A Multi-perspective View on AAL Stakeholders' Needs
A User-centred Requirement Analysis for the Activeadvice European Project

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Abstract: This paper discusses the process of including a multi-perspective view on stakeholders' needs into a specific project, namely the European project ActiveAdvice. It highlights the factors supporting and hindering the development and the implementation of the ActiveAdvice platform – as an integrated communication tool targeted at bridging the gaps between AAL stakeholders by facilitating cooperation and information exchange – regarding user requirements, preferences, acceptances and expectations. For this, a qualitative study was carried out, taking into account not only the older adults as primary end-users but the whole AAL stakeholder ecosystem. 23 semi-structured interviews with stakeholders of different groups – older adults and their relatives, business as well as government representatives – were conducted. The results show that even though different stakeholders can have conflicting needs, e.g. regarding online communication or feedback, those can be integrated into the requirements analysis, thus including the whole stakeholder ecosystem in the designing process. Furthermore, all three included stakeholder groups agree on the importance of raising awareness of AAL solutions, technologies and products. In including not only consumers but other secondary and tertiary stakeholders as well, ActiveAdvice has the chance to reach a broader audience and thus raise public awareness of AAL.

1 INTRODUCTION

The emergency of political, economic, and social challenges resulting from the current unprecedented phenomenon of population ageing led many countries to invest in policies that promote ageing in place while maintaining healthier and independent lifestyles (AAL Programme, 2014; Vasunilashorn et al., 2012). Frequently, policies designed with this purpose focus on the use of Information and Communication Technology (ICT) and, more precisely, on Ambient/Active Assisted Living (AAL) technologies. Nevertheless, numerous constraints have been found in the implementation of AAL, namely associated with a lack of user-centred design and low adherence by end-users (Doyle et al., 2013; Michel & Franco, 2014; Peek et al., 2014); business sustainability problems (Ehrenhard et al., 2014); absence of interoperability between systems (Balta-Ozkan et al., 2013; Ehrenhard, et al., 2014; Perumal et al., 2011); and

limited evidence on interactions between technology and society, on technologies' impact and their cost-effectiveness (Balta-Ozkan et al., 2013; Graybill, McMeekin & Wildman, 2014). These, among other constraints, suggest the need for better approaches for conceiving new technological developments. In particular, the requisite of involving multiple stakeholders with heterogeneous competencies, interests and needs in technological development contributes to the abovementioned scenario. A close involvement of end-users is challenging and can be less successful when the user population is varied, thus requiring researchers to find successful strategies to motivate users and foment trust (Leonardi et al., 2008; Queirós et al., 2014).

Older adults have been identified as the main stakeholders of AAL technologies, yet including also people with disabilities, cognitive impairments or long-term diseases (Bygholm & Kanstrup, 2015; Calvaresi et al. 2016; Clark & McGee-Lennon, 2011; Marschollek et al., 2007; Peek et al., 2016;

van Hoof et al. 2011). Other stakeholder groups for AAL frequently pointed out in literature include relatives and informal caregivers such as friends and neighbours; formal caregivers, health operators, healthcare professionals, medical specialists including GPs, community nurses, occupational therapists, physiotherapists, and consultants; care organizations and service providers; national governments, local authorities and councils, decision and policy makers, government officials; companies producing or supplying the devices, methods or infrastructure required for AAL technologies; technology designers and developers, engineers and researchers; insurance companies; NGOs and voluntary groups; and mass media (Bygholm & Kanstrup, 2015; Calvaresi et al., 2016; Clark & McGee-Lennon, 2011; Cunha et al., 2013; Damodaran & Olphert, 2010; Finn & Wright, 2011; Kriegel et al., 2013; Peek et al., 2016; Reginatto, 2012; Ruscher et al., 2016; Sponselee et al., 2007; van Gemert-Pijnen et al., 2011). It should be noted that other groups of stakeholders can be a combination of those categories, all with different needs, expectations and goals regarding technology and ageing.

Proposals to cluster this multitude of AAL stakeholders or end-users into primary, secondary, tertiary and even quaternary end-users were advanced in the literature (Moschetti et al., 2013; Nedopil et al., 2013). According to Nedopil et al. (2013), primary end-users are older adults using AAL solutions; secondary end-users are people using AAL solutions for the benefit of a primary end-user (e.g. informal caregivers); and tertiary end-users are not directly in contact with AAL solutions but contribute in organising, paying or enabling. However, end-user categorization is not straightforward, depending on the AAL solution being discussed and other classifications can be used. In the ActiveAdvice project (http://project.activeadvice.eu), stakeholders are divided into three groups in order to foster the actual uptake and implementation of AAL solutions in older adults' home and living environment: consumers (AAL2C), i.e. older adults and their relatives, businesses (AAL2B), and governments (AAL2G).

