

# Towards a Proposal of an Application to Promote Volunteering through Television to Help Older Adults

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**Keywords:** Application for Set-Top TV Box, Ask for Support, Volunteering, Voice Interaction.

**Abstract:** This article seeks to present a proposal of a project that aims to develop a television (TV) application that allows older adults to ask for support from a group of volunteers in specific tasks, using voice to carry out some tasks. To this end, a review was made to identify projects that have been addressing TV and voice interfaces in the context of systems and services directed to older adults. The review also focused on initiatives that use digital technologies to support volunteering targeting older adults. In addition, a questionnaire was applied to a group of people considered to be among the groups of stakeholders of the abovementioned application. The results of the review show that, even with several improvements in the last years in voice interaction area, it is not yet generally considered in TV applications and there seem to be few applications that are focused on foster volunteering targeting older adults. Furthermore, the data obtained by the questionnaire reveal the existence of a set of factors that do not allow a generalized acceptance of the use of a TV application to ask for help from a group of volunteers, despite being recognized by diverse groups of stakeholders that this type of applications is important.

## 1 INTRODUCTION

Ageing is a natural and inevitable process, that all human beings face and is characterized by a set of normal modifications at the physical, psychological and social level. In Portugal, about 60% of the elderly population lives alone or in the exclusive company of other older adults, which reflects a phenomenon of social isolation whose dimension has increased around 28% over the last decade (Statistics Portugal, 2012). Even if older adults stay at home, there are often innumerable difficulties that they cannot overcome alone. These situations can be avoided if older adults were supported by other people that help them, for example, to perform daily life activities. Individuals from younger generations often live far away from their elderly relatives or, even if near, they are increasingly committed to their professional career and family obligations, which often prevents them from providing support to their older relatives. In this context, volunteering emerges as one of the possible answers, based on the kindness and altruism of others, both during

emergencies as well as contributing to the long-term development (International Federation of Red Cross and Red Crescent Societies, 2015). Portugal is among the countries in Europe in which participation in voluntary activities is lower (Público, 2012). This is particularly concerning in an aged country where volunteering actions could represent an important help to the elderly and improve their quality of life, as this life stage is characterized by physical difficulties that affect the elderly's ability to perform several tasks.

The idea of using TV to make requests to a group of volunteers seems to be a great asset for the elderly. In fact, TV is the most preferred audio-visual media and also the most used by Portuguese people 65 years or over (daily average of 5 hours and 8 minutes watching TV) (Portuguese Regulatory Authority for the Media, 2016). Therefore, it seems reasonable to assume that TV might be also used to undertake other activities that older adults understand as useful. Furthermore, in Portugal there is an age group gap in the use of new digital media and Internet, where the group of people 65 plus

presents a very modest use of digital media despite several projects dedicated to promoting digital literacy in that target. Therefore, it is not surprising that a growing number of projects/services are regarding TV as a means of providing diverse useful services to the elderly. Nevertheless, there are still several obstacles to a wider use. One of these is the fact that the interaction is mediated by TV remote control, which may be difficult to use in certain contexts, especially in conditions associated with aging (Ribeiro et al., 2015). In this context, voice can be a way to bypass these difficulties and several projects have been invested in voice features as demonstrated in the next section.

The aim of this paper is to present the results of a review process to deepen knowledge about initiatives and projects based on digital technologies and TV, directed at helping older adults, and about how multimodal interfaces, specially voice, are being used in these kinds of applications. In this review, projects that aimed to promote volunteering targeted at older adults were also analyzed. Besides this review phase, the paper also presents the results of a questionnaire that was applied to older adults, relatives and persons that work in Institutions related with older adults. Finally, a general outline of a project aiming to develop a TV application that, in a simple and quick way through voice, will allow older adults to request help from a group of volunteers in daily life tasks is also presented. The results here presented are intended as a contribution to projects that aim to use TV and voice to interact with older adults to deliver a specific service.

