adults, here designated as costumers (C), were therefore identified:

- **Sub-group C1** – Targets older adults aged between 55 to 70 years old, characterized by being active and autonomous. Includes older adults who decided to invest in a new home, usually in a smaller housing unit, and/or who wish to think ahead and adapt the house for an upcoming chronic illnesses and future loss of autonomy. Individuals within this group should have informatics literacy and be able to access information online.
- **Sub-group C2** – Targets older adults aged from 65 years old, who are facing loss of autonomy and wish to live longer at home, therefore avoiding/postponing institutionalization. To accomplish that desire, these older adults are forced to look for solutions that enable them to improve their quality of live without leaving home. Those adults are not necessarily literate in informatics and are not necessarily able to access information online. However, they must be able to do it with caregiver's support.[11]

[11] For the purpose of the interviews carried in the scope of the deliverable 2.3 foreseen in the ActiveAdvice DoW, the informal caregivers of older adults with this profile can also be considered in this group.

As previously exposed, not only older adults but also their relatives and/or informal caregivers are here included in the 'clients' group for ActiveAdvice solution. In fact, in a recent systematic literature review, Calvaresi and colleagues (2016) concluded that a tight coupling between 'patients' (i.e. the older adults) and 'caregivers' or between 'patients' and 'relatives' is widely present on the literature produced in the AAL field. This is not surprising once, as discussed in chapter 4.1, the support network around older adults – which includes relatives, children, friends and neighbours, who frequently assume the role of informal caregivers – play a big part in the decision-making process regarding the acquisition of AAL products and services. Since the management of a wide range of tasks to support older adults in the activities of daily living (ADL) is usually a burden for caregivers, products or services able to improve the quality of life of older adults and facilitate the caregiving routine tend to be attractive and improve their well-being (Costa et al., 2014; Cunha et al., 2013; Nedopil et al., 2013). Thus, informal caregivers are the actors who frequently search and take the initiative for the acquisition of AAL solutions or who promote these solutions near the older adults. This is illustrated, for example, by the study of Cunha and colleagues (2013) where informal caregivers report to use internet with the purpose of searching for information, products and services targeted at improving older adults' quality of life. Since relatives and caregivers are often the decision-makers on this process, the older adults' relatives and informal caregivers are considered here as a third segment for 'clients' target audience.

Therefore, a third profile for relatives/informal caregivers was defined as follows:

- **Sub-group C3** – Targets the relatives of seniors, who wish to help and assist their elderly parent(s). This wish and need of providing support can be because of effective loss of autonomy, but also to prevent further degradation, loss of functionality and autonomy.

4.3.1.2 AAL2B

As we could conclude from the triangulation of literature review, use case exploration and consortium experience and expertise in AAL field, enterprises in the business field of AAL – producing or supplying the devices, methods or infrastructures required for AAL technologies – are among the most mentioned stakeholders in this matter (e.g. Calvaresi et al., 2016; Peek et al., 2016; Clark & McGee-Lennon, 2011). Gabner and Conrad (2010) define providers of AAL products or services as "organizations that have a clear focus on supporting an independent living of elderly people. This comprises organizations offering integrated systems, such as emergency calls for elderly or only services designed for elderly that have no technology as a central part" (p. 26). It was noticed that organizations with these characteristics not always define themselves as providers of AAL products or services despite their focus on that kind of solutions (Gabner & Conrad, 2010). Frequent collaborations exist between providers of AAL products and services and technology providers (who create or provide hardware, software or IT devices in a broader sense) or service providers, in order to develop more complex solutions that fit older adults' needs. Industry stakeholders, for example, encompass all private companies that develop and produce technological devices, but they usually don't commercialize them on the market as AAL products, such as telecommunication companies (Gabner

& Conrad, 2010). Hence, the group of AAL product or service providers can be an intersection of different other organization types. Therefore, in a broad sense, businesses stakeholders may include organizations that provide ICT/AAL solutions through research and development as well as manufacturers, service providers, suppliers/wholesalers, retailers and professional users of ICT services, among others. Research partners are also incorporated in this group, with research groups belonging mainly to laboratories placed in universities. This group can benefit from ActiveAdvice by multiple reasons: it can be a stimulus for businesses to invest in research and development of new and innovative AAL products and services; it can help translating knowledge from university to society; it gives an opportunity to develop AAL solutions more suitable to consumers' needs as well as to present products and services to an international audience and collect feedback. Also, for this group, the project offers the chance of receiving specialized training in AAL know-how and environment usage, and offer advisory support for older adults. Taking into account this last topic, the use case exploration presented in section 4.2 allowed to conclude that businesses representatives' view about ActiveAdvice training to become advisors is not consensual.[12] Even though this statement is based on a small number of exploratory interviews, this should be considered when segmenting, targeting and communicating with businesses within the project, since different needs and expectations among this target group seem to be revealed. For example, large companies like Tunstall have relationships with government partners which they have developed over many years. These incumbents may see little added value in ActiveAdvice, perhaps even seeing it as a threat as commissioners learn about alternative systems. Small and Medium sized enterprises may be more open to ActiveAdvice as it offers an additional route to market. The stakeholder consultations under the deliverable 2.3 should attempt to validate these observations.

Talking into account all the above mentioned, the 'Business' target audience was segmented for ActiveAdvice project in two different sub-groups:

- **Sub-group B1** – Targets suppliers of solutions, namely products, services or a combination of both.
- **Sub-group B2** – Targets suppliers of solutions and services that could take a role as "active advisor". These suppliers offer advisory services to their customers and could have interest in reinforce those services through ActiveAdvice solution.

4.3.1.3 AAL2G

The term 'government' encompasses authorities, institutions or organizations that are responsible for the development and performance of policies at a national level (e.g. national ministries; Gaßner & Conrad, 2010). These structures are typically interested in supporting research in AAL and ageing fields, therefore providing funding and/or infrastructures for research projects in their countries. Frequently, they supervise and coordinate research projects on that matter. Governments were more broadly defined as "all public and private agencies and entities working at local, regional, national and international levels to manage, regulate and govern the society and to organize services for its citizens"

[12] While SLH representatives (use case 3) showed no interest in getting training to be advisors, Intellicare agents demonstrated some interest in receive this training, even if it depends of its characteristics.

(van den Broek et al., 2010). In line with this definition we must also include in this group local or regional authorities, such as municipalities and councils that hold responsibilities in developing and performing policies, at a regional level (Gabner & Conrad, 2010). In some cases, those governance structures also have a responsibility for social infrastructure, welfare systems and public services. Moreover, those frequently act as partners in the implementation of research projects being in many cases the gateway for a successful execution of those projects (ibidem). This target audience holds a considerable influence in the future growth and use of ICT by older adults, both politically and commercially, due to its role in the definition of policies and guidelines. Moreover, governments face current challenges related with efficiency and sustainability of care, because they have potentially a high interest in AAL solutions able to extend independent living of older adults. Even considering that the initial stakeholders' auscultation, namely near South Lakes Housing, have shown relatively high levels of inertia and a conservative approach to procurement, the fact is that all these governance structures have an impact on the dissemination and acceptance of ICT for ageing solutions. Moreover, ActiveAdvice will contribute for governments to know the best practices, be better informed, and therefore take the most suitable decisions on that matter.

Taking this aspects into consideration, the 'Governments' target audience was here segmented by; first, differentiating between institutions which are aimed at supplying services or solutions to older adults from policy and decision-makers who design policies at several levels (local, regional and national); second, by distinguishing between organizations that only supply services or solutions to older adults from those that also provides advisory services (in resemblance with the segmentation established for businesses); third, an additional segment was created to include public services, senior organizations and other groups of interest.

Therefore, four segments for 'Governments' were defined as follows:

- **Sub-group G1** – Targets suppliers of services or solutions both under normal market conditions or subsidized schemes.
- **Sub-group G2** – Targets suppliers of services assessing needs of elderly and advising them for the most suitable solution. Therefore, these suppliers offer advisory services to their customers and could can have interest in reinforce those services through ActiveAdvice solution. They could play a role as "active advisor".
- **Sub-group G3 –** Targets policy makers at local, regional and national levels acting in AAL relevant areas (e.g. ageing, health services, and homecare services).
- **Sub-group G4 –** Targets public services, senior organizations, interest groups.

These target audiences and their respective segments are further addressed in the Communication and Dissemination Plan as well as in the exploitation plan, both developed under ActiveAdvice WP6. Objectives, actions, messages and channels for communicating with each above defined sub-group are described in those documents. The defined end-users will also serve as a baseline for going further in the collection and targeting of concrete ActiveAdvice stakeholders to be or already involved in the project.

4.3.2 ActiveAdvice stakeholder collection and description

A baseline collection of organizations operating in each partner country and fitting in the three end-user groups above identified and characterized – AAL2C (Clients), AAL2B (Business) and AAL2G (Governments) – was carried out by the ActiveAdvice consortium.

A study by Gabner and Conrad (2010) identified a total of 676 organizations dealing with AAL products or doing research in this field in the EU-27 Member States, which was considered to be a small market for AAL products and services targeted at older adults. The authors concluded that the number of private organizations of this kind slightly outweighs the number of public ones (Gabner & Conrad, 2010).[13] Moreover, a geographical uneven distribution of those organizations seems to be the trend: while 80% of all organizations are located in northern countries, only 20% can be found in southern ones, being explored in this line a correlation between the number of AAL organizations and countries' economic strength (ibidem).[14] In fact, it is very likely that economically weaker countries have also weaker infrastructures and funding conditions for research and provision of AAL products and services. If we look to the relative European position for the countries integrating the ActiveAdvice project and concerning their number of AAL specific organizations, one can conclude, according to this research, that Portugal is the worst positioned country[15], while the UK holds the most favourable position (Gabner & Conrad, 2010)[16]. Therefore, dealing with a consortium composed by countries with very different realities regarding AAL developments, the ActiveAdvice project offers both a challenge and a window of opportunity concerning the identification of AAL stakeholders.

In this line, a desktop research was carried out in order to gather organizations regarded as ActiveAdvice stakeholders and including pertinent non-profit organisations, end-user organisations, businesses and governmental institutions, charities and associations with local affiliations. It has to be noticed that considering the big weight of the research sector in the set of organizations operating in the AAL field (Gabner & Conrad, 2010), private and public research institutes were gathered for the AAL2B (Business) group. Enterprises already operating in the AAL business, private and public research institutes, and health professional associations, ICT infrastructure suppliers and so on have been identified and listed in this group, as expected. Nursing homes and hospitals where also considered in the gathering exercise, since on the one hand those are partners when it comes to equip their facilities with AAL devices, both for their patients/customers as well as for their staff; and on the other hand, they might offer support and counselling to their patients relatives. The third pillar of the ActiveAdvice, the AAL2G, integrates public administrations, governmental agencies, policymakers, municipalities and local authorities, councils and associations. For the analysis, the potential stakeholder group was divided into associations representing professionals; public organizations responsible for policy making, agenda setting and creating guidelines for this field. Furthermore, relevant services offered by the governments have been identified and listed; Portugal, for example, has a free telephone advice line targeted at the elderly population. Table 4 shows the inclusion criteria for stakeholders to be

[13] With 356 private organizations and 315 public organizations being identified.
[14] By using GDP.
[15] With 10 of those organizations being identified in Portugal.
[16] With 62 AAL specific organizations being mapped in UK.

collected in this exercise, obviously for the organizational level (e.g. associations, agencies, institutions).

The results from the desktop research were entered into a matrix containing a description of each organization identified in Austria, Belgium, the Netherlands, Switzerland, Portugal and UK. For the purpose of the scoping exercise, a sample of organisations was gathered at local level in the UK, for Cumbria region; in Switzerland, the focus was laid on the German speaking part; and in Portugal, for the Porto region. In total, were identified, listed and described 333 organisations for the above-mentioned territories: 68 for Austria; 51 for Belgium; 34 for the Netherlands; 27 for Switzerland; 120 for Portugal; and 33 for the UK, in total for the 3 groups of stakeholders. The group of AAL2C was the one listed more extensively for all countries including 155 organizations; followed by the AAL2B group with 128 organizations; and finally, by the AAL2G stakeholders group including 50 organizations. It has to be noticed that comparisons between countries cannot be done, neither judgements must be based on the number of stakeholders listed in each group (for example, about the relative weight of each group in a certain country). As previously described, the desktop research made by all partners was neither exhaustive nor systematic, and covered different territorial areas (local search vs. national search). Therefore, the numbers provided above are merely informative and serve mainly the project internally, in order to guide the following steps for stakeholders' involvement.

The stakeholders list resulting from the described exercise can be consulted in the Appendix 2. An extension and enrichment of this list is expected to happen over the project lifetime. Moreover, these organizations will be targeted to actively participate and contribute to the ActiveAdvice project, therefore being considered in the Communication and Dissemination Plan (CDP) developed for the project.

Table 4: Inclusion criteria for the stakeholder collection regarding AAL2C, AAL2B and AAL2G groups

ActiveAdvice Stakeholder	Criteria
AAL2C	• Stroke survivors • Older adults with any kind of dementia • Older adults with disabilities • Older adults that suffer chronic diseases • Informal caregivers • Older adults that are in the day centre • Older adults that receive support from home care associations • Associations that support families of people with some kind of disability • Older adults that do not have any kind of support • Organizations representing older adults and their relatives • Nursing homes
AAL2B	• Enterprises that want to or are already operating in the business field of AAL • Employers • Designers • Engineers • Health professional associations • Telecare installation technicians • Distribution and vendor channels • Private and public research institutes • Suppliers
AAL2C	• Policy-makers • Public administrations • Local authorities • Governmental agencies • Municipalities • Ministries • Public administrations • NGOs

As the stakeholders list *per se* holds limited value for others besides the project consortium, a summary of the countries situation concerning AAL stakeholders is shortly presented below.

4.3.3 AAL stakeholders in ActiveAdvice consortium countries

The consortium partners reflected on the respective national contexts – Portugal, the Netherlands, the UK, Switzerland and Austria – regarding AAL stakeholders. In the following some general insights are presented.

4.3.3.1 Austria

In Austria, Information and Communication policy responsibilities and programme implementation are divided between several ministries and other administrative bodies. Federal Ministries with special relevance for ICT in the country include the i. Federal Chancellery (BKA) managing mainly safety and data protection issues; ii. Federal Ministry for Economic Affairs and Labour (BMWA), having responsibilities on ICT innovations and e-business; iii. Federal Ministry for Transport, Innovation and Technology (BMVIT), as a main structure for ICT R&D as well as in ICT infrastructure and telecommunication, having promoted thematic programmes contributing to the AAL field; iv. Federal Ministry for Education, Science and Culture (BMBWK); v. Federal Ministry of Finance (BMF); vi. Federal Ministry of Justice (BMJ); vii. Ministry of Social Security, Generations and Consumer Protection (BMSGK); and viii. Federal Ministry for Health and Women (BMGF) which has been promoting AAL-

relevant work in the field of health telematics.[17] Some of those ministries hold strategic and financial responsibilities for numerous technology policy agencies which are responsible for implementing and managing programmes and instruments related, for example, with applied research in private business. Austria counts as well with a consulting body in the ICT field: the Austrian Council for Research and Technology Development with responsibilities in advising the federal government, therefore being a relevant stakeholder.

AAL related problems are addressed in several research institutions, such as the University for Technology of Vienna, where research investments have been mainly done on the fields of usability, assistive communication, smart homes technology, human computer interface, robotics, rehabilitation, sensory aids and sensors for social alarms, robotics, among others (see http://www.tuwien.ac.at/en/). Research projects in the AAL field developed in the country include, as mere examples the AAL-eHome - Living with supportive intelligence[18] or the AUTONOMY - Technical Assistance System[19]. According to the Austrian Federal Ministry of Transport, Innovation and Technology (2010), the "major agency for applied R&D is the FFG, bringing four previously independent subsidy-distributing institutions (FFF – Industrial Research Promotion Fund; TIG – Technology Impulse Association; BIT – Bureau of International Technology; ASA – Austrian Space Agency) under a single umbrella" (p. 10).

Regarding the business area, among the highly active providers of AAL products in the country has been the Transdanubia Nikolai G.m.b.H, Technik für Sehbehinderte und Blinde (TSB), which provide mainly technological applications to be used by visually impaired people.

It is noteworthy that regarding the ageing population phenomena, Austria is among the European countries with the major predictions for life expectancy at birth by 2050, both for males and females, with 82.8 and 87.2 years respectively (European Commission, 2004).

4.3.3.2 Belgium

The situation in Belgium is partly defined through the country's structure. Public health is a federal responsibility, including the health insurance. As funds are available, this means the federal level has a key role to play. It is e.g. at federal level that e-health is being promoted and a national plan was set up. The same applies to chronic diseases with a national health plan. The more dynamic competencies have been transferred to the regions: prevention, innovation, etc., as is the organisation of the home care. The consequence is significant differences between the north and south of the country, and the appearance of different types of actors. Most of the innovation takes place in the north where decisions are being taken faster and where initiatives were launched like Flanders Care to facilitate innovation and feed an innovation eco-system.

AAL2C: the patient organisations are becoming increasingly active in the country with two strong, even if very different, umbrella organisations: VPP for Flanders and LUSS for Wallonia. Membership

[17] http://rp7.ffg.at/upload/medialibrary/ICTinAT_Final.pdf
[18] http://www.ceit.at/333.html
[19] http://www.is.tuwien.ac.at/autonom/index_en.html

organisations of elderly are also strong. This grew from labour unions (Christian and socialists), but has led to grass root organisations with large membership. Their role goes from the organisation of meaningful activities, to training, to lobby at all political levels. Social innovation is booming, with citizens taking initiatives to solve unmet needs. This happens in both parts of the country, but is more important in Wallonia than it is in Flanders.

AAL2B: many private companies are active on this market, mainly technology driven. But the market is dominated by the social profit sector with sometimes very large organisations covering all forms of care. Organisations not directly involved in elderly care are also looking at the market: the health insurers (memberships based organisation in Belgium), institutions taking care of handicapped looking for diversification and innovative services, very large service groups looking for investment opportunities. The sector of housing for the elderly is quite innovative with many investors, from large to small citizen's cooperatives. The largest employer's network in Flanders (VOKA) has launched a health innovation community which is quite active and well networked.

AAL2G: as mentioned above, the federal structure of the country means significant differences between both parts. The RIZIV/INAMI plays an important role in the landscape as money is channelled through it. They recently launched pilot projects for integrated care, are at the origin of the national plan for chronic diseases, etc. Each of the regions has a specialised agency for care (the equivalent of a ministry), both being very active. In Flanders, the creation of Flanders Care as an innovation platform has created dynamics. This "project" led to the creation of 6 living labs and is currently being evaluated.

4.3.3.3 United Kingdom

In the UK, small social enterprises such as Designability design adaptive equipment some of which is especially for older people[20], and commercial SMEs such as Canary, Yecco, 3rings are also developing AAL products and services. Where the technology is more mature such as telecare and telehealth monitoring systems, there are a large number of service providers that use equipment from large manufacturers such as Tunstall and Chubb. They operate monitoring services and react to alerts generated by the equipment. The Disability Living Foundation maintains a database of equipment and suppliers.[21] This is a subscription service for public sector organisations that wish to understand what products are available on the market. They also support public sector organisations with training, but this does not tend to focus on AAL services. The DLF operate a decision-making support system.[22] The Telecare Services Association (TSA) focuses on Technology Enabled Care – TECs and acts a trade body for technology and care sectors. They have a directory of suppliers of services drawn from their members. In the UK, e.g. Housing Associations have a role in supporting elderly residents through sheltered accommodation and provision of telecare services. Examples are Eden Independent Living and South Lakes Housing; providing sheltered accommodation respective telecare services.