In a review about stakeholders' involvement in eHealth frameworks it was discovered that differences between those frameworks include the consideration of single or multiple stakeholder groups; and the emphasis lies either on a user-centred design approach – that takes mainly into account the (primary) end-users' needs – or in a comprehensive overall approach that involves different stakeholders and argues for a multi-perspective view (van Gemert-Pijnen et al., 2011). In resemblance to what was defended in past researches (Dansky et al., 2008; Yusof et al., 2008), the author concluded by defending a holistic approach in the development of eHealth technologies in order to favour its uptake and impact (van Gemert-Pijnen et al., 2011). The current paper is driven by said conclusion, deepening research with the findings from the ActiveAdvice project towards a holistic display of the highly complex AAL stakeholder ecosystem.

2 STAKEHOLDER INVOLVEMENT

It has been largely stated that a successful implementation of AAL interventions depends on a good understanding of stakeholders' common and divergent perspectives, since different agendas are likely to affect the technology uptake (Bygholm & Kanstrup, 2015; Clark & McGee Lennon, 2011; Freeman, 1984; Lambooij & Hummel, 2013; Murray et al., 2011). At European level, concerns were expressed about the lack of suitable collaboration and co-operation among stakeholders towards active ageing and e-inclusion of older adults' needs (European Union Committee of the Regions, 2011). In research conducted by Peek et al. (2016), all the inquired stakeholders called for a change in attitudes and policies towards a more collaborative approach, targeted at bridging the gap between technologies and individuals. These concerns find support in a recent systematic literature review concluding that the entire AAL ecosystem has been neglected in solutions development (Calvaresi et al., 2016). 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). By integrating a diversity of actors, each with different value systems, the AAL ecosystem forms 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 et al., 2015).

2.1 Participatory Development of AAL Technologies

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 (Camarinha-Matos et al., 2015; 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 which are incapable of meeting users' requirements, and being adapted as these requirements change. This was concluded in a recent systematic literature review, noticing that existing AAL solutions seem to be built on the available technology rather than 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. Olphert et al. (2009) propose the application of four theoretical approaches for the design of digital assistive technologies: the *socio-technical approach* (Cherns, 1976), where technical and social components co-operate and co-evolve; the *participatory approach*, where end-users participate and engage in the decision-making in all stages of the design process and not only in its use and evaluation; the *inclusive design*, which recognizes the need for including stakeholders with diverse needs; and the *information ecologies*, where stakeholders' contexts are taken into account and they are given the opportunity to share knowledge and take decisions. An integrated approach should then result in the development of a culture of participation and engagement, promoting higher levels of stakeholders' influence and empowerment as well as an enhanced sustainability of assistive technology (Leonardi et al., 2008; Olphert et al., 2009; Queirós et al., 2014; van Gemert-Pijnen et al., 2011). It is widely agreed that both user-centred design (UCD) and participatory design (PD) are meaningful approaches in designing AAL solutions and their importance is shown in a variety of different studies (e.g. Lindsay et al. 2012; Mao et al., 2005; Röcker, 2013). At the same time, however, a lack of USD is observed (Peruzzini & Germani, 2014; Röcker, 2013).

Furthermore, most of the studies concentrate on the integration of primary end-users, i.e. older adults. Other stakeholders are considered very seldom, even though secondary and tertiary stakeholders can also be affected by AAL technologies (McGee-Lennon et al., 2011). Whilst this inclusion of older adults is a positive development in the design of AAL technologies, there is still a lack of involvement of other stakeholders. As stressed by Leonardi et al. (2008), stakeholders should not be treated as mere 'servants' of the technology development. Instead, according to Freeman's stakeholder theory (1984), organizations hold a moral relationship with stakeholders of creating for them as much value as possible. In order to succeed and be sustainable over time, organizations must keep the interests of *several* stakeholders aligned and going in the same direction (Freeman, 1984). In this line, Frooman (1999) elicits the concept of stakeholder management that can be seen as handling potential conflicts stemming from diverging interests. Seeing stakeholders' mutual interests rather than their opposite ones is challenging, since it's not always straightforward to find and accommodate all stakeholders' interests without trading off one against another (Frooman, 1999). In a recent systematic literature review it has been found 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). In this line, a recent study in the Austrian AAL community shows that a comprehensive view on the involvement of different stakeholders in AAL projects is still missing; and while end-users are involved in both requirements definition and evaluation, other stakeholders like insurance companies and public bodies are mostly left out (Garschall et al., 2016). In fact, 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 (Gudowsky & Sotoudeh, 2015; Olphert et al., 2009).