## 2 REVIEW OF INITIATIVES AND PROJECTS

During the last years, several initiatives and projects have been launched and funded by the European Union and other international Institutions with the aim of using ICT to help older adults to stay healthy, independent and active in their community (European Commission, 2011). Examples of those relevant initiatives are the European Innovation Partnership on Active and Healthy Ageing (European Commission, 2017). In this area, is unavoidable to mention the Active and Assisted Living (AAL) Programme, “a funding activity that aims to create better conditions of life for the older adults and to strengthen the international industrial opportunities in the area of information and communication technology (ICT)” (AAL

Association, 2017). These initiatives have been followed by projects such as eCAALYX, a project that was dedicated to monitor the health of older and elderly persons with multiple chronic conditions, at home and on the move. The approach involved the development of a device linked to a home communication system, which integrated the most relevant sensors for monitoring of common chronic conditions in a comfortable garment linked to a smartphone. Embedded in the garment were also sensors for detecting falls (Boulos et al., 2011).

Transversal to these initiatives is the idea of the importance of a strong user involvement to develop technology-based solutions that will be relevant to elder people in their daily-lives. Also, the revision undertaken highlighted the growing concern of taking into consideration the capabilities of older or disabled people in the development of user interfaces. For that purpose, several projects have been assuming that people can interact through movements and gestures, voice, by touch, and other means, using a TV remote control, a mobile device, a smart watch, or any other digital devices. One example is the HOST project - smart technologies for self-service to older adults in social housing - which aimed to provide an answer to the needs of today's Social Housing requirements, in order to enrich the life of the elderly people living in the current social house park (Rhône, 2017). The proposed platform aimed to provide easy-to-use technologies (like voice synthesis and Android based touch-screen devices) in social housing flats to allow better communication and better access to special services from the elderly.

In the revision undertaken, it was clear the importance that speech interfaces have as an interaction method in applications developed for the elderly for home environments. One example of such projects is Speech-driven Environmental Control Systems (SPECS), aimed at developing a novel environmental control system for disabled and elderly people, controlled by automatic speech recognition. SPECS was part of a larger project named STARDUST (Speech Training and Recognition for Dysarthric Users of Speech Technology), and one of its findings was that the control of the environmental systems is very difficult since they were deployed in the home where varying levels of background noise can make automatic speech recognition systems unreliable (Judge et al., 2009). Another project, Miraculous-Life, focus on how to design, develop and evaluate an innovative user centric technological solution named Virtual Support Partner (VSP), for attending elders (65+) in

their daily activity and safety needs, while they go about their normal daily life. The VSP fuses together user's facial expressions, voice intonation, gestures and other contextual information of the user's environment. It provides responses and delivery of services through an Avatar-based interface exhibiting empathic response through face emotions and voice intonations (Samaras, 2016). Another project using a VSP is CaMeLi, "a two-year AAL project seeking to provide automated services with the purpose of assisting elderly people in their daily activities and assist them in the provision of a comfortable quality of care". The CaMeLi project features avatar interfaces that can recognize the users' affective state and behavior, express emotions and other human-like behaviors, and also includes a speech interface (Tsiourti et al., 2016).

Focusing on projects that consider TV as an important device in the use of applications that promote health and well-being by the older adults group, it is also possible to find some projects in that context. Under the AAL programme, the HEREiAM project aimed to develop a platform based on the Android operating system that, considering the specific needs and preferences of the older adults, allowed them to access and consume a set of services and information directly from their own TV such as shopping, social networking, home security monitoring, self and healthcare (Macis et al., 2015). Senior-TV is another similar project that is currently being developed and whose main objective is to develop a platform for providing formal caregiving services as well informal (i.e. weather, NEWS, events) to the elderly that live alone in their own homes. The platform will be a multichannel system developed to be used on Smart TV in combination with smartphones and tablets as main interfaces (Senior-TV Consortium, 2017). Another example is the SeniorChannel, a project that aimed to develop an Interactive Internet Protocol Television Channel "(...) that will not only provide the elderly people with a method of interacting but also with a unique means to access the range of diverse activities in their community including the opportunity to share knowledge and experience, the ability to participate in topical debates, entertainment services, workshops and discussion groups regardless of their geographical location" (AAL Programme).