[20] Website: www.designability.org.uk
[21] Website: http://www.dlf-data.org.uk/
[22] Website: http://asksara.dlf.org.uk/?auth=sara5

ActiveAdvice can also profit from Advice Quality Standard.[23] ActiveAdvice can use their guidelines and accreditations for the advice service component of the project.

The National Health Service (NHS) is a major stakeholder in the UK as they provide free healthcare. Local Doctors (GPs) have a close link with elderly patients and are trusted to provide good advice. They often recommend equipment like blood pressure monitors. Also in the NHS in Cumbria are Integrated Care Communities, delivering area based care to discharge people from hospital more rapidly. Similar organisations exist across the NHS in the UK. NHS Innovations North carries out research on telehealth and other assisted living technologies. NHS Informatics teams have an interest in new technologies around the implications for data privacy, compatibility and security. They are most interested when AAL systems try to integrate with NHS systems e.g. allowing patient's blood pressure monitor data to be sent directly to their NHS patient record. County Councils are responsible for social care and they offer advice and support, while also developing care packages for older adults. They are also faced with major cuts to their budgets and are having to do more with less.

4.3.3.4 The Netherlands

Information and Communication Technologies are among the priority areas for the country's scientific-technological development, as defined of the Dutch Government. One clear expression of this concern was the establishment of a steering body for ICT research and innovation by the ministers of Research, Culture and Sciences and of Economic Affairs. On top of that the state secretary set an ambition to increase the use of E-health and technology in (health)care.

A Dutch online research platform (http://www.onderzoekinformatie.nl/en/) host items related to ICT and health science. Example of funding programmes driving research in AAL related fields were the 'Innovation in the care for the elderly' and the 'eHealth – ICT in Healthcare'. Examples of research projects in the AAL field implemented in the country include the In-HAM (Innovationcenter in Housing for Adapted Movement)[24]; the VieDome (TV applications and conctens for elderly people)[25], or the Tele Medicine and the consequences for urban planning[26]. According to Gabner and Conrad (2010), the Netherlands is among the European countries which are better positioned regarding the involvement in research projects on the AAL field.

Regarding the business stakeholders, among the largest providers of health and wellness products in the country is the company Medipoint, providing services regarding care demands, personal advice and tools. There are many businesses active in the field of home automation and E-health. Most of them do business with larger care institutions instead of individual customers. Many companies need to make the change from business-to-business (B2b) to business-to-consumer (B2C).

With regard to the government stakeholders, the structure of the Dutch system determines the state of innovation. Since healthcare is financed by national insurance companies they feel hesitation to invest in innovations that contribute to AAL, if it doesn't pay off on short term. Local governments are

[23] Website: http://advicequalitystandard.org.uk/
[24] http://www.in-ham.be
[25] http://www.viedome.nl/
[26] http://www.telemedicine-europe.net/

responsible for social and care support since 2015. Each municipality decides how it spends its budget. This leads to differences between municipalities. Many innovations are only on a small scale.

4.3.3.5 Portugal

The scenario in Portugal is characterized by a great commitment towards the development of an inclusive information society, being one example of these investments the constitution of the Knowledge Society Agency – a public body operating within the Ministry of Science, Technology and Higher Education whose goals is to mobilise the country for the information society, to stimulate entrepreneurial innovation, to promote scientific and technological development, as well as the qualification of human resources in this matter.[27]

A noteworthy milestone for the AAL Portuguese scene was the cooperation established between German research organizations, such as Fraunhofer, and the Fundação para a Ciência e Tecnologia (FCT), with a remarkable volume of research projects in the Ambient Assisted Living sector developed by this institute in collaboration with other relevant national stakeholders. In spite of those developments, Portugal still is among the countries with fewer organizations active in AAL research projects in EU-27 (Gabner & Conrad, 2010). Moreover, by being one of the European countries most affected by the 2008 economic downturn, the national public spending on healthcare as a percentage of national GDP (as one indicator for funding in health and ICT related projects) clearly decelerated.

4.3.3.6 Switzerland

The Swiss situation is challenging as on the level of customer and end-user as well as government, 26 cantonal regimes need to be taken into consideration. On the business side, potential partners are very often only active in one or two of the language regions. For small and middle sized companies the effort provides all information and services provided in two languages are challenging. On the national government level, however, this is not a problem. Therefore, these organizations will become important partners when it comes to the promotion of AAL and AAL services. Informal care giving is also organized on the cantonal level. The biggest care organization is Spitex. Care facilities on the other hand are organized along the line of private and public and have their respected representatives. These have to regard the different language regions. Also, hospitals need to be taken into considerations as important stakeholders in the Swiss context; be it because they might be interested in AAL products for being introduced to their own settings or they might support their patients. In Switzerland, e.g. the monitoring of older adults with hip fractures has become an important issue. The Zurich University Hospital no longer only focuses on the in-house therapy but offer their patients tools and services for them to take home. For almost a year the doctors and physiotherapists are further involved in the home care therapy of their former patients. Nevertheless, the hospital and rehabilitation market in Switzerland is highly differentiated with many independent and often only cantonal active members. Switzerland has several end-user organizations such as the Terz Stiftung or the Alzheimer Organizations which more and more become interested in AAL topics. More recently, also consultants became aware of the topic and start to develop services. Important actors in the Swiss context are

[27] http://www.infosociety.gov.pt/

health insurances; while Switzerland has a mandatory for a health insurance, people choose their partners. There are several actors which have already started to invest into prevention, information campaigns and the use of technologies. However, the insurance companies have very distinct policies.

4.3.4 Stakeholders relationships in the scope of ActiveAdvice

In previous chapters we described the stakeholders addressed by the project, which will help the consortium to promote relationships among them, creating conditions for the creation of a true stakeholders collaborative ecosystem. The relationships between the stakeholders are essential for the success of any project (Leana & Rousseau, 2000). In accordance to Bourne and Walker (2005) "stakeholder relationships can be considerable assets contributing to knowledge, insights and support in shaping a project brief as well as supporting its execution". Can different stakeholders work in partnership to contribute to the success of the ActiveAdvice and to reach the main goal that is to improve the quality of life of old people? The consortium thinks that the answer is "yes".

ActiveAdvice can promote multiple and bidirectional links among the previously identified stakeholders. It is important to note that all stakeholders have the ability to interact with one another in order to satisfy the end users' needs. However, naturally, some stakeholders are more likely to interact than others; for example, it is clear that an enterprise and a NGO are more likely to interact with each other than an older adult and the government. Nevertheless, the success and long-term sustainability of the ActiveAdvice platform highly depends on this interaction among all potential stakeholders. If their needs are satisfied, the users will continue to use the ActiveAdvice environment in the following manner: i. older adults and their relatives (AAL2C) benefit directly from AAL solutions which allow them to increase their quality of life; ii. thus, there is a relationship between the AAL2C and AAL2B stakeholders once the primary group buys the products that the secondary group develops/commercializes those products. There is a reciprocal relationship between these two groups because the AAL2B stakeholders are constantly looking for new solutions that fit the needs of the AAL2C group and, as showed by the literature review carried out, the first does not always success in achieving that goal; iii. we can also find a reciprocal relationship between the AAL2B and the AAL2G groups. The AAL2G is not directly in contact with AAL products, but contribute by setting the agenda, paying for or enabling their development and market distribution. Moreover, these stakeholders frequently provide services in the field of health and care to older adults. Governments can benefit from the increased efficiency and effectiveness that AAL solutions may provide, since those solutions hold the potential of reducing the costs or avoiding increased costs related with the provision of care to dependent older adults.

Summarizing, older adults will benefit from innovation, although research and development probably are things that don't concern their daily thoughts. In this equation, the business sector is defined as a stakeholder that improves innovation, research and development. On the other hand, the government agencies want to see economic growth and they know that this increasingly comes from the innovation conducted by businesses. Their role is more around defining policies and guidelines that facilitate and regulate the market, at the same time that increases older adults' quality of life, then benefiting the

whole society. Figure 2 offers a conclusion by illustrating the multiple and bidirectional relationships between stakeholders in the scope of the ActiveAdvice project.

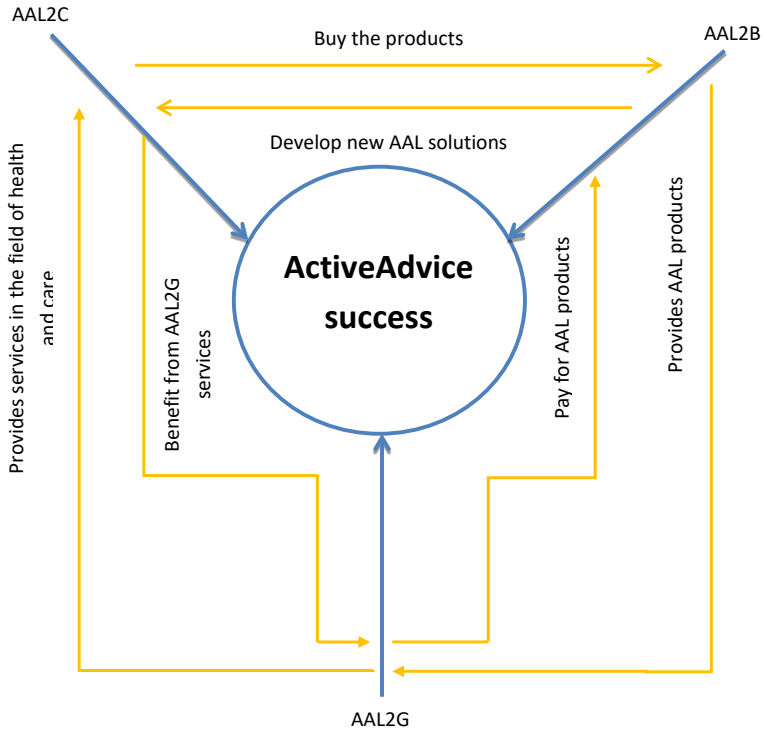

Figure 2: Relationships among stakeholders for ActiveAdvice project

5 A mechanism for stakeholders' participation: The ActiveAdvice Expert and Advisory Board

In line with the calls for greater collaboration and co-ordination among stakeholders, largely expressed in the scientific literature on the AAL topic, a mechanism for stakeholders' participation and engagement in ActiveAdvice was installed since the project beginning. As stressed by Finn and Wright (2011), a suitable stakeholder co-ordination mechanism in ICT and ageing must enable a close collaboration within and between special interest groups.

The ActiveAdvice Expert and Advisory Board (EAB) was established to deliver valuable inputs at different phases of the project, encompassing representatives of a broad variety of AAL actors, including older adults. Therefore, the ActiveAdvice EAB mirrors the project participatory approach, where the involvement of stakeholders is valued and promoted in all phases of technology development – from ideation to operationalization. The Active and Assisted Living Association (2014) defined the Advisory Board as a group of "representatives from industry and other stakeholders, including representatives of people from different generations that will provide recommendations for priorities and topics (…)". Therefore, this structure will create conditions for the engagement of the different ActiveAdvice stakeholders, and will allow developing direct linkages for research and to disseminate and mobilize activities. Moreover, the EAB will guarantee that the project remains aligned

with end-user needs and technology trends during the course of its execution and that the project results are sustainable, remaining beyond the project lifetime. The EAB members represent the different groups of the stakeholders identified within the project: i. older adults; ii. relatives and/or informal caregivers; iii. enterprises in the business field of AAL; and iv. governmental bodies. An EAB brings credibility to a project team and facilitates the process of building stable partnerships. Also, this structure introduces a wide range of real-world experiences to be discussed and provide access to a variety of tangible and intangible assets (e.g. equipment, networking contacts, experiences, knowledge, good practices).

In the constitution of the ActiveAdvice EAB, some factors were taken into account to guarantee the good functioning of this structure, such as the selection of EAB's members, the definition of a feasible number of members to involve; and some underlying principles. The principles proposed by Freeman and colleagues (2010) can serve as a framework for value creation within ActiveAdvice with EAB's cooperation which contemplates: stakeholder cooperation, for an negotiation and agreement on meeting their different needs; stakeholder engagement; stakeholder responsibility, where parties take the ownership of the project and accept responsibility in it; as well as assume complexity of human relationships; emergent competition; and continuous creation. Finn & Wright (2011) also points that among the objectives that a successful stakeholder co-ordination mechanism must address are the ones of being inclusive, open, democratic and self-sustaining.

Taking the above-mentioned into account, it has been concluded that the following aspects must be guaranteed in EAB's constitution and functioning:

i. Manageability: a large EAB can be more difficult to manage and coordinate. Establishing a rich dialogue, a good platform for knowledge sharing and building consensus can be challenging when managing an overly large group of stakeholders.
ii. Sustainability: mechanisms for stakeholders' cognitive participation, i.e. engagement and commitment must be installed and monitored to avoid excessive members' turnover. EABs with frequent alterations in its members run the risk of loss efficiency and orientation towards its goal.
iii. Diversity: taking into account an 'inclusive design' approach, the EAB's constitution must include stakeholders with diverse needs, backgrounds, coming from different contexts and having diverse relevant experiences (such as older adults from different contexts, designers, decision and policy makers, business actors). It must be ensured that members are good representatives of a certain group of stakeholders and together can provide a variety of perspectives to take into account in the development process.
iv. Responsibility: higher levels of stakeholders' influence and empowerment are promoted within the ActiveAdvice project, which also translates in higher responsibilities for EAB's members. Collective action must result from this participation platform, with members taking the ownership of its outputs. In order to allow all members to participate and take the responsibility for the process, the number of participants must be considered: if the group is

too small, members can become overwhelmed; if it is too large members may defer the responsibility for the others.

Regarding the organization of this participative structure, some actions were outlined to promote its engagement and participation:

i. Organize phone conference meetings, at least 3 times a year;
ii. Create and disseminate a targeted newsletter to inform the EAB about the project activities, progress and outcomes;
iii. Invite the EAB's members to engage in events organized by the consortium, so that they can have the opportunity to give their contributions;
iv. Promote the EAB's participation in the entire process of developing the ActiveAdvice solution;
v. Include the EAB in the communication and dissemination plan, as a privileged gateway to broadcast the project results near its end-users.

The EAB currently in place for the ActiveAdvice project – its members and their description – is described in Table 5. Moreover, Table 6 provides a proposal for additional organizations to be included in the ActiveAdvice EAB, which can be helpful for a better national and regional representation of older adults and their caregivers.

Table 5: ActiveAdvice EAB's members: name, country, type of organization and its characteristics

Participant Organization Name	Type	Country	Description
Anziani e non solo soc. Coop.	NGO	Italy	It is a cooperative company operating since 2004 in the social innovation sector with specific reference to the design and implementation of interventions, products and services in the field of care and welfare for social inclusion (www.anzianienonsolo.it).
Age & Opportunity – Marino Institute of Education	Public	Ireland	It is a national organisation that inspires everyone to reach their full potential as they age. This institution works to provide opportunities to encourage people to live their longer lives to the full. They provide opportunities: i. To engage in arts and cultural activities; ii. For sport and physical activity; To learn and be involved as active citizens (www.ageandopportunity.ie).
Aging Office 50+	NGO	Portugal	It is placed in the Institute of Biomedical Sciences Abel Salazar (ICBAS) of the University of Porto since 2004, and develops a specialized service of excellence about ageing. The CA50+ aims to meet the needs of old people in the region, and translate knowledge from University to practice (www.icbas.up.pt/ca50mais).
City of Karlskrona	Public	Sweden	It is a locality of Karlskrona Municipality, Blekinge County, Sweden. It is also the capital of Blekinge County. Karlskrona is known as the only Sweden's baroque city. This city is the headquarters of the Swedish Coast Guard (en.wikipedia.org/wiki/Karlskrona).
City of Rijeka	Public	Croatia	It is the principal seaport and the third-largest city in Croatia. It is located on Kvarner Bay, and has 128,624 habitants (2011). The metropolitan area, which includes adjacent towns and municipalities, has more than 240,000 habitants. (en.wikipedia.org/wiki/Rijeka).
Design 4 All Foundation	NGO	Spain	It is a foundation that aims to ensure that everyone, including future generations, regardless of age, gender, capacities or cultural background, can participate in social, economic, cultural and leisure activities with equal opportunities (designforall.org).
Eticas Research & Consulting	SME	Spain	It is a Spain-based SME working on the social, ethical and legal impact of security policy, innovation and technology development, and the interaction between changing societal values, engineering possibilities and fundamental rights (www.eticasconsulting.com).
Info-handicap	NGO	Luxembourg	It listens to people with disabilities, their families, professionals and, more generally, any person looking for specific information. The service has an agreement with the Ministry of Family and Integration (www.info-handicap.lu).
Nationaal Ouderen Fonds	NGO	Netherlands	It is a charity institution that promotes quality of life for older adults in Netherlands. The primary focus of the Foundation is combatting loneliness. It supports older adults through meaningful projects that: i. Combat loneliness; ii. Combat poverty; iii. Improve safety; iv. Improve active ageing and health (www.ouderenfonds.nl).
Regione Umbria	Public	Italy	It is a central Italian region of 902,475 habitants, which capital is Perugia. The regional economy encompasses a network of SME and the city is known for its farm products. (it.wikipedia.org/wiki/Umbria).
Luxembourg Institute of Science and Technology	University	Luxembourg	It is an RTO (Research and Technology Organization) active in the fields of materials, environment, and IT. Its mission is twofold: • Contribute to Luxembourg's reputation through their participation in several targeted research areas among the best RTOs; Participate in the country's socio-economic development (www.list.lu).
COOSS Marche Onlus	End user	Italy	It is a social cooperative which strives for care, assistance and promotion of the individuals. They recognize that everyone has a fair quality of life and, to make this happen, they study, specialize and work every day with healthcare and self-care professionals (www.cooss.it).
Johanniter Österreich Ausbildungs – und Forschung gemeinnützige GmbH	End user	Austria	The Johanniter offers the following services: i. Unit rescue; ii. Ambulance service; iii. Nursing care at home; iv. Palliative care; v. Social services; vi. First aid training; vii. Work with young people. They help people in need in Austria and worldwide (www.johanniter.at).

Table 6: Suggested organizations to be involved in the ActiveAdvice EAB in the near future

Participant Organization Name	Description
Curaviva	It is an organization placed in Swiss that represents the interests of social institutions and nursing homes for the older adults, adults with disabilities as well as children's and adolescents with special needs (www.curaviva.ch).
TerzStiftung	It is a Swiss foundation operating as a representative body for mature people and as a service provider in the market for older adults. Composed as a membership organization, terzStiftung maintains close ties to both private households from the target groups 50+ and professional partners in politics, media, research and the business sector (www.terzstiftung.ch).
UNIFAI (Unit of investigation and training about adults and old people)	It's a research unit placed in Portugal that works on gerontology and geriatrics fields. The strategy of UNIFAI focuses essentially on three main elements of action: investigation, training and specialized services provided to the communities (http://www.unifai.eu).