A recent systematic literature review gives account that besides the scarcity of studies on AAL stakeholders' convergent and divergent perspectives, those studies don't provide a complete understanding of stakeholder's positions and relations (Peek et al., 2016). Therefore, before addressing technical implementation issues, it is vital to consolidate concepts bearing in mind the mobilization and alignment of all the appropriate stakeholders. In this paper, we discuss how a specific project – ActiveAdvice – has been approaching the goal of involving different stakeholders in the process, illustrating results and

conclusions drawn from it. 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 broad range of available AAL services, products, experts, users and related technologies.

In line with what was argued above, for the ActiveAdvice platform development the integration of stakeholders at a very early stage of the project was a precondition. Therefore, this exploratory study was conducted with the aim of answering the following question: Which are the factors supporting and hindering the development and, in the ongoing process, the implementation of the ActiveAdvice platform, regarding user requirements, preferences, acceptances and expectations? Research objectives included: (i) to explore stakeholders' attitudes and motivations, as well as their experiences and problems with care structures, AAL products and services currently offered; (ii) to understand how stakeholders currently deal with problems in those domains, i.e. coping strategies; (iii) to explore the potential role of ActiveAdvice in the overall care taking and giving process; and (iv) to clarify whether and in which form the different stakeholders could pro-actively contribute to build up a community around the ActiveAdvice software solution. The user requirement engineering process therefore built on semi-structured interviews with selected stakeholder representatives in five countries participating in the ActiveAdvice project. The end-user groups we intend to discuss in this article are the ActiveAdvice 'clients' who are, as mentioned, older adults and their relatives (summarised as the stakeholder group AAL2C); the enterprises in the business field of AAL (AAL2B), and governmental bodies defining policies and providing services in the field of health and care (AAL2G).

3 METHODOLOGY

Semi-structured interviews were conducted in Austria, Switzerland, Belgium, the Netherlands and the United Kingdom, with a total of 23 interviews being finally included in the study. This approach was chosen because qualitative interviews allow a better understanding and in-depth learning on how and why people argue, what they expect and how individual circumstances determine their reasoning. This, however, means that the results cannot be generalized nor quantified; nevertheless, they give insights in the stakeholders' different perspectives and needs. In the discussion on AAL solutions and products, the following overall AAL domains were reflected: health-related services; home care services (nursing); home & living services (household related services, family support); leisure, culture, tourism; activities & sports & mobility; safety, security; obtaining and sharing information; and communication (social interaction).

3.1 Participants and Recruitment

Based on a comprehensive narrative literature review previously carried out – with the aim of exploring the extent to which the scientific production refers to different stakeholders within the AAL domain, concerning their needs, requirements, interests and relationships – the stakeholder groups were specified and segmented as the subjects of this study. The three previously mentioned groups (clients, businesses and governments) and nine subgroups were defined as described in the following:

Clients subgroup 1 (C1) – Older adults investing in a new home: These are active seniors (55 to 70) who decide to move to a potentially smaller housing unit, and who wish to think ahead and adapt the house to future loss of autonomy and upcoming chronic illnesses;

Clients subgroup 2 (C2) – Older adults who are facing loss of autonomy and wish to live longer at home. In contrast to C1 they are forced to look for solutions.

Clients subgroup 3 (C3) – Children of older adults who wish to help and assist their older parent(s). This can be because of effective loss of autonomy, but also to prevent further degradation;

Businesses subgroup 1 (B1) – Suppliers of AAL solutions (products, services or a combination);

Businesses subgroup 2 (B2) – Suppliers of solutions and services that could take a role as 'active advisor' in the field of AAL and the ActiveAdvice ecosystem;

Governments subgroup 1 (G1) – Suppliers of services or solutions. This can be under normal market conditions (e.g. a provision of home assistance services), or under subsidized schemes for specific target groups;

Governments subgroup 2 (G2) – Suppliers of services assessing needs of older adults and directing them towards the right solution or service. This segment could also play a role as 'active advisor', depending on national and regional responsibilities;

Governments subgroup 3 (G3) – Policy makers at local, regional and national levels, linked to ageing, living longer at home, health services and homecare services;

Governments subgroup 4 (G4) – Public Services, senior organizations, interest groups, care cooperatives.