With a strong focus on presenting TV as a communication platform with social and entertainment capabilities (although not only), it is possible to identify projects as the HELASCOL, which aimed to provide the elderly people "(...)" with the means of maintaining social relations by

developing an easy to use and easy to understand communication platform with social and entertainment capabilities that can be easily upgraded with security and medical features" (AAL Programme) or the Silver Game, a multimedia platform which combines a variety of game-based applications, community features and web-based services and that focuses on activities like singing, dancing and driving to stimulate senior citizens and encourage social interaction among them (AAL Programme).

In the Portuguese context, some projects that are developing TV applications for older adults also have been arising. One example is the iNeighbour TV project that aimed "to seize television (...) with a related consumption that triggers conversations, representing an important contribution (directly or indirectly) to social network's dynamics" (Social iTV). Other example is +TV4E, a project that is taking place and that intends to develop an interactive television platform "(...) which allows automatically the enrichment of television experience with the integration of contents about public and social services (...) considering the user's profile (age, geographic localisation, clinical condition, etc.)" (Social iTV).

In the revision undertaken, projects and initiatives that aim to encourage volunteering with older adults using digital technologies were also considered. Some examples of platforms that have been used in real contexts, especially in US and Canada, were identified, presenting the potential to enhance users' independence, connecting older adults who want a service or support for a small home-based task with people who are offering that specific service/task such as volunteers, caregivers, friends, neighbours or elderly associations.

One example is the "Drive a Senior" application, which connects volunteers with older adults of Austin, Texas, who no longer drive. This platform offers transportation, companionship and minor home repairs, that is, services that enable older adults to continue living independently. Although not restricted to be used with the aim of helping older adults, it was possible to identify other several platforms to support general voluntary activities such as VolunteerMatch or VInspired. In the Portuguese context, one of the biggest online platform is "Bolsa de Voluntariado" (*Volunteering Register*). When looking for voluntary opportunities, it is allowed to choose older adults in the target group filter. What all these platforms have in common is the fact they are only available as a Website. Moreover, they only allow the direct interaction between volunteers and organizations.

“GozAround” is another platform similar to VolunteerMatch but, on the other hand, allows the direct connection between volunteers and offers. Some applications, such as GoVolunteer provide access not only through a website but also provide mobile apps (both Android and IOS-based) for their users. One aspect that emerged is that often these platforms only allow that the needs of help are registered by an organization and not by individuals. Also, it is seen that most of the platforms promote the evaluation of the volunteer, a practice that is encouraged in the implementation of volunteer’s networks (Moon and Sproull, 2008).

Regarding the use of TV to encourage and support volunteering targeted at older adults, there were no identified initiatives or projects with that aim. An analysis of the applications of the TV operators MEO and NOS (two main Portuguese TV operators) was also undertaken, showing the absence of TV applications with that goal.

The information presented throughout this topic shows that major initiatives and projects that aim to promote older adults’ well-being and active ageing through ICT have been receiving a considerable attention and that (web-enabled) TV has also been playing a key role with the argument that TV-based system ensures high user acceptance, overcoming the digital divide affecting most of the aged people associated to the use of PC or smartphone. It is also possible to conclude that new forms of interaction, as by voice, are being used and are here to stay, with the aim of overcome several possible elderly limitations. However, the use of voice as a means of interacting with TV is not yet a very explored scenario although a more widespread use may occur soon since factors such as technological constraints tend to be overcome. The revision undertaken also emphasized that despite the existence of several ICT-based products that could be used to support volunteering activities with older adults, their use, at least in Portugal, is not yet a reality and most probably will be useful to younger generations (International Federation of Red Cross and Red Crescent Societies, 2015).

### 3 EXPLORATORY QUESTIONNAIRES

#### 3.1 Context

In addition to trying to understand whether ongoing projects and initiatives regarding TV applications and volunteering for older adults are currently

underway, which was described in the previous section, it was considered of the utmost importance to better know how key stakeholders see the relevance and acceptance of having a TV application which will allow older adults to request help from a group of volunteers, in specific tasks of their daily life. In the field of applications that promote the volunteering aimed at the elderly, players such as family members/caregivers, employees in Institutions for older adults (such as nursing homes or adult day care centres) and the elderly themselves were considered key stakeholders that should be consulted. The strategy chosen to accomplish this was applying a questionnaire to a collection of individuals representing those groups.