6 Conclusions and outlook

Notwithstanding the promising contribution offered by Information and Communication technologies (ICT) to face the contemporary challenges of providing care and assistance to a rapidly growing percentage of aged population, the uptake of AAL technologies by end-users still faces numerous constraints. Even considering the significant advancements in technology in general, and the research efforts in the AAL field carried out in the last few years, the digital divide currently separating many older adults from mainstream European society still needs to be surpassed. Multiple interesting technological solutions designed for older adults are already available but not fully used due to lack of user-centred designs, miss adoption of suitable guidelines and privacy issues, among many others deterrents. This means that approaches being used to develop AAL technologies are not well at succeeding in creating meaningful and sustainable technologies. In fact, it has been largely stated that a sustainable technology uptake can only take place if technologies are based on an in-depth understanding of users' needs, values, requirements, goals and deterrents about the use of AAL technologies. Also, as stressed by Olphert and colleagues (2009), support mechanisms for the engagement of end-users in the design processes and establishment of communication flows between different groups of stakeholders are needed.

This deliverable gathers some of the key insights into the decision drivers (e.g. needs, barriers) of different AAL stakeholders, achieved by the research carried out in the recent years. The narrative literature review revealed that usability problems are reported to be a major issue for older adults and other end-users for accepting AAL technologies and interacting with them in a successful way. The uptake of any interface by its targeted end-users or stakeholders depends on both technical (e.g. design, practical use) and human factors (e.g. age, mental and cognitive skills, expectations).

Regarding older adults, although it is recognized their minor inclination to embrace new technologies than younger people, it is not true that age alone predicts technology acceptance and use. In fact, the 'technophobic' image frequently being used to depict older adults has been showing to be skewed since it was largely stated that if older adults recognize the technological solutions as beneficial, they will be motivated to use it. Among the issues that have been approached by the literature as influencing technology acceptance by these end-users are: the interest and need in using technologies as well as the real and perceived lack of ICT skills; the existence of physical and cognitive impairments as well as the technology influence in the perceived health and self-care status; technology affordability; ethical issues such as security, confidentiality and privacy; trust in technological solutions, namely in aspects such as reliability and accuracy; the technology weight in the amount and quality of social interaction; and technology features such as customization.

Older adults' relatives, as well as formal and informal caregivers also have a number of technology-related concerns. While informal caregivers can embrace AAL technology if its benefits are recognized in reducing older adults' dependence and improving the quality of care provided, technology uptake by these end-users depends on the assurance of ethical, relational, financial and learning conditions.

Furthermore, several deterrents for professional caregivers where identified, mostly associated with ethical issues and medical liability; lack of evidence about the cost-effectiveness of the interventions; and technologies interference in the care 'nature' and work practices.

The ActiveAdvice project intends to address some of the issues abovementioned, by expecting impacts in terms of providing older adults and caregivers with: i. comprehensive AAL products, services and solution information; ii. personal empowerment; iii. freedom of choice for desired products & services; iv. support in making choices; v. exchange experiences on existing AAL solutions; vi. support of other older adults as digital advisor; vii. access to AAL solutions & providers; viii. a sense of community and experience exchange; and finally, ix. a better quality of life.

This knowledge base also provided insights about the expectations and multiple challenges faced by business stakeholders in the AAL field. Among the numerous themes emerged on this topic (e.g. funding and reimbursement; ethical guidance and market regulation), the most valued topic relied on the failure in developing sustainable business models and collaborative businesses ecosystems. This issue has not only been one of the most prominent in the recent literature, but can also be regarded as the source for many other barriers perceived by business stakeholders.

Having been established as ActiveAdvice secondary end-users, the businesses are expected to benefit from the project by having the opportunity of: i. presenting products and services to an international audience; ii. collecting feedback from users across Europe; iii. exploring new fields of business; iv. creating unique selling propositions; v. having support in advisory for older adults; vi. receiving specialized training in AAL know-how and environment usage; vii. receiving certification as proof of quality; and also, viii. participating in an international network of experts.

Governmental institutions are among the main AAL stakeholders, having a crucial role in the provision of funds, infrastructures, legal framework, services and even ethical guidance for a successful implementation of these technologies. In this sense, these stakeholders have also a set of technology-related concerns, which, not surprisingly, seems to be mostly related with ethical and regulatory issues, as well as with evidence on the interventions' cost-effectiveness.

Having been defined as tertiary end-users for ActiveAdvice, it is expected that Governments could benefit from the project by: i. having access to most recent information on AAL; ii. knowing the best practices for ageing healthier and with quality of life; and iii. promoting advances in AAL innovative support.

The ActiveAdvice platform should be seen as an integrated communication tool targeted at bridging the gaps between AAL stakeholders by facilitating cooperation, information exchange, and ultimately e-commerce. More than its value regarding the front-end (i.e. the website/app), the power of ActiveAdvice platform lies in connecting the organizational, non-visible parts, in the back-end. Therefore, user participation in the implementation phase of the ActiveAdvice project will be particularly important for a successful innovation process. Collaboration among different stakeholders is identified as a key factor in the design of AAL environments and services. As a reflection of their different requirements towards technology use (see Chapter 4.1.5 AAL stakeholders: convergent and

divergent perspectives), diverse stakeholders bring different perspectives, expectations, skills and resources to the ActiveAdvice environment. Then, we are dealing with subjective evaluations of the technology use which differ along the stakeholders and must be taken into account for a successful implementation of the ActiveAdvice solution. This is a challenge, but it must be mainly regarded as a strength, because once stakeholders work together and are able to align these differences, the results can be meaningful and useful for interventions. For the success of ActiveAdvice it is essential to bring together all the groups of stakeholders and make possible the networking between older adults and their relatives, policy makers, developers, researchers, producers, service providers, designers, health professionals, municipalities, NGOs and other potential end user groups. Although recent concerns take different directions, most of the technology related projects developed until now were focused on the development of non-integrated services. In contrast, ActiveAdvice intends to offer an integrated service, which is more likely to result from collaborative contributions of various stakeholders. In general, it is expected that ActiveAdvice could increase the understanding of all stakeholders about the challenges that ICT & Ageing are facing. This is expected to contribute directly and indirectly to improve the quality of life of the users and their community as well as to foster the dialogue and synergies among ICT & Ageing stakeholders.

The knowledge in this document is meant to be comprehensive but not exhaustive, thus similar works are encouraged to bring additional information on what is needed to build a human-centred AAL solution and mostly a collaborative AAL stakeholder's ecosystem. Steps for the ActiveAdvice project to take in the short-term include expanding the European stakeholders' collection work done in this deliverable; the further collection of end-users' requirements through the development of in-depth interviews with individuals fitting in the segments here defined; and finally, the design of a Communication and Dissemination plan strategically conceived to involve the project stakeholders.

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South Lakes Housing Association Website: www.southlakeshousing.co.uk

8 Appendix

8.1 Topic, title, Key-words, country, source, authors and description data for papers included in the narrative literature review analysis.

Nr.	Topic	Title	Key-words (and, or…)	Country	Source/URL/PDF	Authors & pub. year	Description/abstract
1	Older adults needs & requirements in ICT use	ICT-based health information services for elderly people: Past experiences, current trends, and future strategies *Systematic review*	ICT-based health information, health information services, consumer health informatics, telematics, telemedicine	Germany	https://www.ncbi.nlm.nih.gov/pubmed/?term=ICT-based+health+information+services+for+elderly+people%3A+Past+experiences%2C+current+trends%2C+and+future+strategies	Marschollek M, Mix S, Wolf KH, Effertz B, Haux R, Steinhagen-Thiessen E.; 2007	"With a focus on elderly people, this paper summarizes current trends in consumer health informatics, discusses past and present initiatives providing health-information services, and proposes a future strategy for the design of sustainable services. A systematic literature review and a review of past German and EU projects concerned with health information services for elderly people are given. Many publications focus on health information services for specific diseases and on their quality and semantic accessibility, yet few deal with presenting and customizing health information for elderly and disabled people. Past experiences from Germany suggest that very often the specific needs of this target group are not met, and therefore accessibility remains largely hypothetical. We propose a strategy with five key points for the design of sustainable health-information services for elderly people. More research is needed to customize web-based health information services to the needs of the user group that needs them most urgently - elderly and disabled people."
2	Older adults needs & requirements in ICT use	Ambient intelligence in assisted living: enable elderly people to handle future interfaces.	"Ambient Intelligence; Assisted Living; User-Interfaces; Learning; Elderly People"	Germany	http://link.springer.com/chapter/10.1007/978-3-540-73281-5_11	Kleinberger, T., Becker, M., Ras, E., Holzinger, A., & Muller, P.; 2007	"In this article, we present an Assisted Living Laboratory that is used to train elderly people to handle modern interfaces for Assisted Living and evaluate the usability and suitability of these interfaces in specific situations"
3	Business stakeholders; other stakeholders	Shining light on the dark side of ambient intelligence	Privacy, Data security, recommendations for stakeholders	UK	http://www.emeraldinsight.com/doi/full/10.1108/14636680710737759	David Wright, Serge Gutwirth, Michael Friedewald, 2007	The paper identifies "safeguards against threats and vulnerabilities posed by the emerging world of ambient intelligence (…) It identifies specific recommendations for the European Commission, Member States, industry, civil society organizations, academia and individuals"
4	Multiple stakeholders	Smart home technology for the elderly: Perceptions of multidisciplinary stakeholders.	"smart home technology; perception; technology acceptance"	Netherlands	http://link.springer.com/chapter/10.1007/978-3-540-85379-4_37	Anne-mie Sponselee, Ben Schouten, Don Bouwhuis & Charles Willems, 2007	"The purpose of this study is to show that problems with smart home technology can be partially ascribed to differences in perception of the stakeholders involved. The perceptual worlds of caregivers, care receivers, and designers vary due to differences in background and experiences. To decrease the perceptual differences between the stakeholders, we propose an analysis of the expected and experienced effects of smart home technology for each group. For designers the effects will involve effective goals, caregivers are mainly interested in effects on workload and quality of care, while care receivers are influenced by usability effects"

5	Older adults needs & requirements in ICT use; Other stakeholders	Getting Older People Involved in the Process of Ambient Assisted Living Research and Development	"Ambient Assisted Living Technologies; user motivation; stakeholders network"	Italy	http://www.gerontechnology.info/Journal/Proceedings/ISG08/papers/048.pdf	Chiara Leonardi, Claudio Mennecozzi, Elena Not, Fabio Pianesi, and Massimo Zancanaro; 2008	"This paper proposes an investigation protocol for research and development of Ambient Assisted Living technologies for elderly people, based on effective strategies for motivating users and establishing a long-term relationship that enables them to enter in the User Centered Design loop. It is crucial to involve local authorities, associations of elderly people, and social operators as partners of the project sharing with them the ambitiuos research and development objectives, and identifying ways of integrating research activities with their existing daily practices."
6	Older adults needs & requirements in ICT use	Ambient Assisted Living: Elderly People's Needs and how to Face Them	"Ambient Assisted Living, Lifelong Learning, Technologies, Media, IPTV, Pedagogics"	Austria	http://delivery.acm.org/10.1145/1470000/1461917/p21-fuchsberger.pdf?ip=193.136.36.133&id=1461917&acc=ACTIVE%20SERVICE&key=2E5699D25B4FE09E%2E6F699AA92A518455%2E4D4702B0C3E38B35%2E4D4702B0C3E38B35&CFID=884414464&CFTOKEN=63416493&__acm__=1483456018_29a134bdd1a6e67e9945f8f581d3cb90	Mag. Verena Fuchsberger; 2008	"This paper is about challenges of technological and media innovations concerning elderly's quality of life. This paper tries to point out pedagogical and psychological positions in order to reflect innovations critically. There are many questions concerning the necessity and the problems of all projects. Some of them will be discusses here: (1) Which possibilities and barriers arise with technological and media inventions?, (2) How does the target group, which consists of elderly people, influence design, performance and effects of technological innovations?"
7	Business stakeholders; other stakeholders	Innovation Barriers for Telemonitoring	"Innovation barriers; telemonitoring; Missing Diffusion of telemonitoring; Ambient Assisted Living"	Germany	http://link.springer.com/chapter/10.1007/978-3-642-03904-1_13	H. -G. GruberB. WolfM. Reiher; 2009	"An expert study was conducted with 23 experts to identify and weight possible innovation barriers. The interviewed group consisted of telemonitoring providers, doctors and health insurances. The interviews consisted of a numeric and a qualitative part."
8	Older adults needs & requirements in ICT use	Process requirements for building sustainable digital assistive technology for older people	"Digital assistive technology; older people; technology abandonment; participatory development of technologies"	UK	http://www.emeraldinsight.com/doi/pdfplus/10.1108/17549450200900019	Wendy Olphert, Leela Damodaran, Panos Balatsoukas & Catherine Parkinson; 2009	"The purpose of this paper is to propose a framework for process requirements to inform the decision-making of designers and implementers of digital assistive technologies. These process requirements should facilitate the development of more adaptable user-centred systems that can dynamically accommodate the changing needs of older people and decrease the rate of abandonment of digital assistive technologies."
9	Multiple stakeholders	Structuring stakeholder e-inclusion needs	"Stakeholder analysis, Electronic media, Communication technologies, Older consumers, Partnership"	UK	http://www.emeraldinsight.com/doi/full/10.1108/14779961011040587	David Wright; 2010	The paper purpose is "to identify principal stakeholders and needs in e-inclusion, with particular reference to senior citizens, this paper compiles a list of principal stakeholders and their e-inclusion needs"

10	Other stakeholders: experts	Healthy ageing supported by technology – a cross-disciplinary research challenge	"Ageing, consumer health information, independent living, medical informatics, technology"	Sweden	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3793263/	Sabine Koch; 2010	"The aim of this article is therefore, to collect and describe different scientific viewpoints in this regard and to point out research gaps to be addressed in the future. The article is based on a number of review articles and keynote lectures given by the author, and complemented with informal interviews of experts from different scientific fields engaged in the field of technology and ageing."
11	Older adults and caregivers needs & requirements in ICT use	User Responses to Assisted Living Technologies (ALTs) - A Review of the Literature	"Assisted living technologies; telehealth; telecare; user needs"	UK	http://www.emeraldinsight.com/doi/pdfplus/10.5042/jic.2010.0133	Leela Damodaran & Wendy Olphert; 2010	"This paper reports the findings of a literature review conducted to investigate user responses to Assisted Living Technologies (ALTs), principally telehealth and telecare applications. The documents were analysed to extract data relating to end-user needs, what attracts end users and informal carers to telehealth/ telecare services, and what deters them from adopting these technologies"
12	Caregivers' needs & requirements in ICT use	360 degrees of care	"Telecare, Telehealth, Stakeholder"	UK	http://www.emeraldinsight.com/doi/pdfplus/10.5042/qiaoa.2010.0717	Pat Begley; 2010	"Examines impact of telecare on carers, study of carers and other key stakeholders"
13	Older adults and professional caregivers needs & requirements in ICT use	The role of technology for healthy aging among Korean and Hispanic women in the United States: A pilot study	"USA immigrant, gerontechnology, minority, acceptance, perception"	USA	file:///C:/Users/nsduarte/Downloads/1397-1396-1-PB.pdf	Carmen D. Steggell, Karen Hooker, Sally Bowman, Soyoung Choun, Sun Joong Kim, 2010	"This study was guided by a conceptual model of the use of gerontechnology that integrates the Life-span Theory of Control and a congruence model of person and environment interaction. Focus groups in the Participants' native language were used to explore attitudes and values of immigrant Korean (n=19) and Hispanic (n=13) older women"
14	Business stakeholders	Challenges and Limitations of Intelligent Ambient Assisted Living Environments	"Ambient Assisted Living; Ambient Intelligence; market potential of AAL; business model; self-organisation; software infrastructures; AAL reference platform; standardisation; Smart Home; Fraunhofer AAL Alliance"	Spain	https://apps.webofknowledge.com/full_record.do?product=WOS&search_mode=GeneralSearch&qid=4&SID=Z1XQsSd8ixBAWZ57p8b&page=1&doc=10&cacheurlFromRightClick=no	Wichert, R, et al., 2010	"Despite its tremendous market potential, the AAL (Ambient Assisted Living) branch is still on the cusp of a mainstream breakthrough. A lack of viable business models is considered almost unanimously to be the greatest market obstacle to a broad implementation of innovative AAL systems. This paper highlights possible explanations for this deficit and shows why the AAL community has yet to arrive at joint solutions based on a unified AAL reference platform."
15	Multiple stakeholders	-Government for the Citizens: Digital Divide and Internet Technology Acceptance among the Elderly	Unified Theory of Acceptance; Use of Technology; t-government; e-inclusion	Germany	https://www.researchgate.net/publication/228430912_T-Government_for_the_Citizens_Digital_Divide_and_Internet_Technology_Acceptance_among_the_Elderly	Niehaves, B. and Plattfaut, R. 2010	"this paper aims at explaining senior citizens' private internet use and identifying important influencing factors. We develop a model based on the Unified Theory of Acceptance and Use of Technology and digital divide research which is tested against comprehensive survey data (n=192). Results show that we can explain more than 70% of the variation of private internet use. Moreover, we discover that the integration of digital divide constructs as moderating effects yields an improvement of this coefficient of determination (to R 2 =.744). We discuss major implications for t-government and e-Inclusion practice and potentially fruitful paths for future research and theory development."