The older adults' segmentation is based on the interlink of the following factors: (i) chronological age; (ii) life course events; (iii) health and functionality status; (iv) relationship with ICT (particularly internet use); and (v) AAL related needs and desires. Since literature has shown that relatives are often the decision-makers or facilitators regarding the acquisition of AAL products and services, they are considered as a third segment for 'clients'. Similarly, the 'governments' target audience was segmented 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; moreover, an additional segment was created to include public services, senior organizations and other groups of interest. It is noteworthy that during the data collection it was verified that some participants reunited criteria to cluster in more than one subgroup (e.g. older adults who simultaneously assists a relative).

Potential participants under these stakeholders' sub-groups were approached through convenience sampling strategy. The 23 semi-structured interviews included in the preliminary analysis discussed here were evenly distributed among the different stakeholder groups: clients (8), business representatives (8), and members of local and regional governments or representatives of end-user organizations (7); furthermore, all subgroups are represented with a minimum of 1 (C1, G3) and a maximum of 6 (B1) participants.

With respect to the stakeholder subgroups, different objectives have been set as follows:
- To understand the importance of specific features we plan to include in ActiveAdvice platform (in order to make a hierarchy and prioritization) and to understand the attitude and readiness for ICT-based advisory service (peer-to-peer, peer-to-supplier and peer-to-expert) (C1, C2, C3);
- To understand business models and distribution channels (B1, B2, G1, G2);

- To understand challenges and problems when trying to face customers (B1, B2, G1, G2, G4);
- To understand the potential added value of ActiveAdvice (B1, B2, G1, G2, G3, G4);
- To understand how customers are advised today and to explore how ActiveAdvice can reinforce their advisory services (B2, G1, G2, G3, G4);
- To learn what products and services are currently recommend to customers (G1, G2, G3, G4).

3.2 Data Collection and Analysis

For the data collection, a study information sheet was first developed, consisting in a general introduction section, a stakeholder oriented specification and a clarification of the overall aims of the interviews. Additionally, with support in the narrative literature review previously carried out, three semi-structured interview guidelines were developed, resulting in different but analogous versions for 'clients', 'businesses' and 'governments', to suit the diverse stakeholders' backgrounds. The following requirements were taken into account when developing the interview guidelines:

Clients (C1, C2, C3) – perceived ease of use/design/functionality motivation in using ICT in general; perceived usefulness of provided information & offers; attitudes about ICT-based feedback/advice; attitudes regarding online purchase; use and familiarity with social media; knowledge, use and access to AAL products and services.

Businesses (B1, B2) – perceived ease of use/design/functionality; business models (current and projected); distribution channels/concepts; perceived added value of ICT-based distribution; perceived advising concepts, actual use, needs and opportunities; inclusion of customer feedback; interest on ActiveAdvice platform and role as active advisor.

Governments (G1, G2, G3, G4) – perceived ease of use/design/functionality; national/organizational strategies regarding ICT and AAL; advice strategies used/services provided; existing offers and concepts; portal use (i.e. integration of new media and solutions for policy making and information distribution); existing programs and activities regarding AAL and ICT awareness.

Both study information sheet and interview guidelines were made available in four languages (Dutch, English, French, German) and the interviews were carried out in the stakeholders' country and languages by each ActiveAdvice project consortium member. Moreover, local and national specifications

were taken into consideration when conducting the interviews (e.g. role of health insurances versus social security). All participants received the study information sheet and gave informed consent. Each interview took between 30 to 45 minutes and was carried out either face-to-face in a suitable setting, or using teleconference or telephone, according to interviewees preferences and availability.

For the data analysis, a common matrix was used by all partners. Relevant contents were transferred into the Matrix Analysis and the material was analysed by following both a horizontal and vertical scheme, i.e. with an intra- and inter-interview comparison. This strategy allows a better understanding of individual assumptions as well as a comparison of assumptions across cases. The collected data was grouped in units of analysis (categories), which were based on the issues that emerged from a first reading of the interviews. The final scheme was built as the new features emerged from an exhaustive classification of the features. During the codification process, the semantic units were selected as registration units, more specifically the theme (Bardin, 2011).

In order to determine the most prominent user requirements and, therefore, the most pressing factors supporting and hindering the ActiveAdvice platform, interviews findings were critically analysed and compared to the literature published in this field and previously reviewed.

4 RESULTS AND DISCUSSION

The following overview addresses the preliminary results from 23 conducted interviews. The most significant contents approached by interviewees – clients (Cs), business representatives (BRs) and government representatives (GRs) – are presented below. These findings support a better understanding of different and common stakeholders' motivations, intentions, needs and expectations in the scope of ActiveAdvice.