#### 3.2 Method

A different questionnaire was developed and applied in person to three groups of stakeholders: (1) elderly; (2) responsible/employees in social care institutions for older adults and (3) family members/caregivers. The selection of the participants was made by convenience. Not all family members/caregivers included in the study were related with the elderly that participated in the study.

The questionnaires directed to (1) and (3) included the following parts: a) sociodemographic characterization; b) TV and technology consumption habits and; c) potential usefulness of volunteering and of using digital technologies and TV as an interface for a volunteering platform and; d) tasks in which it would be useful to get help from volunteers. The questionnaire that was applied to (2) did not include the b) part and part a) had less questions.

Data was analyzed using Microsoft Excel 2017 through simple descriptive analysis and content analysis of responses to open questions. To describe participants characteristics, central tendency and dispersion measures were used, including mean, range and standard deviation.

#### 3.3 Results

The results from the questionnaires are presented according to the target groups inquired.

##### 3.3.1 Elderly

The number of elderly participants was 34 (32 women (94.1%) and two men (5.9%)). The participants had an average age of 73.45 years (SD = 7.5), maximum of 90 and a minimum of 59 years.



All participants were retired. Half were married (n = 17), 12 participants were widowers (35.3%), two were single (5.9%) and two were divorced (5.9%).

The education level reached by the majority (n=23; 67.6%) was higher education, nine referred secondary education (26,5%), and two participants (5.9%) said basic education. About 94% of the participants (n = 32) had TV at home and a paid TV service and 23 of those used some functionality of the box, namely: check the TV schedule (n = 17); watch programs issued in the past (n = 12); schedule recordings (n = 8); use apps about the weather (n = 3); use apps about sports (n = 2); see the time on the programming screen (n = 2). Participants also referred to watching, on average, 4 hours and 15 minutes of TV per day (SD = 1.92).

More than half of the respondents used smartphones (53.1%), and the most commonly used features were: receive/make phone calls (n = 17); read messages (n = 17), write messages (n = 16), save a new phone number (n = 17) and take pictures (n = 16). In the other hand, the least used features were: play (n = 2), use the agenda (n = 8) and save notes (n = 8). About 91% of the participants accessed the internet regularly, namely through a computer (n = 29), smartphone (n = 12) or tablet (n = 9).

Of the total participants, 25 (73.5%) said that it would be useful to have access to a network of volunteers who could support them in specific tasks, seven participants (20.6%) did not consider it useful and two participants (5.9%) did not respond. Participants who answered negatively revealed some difficulty in abstracting from their condition on that date as they said they were still independent and did not need any kind of support.

Only two participants did not consider digital technologies useful for requesting help in specific tasks. In terms of asking for help via TV, 26 participants (76.5%) said that this might be useful, three (8.8%) did not find it useful and five (14.7%) did not respond. Participants who did not find it appropriate justified the choice by saying that it is not easy to write on TV and the menus are difficult to navigate. When questioned if they would use the TV to launch help requests, not all the people that considered the application useful said that they would use it. 15 participants (44%) said they would use it, 12 would not use it (35.3%) and seven (20.6%) did not respond to this question. Some of the justifications for the negative answers were: difficulties in using the TV to make help requests and the difficulty of making requests in an emergency.

When questioned about which specific tasks they considered that might be useful to get help from a group of volunteers, the participants referred the following categories: go shopping; accompany to the doctor/hospital; accompany/ go on outings (sightseeing, going to the cinema); household tasks (preparing meals, cleaning, small household maintenance).

### 3.3.2 Responsible/Employees in Social Care Institutions for Older Adults

Six employees of institutions focused on the elderly were included in this group, namely five women (83.3%) and one man (16.7%). In terms of responsibilities, four participants (66.7%) were gerontologists in a social care institution (with responsibilities for coordination and management), one participant (16.7%) was a consultant/trainer in gerontology and another participant (16.7%) was the chairman of the board of a senior university.