16	Business stakeholders	A Holistic Framework to Improve the Uptake and Impact of eHealth Technologies	"eHealth, design, participation, implementation, evaluation, multidisciplinary approach, Health 2.0, Wiki, e-collaboration"	Canada	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3278097/	Julia EWC van Gemert-Pijnen et al., 2011	"The aim of this viewpoint paper is to improve the uptake and impact of eHealth technologies by advocating a holistic approach toward their development and eventual integration in the health sector."
17	Multiple stakeholders	A stakeholder-centred exploration of the current barriers to the uptake of home care technology in the UK	"Home care systems, Telecare, Care at home, Stakeholder requirements, Participatory design, Technology acceptance, Ethical considerations"	UK	http://www.emeraldinsight.com/doi/pdfplus/10.5042/jat.2011.0097	Julia S Clark, Marilyn R McGee-Lennon; 2011	"Wide variety of stakeholders in home care, identify the existing barriers to the successful uptake of ALTs and telecare in Scotland, stakeholder groups are: social care workers, policy makers, telecare installation technicians, older users, informal carers"
18	Multiple stakeholders	Why is it difficult to implement e-health initiatives? A qualitative study	Case study, e-health; Normalization Process Theory	UK	http://www.implementationscience.com/content/6//6.	Murray E, Burns J, May C, Finch T, O'Donnell C, Wallace P, Mair F., 2011	"We used a case study methodology, using semi-structured interviews with implementers for data collection. Case studies were selected to provide a range of healthcare contexts (primary, secondary, community care), e-health initiatives, and degrees of normalization. The initiatives studied were Picture Archiving and Communication System (PACS) in secondary care, a Community Nurse Information System (CNIS) in community care, and Choose and Book (C&B) across the primary-secondary care interface. Implementers were selected to provide a range of seniority, including chief executive officers, middle managers, and staff with 'on the ground' experience. Interview data were analyzed using a framework derived from Normalization Process Theory (NPT)."
19	Older adults needs & requirements in ICT use	Ageing-in-place with the use of ambient intelligence technology: Perspectives of older users	"Older adults; Home automation; Ambient intelligence; Home care; Home modifications; Ageing-in-place; Safety and security; Dementia"	Netherlands	http://www.sciencedirect.com/science/article/pii/S1386505611000566	J. van Hoof, H.S.M. Korta, P.G.S. Ruttenb, M.S.H. Duijnsteea; 2011	"This paper presents the results of a qualitative study comprised of interviews and observations of technology and environmental interventions in the home environment among 18 community-dwelling older adults with a complex demand for care"
20	Multiple stakeholders	A New Living Lab for Usability Evaluation of ICT and Next Generation Networks for Elderly@Home.	"Usability, Living Lab, Elderly, Universal Design, Multimodal Interaction, Next Generation Networks."	Portugal	http://www.scitepress.org/DigitalLibrary/PublicationsDetail.aspx?ID=zXaC07xl76Q%3d	Teixeira, A. et al., 2011	"Living Usability Lab for Next Generation Networks (www.livinglab.pt) is a Portuguese industry-academia collaborative R&D project, active in the field of live usability testing, focusing on the development of technologies and services to support healthy, productive and active citizens. The project adopts the principles of universal design and natural user interfaces (speech, gesture) making use of the benefits of next generation networks and distributed computing. Therefore, it will have impact on the general population, including the elderly and citizens with permanent or situational special needs. This paper presents project motivations, conceptual model, architecture and work in progress."
21	Multiple stakeholders	Mechanisms for stakeholder co-ordination in ICT and ageing	"Elderly people, Communication technologies, Information technology, Stakeholder co-ordination, Organisational models,	UK	http://www.emeraldinsight.com/doi/full/10.1108/14779961111191066	Rachel L. Finn, David Wright; 2011	"Identifies, describes, assesses and compares various candidate multi-stakeholder mechanisms to improve stakeholder co-operation, strengths and weaknesses of stakeholder performing certain tasks and integrating particular types of stakeholder, response to various calls for closer stakeholder collaboration by the European Commission and other stakeholders, in order to improve the quality of life for older persons and to meet European social objectives"

			E-inclusion, Senior citizens, Stakeholder needs"				
22	Business stakeholders	Aging in Place: Evolution of a Research Topic Whose Time Has Come	Aging in place; technology and health functioning; environment and services	USA	https://www.ncbi.nlm.nih.gov/pubmed/?term=Aging+in+Place%3A+Evolution+of+a+Research+Topic+Whose+Time+Has+Come	Sarinnapha Vasunilashorn, Bernard A. Steinman, Phoebe S. Liebig, & Jon Pynoos; 2012	The paper "examined scholarly articles published from 1980 to 2010 that included the concept [of aging in place] in eleven academic gerontology journals" The authors "report an increase in the absolute number and proportion of aging-in-place manuscripts published during this period, with marked growth in the 2000s. Topics related to the environment and services were the most commonly examined during 2000–2010 (35% and 31%, resp.), with a substantial increase in manuscripts pertaining to technology and health/functioning."
23	Multiple stakeholders	The organising vision for telehealth and telecare: discourse analysis	Stakeholders; telehealth; telecare; discourse analysis	UK	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3401833/	Trisha Greenhalgh, Rob Procter, Joe Wherton, Paul Sugarhood, & Sara Shaw, 2012	The paper intends "To (1) map how different stakeholders understand telehealth and telecare technologies and (2) explore the implications for development and implementation of telehealth and telecare services."
24	Older adults needs & requirements in ICT use	Exploring barriers to participation and adoption of telehealth and telecare within the Whole System Demonstrator trial: a qualitative study	"Telehealth, Telecare, Patients' perspectives, Non-adoption, Non-participation, Barriers, Qualitative research, Whole System Demonstrator"	UK	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3413558/	Caroline Sanders et al., 2012	"This paper reports from a qualitative study nested within a large randomised controlled trial in the UK: the Whole System Demonstrator (WSD) project. It explores barriers to participation and adoption of TH and TC from the perspective of people who declined to participate or withdrew from the trial."
25	Older adults needs & requirements in ICT use; other stakeholders	Understanding barriers to wider telehealth adoption in the home environment of older people: An exploratory study in the Irish context	"Older people; chronic disease management; telehealth; barriers to adoption; acceptability; incentive"	UK	https://www.academia.edu/7893641/Understanding_Barriers_to_Wider_Telehealth_Adoption_in_the_Home_Environment_of_Older_People_An_Exploratory_Study_in_the_Irish_Context	Brenda Reginatto; 2012	"The aim of this exploratory study was to identify barriers to wider Telehealth adoption in the homes of older people, in the Republic of Ireland. Objectives included identifying barriers from the perspective of five groups of stakeholders, determining the most pressing barriers and suggesting possible approaches to addressing such issues. Fifteen semi-structured interviews were conducted. Findings were analysed against existing literature, current technology adoption trends and successful initiatives implemented in different countries. This study suggests that the lack of incentive to healthcare professionals to embrace Telehealth, technology usability issues, implementation costs and lack of organisational willingness to change are the most pressing barriers to wider Telehealth adoption."
26	Multiple stakeholders	Differentiating innovation priorities among stakeholder in hospital care	"Implementation, Information technology, Innovation, Hospital care, Stakeholders"	Netherlands	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3751765/	Mattijs S Lambooij & Marjan Hummel; 2013	"In this study, we explore the differences in stakeholder preferences for innovations, and quantify the difference in stakeholder priorities regarding costs and benefits"
27	Multiple stakeholders	Personal health monitoring: ethical considerations for stakeholders	"Stakeholders, Justice, Ethics, Healthcare ambient systems, Patient-centric approach"	Sweden	http://www.emeraldinsight.com/doi/full/10.1108/JICES-06-2013-0015	Anders Nordgren; 2013	"Ethical checklist, that can be used by various stakeholders, ethical matrix consists of the values in the checklist and a number of stakeholders, categorizes values that can be useful for stakeholders in personal health monitoring"

28	Older adults, informal caregivers and formal caregivers needs & requirements in ICT use	Ambient Assisted Living Technology: Comparative perspectives of users and caregivers	"Ambient Assisted Living Technology; caregivers; older adults"	Portugal	https://www.researchgate.net/publication/269330776_Ambient_Assisted_Living_Technology_Comparative_perspectives_of_users_and_caregivers	David Cunha, Gabriela Trevisan, Florbela Samagaio, Ricardo Simões; 2013	"This paper presents a comparative perspective of the needs and attitudes towards technology of the AAL users and caregivers identified in the analysis of a set of three different surveys: a users survey targeted at the Portuguese seniors and pre-seniors; an informal caregivers survey targeted at the family, friends and neighbours who provide care without any financial compensation; and a formal caregivers survey targeted at physicians, nurses, psychologists, social workers, and direct-care workers providing care to elders."
29	Older adults and formal caregivers needs & requirements in ICT use	New service development in German and Austrian health care – bringing e-health services into the market	"ICT solution for patients, E-health, New service development, Efficient Consumer responses, Marketing mix, Modular design, Service provider"	Austria, Germany	http://www.tandfonline.com/doi/pdf/10.1179/2047971913Y.0000000034	Johannes Kriegel, Stephanie Schmitt-Rüth, Bernhard Güntert & Patricia Mallory; 2013	"This paper discusses the challenges of work sharing and networking in health care. It outlines critical points in building a solution-oriented and knowledge-based service platform for individual patient needs. It looks at patients, health professionals and institution that play a critical role. New service developments in health care are examined, different areas of ICT solutions for patients are presented"
30	Older adults needs & requirements in ICT use;	The impact of ICT services on perceptions of the quality of life of older people	"Older people, Quality of life, Telecare, ICT, Methodology, Elderly people, Information technology"	UK	http://www.emeraldinsight.com/doi/full/10.1108/17549451311313183	Jacqueline Damant, Martin Knapp, Sarah Watters, Paul Freddolino, Margaret Ellis, Derek King; 2013	"The aim of the paper is to report results of the impact of ICT platform and telecare services developed by the MonAMI consortium on the quality of life of older people in three European communities."
31	Business stakeholders; Older adults & informal caregivers needs & requirements in ICT use	Wireless sensor technology in dementia care: Caregiver perceptions, technology take-up and business model innovation	"Elder care, Sensors, Technology, Gerontechnology, Wireless sensors, Self-care, Technology acceptance model, Dementia, Quality of life, Caregiver, Business model, Eudemonic, Hedonic"	Switzerland	http://www.emeraldinsight.com/doi/full/10.1108/EMJB-05-2013-0019	Elizabeth Delbreil, Gilbert Zvobgo; 2013	"The purpose of this paper is to empirically examine health professionals' recognition of sensor technology as a means to enhance quality of life (QoL) of care recipients with dementia, in Switzerland and France"
32	Older adults needs & requirements in ICT use	Lessons learned in deploying independent living technologies to older adults' homes	Independent living technologies, Older adults, Recommendations, Ethnography, Design, Deployment, Evaluation	Ireland	http://link.springer.com/article/10.1007/s10209-013-0308-1	Julie Doyle, Catherine BaileyCliodhna Ni ScanaillFlip van den Berg; 2013	"The paper argues for the necessity of moving [Independent living technologies] out of the research laboratory and into the home, where its real impact on the lives of older adults can be assessed. Moreover, a series of recommendations are outlined, encompassing the life cycle of independent living technologies, from ethnographic assessment, through to design, deployment and evaluation. This work is based on lessons learned in deploying such technologies to older people in over 200 homes"

33	Older adults needs & requirements in ICT use	Towards an Acceptance Model for AAL	"Ambient Assisted Living; Technology Acceptance; Gender Differences"	Austria	http://link.springer.com/chapter/10.1007%2F978-3-642-39062-3_48	Gerhard Leitner Oana Mitrea Anton J. Fercher; 2013	"As one of the major goals in the ambient assisted living project Casa Vecchia (performed in 20 real world household installations) we want to thoroughly evaluate the life circumstances of elderly people in order to be able to establish a basic ontology including all relevant factors that are actually or potentially influencing the acceptance of AAL technology."
34	Older adults needs & requirements in ICT use;	Elderly activities recognition and classification for applications in assisted living	"Assisted living systems; Activities of Daily Livings (ADLs); Wrist-worn multi-sensors; Elderly care; Feature selection and classification"	UK	http://www.sciencedirect.com/science/article/pii/S0957417412010585	Saisakul Chernbumroonga, Shuang Cangc, Anthony Atkinsa, Hongnian Yud; 2013	"This paper aims to address the issue of how to develop an activity recognition method for a practical assisted living system in term of user acceptance, privacy (non-visual) and cost. The paper proposes an activity recognition and classification method for detection of Activities of Daily Livings (ADLs) of an elderly person using small, low-cost, non-intrusive non-stigmatize wrist worn sensors. Experimental results demonstrate that the proposed method can achieve a high classification rate (>90%). Statistical tests are employed to support this high classification rate of the proposed method. Also, we prove that by combining data from temperature sensor and/or altimeter with accelerometer, classification accuracy can be improved."
35	Other stakeholders: experts and general public	Social barriers to the adoption of smart homes	Public perceptions; Smart homes; Social barriers	UK	http://www.sciencedirect.com/science/article/pii/S0301421513008471	Nazmiye Balta-Ozkana, Rosemary Davidsonb, Martha Bicketa, Lorraine Whitmarshc; 2013	The paper aims to "explore social barriers to the adoption of smart homes through the analysis of expert views and public attitudes (…) Using a combination of in-depth deliberative public workshops, expert interviews and a review of the existing literature, this paper explores social barriers to smart home diffusion, including how these vary by expertise, life-stage and location. The research highlights the importance of barriers such as control, security, and cost, providing insights for policymakers as well as smart-home designers and developers as to how these might be addressed."
36	Older adults needs & requirements in ICT use, elder with dementia	Participatory Research to Design a Novel Telehealth System to Support the Night-Time Needs of People with Dementia: NOCTURNAL	"dementia, ambient assisted living, participatory design"	UK	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3881140/	Suzanne Martin et al.,2013	"This paper presents a technology-based system, which expands on the smart home architecture, orientated to support people with daily living. The system, NOCTURNAL, was developed by working directly with people who had dementia, and their carers using qualitative research methods. The research focused primarily on the nighttime needs of people living with dementia in real home settings."
37	Multiple stakeholders	Preliminary findings of the AALIANCE2 Ambient Assisted Living roadmap	AAL, stakeholders, strategic agenda	Italy	https://books.google.pt/books?id=4tQhBAAAQBAJ&pg=PA337&lpg=PA337&dq=stakeholders+assisted+living&source=bl&ots=jGne8pBqEU&sig=N4M03sUw8GhhfBFAzvVQStz4Vpo&hl=en&sa=X&ved=0ahUKEwjAmon8hL_RAhVLCsAKHcgXAbUQ6AEIQTAH#v=onepage&q=stakeholders%20assisted%20living&f=false	Moschetti et al., 2013	The paper identifies four groups of AAL stakeholders and discusses their needs.
38	Business stakeholders	eHealth Technology Competencies for Health Professionals Working in Home Care to Support Older Adults to Age in	"competencies, nurses, professionals, technology, CanMEDS, health care, eHealth, health information	USA	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4084768/	Ansam Barakat et al., 2013	"The objective of this paper is to discuss the competencies required by health care professionals working in home care, with eHealth technologies such as remote telecare and ambient assisted living (AAL), mobile health, and fall detection systems."

		Place: Outcomes of a Two-Day Collaborative Workshop	technologies, ambient assisted living, mobile health"				
39	Older adults (dementia) & Professional caregivers requirement in ICT use	Deployment of assistive living technology in a nursing home environment: methods and lessons learned	"Ambient assistive living, Dementia assistance, Real life deployment, Dynamic and adaptable systems, Context aware services"	Singapour e	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3691578/	Hamdi Aloulou et al., 2013	"The aim of this paper is to present the approach we have adopted to develop and deploy a system for ambient assistive living in an operating nursing home, and evaluate its performance and usability in real conditions. Based on this approach, we emphasise on the importance of deployments in real world settings as opposed to prototype testing in laboratories"
40	Multiple stakeholders	Experience in Evaluating AAL Solutions in Living Labs	"ambient assisted living, living lab, verification and validation, evaluation guidelines"	Spain	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4029718/	Juan Bautista Montalvá Colomer et al., 2014	The paper presents lessons learned from the experience of evaluating AAL systems and services in the framework of various research projects. It proposes a set of harmonized guidelines to conduct evaluations in living labs, namely concerning user aspects.
41	Business stakeholders	Professional values, technology and future health care: The view of health care professionals in The Netherlands.	"Nurses; Adoption; Acceptance; Implementation; Ehealth"	The netherlan ds	http://www.sciencedirect.com/science/article/pii/S0160791X14000293	Nieboer ME, van Hoof J, van Hout AM, Aarts S, Wouters EJM; 2014	"The aim of this study was threefold: (1) to explore the main values of health care professionals, (2) to investigate the perceived influence of the technologies regarding these values, and (3) the accumulated views of care professionals with respect to the use of technology in the future."
42	Multiple stakeholders	A Multi-Collaborative Ambient Assisted Living Service Description Tool	"Ambient Assisted Living (AAL), multidisciplinary, assistive technology, collaboration, sustainability, services provision"	Spain	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4118338/	Jorge L. Falcó, Esteban Vaquerizo, & José Ignacio Artigas, 2014	"This paper highlights identified critical items for collaboration among technicians, users, company and institutional stakeholders and proposes as a communication tool for a project steering committee a service description tool which includes information from the different fields in comprehensible format for the others"
43	Multiple stakeholders	The Day-to-Day Co-Production of Ageing in Place	"bricolage, co-production, assisted living, ageing in place, telecare, telehealth"	UK	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4551166/	Rob Procter et al., 2014	"We report findings from a study that set out to explore the experience of older people living with assisted living technologies and care services. We find that successful 'ageing in place' is socially and collaboratively accomplished – 'co-produced' – day-to-day by the efforts of older people, and their formal and informal networks of carers (e.g. family, friends, neighbours)."
44	Multiple stakeholders	Care services ecosystem for ambient assisted living	"Ambient Assisted Living ecosystem; conceptual architecture; stakeholders"	Portugal	http://ac.els-cdn.com/S1959031814000852/1-s2.0-S1959031814000852-main.pdf?_tid=a63a2414-d1a5-11e6-ba58-00000aab0f27&acdnat=1483442187_e81286129e8d698db41a5f915c20fe5f	L.M. Camarinha-Matos, F. Ferrada, A.I. Oliveira, J. Rosas, J. Monteiro; 2014	The paper presents "a conceptual architecture for an ambient assisted living ecosystem (…) with the objective of facilitating the development and provision of technology-supported integrated care and assistance services for senior citizens. These services are the result of collaboration among various stakeholders, enabled by the notion of collaborative ambient assisted living ecosystem. A 3-layered model is adopted for the architecture: Infrastructure layer, Care and Assistance Services layer, and Ambient Assisted Living ecosystem layer. The involved actors and their relationships are modeled as part of the architecture implementation specification. An example of service design in this context is also presented."
45	Business stakeholders	Market adoption barriers of multi-stakeholder	"Smart Home; Aging; Market adoption; Platform; Business	Netherla nds	http://www.sciencedirect.com/science/article/pii/S0040162514002418	Ehrenhard, M ; Kijl, B;	"The main question driving this study is why Smart Home technology is so scarcely implemented despite its benefits to an aging population. From the literature we derive key market barriers in Smart Home value networks. We expand on these findings by means of a value network analysis of a Dutch

		technology: Smart homes for the aging population	ecosystem; Value network"			Nieuwenhuis, L; 2014	smart home implementation case. In addition, we conducted 14 interviews that provide more insight into the value network of specific Smart Home services."
46	Other stakeholders: Gerontologists/experts	Geriatricians and Technology	Gerontechnology; geriatricians	Switzerland France	http://www.sciencedirect.com/science/article/pii/S1525861014006185	Jean-Pierre Michel, MD, Alain Franco, MD; 2014	The paper discuss the concept of gerontechnology "which is defined as an interdisciplinary academic and professional field combining "gerontology" and "technology," a concept referring to the fusion of the sciences of aging and engineering" and focus on the gerontologists position on this topic.
47	Older adults and formal caregivers needs & requirements in ICT use	Rita Project: An Ambient Assisted Living Solution for Independent & Safely Living of Aging Population	"Elderly people, caregivers, safety, socio medical services"	Italy	https://www.researchgate.net/publication/300487189_RITA_Project_An_Ambient_Assisted_Living_Solution_for_Independent_and_Safely_Living_of_Aging_Population	Raffaele Esposito, Manuele Bonaccorsi, Dario Esposito, Paolo Dario, 2014	"This article discusses the design of low cost technology for elderly people using a socio medical approach whereby the real needs of the people are taken into consideration. The article only shows that elderly people and their caregivers are in favour of better technologies to support independent living. The article does not however discuss AAL decision support."
48	Older adults needs & requirements in ICT use	Designing a user-centred ICT platform for active aging	"Smart Objects; Active aging; Requirements Elicitation; User-Centred Design (UCD); Delphi methodology"	Italy	http://ieeexplore.ieee.org/abstract/document/6935624/	Margherita Peruzzini & Michele Germani; 2014	The paper "proposes a new model to design an AAL system to support active aging by adopting a user-centred approach to define an interoperable architecture integrating different types of Smart Object. (…) The research case study specifically addresses elderly people needs living alone or affected by chronic disease, which require a continuous control and feedback"
49	Older adults needs & requirements in ICT use	Factors influencing acceptance of technology for aging in place: A systematic review. *Systematic review*	"Aged; Assistive technology; Behavior; Independent living; Review; Technology; eHealth"	Netherlands	https://www.ncbi.nlm.nih.gov/pubmed/24529817	Peek STM, Wouters EJM, van Hoof J, Luijkx KG, Boeije HR, Vrijhoef HJM; 2014	The paper "provide an overview of factors influencing the acceptance of electronic technologies that support aging in place by community-dwelling older adults. Since technology acceptance factors fluctuate over time, a distinction was made between factors in the pre-implementation stage and factors in the post-implementation stage."
50	Older adults needs & requirements in ICT use	Contributions of ambient assisted living for health and quality of life in the elderly and care services - a qualitative analysis from the experts' perspective of care service professionals	"Ambient assisted living, Quality of life Independent living, Independent elderly, Assistive technologies"	Austria	http://bmcgeriatr.biomedcentral.com/articles/10.1186/1471-2318-14-112	Christian Siegel, Andreas Hochgatterer & Thomas Ernst Dorner; 2014	"Because of the demographic change in industrial countries new technical solutions for the independent living of elderly will become important in the next years. Ambient Assisted Living seeks to address the upcoming challenges by providing technical aids for elderly and caregivers. Therefor it is crucial to understand how those socio - technical can address their needs and quality of life. The aim of this study was to analyse the main needs of dependent elderly and to investigate how different solutions can contribute to health and quality of life."
51	Older adults needs & requirements in ICT use	Evaluation of a modular scalable system for silver-agers located in assisted living homes in Austria - Study protocol of the ModuLAAr Ambient Assisted Living Project	"Quality of life, technology acceptance, effects of AAL"	Austria	http://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-14-736	Christian Siegel, Barbara Prazak-Aram, Johannes Kropf, Michael Kundi & Thomas Dorner; 2014	"The aim of this study is to examine the effects of AAL on quality of life, health and technology acceptance of people at advanced age living in assisted living homes providing them the ModuLAAr Ambient Assisted Living system"