4.1 Attitudes Towards ICT and Internet Use

4.1.1 ICT Skills, Interest and Internet Use

In general, Cs have demonstrated interest in ICT-based solutions. However, not all interviewees in this group reported to use internet regularly, neither to consult the web for health-related information. This constraint was also identified by GRs, who have shown concerns about whether or not older adults would be able to access an advisory platform in the first place. Perceived barriers for access include older adults' lack of ICT skills or fear of technology; and missing access to technological devices or internet connection. GRs also stressed that different profiles for older adults must be taken into account, since those in need for geriatric help are very unlikely to use the internet.

For those older adults who use internet, particularly to gather health information, a preference for receiving information (e.g. via newsletters) rather than actively searching for it has been expressed. Care consultancy is more often sought to be found in the virtual reality; but the use of internet is often reduced to a first consultancy rather than an ongoing advice. Regarding social media as a mean to look and provide information, neither Cs nor BRs see it as a privileged or priority channel. On the one hand, Cs tend to see social networks as a mean for social interaction rather than a platform for learning or getting informed about products and services; on the other hand, BRs tend to report lack of resources or skills to invest in the use of social networks, although they wish to do it in a later stage. Furthermore, Cs reported to only rarely have used online catalogues (not necessarily of AAL solutions) so far. On this topic, BRs consider that ActiveAdvice must avoid to become just another online catalogue providing a selling service.

Main observations by Cs and GRs on these topics are in line with the vast literature concluding that to the rejection of technology by older adults contributing factors are: poor ICT skills, fear of both the technology itself and the learning process, and lack of financial resources to purchase devices and internet access (Doyle et al., 2013; Finn & Wright, 2011; Lewin et al., 2010; Marschollek et al., 2007; Sanders et al., 2012). However, concerns with older adults' fear of technology were expressed rather by GRs than the older adults themselves, thus reflecting the stereotypes on older adults use of technology, discussed in chapter 1. Also, it is documented a recognition by older adults that barriers associated with ICT skills will tend to decrease in future generations (Reginatto, 2012). In this study, some Cs report to not search for health information online. However, searching for health information was identified as the activity most performed online by seniors (Marschollek et al., 2007).

4.1.2 Knowledge on AAL Products & Services

The three groups of stakeholders interviewed tend to

consider that ICT products and services are not well known by older adults and welcomed a possibility to raise awareness and give information. GRs stressed that older adults either do not know where to find solutions or they only start looking once they are in need. Hence, GRs considered that the ActiveAdvice project should target the awareness rising as much as offering advice. In the BRs perspective, more and better information on AAL solutions is welcome in order to make those solutions widely known.

Evidence from the literature pointed in that same direction when concluding by the lack of general public awareness about AAL technologies (Balta-Ozkana, et al., 2013; Begley, 2010; Lewin et al., 2010; Reginatto, 2012). For example, caregivers had perceived 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); while business stakeholders identified it as an obstacle to introduce and succeed with these products and services in the market (Balta-Ozkana, et al., 2013).

4.1.3 Online Promotion of AAL Services & Products

BRs report to use internet predominately for marketing. However, some also stressed they do not use it at all, one of the reasons being the fact that while online promotion reduce costs from a customer perspective, this is not automatically the case for businesses. Internet was seen as an important mean for promoting more simple solutions: the less service a product needs the more suitable it is to be promoted online. In BRs perspective, internet loses relevance with B2B promotions, since negotiations are dependent on time, experience and trust building. Similarly, GRs also seem to use multiple formats for AAL products and services promotion, including ICT-based promotion, but also other strategies (e.g. events). GRs stress that regardless of the channel used, promotion should include co-creation with older adults, a focus on services rather than on technologies, in order to guarantee solutions' quality and flexibility, i.e. allowing easy entry for companies to promote services and products. As argued in the theoretical explanation in Section 2, interviewees' statements are aligned with the extensive literature calling for a greater collaboration among stakeholders. As postulated in the socio-technical theory (Cherns, 1976), these participants seem to endorse a co-operation and co-evolution of technical and social components in the development of ICT-based solutions.