All the participants considered that it would be very useful for the elderly to have access to a network of volunteers who could support them in specific tasks, as all agree that access to this network through easy digital technologies could be an asset for this population segment. The positive and unanimous opinion on the potential of the technologies in this case was justified by need of connection between the elderly and the outside world. Another advantage pointed out was that technological innovations are increasingly being known by the older public, especially if they are intuitive and easy to use.

Five participants (83.3%) considered that using the TV to make requests would be helpful for the elderly. The only participant who did not consider this option viable said that TV does not seem to be the most appropriate via when compared with mobile phones, because in his opinion the latter has more practical and user-friendly features.

Four participants (66.7%) agreed that older adults would adhere to use TV to launch requests to volunteers, one disagreed (16.7%) and another (16.7%) assumed that perhaps this scenario could happen. The participants with a more negative position assumed that the use of technological solutions may not attract the elderly population that is detached from technological means. However, it is perceived by them that TV could be a good incentive and attractive to a future adhesion.

People with responsibilities/employees in institutions for older adults also considered that older adults could need help from a group of

volunteers in the following tasks: go on outings /accompanying (shopping, health services, post office, public offices, hairdresser); buying medication in situations of an emergency; assistance in small household tasks; socio-emotional support; company and; support in tasks that include the use of technologies.

### 3.3.3 Family Members/Caregivers

Finally, eight family members/caregivers were surveyed, six women (75%) and two men (25%), with a mean age of 34.9 years (SD = 9.37). Five participants were children of one or more elderly people (62.5%) and the other three participants were grandchildren (37.5%).

All the participants had a professional occupation. Five participants (62.5%) have higher education. All the participants referred to having TV at home and use the internet regularly, and seven (87.5%) used smartphones. Only one had no paid TV service at home.

All participants found that it would be useful for their family members to have access to a network of volunteers who can support them in specific tasks. Also, all agreed that digital technologies could be useful to mediate this type of requests and five (75%) also thought that the TV could play a fundamental role in this. The frequency of TV use and familiarization with this medium were the main reasons pointed by the family members to consider TV as an excellent medium to be used by older adults (e.g. "TV is a device widely used by the senior and is always connected" and "I think they could easily learn to ask for help through TV").

Six participants considered that senior adhesion would not be an issue and two disagreed (25%). Whoever answered negatively justified this option by saying that using the internet or the phone seems to be simpler for their family member. One of these participants also said that not knowing the volunteers and exposing their privacy and residence to strangers could be a factor of resistance to the use of this type of application.

From the perspective of this group, the tasks in which the elderly could request help were quite in line with what was mentioned by the two other groups of stakeholders analysed previously, especially those tasks that require more physical effort, namely gardening and other household tasks, transportation/ accompanying to health services centres or support in the installation and maintenance of computer equipment.

### 3.3.4 Summary of the Collected Data

The elderly participants that took part in the study presented a higher education level, use of paid TV, use of smartphones and use of Internet in comparison with other studies (Portuguese Regulatory Authority for the Media, 2016).

Most of the elderly (73.5%) and all the participants of the other groups found it useful to have access to a network of volunteers who could support them in specific tasks. Only two participants (of the elderly group) did not consider digital technologies useful for requesting help from a group of volunteers in specific tasks. However, the opinions of concordance are slightly lower when the question is the use of TV to make those requests; with the most mentioned reason being the difficulty of using a TV remote control in comparison with, for example, the mobile phone.

Not all the elderly participants that considered the application useful said that they would use it but almost half of the participants showed a willingness to use it. Most of the participants in the other two groups said that the elderly would adhere using TV to launch requests to volunteers.

Finally, it was possible to verify that the three groups have a very similar opinion regarding the main categories of help requests. The main categories identified were: Animals, Shopping, Outings, Gardening, Leisure and Well-being, Meals, Home repairs and Technology.