52	Business stakeholders	ICF inspired Personas to improve development for usability and accessibility in Ambient Assisted Living	"Personas; Scenarios; Usability and accessibility; Ambient Assisted Living developments"	Portugal	http://ac.els-cdn.com/S1877050914000477/1-s2.0-S1877050914000477-main.pdf?_tid=d8dbd97a-ceb3-11e6-a104-00000aab0f6b&acdnat=1483118431_2f1e43616f66506a05e7078bdd5bb42a	Alexandra Queirós, Margarida Cerqueiraa, Ana Isabel Martins, Anabela G. Silva, Joaquim Alvarelhão, António Teixeira, Nelson Pacheco Rocha, 2014	"The paper discuss the topic of Living Usability Lab, has a methodology which has a central aspect the continuing involvement of the different stakeholders at all stages of the development process. It provides a conceptual Model for the Definition of Personas and Scenarios, gives example of a Persona and Respective Scenario."
53	Multiple stakeholders	Framing the evidence for health smart homes and home-based consumer health technologies as a public health intervention for independent aging: a systematic review *Systematic review*	"Health Smart Homes, Evidence-Based Public Health, Aging in Place, Independent Aging, STARE-HI"	USA	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3740158/	Blaine Reeder et al.; 2014	The paper provides a systematic literature review about Health smart homes (HSH) and home-based consumer health (HCH) technologies. "The aim of this study is to characterize the state of HSH/HCH research to inform population-based interventions that support aging in place through systematic review and classification of the scientific literature using health informatics evaluation guidelines[16–18], informatics study types[19] and an evidence-based public health (EBPH) typology[20,21]. In addition, we identify the stakeholders involved in each included study."
54	Older adults needs & requirements in ICT use: people with dementia	Empirical studies on the effectiveness of assistive technology in the care of people with dementia: a systematic review *Systematic review*	Assistive technology, Dementia, Elderly people	Australia	http://www.emeraldinsight.com/doi/full/10.1108/JAT-09-2012-0021	Richard Fleming & Shima Sum, 2014	"The purpose of this paper is to assess the empirical support for the use of assistive technology in the care of people with dementia as an intervention to improve independence, safety, communication, wellbeing and carer support."
55	Older adults needs & requirements in ICT use;	Assessing Older Adults' Perceptions of Sensor Data and Designing Visual Displays for Ambient Assisted Living Environments: An Exploratory Study	Ambient assisted living; sensor data; older aults	USA	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4082667/	B. Reeder, J. Chung, T. Le, H.J. Thompson, & G. Demiris; 2014	The paper aims to "1) characterize older adult participants' perceived usefulness of in-home sensor data and 2) develop novel visual displays for sensor data from Ambient Assisted Living environments that can become part of electronic health records."
56	Business stakeholders; decision makers	Big Data, Smart Homes and Ambient Assisted Living	"Big data, smart homes, ambient assisted living"	Sweden	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4287073/	V. Vimarlund & S. Was; 2014	The paper aims "To discuss how current research in the area of smart homes and ambient assisted living will be influenced by the use of big data.(…) The interdisciplinary area of big data, smart homes and ambient assisted living is no longer only of interest for IT developers, it is also of interest for decision makers as customers make more informed choices among today's services. In the future it will be of importance to make information usable for managers and improve decision making, tailor smart home services based on big data, develop new business models, increase competition and identify policies to ensure privacy, security and liability"

57	Older adults needs & requirements in ICT use; other stakeholders	User participation and stakeholder involvement in health care innovation – does it matter?	"Stakeholder, Coordination, Local health and care services, Telecare and telehealth technology, User participation"	Norway	http://www.emeraldinsight.com/doi/full/10.1108/EJIM-08-2013-0081PDF	Catharina Bjørkquist, Helge Ramsdal, Kjetil Ramsdal; 2015	The paper "discusses how and to what extent users can become involved in the process of selecting and implementing telecare and telehealth technologies in local health care services, provides an understanding of how different groups of product users and stakeholder groups relate to, can be involved in an expanded implementation process of telecare and telehealth technology"
58	Multiple stakeholders	A multi-level qualitative analysis of Telehomecare in Ontario: challenges and opportunities	"Telehomecare, Telehealth, qualitative research, implementation, adoption, barriers, multi-level, heart failure, chronic obstructive pulmonary disease, chronic disease management"	Canada	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4673764/	Gemma Hunting et al.; 2015	"The study employs a multi-level framework as a conceptual guide to explore the facilitators and barriers to Telehomecare implementation and adoption across five levels: technology, patients, providers, organizations, and structures."
59	Older adults needs & requirements in ICT use: people with dementia; other stakeholders	A Review of Contemporary Work on the Ethics of Ambient Assisted Living Technologies for People with Dementia	"Dementia; Ethics; Ambient assisted living; Ambient intelligence; Ambient technology; Informed consent"	Ireland	http://link.springer.com/article/10.1007%2Fs11948-014-9552-x	Peter Novitzky et al., 2015	"This paper is a systematic literature review of the on-going scholarly debate about (…) the ethical issues involved in research and development, clinical experimentation, and clinical application of AAL technologies for people with dementia and related stakeholders."
60	Multiple Stakeholders	The Living Challenge of Ambient Assisted Living – a literature review	"Ambient Assisted Living, Literature review, Assisted technology, Living Lab"	Denmark	http://www.ep.liu.se/ecp/115/014/ecp15115014.pdf	Ann Bygholm and Anne Marie Kanstrup; 2015	"This paper presents a literature review of the current state-of-the-art of AAL. The objective is to point towards methodological actions to be taken into account in AAL research on this basis. Searches were conducted in five research databases. The search identified 86 papers."
61	Multiple Stakeholders	Personal Health Systems Technologies: Critical Issues in Service Innovation and Diffusion	"Personal health systems, service innovation, E-Health, healthcare, health and social care, stakeholders, innovation ecosystem, service systems, system design"	Austria	http://timreview.ca/article/873	Doris Schartinger, Ian Miles, Ozcan Saritas, Effie Amanatidou, Susanne Giesecke, Barbara Heller-Schuh, Laura Pombo-Juarez,	"This paper looks at Personal health system (PHS) technologies, research and innovation landscape, and its relevant markets, using several types of analyses: bibliometrics, patent analysis, social network analysis, stakeholder workshops, and interviews. The paper looks at social acceptance, service systems, markets, research and technological developments, framework conditions."

						Günter Schreier; 2015	
62	Older adults needs & requirements in ICT use	Acceptance Criteria of Ambient Assisted Living Technologies	"Acceptance, perceptions of old people, AAL technologies"	Austria	https://www.researchgate.net/publication/281167838_Acceptance_Criteria_of_Ambient_Assistant_Living_Technologies	Harriet Weegh & Martin Kampel; 2015	"This paper discusses the opinions and perceptions of old people regarding the use of AAL technologies and also gives an insight into why acceptance of these very technologies is still quite low"
63	Business stakeholders	Open innovation practices adopted by private stakeholders: perspectives for living labs	"Open innovation, Living lab, Private businesses"	Canada	http://www.emeraldinsight.com/doi/pdfplus/10.1108/info-01-2015-0003	Dominic Lapointe & David Guimont; 2015	"This paper aims to explore the role of private stakeholders in the living lab (LL) ecosystem and the relationship of private stakeholders to open innovation (OI) practices. There is extensive literature on private stakeholders and OI, but seldom mention is made on the specific question of how private stakeholders integrate OI in the context of LL."
64	Older adults needs & requirements in ICT use	Increasing the Acceptance of Asssitive Robots for Older People Through Marketing Strategies Based on Stakholder Needs	"Assistive robotics marketing; Stakeholder-centred design; User-centred design; Stakeholder cards; Demographic change; Ambient assisted living; Robot-Era"	Germany	http://link.springer.com/article/10.1007/s12369-015-0328-5	Sebastian Glende; Isabel Conrad; Livia Krezdorn; Susann Klemcke & Carola Krätzel; 2015	"Modern assistive systems, such as robots, will have increasing relevance for support at home in the future due to changes in society, such as ageing. Older people, especially, can benefit from assistive robots that give physical, cognitive and emotional support. However, thus far, little is understood of how to increase currently low acceptance of assistive robots through marketing. Therefore, marketing strategies need to be developed addressing needs and fears of the stakeholders, which is especially critical regarding utopian-appearing assistive robot5s. To understand what drives acceptance, conscious and subconscious needs, wants and barriers of use of the relevant stakeholders have to be analyzed. As such, in this intelligence gathering process not only end-users should be integrated. Also other stakeholders (e.g. as users, decision makers and buyers might not be identical) should be identified and their needs understood"
65	Informal caregivers needs & requirements in ICT use	A systematic review of telehealth tools and interventions to support family caregivers *Systematic review*	Telehealth; telecare; caregivers	USA	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4486048/	Nai-Ching Chi & George Demiris; 2013	The paper provides "a systematic review of studies employing telehealth interventions which focused on family caregivers' outcomes"
66	Business stakeholders	Exploring the perspectives and preferences for HTA across German healthcare stakeholders using a multi-criteria assessment of a pulmonary heart sensor as a case study	"Decision-making, Health Technology assessment, Heart failure, Multi-criteria decision analysis, Stakeholder participation, Stakeholder perspective"	Germany	https://www.ncbi.nlm.nih.gov/pubmed/?term=Exploring+the+perspectives+and+preferences+for+HTA+across+German+healthcare+stakeholders+using+a+multi-criteria+assessment+of+a+pulmonary+heart+sensor+as+a+case+study	Philip Wahlste, Mireille Goetghebeur, Sandra Schaller, Christine Kriza, Peter Kolominsky-Rabas; 2015	"This paper focuses on a Multi-criteria decision analysis (MCDA) that offers a potential framework to systematize health technology assessment and healthcare decision-making process and take different perspectives of stakeholders into account. The survey was tested on participants with pulmonary heart sensors. The application of a multi-criteria framework allowed to identify perspectives across German stakeholders when appraising a healthcare intervention at the criteria level, both quantitatively and qualitatively. The application of a multi-criteria framework allowed to identify perspectives across German stakeholders when appraising a healthcare intervention at the criteria level, both quantitatively and qualitatively."
67	Business stakeholders; Older adults needs &	What is quality in assisted living technology? The ARCHIE framework for effective telehealth and telecare services	"Telehealth; Telecare Multi-morbidity; Quality; Co-design Ethnography"	UK	http://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-015-0279-6	Trisha Greenhalgh et al., 2015	"This was a three-phase study: (1) interviews with seven technology suppliers and 14 service providers, (2) ethnographic case studies of 40 people, 60 to 98 years old, with multi-morbidity and assisted living needs and (3) 10 co-design workshops. In phase 1, we explored barriers to uptake of telehealth and telecare. In phase 2, we used ethnographic methods to build a detailed picture of participants' lives, illness experiences and technology use. In phase 3, we brought users and their carers together with suppliers and providers to derive quality principles for assistive technology products and services."

	requirements						
68	Multiple stakeholders	Implementing a national Scottish digital health & wellbeing service at scale: A qualitative study of stakeholders' views	"eHealth; Chronic Disease; Wellness Programs; Implementation"	UK	https://www.ncbi.nlm.nih.gov/pubmed/26262098	Agbakoba R, McGee-Lennon M, Bouamrane MM, Watson N, Mair F.; 2015	"The aim of the study is to examine implementation issues including the challenges or facilitators which can help to sustain this intervention. We gathered data in three ways: a) participant observation to gain an understanding of LiU (N=16); b) in depth interviews (N=21) with stakeholders involved in the process; and c) analysis of documentary evidence about the progress of the implementation (N=45). Barriers included the need to "work at risk" due to delays in financing, inadequate infrastructure and skill-set deficiencies, whilst facilitators included trusted relationships, champions and a push towards normalization. The findings suggest that a Scottish ehealth service is achievable but identifies key considerations for future large scale initiatives."
69	Multiple stakeholders	Citizens' visions on active assisted living	"Foresight, Aging, Assisted Living Facilities, Public Participation, Assessment of Health Care Needs, Patient-Centered Care "	Austria	https://www.ncbi.nlm.nih.gov/pubmed/26063256	Gudowsky N, Sotoudeh M., 2015	"the main research question concerned desirable settings of ageing in the future from different perspectives. The participatory foresight study CIVISTI-AAL cross-linked knowledge of lay persons, experts and stakeholders to include a wide variety of perspectives and values into productive long-term planning of research and development. Results include citizens' visions for autonomous living in 2050, implicitly and explicitly containing basic needs towards technological, social and organizational development as well as recommendations for implementation"
70	Business stakeholders	Smart homes and their users: a systematic analysis and key challenges *Systematic review*	Smart homes; users; Technologies; Households; Energy; Assisted living	UK	http://link.springer.com/article/10.1007/s00779-014-0813-0	Charlie Wilson; Tom Hargreaves; Richard Hauxwell-Baldwin; 2015	The paper carries a systematic analysis of peer-reviewed literature on smart homes and their users. "Key findings within each of nine themes are analysed, grouped into three: (1) views of the smart home—functional, instrumental, socio-technical; (2) users and the use of the smart home—prospective users, interactions and decisions, using technologies in the home; and (3) challenges for realising the smart home—hardware and software, design, domestication."
71	Multiple Stakeholders	Exploring the ambient assisted living domain: a systematic review *Systematic review*	"Ambient assisted living; Active assisted living; AAL Systematic literature review; Assistive Technologies; Assistive needs; Elderly"	Italy	http://link.springer.com/article/10.1007/s12652-016-0374-3	Davide Calvaresi, Daniel Cesarini, Paolo Sernani , Mauro Marinoni, Aldo Franco Dragoni, Arnon Sturm; 2016	"This paper aims at providing a comprehensive overview of the AAL domain, presenting a systematic analysis of over 10 years of relevant literature focusing on the stakeholders' needs, bridging the gap of existing reviews which focused on technologies. The findings of this review clearly show that until now the AAL domain neglects the view of the entire AAL ecosystem. Furthermore, the proposed solutions seem to be tailored more on the basis of the available existing technologies, rather than supporting the various stakeholders' needs. Another major lack that this review is pointing out is a missing adequate evaluation of the various solutions."
72	Older adults needs & requirements in ICT use; other stakeholders	An ICT-Driven Hybrid Automation System for Elderly Care Support: A Rehabilitation Facility Study Case	"User groups, information needs, maintanance, nurses, facility owner, residents, field study"	USA	http://www.tandfonline.com/doi/full/10.1080/02763893.2015.1129382	Yulia Evchina & Jose Luis Martinez Lastra; 2016	"The paper presents a case study of a rehabilitation facility that uses an automation system that includes AAL and BA system functionalities. Field study identified five user groups were identified: maintenance, nurses, facility owner, residents. Their information needs are explored"

73	Business stakeholders	What it Takes to Successfully Implement Technology for Aging in Place: Focus Groups With Stakeholders	"Aged, independent living, technology, eHealth, health services for the elderly, project and people management, implementation management, qualitative research, focus groups"	Netherlands	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4904824/	Sebastiaan Theodorus Michaël Peek, Eveline JM Wouters, Katrien G Luijkx, & Hubertus JM Vrijhoef; 2016	The paper aims "To provide insight into the positions of stakeholder groups involved in the implementation of technology for aging in place by answering the following questions: What kind of technology do stakeholders see as relevant? What do stakeholders aim to achieve by implementing technology? What is needed to achieve successful implementations?"
74	Older adults needs & requirements in ICT use; other stakeholders	The quest for engaging AmI: Patient engagement and experience design tools to promote effective assisted	"ambient Intelligence; Assisted living; Patient engagement; User experience; eHealth"	Italy	https://www.ncbi.nlm.nih.gov/pubmed/27515924	Triberti & Barello; 2016	The paper tackle the field of Ambient Intelligence (AmI) "highlighting: (1) a theoretical framework to include patient engagement in the design of AmI technologies; (2) assessment measures for patient engagement while developing and testing the effectiveness of AmI prototypes for healthcare. Finally (3) this contribution provides an overview of the main issues emerging while implementing AmI technologies and suggests specific design solutions to address them."
75	Multiple Stakeholders	Implementation factors affecting the large-scale deployment of digital health and well-being technologies: A qualitative study of the initial phases of the 'Living-It-Up' programme.	"eHealth, integrated delivery of health care, national health programs, qualitative research"	UK	http://journals.sagepub.com/doi/pdf/10.1177/1460458215594651	Ruth Agbakoba, Marilyn McGee-Lennon, Matt-Mouley Bouamrane, Nicholas Watson & Frances S Mair; 2016	In this research, it was "conducted a qualitative study of the factors affecting the implementation and deployment of the Living-It-Up services. We collected a range of data during the initial phase of deployment, including semi-structured interviews (N = 6); participant observation sessions (N = 5) and meetings with key stakeholders (N = 3). We used the Normalisation Process Theory as an explanatory framework to interpret the social processes at play during the initial phases of deployment"
76	Stakeholders ecosystem; Governments	SCALS: a fourth-generation study of assisted living technologies in their organisational, social, political and policy context	Assisted living technologies; organisational, social, political and policy context	UK	http://bmjopen.bmj.com/content/6/2/e010208.full	Trisha Greenhalgh et al., 2016	The paper "describe a fourth-generation paradigm: studies of assisted living technologies in their organisational, social, political and policy context."
77	Older adults & formal caregivers needs & requirements in ICT use	Patient and provider acceptance of telecoaching in type 2 diabetes: a mixed-method study embedded in a randomised clinical trial	Patient education, Telecare, Type 2 diabetes, Qualitative research	Belgium	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5101679/	I. Odnoletkova et al., 2016	"The aim of the study was to explore the perceptions of patients, nurses and general practitioners (GPs) regarding telecoaching in type 2 diabetes."
78	Formal & informal caregivers requiremen	Usefulness of a Tailored eHealth Service for Informal Caregivers and Professionals in the	"eHealth, web portal, decision aid, personalized support, dementia, Alzheimer's	Germany	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4822652/	Sandra Schaller, Dipl.-Sozw et al., 2016	The paper assesses "the usefulness and impact of the eHM-DP service in the dementia care setting from two user perspectives: informal caregivers and professionals"

	ts in ICT use;	Dementia Treatment and Care Setting: The eHealthMonitor Dementia Portal	disease, informal caregiver, medical professional"				
79	Business stakeholders	Progress in ambient assisted systems for independent living by the elderly	"Ambient assisted living, Independent living, Smart homes, Elderly, Ageing, Dementia"	UK	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4870543/	Riyad Al-Shaqi, Monjur Mourshed, & Yacine Rezgui; 2016	The paper "aimed at a comprehensive and critical review of the frameworks and sensor systems used in various ambient assisted living systems, as well as their objectives and relationships with care and clinical systems. Findings from our work suggest that most frameworks focused on activity monitoring for assessing immediate risks, while the opportunities for integrating environmental factors for analytics and decision-making, in particular for the long-term care were often overlooked."