4.1.4 Face-to-face (f2f) Contact

Both Cs and BRs have shown a preference for f2f contact with each other. For clients, either buying or getting advice online still competes with the f2f experience which is perceived as more trustworthy. For BRs, the f2f approach allows customers to get to know and build a relationship with the company. Moreover, complex solutions need to be adapted, tested and introduced to settings, reason, as buying online only without guaranteeing support and service is perceived as too risky. GRs also stress that in technological innovations, social interaction and prevention of loneliness are important issues to consider. In resemblance, literature produced on usability evaluations have shown that solution's uptake can be hindered by older adults' fear of losing social interaction, f2f contact and becoming lonely (Damodaran & Olphert, 2010; Novitzky et al., 2015; Olphert et al., 2009; Siegel et al., 2014). However, it has been reported that if technologies are seen as facilitators of new social interactions rather than a replacement of human interactions, this apprehensiveness can be partially minimized (Lewin et al., 2010).

4.1.5 Client-business Online Interaction

BRs have shown to be more receptive to online interaction then Cs. While the former considered online interaction with potential customers as very important, the latter might experience businesses directly communicating with them (e.g. via social networks) as an invasion of their privacy. The emergence of the privacy topic in this data collection is not surprising, since older adults' concerns about security and privacy in ICT use – particularly when health and well-being data is involved, or when it comes to online transactions – has been extensively mentioned in the literature (Clark & McGee-Lennon, 2011; Damodaran & Olphert, 2010; Nordgren, 2013; Olphert et al., 2009; Peek et al., 2014; Wright, 2010). In spite of BRs' more favourable positions regarding online interaction, some deterrents were also mentioned by these actors. In particular, it was stressed that everyday activities are dominated by the f2f and problem focused approach: BRs appreciate to get in contact with their customers as quickly as possible but they understand it as an action-and-reaction communication pattern. Moreover, they stress that communication must not take place in a 'public sphere', a statement also extended to feedback and advice.

4.2 Feedback and Advice in an Online Environment

4.2.1 Trustworthiness and Usefulness of Online Feedback

Most important for Cs is feedback about AAL solutions, preferably by other end-users. Cs tend to value feedbacks offering a description of the product or service (e.g. price, functionalities) and personal experiences with those; information on the service providers; information on the website or platform presenting the solutions; and information on the feedback giving person. Cs declare to value family members' and friends' comments for evaluating whether or not a product or a service is reliable, useful or trustworthy. However, even with feedbacks from reliable customers or experts, trust is still the biggest concern for them when accessing the web – thus, the f2f experience is preferred. In the position of giving feedback themselves, Cs report to be driven by negative incentives such as complaints about unfulfilled expectations. For BRs, these negative incentives are a reason to be hesitant about feedback in a 'public sphere'. When customers interact, and discuss their positive and negative experiences, companies of course run the risk that too much negative feedback starts to affect the promotion of a product. However, they also have the chance to learn first-hand about how their product or service is perceived and accepted in the market (Youngtae & Thoeni, 2016). Nevertheless, for BRs, whereas real user testimonials (on the own website or on a meta-site) are welcomed, they doubt the need for and usefulness in general of online customer feedback. Moreover, businesses typically do not appear on websites where customers can leave their reviews. Furthermore, Cs' willingness to provide feedback can be dependent on the age-generation. Literature in that respect clearly differentiates between Millennials and Baby Boomers, with the latter preferring to give feedback in a f2f rather than in the virtual reality, especially as the privacy cue has primacy for them (Obal & Kunz, 2013). Yet, in general, interviewed Cs expressed interest in becoming more active and successful users as well as commenters in a secured, easy-to-use environment.

4.2.2 Neutrality as Precondition for Advice

In general, both Cs and BRs considered advice as an important and needed service. Cs demonstrated willingness to learn about the best products or services for them. However, if asking for advice is something that Cs would like to do, at present it seems that they are not doing it. Lack of trust in online-advice is one of the reasons invoked for that. In this line, both GRs and BRs stress that quality of data and neutrality are important features for them to get involved, and for clients to trust in online advice. Moreover, both GRs and BRs highlighted that when providing advice, it is important to understand what the customer really wants and thereupon offer them a customized, specific support, and one-to-one advice for a perceived added value. Regarding the question of who should provide advice, BRs consider that, on the one hand, advice is best given by those who sell a product, but on the other hand, becoming themselves advisors was not seen as an option due to a lack of resources and the disruption of the neutrality condition. Therefore, a 'neutral' body or a virtual agent is suggested to perform this task. GRs suggest that a panel of older adults could test products and the platform itself, and, similarly, volunteers could act as advisors on the platform.