## 4 PROJECT'S AIM AND REQUIREMENTS

Considering the results obtained from the literature review and from the questionnaires applied to key stakeholders, it was possible to reinforce the relevance of a project whose aim is to develop a TV application that allows older adults in their homes to request help, in a simple and quick way, from a group of volunteers in daily life tasks such as a ride to the supermarket or simple household maintenance such as changing a lamp. Excluded from these tasks are those related with hygiene and medical care, since these kinds of tasks are sensitive and should typically be undertaken by specialized professionals. To overcome difficulties related to the use of TV remote control in the contexts of information provision, it is proposed that the request could be made by voice, although the possibility of making a request by introducing information by TV remote control could be also allowed. One important aspect

that should be mentioned is that, in the meantime, the relevance of this project has also been recognized by one of the biggest Portuguese TV service companies, resulting in financial support to develop the project to be distributed through its TV set-top box.

The scenario of developing to a set-top box seems to be more adequate as the Smart TV (TV directly connected to the Internet) as there is evidence that a weak adhesion exists with regard to the latter (Portuguese Regulatory Authority for the Media, 2016). Since using a TV voice remote control with the TV box for which the application would be developed is not yet possible, the request using voice would be done by voice call. The option of having speech inputs through a telephone, which is close to the speakers' mouth, also brings the advantage of strongly reducing the background noise (a problem that affects voice systems that are deployed in the home context).

The process of asking for help will start with the choice of a request category. In terms of the requests' main categories, they were identified drawing on the results that emerged from the questionnaires. The next step in creating a new help request is to choose the details of the request (phone call or TV remote control). The request using voice would be done as follows: when the user chooses this option in the TV application, he is contacted via telephone, the request is processed and is presented in the TV application. Once the help request is complete, the application will link the available volunteers to the older adult who requested help. It will also be possible for an elderly person to monitor the status of the requests that could be one of the following: a) waiting for the confirmation of the volunteer; b) after a volunteer accepts, waiting for the confirmation of the older adult that accepts that volunteer; c) request waiting to be carry out and; d) request carried out. The TV application will also allow older adults to evaluate the help they have been given. The goal is to accomplish this in an analogous way to the process of asking for help (by receiving a phone call to give feedback and, after the feedback is processed, see it on the TV).

Although this article focuses only on the application directed at older adults, it is important to note that it is also foresee the development of a web application to volunteers see all the requests and accept those more convenient for them. In terms of participants in the process, it is also considered important that an organization exists to supervise the process, guarantee security for both the older adults and the volunteer and take part only in less normal

situations (for example, to understand the reasons for the bad feedback of a volunteer or to take action if any help request is a long time without a volunteer assigned).

In terms of approach to the development process, the choice falls on an iterative design and evaluation methodology. This presupposes the development of wireframes and high-fidelity non-functional prototype before the implementation of the final product and a constant refinement of the project, considering the usability evaluations to be carried out both with potential users as well as with evaluators that will examine the interface using a set of heuristics.

## 5 CONCLUSIONS

Volunteering targeting older adults is one of the ways to allow people that do not have their family members close to get help for daily life tasks, have a companion or even continue lifelong learning. Older adults consistently have lower rates of technology adoption than the general public. In this way, the use of TV, a technological environment which elderly people are so much more familiar with seems to be a natural and appropriate choice in terms of support for an application to promote volunteering targeting older adults. The intention of this article was to present the general workflow and requirements specification of a TV application that aims to support older adults in requesting help from a group of volunteers in daily life tasks to promote volunteering. The review that was undertaken revealed to be fundamental to understand the general state of the art of TV applications targeting older adults, to better know how voice interfaces are being used in systems directed at older adults and identify examples of volunteering initiatives that are using digital technologies, specially websites, to support their activities. The review also permitted to find some projects that should be further analysed to identify other aspects that are important to the application design, mainly related with visual and interaction design. Regarding questionnaires, the data obtained was essential to better identify a set of factors that could not allow a generalized acceptance of the use of TV to ask for help from a group of volunteers, despite being recognized by the diverse groups of stakeholders that this type of applications is important. The collected data was also essential to identify the types of requests that seem to be more useful to them.