8.2 Stakeholder list for ActiveAdvice partner countries.

Stakeholder organization	Country	Description
AAL2C – End-user and Non-profit Organizations		
The Travel Health Experience	PT	It is a company that gives to the tourists with special needs care and long-term and continuous treatments, the opportunity to create a personalized care plan, throughout their stay in Portugal (www.travelhealthexperience.com).
Associação de Aposentados, Pensionistas e Reformados (APRe!)	PT	This is a civic, national and non - profit association that wants to be the voice of the Portuguese retired people and be a social partner of the public institutions (www.apre-associacaocivica.pt).
Coração Amarelo	PT	It is a private social solidarity institution that promotes: initiatives to support old people in situations of loneliness and/or dependency; a spirit of solidarity and cooperation among families, neighbors and friends; the implementation and development in the community of home care services (coracaoamarelo.pt).
Cuidadores Portugal	PT	It is a multidisciplinary independent network of professionals that represents the caregivers in Portugal. They want to promote inclusion, social innovation, development of new technologies and financial instruments for caregivers so that they can have alternatives and solutions for their daily living (www.cuidadoresportugal.pt).
Alzheimer Portugal	PT	It is a private social solidarity institution and the only organization in Portugal that promotes the quality of life of the people with dementia and their informal caregivers, promoting their autonomy and social inclusion (www.alzheimerportugal.org/pt).
Associação Portuguesa de Doentes de Parkinson (APDPk)"	PT	The delegation of Porto was founded in 1998 by a group of Parkinson's patients who wish to maintain mutual support in living with this chronic disease (www.parkinson.pt).
Associação Portuguesa de Doentes de Huntington (APDH)	PT	It was created from a group of patients with Huntington's disease, their families and some friends. Purposes: support and guide the patients and their families; inform the public about the disease characteristics; approximate patients and families so they can exchange experiences; stimulate research and training of health professionals about Huntington's disease (www.huntington-portugal.com).
Associação Nacional de Apoio ao Idoso (ANAI)	PT	It was incorporated in 1994 as a non-profit private social solidarity institution. Its mission is "to promote the protection and support the elderly people" through information and personalized service (www.anai.pt).
Associação Projeto Cuidador	PT	It is a non-profit charity social care association, founded in 2008. It aims to inform, educate and mobilize the society to the importance of being a caregiver, representing and preparing them for their noble occupation (www.aprojetocuidador.org).
Associação AVC	PT	It is an association that provides psychosocial support to stroke patients and their families at home and / or at the office in the municipalities of Barcelos / Esposende. It aims to: promote initiatives of social, preventive and educational nature; improve the quality of life of patients with stroke; monitor the health of the users to ensure their quality of life; clarify / mobilize public opinion to the extent and resolution requirements of the problems of stroke patients (www.associacaoavc.pt).
ADVITA (Associação para o Desenvolvimento de novas Iniciativas para a Vida)	PT	It is a private social solidarity institution that wants to be recognized as a reference organization in the promotion, dissemination and production of information and educational contents for family and professional caregivers (www.advita.pt).
Associação Amigos da Grande Idade	PT	It do research work related to aging issues, with the aim of finding solutions for successful aging and to influence the political system, the media, the opinion leaders, to change the community mentality (www.associacaoamigosdagrandeidade.com).
Cuidamos.com	PT	It is an online platform that informs the old people and their caregivers about issues related to old age. It also allows people to interact among themselves and exchange ideas and experiences (www.cuidamos.com).
Médicos do Mundo	PT	It is a non-governmental organization that assumes that all human beings have the right to receive health care, whatever is their nationality, religion, ideology, race or economic possibilities. They implemented the "Projeto Terceira C(Idade)" in order to create functional residences for the elderly population, contributing to the permanence of seniors in their family environment (www.medicosdomundo.pt).
Vem Vencer	PT	It is an association that supports children, elderly and disable people. Purposes: integrate them and / or reintegrate them in the society; improve their quality of life; to give them moral, material and technical support; to promote the access to health, education and employment (www.vemvencer.pt).
Confederação Nacional de Reformados Pensionistas e Idosos MURPI	PT	It is a non-governmental organization that aims to stimulate retirees, pensioners and old people by contributing to their integration and participation in society (www.murpi.pt).
Associação dos Doentes de Alzheimer de S. Mamede de Infesta	PT	It is a private social solidarity institution that aims to improve the quality of life of the Alzheimer's patients and their family (www.facebook.com/Associacao-dos-Doentes-de-Alzheimer-em-S-Mamede-de-Infesta).
Associação Para a Promoção das Classes Sociais Menos Favorecidas - Paços 2000	PT	It is a non-profit institution that works with children, young people, older adults and beneficiaries of social support (www.pacos2000.pai.pt)

Lágrima Humana – Associação Nacional de Apoio aos Carenciados e à Demência	PT	This institution informs old people, collect blood and develop activities among the elderly (www.academiabacalhauporto.com).
Associação dos Reformados da Galp Energia (ARGE)	PT	It is a non-profit private institution that wants to: promote actions in the social, solidarity, cultural and sport fields; promote home care support as well as the creation of nursing homes and day care centers for old people alone or in partnerships with other organizations; represent and defend the legitimate interests of retired people of "Galp Energia" group (www.arge.pt).
Centro de Convívio de Reformados do Porto	PT	It aims to respond to the requests of the beneficiaries of the North and support retiree people. Promote several entertainment activities like games, dancing, rides, fun activities, music, performances, reading and computing.
Cruz Vermelha Portuguesa	PT	It is a non-governmental and non-profit institution of voluntary and public interest, which mission is provide humanitarian and social assistance - especially to the most vulnerable people - by preventing pain and contributing to the protection of life, health and human dignity (www.cruzvermelha.pt).
FamiliarMente	PT	It is a non-profit organization which purpose is the implementation of measures that will contribute to improve the quality of life of people with mental illness and their families (www.familiarmente.pt).
SUPERA - Sociedade Portuguesa de Engenharia de Reabilitação e Acessibilidade	PT	It is a non-profit scientific association created in 2006 to promote the development of activities that apply science and technology in improving the quality of life of people with disabilities in areas such: access to technologies and services, education, employment, health and functional rehabilitation, transportation, independent living and recreation (www.supera.org.pt).
Encontrar+se	PT	It is a non-profit private social solidarity institution, which emerges from the need of develop solutions for the problems faced in the development, implementation, evaluation and research of appropriate responses to the particular needs of people with severe mental illness (www.encontrarse.pt).
Sociedade Portuguesa do Acidente Vascular Cerebral (SPAVC)	PT	It is a non-profit organization dedicated to improve prevention, reduce mortality, morbidity and handicap due to stroke as well as to promote research and education, through the creation of actions and support plans, contributing to health improvement in Portugal (www.spavc.org).
Abraço Completo- Associação Sénior/Portugal Sénior	PT	It has an interactive dynamic and functional electronic platform that supports the Portuguese senior. Through this platform the seniors can access to a wide range of information that cover the whole aspects of daily living, such as: direct access to information about public and private services; learn techniques that can help them to take care of themselves and their image, helping to improve their self-esteem. It also allows the relationship with others and the sharing of experiences (ww.portugalsenior.org).
Centro de Competências em Envelhecimento Ativo e Saudável da Universidade do Porto"	PT	Its mission is to promote quality and interdisciplinary in research and the development and innovation in the field of Active and Healthy Ageing (www.sigarra.up.pt).
Psychology Center of the University of Porto (CPUP)	PT	It brings together researchers from different areas of psychology with common interests in the study of human brain, mind and behavior, both in sickness as in health and well-being. Its main goal is to produce excellent research and educational and innovative clinical applications, contributing to the development of an inclusive society (www.sigarra.up.pt).
Instituto de Ciência e Inovação em Engenharia Mecânica e Engenharia Industrial (INEGI)	PT	It is an institute of new technologies, designed to carrying out research activity and technology-based innovation and the transfer of technology oriented to the industrial fabric (www.inegi.up.pt).
"Instituto de Engenharia de Sistemas e Computadores, Tecnologia e Ciência (INESC TEC)"	PT	Its activity aims to do scientific research and technological development, consulting and advanced training, as well as technology transfer and creation of new technology-based companies (www.inesc.pt).
Instituto de Investigação e Inovação em Saúde da Universidade do Porto	PT	The I3S consortium, headed by the University of Porto results from the collaboration between IBMC, INEB and IPATIMUP, encompassing joint projects, co-supervision of PhD students, sharing of large equipment and employment of research staff under coordinated policies. Six schools of the University of Porto and three hospitals also contribute to the activities of I3S. This combination creates an environment favorable for real breakthrough research and translation of discoveries into the clinic (www.norte2020.pt).
Laboratório de Processamento da Fala, Electroacústica, Sinais e Instrumentação (FEUP)	PT	It is a group of university teachers, researchers and students dedicated to create engineering solutions based on processing signals for problems in acoustic communication and electric mobility, with applications in accessibility, aging and services based on context.
Parque de Ciência e Tecnologia da Universidade do Porto (UPTEC)	PT	It is the basic support structure for knowledge transfer between the university and the market, designed to support the third mission of the University of Porto - the economic and social value of the knowledge generated. Promoting the creation of technology-based companies, scientific and creative and attracting national and international business innovation centers, UPTEC contribute sustainably to the growth of the North (www.uptec.up.pt).
Cidade dos Cuidados	PT	It is a center of expertise dedicated to the ecosystem of care, people with disabilities, addiction or other incapacity, and especially seniors. It will be the point of reference for anyone / professional that wants to investigate, learn, know, buy or hire a product or service in the area of care, health and welfare (www.cidadedoscuidados.pt).
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Diapotek, Gestão Terapêutica	PT	Its goal is add value to the service provided by nursing homes and provide individualized and personalized service to the healthcare institutions so that they have knowledge about the use of medications (www.diapotek.com).
Instituto Pedro Nunes (IPN)	PT	Created in 1991 through a University of Coimbra initiative, IPN is a non-profit private organization which promotes innovation and the transfer of technology, establishing the connection between the scientific and technological environment and the production sector (www.ipn.pt).
CeNTI - Centro Nanotecnologia Materiais Técnicos, Funcionais e Inteligentes	PT	It is an institute for new technologies, founded in 2006 by CITEVE, University of Minho, University of Porto, University of Aveiro and CTIC. CeNTI services take a multi-disciplinary approach and include the participation of experienced technologists and researchers (physicists, chemists, electronics/ chemical/materials engineers). It provides, in a business to business approach, applied R&D, engineering and scaling-up production of innovative smart materials and devices, with special focus in electronics, polymers, functional materials and products numerical optimization (www.centi.pt).
Fundação para a Ciência e Tecnologia (FCT)	PT	It is a national public agency that supports research in science, technology and innovation in all areas of knowledge (www.fct.pt).
Instituto de Engenharia de Sistemas e Computadores, Investigação e Desenvolvimento em Lisboa (INESC-ID)	PT	It is a R&D institute dedicated to advanced research and development in the fields of information technologies, electronics, communications and energy (www.inesc-id.pt).
Agência para a Sociedade do Conhecimento (UMIC)	PT	It is a Portuguese public agency with the mission of coordinating the policies for the information society and mobilizes it by promoting dissemination, qualification and research activities. Also aims to promote technological development and the creation of knowledge by entities of the scientific and technological system and companies, and stimulate the development of e-Science; promote the creation and social benefit of new knowledge and technology in emerging areas with high potential for wealth creation and employment, and improving the quality of life, in particular ICT, nanotechnology and AAL (www.umic.pt).
Centro Interdisciplinar para o Estudo da Performance Humana (CIPER)	PT	It studies the human motor function in a bio-ecological and multidisciplinary perspective, affirming it in the scientific, advanced training and knowledge transfer to the sports fabric, health and education, in collaboration with other units of R & D and institutions that interact in health (www.fmh.utl.pt).
Laboratory of Robotics and Engineering Systems (LARSyS)	PT	Its ultimate goal is to be actively involved in a new generation of research questions and advances training in Robotics and Engineering Systems, leading to new frontiers of knowledge and the training of skilled human resources at the best international level (www.larsys.pt).
Health Cluster Portugal	PT	Its main goal is the promotion and implementation of initiatives and activities leading to the consolidation of a national cluster for competitiveness, innovation and technology, with an international outlook, to promote and foster cooperation between companies, organizations, universities and public entities, with a view to increase business volume, exports and qualified employment, in the economic areas related to health and to the improvement of health care (www.healthportugal.com).
Ambient Assisted Living for All (ALL4ALL)	PT	AAL4ALL presents an idea for an answer through the development of an ecosystem of products and services for AAL associated to a business model and validated through large scale trial. It is an anchor project of the Health Cluster Portugal (www.aal4all.org).
Ageing Coimbra	PT	It is a consortium that values the role of the elderly in the society and the application of good practices on the support of their well-being and on the promotion of an active and healthy ageing. Its main objective is to improve the lives of senior citizens in the Central Region of Portugal through a better social service and health care, as well as the creation of new innovative products and services and the development of new diagnostics and therapeutics (www.ageingcoimbra.pt).
AIT – AAL	PT	The Austrian Institute of Technology conducts research in many different directions. One of their main topic is health and environment. They invent assistance systems which support elder people in their daily living.
Volkshilfe Österreich	AT	A non-profit association, which support many different social projects. One big topic of this organization is care, but also assistance actions in developing countries.
LIFEtool	AT	A non-profit organization from Linz developing different kind of software for people with a handicap. The 1998 founded company also provides free Consulting and Workshops for disabled people.
Essel Foundation	AT	This foundation was founded in 2008. They supporting people need. They also promote public about the necessity of helping and make supporting research.
BSVÖ	AT	BSVÖ is the biggest association in Austria for blind and visually handicapped people. They make different kind of public work. Another big function of this organization is the promoting of medical prevention and rehabilitation.
Österreichischer Seniorenbund	AT	A service central of the nine province senior organizations in Austria. It is a Non-profit-association, which has over 305 000 members.
Rehaklinik Wien Baumgarten	AT	A big rehabilitation center in Vienna located in the neighborhood to a hospital. This center is specialized for people with orthopedic and rheumatic complaints.
Österreichisches Rotes Kreuz	AT	This big organization provides different services for people which need care like home care. They are also involved in many projects like Active 80+ or PrepAge.
Die Johanniter	AT	It is an organization, which provide several services in different direction. One main topic of them is to support older adults. For example, it is possible to order home care, emergency care services.
Fonds soziales Wien	AT	On big task of this organization is to help and consult older adults and people with a handicap. They also provide offers for living accommodations for these people.
Caritas Österreich	AT	The Austrian Caritas is part of the Internationalis Caritas. In total the Austrian Caritas has nine sub-organisations. In the section of Vienna there are about 4400 people employed and about 10000 people work as volunteers for this organization.
Casa Leben im Alter	AT	It is a part organization of the caritas. They are the administrative body for about 25 nursing homes in Vienna. This institution was founded in 2003. Now there are over 1000 members employed.
Hilfswerk	AT	This organization has more than 1500 voluntary and non-voluntary employees. They offer different social services for young and old people. They help with senior flat sharing communities and support special day centres for seniors.