When it comes to digital and virtual advice, it was argued that use of virtual agents, particularly in the e-commerce context, is especially relevant to older adults due to the expected decline on physical and cognitive abilities (Chattaraman et al., 2011). Studies have supported the strong impact of virtual agents in the context of online-shopping, arguing for their relevance to address age related navigational needs (Rickel & Johnson, 2000). However, building trust is challenging, depends on different conditions and is contradictory (Bart et al. in Obal & Kunz, 2005). For example, consumer cohorts have different trust understandings and thereby reference systems; furthermore, peer-endorsement seems to have different impact on consumer behaviour depending on the national context (Bart et al. in Obal & Kunz, 2005). Moreover, trust is dependent on web site-interface variables; while provider's brand strength, online expertise or web site familiarity were less influential (Bart et al. in Obal & Kunz, 2005). The presence of provider advice, privacy cues and community features have higher influence (McKnight et al., 2002; Liang & Lai, 2002 in Obal & Kunz, 2005).

4.2.3 AAL Solutions, Platform Features and Usability

When questioned about the AAL services and products most relevant for end-users, GRs stressed that platforms must include products that take the older adults' needs and their physical and cognitive

ageing process into account. Both Cs and GRs referred that besides offering information on AAL products and services and their suppliers, the ActiveAdvice platform should contain information about social services, care organizations and other informative websites (e.g. for dementia, epilepsy). Moreover, Cs expected the inclusion of so called 'flow charts' in the platform, as a tool to help older adults solving problems or improving situations step by step, as well as guidelines for ordering products online.

When reflecting on the features that a platform like ActiveAdvice should have, both Cs and GRs stressed the importance of inclusive design. Furthermore, a clear communication strategy and a simple and a well-structured web-layout can help to build trust. This is shown by Ruscher et al. (2016), clearly stating that mistakable wording can lead to negative emotional reactions. It was suggested by GRs that one possibility to address the problem of accessing online information is to design the website in a way that allows neatly formatted printouts that can be easily read. Cs highlighted platform features influencing its use, such as the website organization; used colours; the amount of information included; and, as a critical factor, security and safety. The security topic was highly valued by BRs, as it was the neutrality one, i.e. the platform needs to guarantee impartiality in the presentation of products and services. Neutrality was also valued by GRs, who suggested that the quality standards should be transparent, such as the criteria and guidelines on how products and services are going to be evaluated.

BRs have suggested that specific functionalities of ActiveAdvice must include videos (with comments by developers and users) and 'qualitative photographs'. Both should help to best describe the solution as well as its functionality; and also include eExpert stories. Moreover, testimonials for the platform itself and not only for the single services can be a way to assess and improve platform reliability. BRs also mentioned that both the products and the platform need to be certified as this is a guarantee for quality management; and thus, a valuable and reliable offer – for both the businesses and the customers. Additional features such as the inclusion of a telephone number by country and the presentation of the platform administration were considered by GRs as relevant for raising the website's credibility.

4.2.4 ActiveAdvice Perceived Added Value

All stakeholder groups appear to anticipate and

recognize positive effects of a European advisory platform. GRs value the potential benefit of the ActiveAdvice platform for experience exchange between organizations; in stimulating older adults to use ICT solutions; in offering their own product(s) or specific assistance on local municipal/communal level; and, most of all, in offering information on the AAL market, such as data on suppliers and services and feedback from end-users that could feed into evaluation process for procurement. In addition, it could possibly serve as basis for policies for care for older adults. On the other hand, ICT support was considered helpful for businesses promoting AAL solutions, with interoperability with other systems being seen as an opportunity. A platform such as ActiveAdvice was also seen as posing an opportunity for smaller suppliers to promote their products. Nevertheless, some BRs have raised concerns and shown reluctance in contributing to the platform due to a potential risk of competition. Also, for the occurrence of the benefits pointed above, both GRs and BRs stressed that ActiveAdvice must guarantee quality of products and services, as well as security, and, as already mentioned, neutrality. Those are baseline conditions for these stakeholder groups to let their products and services being promoted through the platform and to promote the platform themselves. BRs asked for transparency with respect to the business model and responsibilities and expressed that they need to make sure that the platform is accepted and reliable. GRs suggested that creating a trustworthy quality label customers ensures reliability and trust; as well as, mobilizing a wider support from governments, large associations with high reputation, suppliers and local persons providing services (e.g. general practitioners). The involvement of municipality and local authorities was considered by GRs as central to better promote the platform and to increase trust in it among older adults.