The presented application proposal seems to have the potential to be accepted and, therefore, used in its target group, specially by people who are currently middle aged, who are more used to interacting with technology and will therefore continue to utilize it as they age. Nevertheless, it is essential that, during the next phases of design and development lifecycle, potential users have a strong involvement and that there is the aim of a continuous improvement through carrying out usability evaluations, to ensure that the system requirements meet user needs and expectations. Finally, considering the issues of trust and security for both the older adults and the volunteers, it is essential to further reflect about a model with the supervision of an intermediary organization that would promote an effective uptake of the TV application.

## ACKNOWLEDGEMENTS

The research leading to this work received funding from AlticeLabs@UA. The authors would like to thank the support provided by the National Association of Gerontologists in Portugal.

## REFERENCES

- AAL Association (2017) *Active and Assisted Living Programme - Success Stories*. Available at: <http://www.aal-europe.eu/about/success-stories/> (Accessed: 10 October 2017).
- AAL Programme (no date) *Our Projects | Active and Assisted Living Programme*. Available at: <http://www.aal-europe.eu/our-projects/> (Accessed: 12 November 2017).
- Boulos, M. N. K. *et al.* (2011) 'How smartphones are changing the face of mobile and participatory healthcare: an overview, with example from eCAALYX', *BioMedical Engineering OnLine*, 10(1), p. 24. doi: 10.1186/1475-925X-10-24.
- European Commission (2011) *How to promote active ageing in Europe - EU support to local and regional actors*. Available at: <https://goo.gl/kT96UV>.
- European Commission (2017) *European Innovation Partnership on Active and Healthy Ageing - European Commission*.
- International Federation of Red Cross and Red Crescent Societies (2015) *Global Review on Volunteering Report*. Geneva, Switzerland. Available at: <https://goo.gl/uhXZPR>.
- Judge, S. *et al.* (2009) 'Speech-driven environmental control systems—a qualitative analysis of users' perceptions', *Disability and Rehabilitation: Assistive Technology*. Taylor & Francis, 4(3), pp. 151–157.
- Macis, S. *et al.* (2015) 'A TV-based ICT Platform for Active Ageing, Tele-care and Social Networking.', in Holzinger, A. *et al.* (eds) *ICT4AgeingWell*. SCITEPRESS, pp. 219–227. Available at: <https://goo.gl/V2ZLt9>.
- Moon, J. Y. and Sproull, L. S. (2008) 'The Role of Feedback in Managing the Internet-Based Volunteer Work Force', *Information Systems Research*, 19(4), pp. 494–515. doi: 10.1287/isre.1080.0208.
- Portuguese Regulatory Authority for the Media (2016) *As novas dinâmicas do consumo audiovisual em Portugal 2016*. Lisboa.
- Público (2012) *Voluntariado. Dez ideias para quem quer ser voluntário e não sabe por onde começar*.
- Rhône, l'Opac du (2017) *HOST project - smart technologies for self-service to seniors in social housing*. Available at: <http://www.host-aal.eu/> (Accessed: 10 October 2017).
- Ribeiro, V. S. *et al.* (2015) 'Usability Evaluation of a Health Care Application Based on IPTV', *Procedia Computer Science*, 64, pp. 635–642. doi: 10.1016/j.procs.2015.08.577.
- Samaras, G. (2016) 'ICT services for active ageing and independent living: identification and assessment', *Healthcare Technology Letters*. Institution of Engineering and Technology, 3(3), p. 159–164(5). Available at: <https://goo.gl/svVgi3>.
- Senior-TV Consortium (2017) *Senior-TV – Providing ICT-based formal and informal care at home*. Available at: <http://seniortv-aal.eu/> (Accessed: 6 November 2017).
- Social iTV (no date) *Sponsored Projects*. Available at: <http://socialitv.web.ua.pt/index.php/projects/sponsored-projects/> (Accessed: 12 November 2017).
- Statistics Portugal (2012) *Censos 2011: Resultados Definitivos - Portugal*. Lisboa, Portugal. doi: ISBN 978-989-25-0148-2.
- Tsiourti, C. *et al.* (2016) 'A virtual assistive companion for older adults: design implications for a real-world application', in *Proceedings of SAI Intelligent Systems Conference*, pp. 1014–1033.