Diakonie	AT	The "Diakonie" is an Austrian organization for help in many different cases. They have about 600 locations in Austria. A big different of the "Diakonie" to other great Austrian helping organizations is, that they are not central organized and present themselves in each region in a changed way.
Malteser	AT	It is an international help organization. Overall there are about 2000 members in Austria, which are working on different projects and places. They have also nursing homes and hospices.
Österreichischer Herzverband	AT	This Austrian association support people, which have heart problems. They also promote information about prevention of heart attacks e.g.
Bundesinnung der Sanitär-, Heizungs- und Lüftungstechniker Österreichs	AT	This association represents the installers in Austria. It is the head organisation of the different parts of the provinces.
AIT – AAL	AT	The Austrian Institute of Technology conducts research in many different directions. One of their main topic is health and environment. They invent assistance systems which support elder people in their daily living.
Forschungsinstitut für Altersökonomie	AT	This institute was founded 2006. It carries out different research projects about the economy of ageing.
ÖPIA	AT	This Austrian research platform carries out different projects to the demographic change. They work on scientific sounded and political relevant strategies for the society.
ÖGDKA	AT	This is an association for dermatological and age research of skin.
AAL – AustriA	AT	That is an innovation platform for intelligent assistance in the daily living. This association was founded in 2012 to connect the Austrian AAL-community. This organization also wants to public the topic AAL at all levels of perception.
TU-Wien - AAT	AT	This part of the Vienna University of Technology is involved in different AAL R&D projects. One important focus of them are technical assistance systems like a smart fall detection.
FH Technikum Wien	AT	Multiple departments of this UAS in Vienna conduct research and development in AAL and Smart Home Technology. They have different research focuses. For example, they work on topics like eHealth and Mobility. There they are partner for many different companies.
ZSI (Centre for social innovation)	AT	The main aim of this Austrian Non-profit organization is to create sustainable innovations. It was founded in 1988. They are involved in different projects and provide many diverse services.
FH Campus Wien	AT	One section of this UAS in Vienna researches social work in AAL context. Their research focus is on Social Work Research, Youth and Families, Social Economy and Ambient Assisted Living.
Fachhochschule Kärnten	AT	At the UAS in Carinthia AAL research is covered by experts from the social department on different projects. They are working on topics like active and healthy ageing.
CTR Carinthian Tech Research AG	AT	That is the biggest extramural research institute in Carinthia. Their main focus is on sensor technology and automation. They make concepts, designs, prototypes, simulation, consulting, e.g.
Forschung Burgenland Ges.m.b.H	AT	This organisation is part of the UAS in Burgenland. One of their main research focuses is Health Service Management, that is including Ambient Assisted Living, and health promotion.
Upper Austrian Research	AT	It is the biggest research institute in Upper Austria. Their main topic is to create innovative new materials, which can be used in the medical and health sector. But they also research to the ICT-Sector.
Action with Communities in Cumbria	UK	Local charity supporting citizens lead groups in rural areas.
Age UK - Barrow	UK	Charity supporting older adults through services and advice.
Age UK - Carlisle and Eden	UK	Charity supporting older adults through services and advice.
Age UK - South Lakeland	UK	Charity supporting older adults through services and advice.
Age UK - West Cumbria	UK	Charity supporting older adults through services and advice.
Bolton Exchange	UK	Association for older people.
Brampton Community Association	UK	Association for older people.
Carlisle Carers Association	UK	Association for carers.
Eden Carers Association	UK	Association for carers.
West Cumbria Carers Association	UK	Association for carers.
Fairfood Carlisle	UK	Delivery of hot meals to older people.
Kendal Gateway Centre	UK	Support resource centre for older people
Northern Fells Group	UK	Support for communities in Northern Fells
Oaklea Trust	UK	Support services for older adults
Parkinsons UK - West Cumbria	UK	Association for people with Parkinsons,
Stroke Association	UK	Association for people with who have had strokes
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Stroke Association	UK	Association for people with who have had strokes
Carers UK	UK	Carers UK is a support organisation that represents the interest of carers.
Applied Universities of St. Gallen, Luzern (iHomeLab), ZHAW	CH	These three research institutes have been focusing on AAL and built up an expertise. They have been involved in many AAL projects and have close contact to end-user organizations as well as businesses in Switzerland
Genossenschaften/ Seniorenvereinigungen Schweiz	CH	Entrance to different organizations for the older adults.
Seniors for Seniors (in verschiedenen Orten angesiedelt)	CH	Informal support network organized by older adults for elderly.
Wohnbaugenossenschaften Schweiz	CH	Housing cooperation also with a strong focus on living in age.
Pro Senectute	CH	Consultancy for aging in general and support for older adults and their relatives when it comes to decide how and where to live in age, which support mechanisms make sense. The association is well-known and has branches in the cantons and their in many cities.
Spitex	CH	Formal home care service which is well known in Switzerland and exists in every canton. Performance varies between the cantons though.
Red Cross Switzerland	CH	Offers home care services and general support services.
Zeitvorsorge St. Gallen	CH	An example for a local care and support imitative which is publicly supported but based on individual contributions by people who want to spend now time and expect to get it back when they are in need themselves.
Alzheimervereinigung Schweiz	CH	The ALZ association is organized along the line of the canton and there they are community based. They work closely with most relevant institutions such as Memory Clinics. Here AAL has become an issue and technological support for the private homes is an issue too.
Curaviva	CH	The association represents the public healthcare and senior homes in Switzerland. They have their own journal and reflect on many different issues in the ageing debate. AAL has become an issue.
SeneSuisse	CH	The association represents the private healthcare and senior homes in Switzerland.
AgeStiftung	CH	Is a Swiss wide well known funding agency for end-user und community based project initiated and carried out by local and regional actors.
Almacasa	CH	Is an example for a small care facility provider with only two facilities, however very active in consultancy and with facilities integrating technological devices. Most recently they have established a Almacasa academy.
Tertianum	CH	Terianum is an elderly home and care facility provider most likely in the German speaking part of the country, close to the urbanized areas and a partner for the higher income.
Senevita	CH	Senevita is an elderly home and care facility provider who offers this service all over Switzerland. They are an interesting partner for people with a middle income.
Terz Stiftung	CH	terzStiftung is a Swiss foundation operating as a representative body for mature people and as a service provider in the market for older adults. Our community promotes a modern vision on ageing and helps to improve the quality of life after retirement.
Rajovita Stiftung	CH	The cities of Jona and Rapperswil at Lake Zurich have developed an integrated service for their aging society. They offer a service called “Drehscheibe” (seniors hub) where seniors and their relatives can ask for their advice.
Community Age Consultancies	CH	Many Swiss communes have started to hire consultants to support the community as well as the people living in the community in aging issues.
Thebe	NL	Thebe is a home care and service organization. They offers maternity care, home care and care in residential care centers. Thebes is found in several places in the Dutch province of Brabant (https://www.thebe.nl).
Seniorennet	NL	Main page with lots of info and useful links for active and retired older people (http://www.seniorennet.nl/).
Zuidzorg	NL	ZuidZorg offers care to different groups of people, they think it’s important that people can live comfortably at home even if they have physical problems (https://www.zuidzorg.nl).
Amaliazorg	NL	Amalia Care is an institution that provides care, housing and welfare for the elderly from five nursing homes in North Brabant. They assist people who live in assisted living homes in search of solutions to live independently as long as possible (http://www.amaliazorg.nl).

Archipel	NL	Archipel has a wide range of services in health care, welfare and housing. They work with general practitioners and other organizations in Eindhoven (http://www.archipelzorggroep.nl/home).
Zorggroep Sint Maarten	NL	Care Group St Maarten helps primarily elderly to maintain or improve quality of life. They achieve this by providing comprehensive care to you. Care Group St. Maarten has seventeen residential care locations across the Netherlands (http://www.zorggroepsintmaarten.nl).
Zorg Optimalisatie Noord-Holland (ZONH)	NL	ZONH is the partner for primary health care providers as well as for parties in care and welfare and the municipalities in the province of North Holland. ZONH works with these parties to enable accessible, sensible and efficient care for citizens in North Holland (http://www.zonh.nl).
Protestants Christelijke Ouderen Bond (PCOB)	NL	For 50 years already, the PCOB is one of the largest civil society organizations for seniors. Their mission is to promote self-reliance and act as service organization to represent more than 108,000 members. These members are spread throughout the Netherlands (http://www.pcob.nl).
Artrosezorg	NL	The mission of the Arthritis Foundation is the fight against arthritis and its effects in the Netherlands. The care of patients is the most important motive (http://www.artrosezorg.nl/).
Parkinson-Vereniging	NL	The Parkinson Association is the national information center for persons with Parkinson's disease. They aim to improve the quality of life of patients by improving care (https://www.parkinson-vereniging.nl/).
Alzheimer-Nederland	NL	Alzheimer Netherlands provides help and information to people with dementia and their immediate surroundings. They work closely with regional and national healthcare providers (http://www.alzheimer-nederland.nl/over-alzheimer-nederland.aspx).
Huisautomatisering	NL	Huisautomatisering is a platform where consumers can find ICT companies that can install the desired applications in home automation (https://www.huisautomatisering.nl/)
Zorgvoorbeter	NL	There is a lot of information about care, but it is fragmented across different websites and publications. At Zorgvoorbeter this knowledge is bundled with reliable and timely information that health care workers can use in practice (http://www.zorgvoorbeter.nl/).
Mantelzorg	NL	Caregiver Central is a professional organization for all caregivers and aims to support caregivers to provide information, advice, support and personal counseling (http://www.mantelzorg.info/).
OKRA	BE	Association of elderly; grassroots organisation offering a variety of services to members (Flanders). Linked to one of the major health insurers.
ENEO	BE	Association of elderly; grassroots organisation offering a variety of services to members (French-speaking region). Linked to one of the major health insurers.
ALS-loga België	BE	Patient organization for patients with ALS
Alzheimer liga Vlaanderen vzw	BE	Patient organization for dementia
NEMA vzw	BE	Patient association for neuro-muscular diseases
King Baudouin Foundation	BE	Charity that supports various initiatives linked to ageing, e.g. dementia-friendly cities and municipalities, thinking earlier about later, …
Vlaamse Parkinsonliga	BE	Patient organization for Parkinson
CAS	BE	Coordination of association of seniors (Walloon region).
Asbl aidants-proches	BE	National Association of informal caregivers (French-speaking)
Ligue Alzheimer	BE	French-speaking association to support patients and families. Runs a telephone helpline and various Alzheimer Cafés.
AAL2B – Business and AAL research		
Fraunhofer Portugal	PT	It is a non-profit private association founded by Fraunhofer-Gesellschaft, the largest organization for applied research in Europe. “Fraunhofer Portugal” aims on the creation of scientific knowledge capable of generating added value to its clients and partners, exploring technology innovations oriented towards economic growth, the social well-being and the improvement of the quality of life of its end-users (www.fraunhofer.pt).
ProASolutions.pt – Arquitetura, Gestão de Acessibilidades e Mobilidade, Lda.	PT	It is a consulting company in architecture, urban planning, accessibility, mobility, and Design for All. The projects of the company are developed in a multidisciplinary perspective; integrating public and customer participation as a co-creating element and taking account the criteria of “Design for All”. They believe that all people should participate equally in the environments and activities of human habitat through the promotion of universal access. It performs consulting service in the field of disability, rehabilitation and elderly (www.proasolutions.pt).
ISA - Intelligent Sensing Anywhere	PT	Its mission is to offer products and remote metering intelligent solutions that meet the needs for information, management and optimization, in real time, in the Oil, Energy, Environment, Transport, Security and Health Security and Automation markets, contributing significantly to the creation of sustainable value throughout the world (www.isasensing.com).
Exatronic	PT	Having as starting point a simple idea or concept, this company carries out the technical viability analysis, build the whole R&D process, manufacture the solution and finish by delivering the new product. As leader in electronics solutions, Exatronic combines fine skills in order to vertically conduct research and technological development processes, create tailor-made products with added value, incorporate value and optimize manufacturing processes (www.exatronic.pt).
INOV	PT	Arises in the course of an extensive process of restructuring initiated by INESC. INOV provides an agile and flexible organization, oriented to creating technological skills and establishing cooperation links with various economic entities (universities, industries, companies and Telecommunications Operators). INOV intends to act as an intermediary

		between the University and the Industry, basing on the dedicated cooperation with the University in order to provide sustained, consistent and innovative solutions addressing the problems and challenges faced by its partners (www.inov.pt).
Altice Labs	PT	Its mission is to support customers in building technological innovation and value creation by offering them the most advanced and differentiating solutions. Altice Labs is a key driver of change and innovation, to improve the lives of people and businesses, through technology, services and operations (www.alticelabs.com).
ProcessNet Sistemas de Informação	PT	Its mission is provide innovative services based on technologies able to streamline, relocate and reinvent the organizations business processes and create economic and social value (www.processnet.pt).
Invacare	PT	The goal of Invacare is to ensure that users, clinicians and clients receive the best selection of products, services and training. Invacare is able to: Provide the most mobility needs, and a broad variety of care products for home and institutions; Provide an increased range of support services, including clinical service and technical training, product communication, quality services and digital communication (www.invacare.pt).
Sunrise Medical	PT	It is the world leader in the development, design, manufacture and distribution of manual and electric wheelchairs, scooters and sitting positioning systems (www.sunrisemedical.pt).
Critical Software	PT	It is specialized in developing software solutions and information engineering services to support critical systems oriented to safety, mission and business companies (www.criticalsoftware.com).
Mobilitec	PT	It provides support products for people with reduced mobility (www.mobilitec.pt).
JMS	PT	It is dedicated to the manufacture and commercialization of Hospital and Geriatric Equipment (www.jmshospitalar.com).
Criavision	PT	It is dedicated to the: development of automation solutions, robotics, artificial vision, nanotechnology, surveillance, biometrics and intelligent systems; commercialization and representation of equipment's, products, instrumentation and control, communication, electronics and software; services provision technical assistance and consulting for industrial and non-industrial applications (www.gescontact.pt/criavision).
Sensing Future	PT	*It design, develop and implement technological medical devices in a unique synergy between engineering and health, created by professionals with great experience (www.sensingfuture.pt).*
HIS, e-Health Innovation Systems	PT	It is a company dedicated specifically to the sector of Information Systems and Technologies in Health area (www.his.pt).
Artificial perception team for intelligent systems and robotics (AP4ISR)	PT	The AP4ISR team aims to improve quality of life by enabling robots and intelligent systems with the perceptual and cognitive capabilities of the future (www.ap.isr.uc.pt).
Omron	PT	It is a global leader in the field of automation. It provides a variety of products and services in the fields of industrial automation, electronic component industries and healthcare (www.omron.pt).
PluX	PT	It creates innovative products for physiotherapists and researchers, by developing an advanced bio signal monitoring platform that integrates wearable body sensors such as electromyography, electrocardiography, respiration, and accelerometers combined with wireless connectivity and software applications (www.plux.info).
Enermeter	PT	It is a technological based company working in the development of innovative solutions on metering and artificial vision sectors (www.enermeter.pt).
Healthy Systems	PT	Its main objective is to promote security and robustness on its customers Information Systems and Networking Infrastructures. Its products and services include security optimizations systems, level of service agreements certification, database semantic integrity checking and data quality real time monitoring, network services optimization, comprehensive security auditing and information technology related legal counseling (www.healthysystems.pt).
Virtual Care	PT	It is a company dedicated to the development of quality and innovative clinical applications and also does consulting and training (www.virtualcare.pt).
Intellicare	PT	"Intellicare" ambition is to be a world known player in specialized technology to enable "ageing well" with home services by combining health biomarkers, environmental data, context awareness and artificial intelligence (www.intellicare.pt).
Medtronic Portugal	PT	It provides solutions that alleviate pain, reestablish health and prolong the lives of millions of people around the world (www.medtronic.pt).
Ultrawise	PT	This company develops integrated medical management solutions with a strong technological component, and their main action areas are software development, web design, mobile apps and consulting. "UltraWise" develops standard products and other customized solutions adapted to the specific needs of their clients focusing in particular upon design, usability and connectivity (www.ultrawise.pt).
Alert Life Sciences Computing	PT	It is exclusively dedicated to the creation of an all-encompassing software solution for the complete computerization of healthcare in entire countries, hospitals and primary care centers, all the way to the level of individual patient records (www.alert-online.com).
Altran Portugal	PT	It is present in various industry sectors such as financial, telecommunications & media, public administration, industry, energy & life sciences, intelligent systems eUtilities, and its activity is based on the sale of innovative solutions (www.altran.pt).
Prosegur	PT	It is a multinational company that provides global and integral security solutions adapted to the customer needs. This company is aware of the elderly lifestyle, as it develops special solutions so they can live alone and remain independent (www.prosegur.pt).
Telfax	PT	It commercializes supportive equipment to old people, bedridden or people who live alone so that in case of an emergency they can call for help by pressing a button (www.telfax.pt).
Lojatek	PT	It is a trade online website of technology and electronic products which main activity is based on the development and commercialization of integrated solutions according to the client's needs (www.lojatek.pt.

Focalsystem	PT	It is a company specialized in security systems, automations and services with an extensive experience in these sectors (www.focalsystem.pt).
Tcare - Conhecimento e Saúde, S.A.	PT	It is a pioneer company in the emerging telemedicine market, starting its commercial activities in 2009. Currently provides services in the areas of "Telemedicine" and "Tele-Care for the Elderly" based on technologies and equipment's internationally certificate, combining knowledge and techniques in areas of health, information and communication (www.tcare.pt).
Vivermais.pt	PT	It is a company that has a range of products that facilitate the daily lives of people who, due to the inevitable consequences of a longer life, lost some physical and motor skills (www.vivermais.pt).
Artsensor - Soluções de segurança	PT	It is an experienced and dynamic company that performs in electronic security field (www.artsensor.pt).
Digi-Key	PT	It is one of the fastest growing distributors of electronic components in the world. "Digi-Key" ships products to more than 170 countries worldwide, including Portugal (www.digikey.com).
Vivago	PT	It was established in 1994 to develop, sell and market automatic safety solutions that can also monitor well-being and functional ability. Its solutions can cover nurse call systems, automatic alarm systems, wandering detection and continuous well-being monitoring (www.vivago.com).
InforSolutions	PT	It is a private and independent company, dedicated to the development and trade of equipment, services and technological solutions. It offers a wide range of technological solutions for GSM control (www.inforsolutions.pt).
Segurança online	PT	It aims to provide access to the security expert information and assist all stakeholders who work in this sector (www.segurancaonline.com).
Alarmes48, Lda.	PT	It started its activity in 1999, dedicated to the installation of security systems and all activities related to it (www.alarmes48.com).
Key Vision	PT	They are experts in software and management and offer the best solutions for location systems (www.keyvision.pt).
IncreaseTime	PT	It develops health care solutions based on ICT and wireless sensors networks for the domestic market or care homes. Its solutions allow a permanent monitoring of old people health state and, through a leading edge alarm system, it allow a quick intervention in case of an emergency (www.increasetime.pt).
Loja do Avô	PT	It is a privileged space for the senior population. It was created with the purpose to help and support with professionalism, security and comprehension, the seniors and their families. Its philosophy is to improve the comfort and quality of life of older people through its products and services (www.alojadoavo.pt).
Anditec	PT	It is a company exclusively dedicated to Assistive Technology. With the help of special education and rehabilitation professionals, it aims to continue to develop pioneering work, with particular emphasis in the fields of augmentative communication, interfaces and integrated software solutions, environmental control and mobility (www.anditec.pt).
AC CAT	PT	It is an online store that responds to the needs expressed by citizens, improving access to products and services tailored to people with disabilities, contributing to a better inclusion in school and in society (www.ac-cat.com).
Nourish Care	PT	It works closely with care providers, local health and social care organizations, as well as families and communities to improve how care is managed, delivered, monitored and improved. Its game-changing mobile and cloud applications for care are designed to make care management more effective, care work more satisfying, and staying in touch with loved ones simpler and more reassuring (www.nourishcare.co).
S4S (Smartphones for seniors)	PT	It's a collaborative R&D project coordinated by Microsoft, which aims to provide more adapted technology to the senior population in mobile scenarios, by customizing the user interfaces of the basic functions of a Windows Phone 7 smartphone. The goal is to consider a scope of apps/services (allowing information on: pharmacies' locations and working hours, dictionary, weather and trip advisor/planner), as well as services of a more personal nature (reminders and management of electronic prescript medications, list of tasks, schedules and reminders made by either the senior, their family members or their caregivers, 'take me home,' with directions on how to return home or how to ask for help; 'my diet', with information on nutrition, food and recipes recommended) and playful applications for entertainment purposes, such as word games, chess and games such as on-line "quizzes" (www.smart4seniors.org).
Silincode	PT	Silincode formed a multidisciplinary group with different specialists in several work areas to develop solutions to respond to these needs. This collaboration produced a selection of products that allow the user to merge all the information and share it with the social and job network easily and quickly also offering support for medical and health services (www.silincode.com).
Indra	PT	It is a world leader in the development of integrated technological solutions in areas such as defence & security, transport & traffic, energy and industry, telecommunications and media, financial services, and public and health administration (www.indracompany.com).
Olisipo	PT	It is company specialized in recruitment and professional career management in the area of Information Technology (www.olisipo.pt).
CERTIC - Centro de Engenharia de Reabilitação e Acessibilidade	PT	Develops its activity oriented to the application of science and technology in improving the quality of life of people with special needs, including people with disabilities (www.acessibilidade.net).
Estou protegido	PT	It is a company formed by a multidisciplinary team of security professionals, which sells online products, with specific solutions for seniors (www.estouprotegido.com).
Associação Portuguesa de Segurança (APSEI)	PT	Founded in 2006, represents companies and fire safety professionals, electronic security and health at work (www.apsei.org.pt).
bständig	AT	It is an Austrian family business which was founded in 1912. They sell many kinds of health and care products.
Lifta	AT	That is a company which develops and sells many different types of stair lifts. They are the market leader in the German-speaking Area by selling stair lifts.
Beko	AT	It is a company with over 700 employees. They develop innovative product und try to enable more efficient processes for all sorts of customary. A special project of them is the creating of smart homes.
Pro-Ipso	AT	They develop different solutions for handicapped to be featured in accessible kitchens.