The above analyzed interviews gave valuable inputs on the stakeholders' attitudes – towards the AAL products themselves, the web communication within a community and web services which will be provided in ActiveAdvice. Multiple and bidirectional relationships among the above discussed categories can be identified. At a baseline level, the lack of public awareness about AAL solutions, stressed by all groups of stakeholders, influences the interest towards those solutions, since its benefits are not identified. However, interest in ICT-based solutions is not the only attitudinal factor influencing its uptake, as demonstrated by the group of Cs, who, in spite of showing interest in those solutions, have

shown preference for f2f contact. This preference seems to be, in turn, related with a lack of trust in web communication and services, namely in online advice and purchase; with worries regarding privacy breaks and loss of social interaction. From the data gathered, trust emerged as a key attitudinal factor for AAL solutions uptake as well as for the use of ActiveAdvice platform. It seems to influence the interest in using AAL solutions, as well as the preference for f2f contact demonstrated by stakeholders (Cs, BRs). On the other hand, trust seems to be influenced by the communication strategy and web-layout; by the perception of neutrality regarding the information provided and the individuals providing that information; as well as by the perceived quality of that information (Cs, BRs, GRs); by the access to real users' feedback (Cs); and by the perception that feedbacks are 'fair', i.e. not exclusively guided by negative incentives (BRs). In spite of the added value of an European advisory platform such as ActiveAdvice – that is recognized by all stakeholders - trust, in the AAL products, in the advice platform, as well as in the stakeholders belonging to the AAL ecosystem – is a key aspect to consider when developing the project.

5 CONCLUSIONS

Stakeholders hold different backgrounds and experiences, and further research is required to understand their needs and how divergent or congruent those needs might be. 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, namely around the stakeholders' needs and requirements on AAL technologies.

The results of this paper demonstrate that there are parallels as well as contradictions in the different stakeholders' needs; and that the inclusion of these different perspectives and needs is worthwhile. As stressed by Camarinha-Matos et al. (2015), members in an ecosystem hold different value systems, e.g. a business-oriented system or a social-oriented system. Nevertheless, beyond the different values systems, those actors share one common goal: providing better services for older adults and foster social innovation. Despite the difficulties mentioned in literature as pointed out in Section 2, ActiveAdvice has shown that it is feasible to include different stakeholders' needs into a requirement

analysis, thus adding a new perspective on the involvement of a whole stakeholder ecosystem.

The scientific literature in AAL field is prolific in calls for greater collaboration and co-ordination among stakeholders in order to overcome or minimize the digital divides currently separating many older adults from mainstream European society. While stakeholders in general have been aware of this digital divide for a long time, a limited understanding of older people's technology-related needs still prevails. This is related to a scarce collaboration and co-ordination of stakeholders in order to meet those needs (Wright, 2010). This call for multi-stakeholder partnerships comes not only from the academic stakeholders but also from other major interested parties in AAL fields, such as industry and CSOs, as well as governments, with several policy documents, European Commission (EC) communications and research reports being published in that matter (Finn & Wright, 2011; Wright, 2010).

A hesitant but existing AAL ecosystem development can be identified; yet, we still speak of prototypes rather than success stories. Literature analysis has confirmed that the development of a platform that supports both sharing of information, knowhow and products, and building up networks between different stakeholders is considered to be a challenging task. As platforms annul the typical f2f interaction in health care, the users' acceptance of it has to be a priority concern of developers and promoters. In a next step, therefore, the identified stakeholder needs, interests and expectations will be transferred into requirements and finally into measurable qualities. User-centred requirements engineering methodology involves users right from the beginning, allowing them to give feedback to developers and researchers about their requirements, preferences, acceptances and expectations. For the ActiveAdvice platform development, it was essential to integrate different stakeholders at a very early stage of the project. The results of these efforts are the foundation for decisions in specification of technical requirements, the creation of content structures, decision support logics and service module functionalities. Especially on the topic of personalized feedback and advice, ActiveAdvice will provide added value as there are only few examples to learn from and it is not yet common to provide personalized feedback and advice. Considering the interviewed Cs' value of feedback, this is an important aspect.

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, and 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 to the awareness of each stakeholder about the expected effects for other stakeholders. This can possibly broaden stakeholders' perspectives and lead to more successful implementations of AAL technologies in general.

Based on this qualitative encounter, ActiveAdvice could in a next step promote a 'AAL Barometer', i.e. a quarterly online survey, which helps to learn and even better understand the varying and changing interests of potential stakeholders to finally best serve their interests; and thus, adapt the platform according to their needs.

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The narrative literature review mentioned throughout the paper will be the focus of discussion on a separate paper. The interview guidelines used to gather the interviews are available upon request to the authors.

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