Barrierefreiesbauen.at	AT	That is an architectural practice which has specialized to create handicapped accessible homes. They also provide workshops and other events for different kind of companies.
Universaldesign	AT	It is an architectural practice. One of their mean topics is accessibility.
Sozialwerk St. Georg	AT	This association help especially people with a handicap. They are focused to integrate them as much as possible in the daily live.
SOBIT	AT	This small company create different kinds of software solutions. SOBIT has focus on the sector health and care. They also make Consulting.
Lehmann Elektronik GmbH	AT	It is a company which commercial AAL Profiline Products. They deliver wholesalers but also the endcustomers.
design for all	AT	It is an Austrian association. They have members which are experts in many different topics like industry development or technology. One goal of them is, to create new possibilities for handicapped accessible homes.
alumat	AT	That company develop and install magnetic seals for doors. This kind of seal is an ideal solution for barrier-free homes.
Atelier bauwerk	AT	It is an engineering office. They are specialized to evaluate homes und to create new concepts for barrier-free homes.
RehaPoint	AT	That company commercializes different kind of products which help especially older adults. The main focus of these products is the sanitary rooms.
KEUCO	AT	It is a company which develop different solutions for handicapped accessible bathrooms.
Günther Veigl GmbH	AT	That is an Austrian company which have focused to develop different bathroom solutions. One of their mean topics is accessibility.
Comfort 4 all	AT	That is an Austrian consulting company. They hold lectures and organize many events about accessibility and other topics in this direction.
geemarc	AT	Geemarc develop and commercial products for people with visual and hearing impairment. In this sector they have the greatest variety on the market. They also sell different product to simplify an emergency call for seniors.
Bellman & Symfon	AT	They are specialized to develop and sell products for people which have a hearing loss.
amplicomms	AT	This company commercial fixed phones and mobile phones for people which have a handicap.
dukaPC GmbH	AT	DukaPC provides computers, which are made especially for seniors. The usage of the computers is very simplified. They also offer a special trained customer service
Siemens	AT	This big company has many product fields. One of them is the development of hearing aids. https://www.bestsound-technology.de/siemens-hoergeraete/ Another big business line of them are smart homes. They find solution for good accessibility home which are also energy efficient. http://www.buildingtechnologies.siemens.com/bt/global/de/Seiten/home.aspx
Proflex	AT	Proflex develops and sells many different kind of products for seniors. They offer stairs lifts, diverse bathroom helps and also electronic wheel chairs. Overall they are one of the greatest provider in Austria for senior products.
Transdanubia	AT	This company offers different kind of services special for people with visual impairment. They are founded in 1987 and now they are the leader of the market in Austria.
Future Shape	AT	It is a company which provide different kind of sensor systems. They can be used to help with care activities or to protect seniors.
RWE Smarthome	AT	It is a company which develop different equipment and apps for Smart Homes. So it is possible to create a network with many apparatuses. They are controlled via Smartphone
Philips	AT	That is a big company which has many different product fields. They also develop different equipment especially for elder people.
Ottobock.	AT	This company does research and development on various kinds of products for handicapped people. They also commercialize their produce. Some examples therefore are several prosthesis, wheelchairs and bandages.
Bosch Healthcare Solutions GmbH	AT	This company is the leading provider for Emergency-Call-Systems in Europe. They also have a large spectrum of products that help older adults living independently. This company also performs different kinds of research and development projects.
VAMED	AT	This big company provides different equipment for hospitals. They also help to plan new medical centers. Their business areas are Wellness & Prevention, acute care, aftercare & rehabilitation, care.
Die Post	CH	The Swiss Post has started to develop special services for older adults and highly relies on technical assistant services.
Swisscom	CH	Swisscom has an AAL strategy and security products on the market.
Smart Living Labs	CH	Several small and middlesize labs – university based – introduced their developments and products on the market.
DomoSafety	CH	Is a Swiss AAL-project product on the market and available to purchase. The company offers all-inclusive services.
Compliant Concept	CH	Develops products for care facilities in the area of monitoring and mobilization systems
Dirkse Anders Zorgen (DAZ)	NL	DAZ is an agency specialized in healthcare innovation. They support healthcare providers, client organizations, professional associations, trade associations, public authorities and housing associations in the development and implementation of innovative projects. In different ways DAZ actively contributes to the dissemination of (care) innovations (http://www.anderszorgen.nl).
Ouderenfonds	NL	The Elderly fund is a national charity foundation exclusively for vulnerable older adults in the Netherlands. They provide the means to combat loneliness, increase safety, promote proper care and active healthy aging (https://www.ouderenfonds.nl).
Nationaal ICT Instituut in de Zorg (NICTIZ)	NL	Foundation NICTIZ is the center of expertise for standardization and eHealth. Nictiz is seeking better health through better information. They support the field of healthcare in using ICT to improve the quality and efficiency in healthcare (https://www.nictiz.nl).
Kennis Centrum Wonen Zorg (KCWZ)	NL	The Aedes Actiz Knowledge Housing-Care (KCWZ) is the information point for professionals in the areas of housing, welfare and care. They disseminate specific information on various topics, such as: trends in residential care, ICT solution for elderly, laws and regulations (http://www.kenniscentrumwonenzorg.nl).

Electronic Commerce Platform (ECP)	NL	ECP is a Dutch information society platform where government, business and civil society work together and share knowledge with a view to the application of information and communication technologies in Dutch society (https://ecp.nl/).
Doorbraakmetdezorg	NL	People who need care often do not know what the possibilities are. Information about possibilities is not centrally accessible and do not provide good user reviews. There is also a lack of enough choices for technological innovations. 'carebreakthrough' aims to overcome these and other obstacles, thus promoting the scaling up of innovative ICT solutions (http://www.doorbraakmetdezorg.nl/).
Revahulp	NL	Revahulp sells rehabilitation aids (https://www.revahulp.nl).
Orthocor	NL	Orthocor is an orthopedic company with 25 years of experience. They provide a wide range of orthopedic and medical devices (http://www.orthocor.nl/).
Medipoint	NL	Medipoint is the largest provider of health and wellness products in the Netherlands. At Medipoint people can find services regarding care demands, personal advice and tools which can be lend, rented or bought (https://www.medipoint.nl/icare/).
Thuiscomfort	NL	'Homecomfort' informs people that want to live independently as long as possible, they people with concrete solutions and the latest news in terms of comfort, safety and customized living (https://thuiscomfort.nl/home/over-thuiscomfort.html).
Handiglangerthuiswonen	NL	'Livinglongerathome' helps people to live longer and to continue to live safely in familiar environments (http://www.handiglangerthuiswonen.nl).
Lekkerblijvenwonen	NL	'styingathome' shows numerous small and larger interventions that provide additional convenience to stay at home as long as possible to live in their own comfortable home (https://www.lekkerblijvenwonen.nl/).
Dezorgprofessional	NL	Care-Community was established in October 2015 to better represent the interests of all care-freelancers. They offer regular meeting to communicate current information and related backgrounds (https://www.dezorgprofessional.nl/).
AGE-platform	NL	AGE a European network of more than 150 organisations of and for people aged 50+. Our work focuses on a wide range of policy areas that impact on older and retired people. Membership is open only to non-profit-making organizations (http://www.age-platform.eu).
AAATE	NL	Association for the Advancement of Assistive Technology in Europe (http://aaate.net/).
Espria	NL	Espria is an umbrella organization in the Netherlands that shares innovations with caregivers, municipalities, corporations, doctors, welfare organizations, insurance companies and pension funds. In addition, the connection and cooperation with universities and research institutes is used for exchange of knowledge, testing and support of insights, inspiration and renewal (https://www.espria.nl/over-ons/missie).
LiCaLab	BE	Living and Care Lab, a living lab created with the support of the Flemish authorities. Active in the region "Kempen".
Online Buurten	BE	A living lab created with the support of the Flemish authorities. Active in the province of West Flanders.
InnovAge	BE	A living lab created with the support of the Flemish authorities. Active in the area of Leuven.
Actief Zorgzame buurten	BE	A living lab created with the support of the Flemish authorities. Active in the cities of Antwerp and Brussels.
Careville - Limburg	BE	A living lab created with the support of the Flemish authorities. Active in the province of Limburg.
Ageing in place	BE	A living lab created with the support of the Flemish authorities. Active in the region of Aalst.
Zorgnet-Icuro	BE	The largest association of care organisations from the social profit sector in Flanders. Includes hospitals as well as elederly care and mental health institutions.
Zorgbedrijf Antwerpen	BE	A large care organisation that runs a network of facilities in the city of Antwerp. This includes home care and residential care services. Is actively searching for innovative services and solutions.
Kenniscentrum Woonzorg Brussel	BE	Knowledge centre that provides technical assistance. Concentrates on living solutions for the elderly and on the city of Brussels.
Cubigo	BE	Start-up company developing ICT based solutions for the care sector. Involved in various pilot projects. Are focusing on integration and empowerment.
VUB – research group iCHER	BE	Part of the public health faculty, an interuniversity research group on health economics research; part of the scientific board of the flemish care labs.
VUB - Gerontology	BE	University team part of the scientific board of the flemish care labs, living labs for elderly care.
Wit-Gele Kruis / Croix Jaune et Blanche	BE	Large network for medical home care. Covers a large part of the country. Is linked to the largest health insurer.
Assist	BE	A network of shops with a supply of assistive products. Covers parts of Flanders. Same organisations runs a network of pharmacies.
UCL – University of Louvain	BE	Various research teams involved. One example is public health, also in charge of evaluating pilot projects for proximity care for RIZIV-INAMI.
Solidariteit voor het gezin	BE	Home care service provider, including medical care. Social profit organisation.
Caritas	BE	Large organisation with diversified services in care.
Voka Health Community	BE	Network created by a large employer federation (Flanders). Groups most companies active in ageing.
Familiehulp	BE	Large supplier of homecare services. Social profit organisation.
ADMR	BE	Large supplier of homecare services concentrating on rural areas.
PROF	BE	PRoF is a cooperation of interdisciplinary professionals (care, medical, companies, universities, etc.) envisioning the evolution of care systems. Runs a lifelong test home in city of Aalst.
Expertisecentrum dementie Vlaanderen	BE	Network of expert and knowledge centres on dementia across Flanders.
Haelvoet	BE	Industrial company with an offer of products for the care sector.
Epicura	BE	Network of care institutions

Senior Living Group	BE	Private network of 50+ residential care facilities and assisted living.
Blue Assist	BE	BlueAssist is a social profit company proposing a simple system, on card or phone, for anyone with a disability to help them to communicate when out in the community.
Bioville	BE	health & care incubator on the university campus of Hasselt University
AAL2G – Governmental, Public and Health Care Engagement in AAL		
Associação Portuguesa de Psicogerontologia (APP)	PT	In 1998 four psychiatrists' members of the Portuguese Association of Gerontopsychiatry (APG), joined forces to form a non-profit association dedicated to bio-psychological and social issues related to old people (www.app.com.pt).
Ordem dos Médicos	PT	Its mission is to defend the medicine in Portugal, in particular the quality, independence and regulation of medical practice and it validates and ensures the certification of physicians, the quality of their clinical practice, as well as their education and continuous assessment (www.ordemdosmedicos.pt).
Ordem dos Engenheiros	PT	Has as functions assign the title of Engineer and regulate the profession; defend the interests, rights and privileges of the Engineers, protecting the respective title and profession; defend the dignity and prestige of the profession; develop engineering formation (www.ordemengenheiros.pt).
Ordem dos Psicólogos Portuguesa (OPP)	PT	It is an association that represents the psychologists in Portugal (www.ordemdospsicologos.pt).
Ordem dos Enfermeiros (OE)	PT	It is an association that gathers all nursing professionals working in Portugal (www.ordemenfermeiros.pt).
Confederação Nacional das Instituições de Solidariedade (CNIS)	PT	It is the main representative organization of private social solidarity institutions in Portugal and tries to motivate institutions in the search of quality and modernization, with the necessary qualification of the agents that make up the universe of institutions (www.novo.cnis.pt).
Instituto da Segurança Social	PT	It is a system that aims to ensure the basic rights of citizens and equal opportunities for everybody, as well as the promotion of well-being and social cohesion for all Portuguese citizens or foreigners (www.seg-social.pt).
Direção Geral de Saúde (DGS)	PT	It is a central department of the Ministry of Health, integrated in the direct administration of the State, with administrative autonomy. Its mission is regulate, guide and coordinate activities to promote health and disease prevention, defining the technical conditions for the appropriate provision of health care, planning national policies for quality in the health system and ensures the development and implementation of the National Health Plan (www.dgs.pt).
Associação Nacional de Cuidado e Saúde (ANCS)	PT	It is a Portuguese non-profit association, which aims to provide to older people a longer, healthier and happier life. Their mission is to help local institutions to provide a more complete support to more people, in an economically sustainable way (www.ancs.pt).
União das Misericórdias Portuguesas (UMP)	PT	It was established in 1976 to guide, coordinate, stimulate and represent the "Santas Casas de Misericórdia" spread across all country, defending their interests and organizing services of common interest (www.ump.pt).
ARS Norte (Associação Regional de Saúde do Norte)	PT	Its mission is to ensure to the North Region's population the access to the provision of health care, adapting the available resources to the needs of them, implementing health policies and programs in its intervention area (www.arsnorte.min-saude.pt).
Administração Central do Sistema de Saúde (ACSS)	PT	Its mission is to: ensure the management of financial and human resources of the Ministry of Health and the National Health Service; initiate the development and implementation of policies, standardization, regulation and integrated planning in health; promote innovation and efficiency in the National Health System (www.acss.min-saude.pt).
União Distrital das Instituições Particulares de Solidariedade Social (UDIPSS-PORTO)	PT	It is an intermediate structure of the CNIS and represents approximately 370 Private Social Solidarity Institutions of the district of Porto, supporting them in the development of their activity and their social responses, through the provided services (www.udipss-porto.org).
Câmara Municipal do Porto	PT	It is the administrative body of the municipality of Porto. Has executive functions and is elected by universal suffrage from voters residing and registered in the municipal area (www.cm-porto.pt).
Centro Hospitalar São João (CHSJ)	PT	Is placed in Porto and provides direct assistance to the population of Bonfim, Paranhos, Campanhã and Aldoar, inside the municipality of Porto, as well as the municipalities of Maia and Valongo. Its mission is to provide the best healthcare, with high levels of competence, excellence and rigor, encouraging pre and post-graduate training and research, while respecting the principle of humanization and promoting a feeling of belonging for all professionals (www.portal-chsj.min-saude.pt).
Centro Hospitalar do Porto	PT	It is a central university hospital, because of its association with the ICBAS. Its mission is to provide humanized and competitive healthcare, promoting coordination with other system partners, the improvement of pre and post-graduate and professional training, the promotion and encouragement of research and the scientific development in the health area (www.chporto.pt).
Linha do Cidadão Idoso	PT	It is a free telephone line for elderly population with problems. It aims to inform them about their rights and support in areas such as health, social security, housing equipment and services (www.provedor-jus.pt).
TIO - Terceira Idade Online	PT	It is a communication platform for seniors and professionals working in the area of aging. Encourages the sharing of interests and experiences (www.projetotio.net).
Ärztekammer für Wien	AT	This medical chamber represents the doctors in Vienna. (http://www.aekwien.at/)
Österreichischer Gesundheits- und Krankenpflegeverband	AT	It is an association which represent several care professions. The main aim of this organization is the guarantee of high quality in care activities and to promote the interests of care helpers public.
BÖC	AT	It is the most important association which represent the Austrian surgeons. They organize different Workshops and events for this profession and promote their interests public.

ÖHKV	AT	This association represent the Austrian spas and health resorts. It was founded in 1908 and represent the interests the 152 spas e.g. in Austria. They also have different kind of information for members and visitors.
NÖ Landeskliniken Holding	AT	This organization is responsible for 27 hospitals in Lower Austria. One main aim of the is to guarantee high quality and the security of supply. Overall the clinics of the Holding employ about 20500 staff members.
Wiener Krankenanstaltenverbund	AT	It is the head organization of over 20 hospitals and nursing homes in Vienna. It employs about 30 000 people.
Österreichischer Verband für Elektrotechnik	AT	The main goal for this association is the safety use of electric equipment. Therefore, they made several safety regulations and support the standardization in electronics.
AGES	AT	The Austrian agency for health and food security was founded in 2002. They assist federal ministries in topics among others public health, animal health and pharmaceutical drug safety.
Gesundheit Österreich GmbH	AT	This is the national research institute for healthcare in Austria. It is a promotional agency and also a quality assurance instance for this sector. This organization exists since 2006.
Gesundheitsministerium	AT	That is the Federal Ministry for Health and Women. They have different controlling and quality assurance tasks. Another function of this institute is to inform the public about important health topics.
SBFI	CH	State Secretariat for Education, Research and Innovaiton SERI is the supporter and facilitator of AAL in Switzerland on a national level.
Helsana	CH	A health insurance supporting strategies and services in the field of better and saver living
Sanitas	CH	A health insurance focusing assisting technology and discussing e.g robotics.
Kanton Aargau	CH	One of various cantons in Switzerland who support AAL-related projects.
Rijksoverheid	NL	Rijksoverheid is the governmental authority of the 11 ministries in the Netherlands. Ministries, among other things, propose legislation, rules and determine policies (https://www.rijksoverheid.nl/onderwerpen/ouderenzorg/inhoud/ouderen-langer-zelfstandig-wonen).
WMO	NL	Municipalities must ensure that people can continue to live at home as long as possible. Municipalities provide home support through the Social Support Act (WMO) (http://wmo.startpagina.nl/).
Zorgverzekeraars Nederland (ZN)	NL	ZN represents the interests of all insurers. The association aims to support insurers in their mission: to achieve good, affordable and accessible care for all insured persons, aimed at promoting health and quality of life (https://www.zn.nl/).
Sociale Verzekerings Bank (SVB)	NL	SVB conducts laws and regulations of the government in the Netherlands and processes personal budgets (https://www.svb.nl/int/nl/).
RIZIV - INAMI	BE	National agency in charge of managing the health insurance system.
FOD Volksgezondheid / SPF Santé publique	BE	National ministry in charge of public health
AVIQ	BE	Walloon agency in charge of public health, including prevention and care at home. (equivalent of a Ministry)
Flanders Care	BE	Flanders' Care is a project of the Flemish Governement with its mission being to measurably improve the offering of quality care through innovation and to stimulate responsible entrepreneurship in the care economy. Its objective is to develop and implement innovative breakthroughs in all forms of care.
i-Minds	BE	Research and innovation centre, financed by the Flemmish authorities, to develop and promote digital applications.
Flemish agency for care and health	BE	The Flemish Agency for Care and Health develops and implements the health policy of the Flemish community. It is part of the Flemish Ministry for Welfare, Public Health and Family.
KCE	BE	Expert and knowledge centre linked to the federal government, in charge of advising policymakers on decisions relating to health care and health insurance. Acts as a HTA.
Socialist health insurers	BE	Health insurers (mutualities) are membership based organisations. Their role in the landscape is gradually changing, they start differentiating their offer, some do control care organisations and networks.
FIH	BE	Federation of the hospitals (Walloon region)
VVSG	BE	Umbrella organization of the Flemmish cities and municipalities. Active in stimulating innovation and exchanges of good practice.
Union des Villes et des Communes de Wallonie	BE	Same as above, but for the Walloon region.
SSMG	BE	Scientific society and association of general practitioners.
UNIPSO	BE	Federation of employers of the social profit sector – Walloon region.
Lifetech Valley	BE	A regional organisation to promote innovation and economic cluster in healthy and active ageing in the province of Limburg.