

# Proposal of an iTV Splash Screen Targeted to Seniors

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**Keywords:** Seniors, Active Ageing, +TV4E, iTV, Splash Screen, Health, Quality of Life, Social Services, Public Services, Time Orientation, Time Perception, Isolation.

**Abstract:** Population around the world is getting older every year so it is progressively getting more important to find ways to use modern technology to promote active ageing and the general well-being of seniors. In this paper, contextualized in the +TV4E project, a splash screen for an interactive television application is proposed, which serves to contextualize the users by providing information regarding weather, time, date and season, as well as contact information for the nearest pharmacy and taxi. This paper describes the splash screen and its components as well as the field tests carried out to validate its utility.

## 1 INTRODUCTION

The natural ageing process and the increment of individuals' longevity are stressing almost every country regarding their socio-demographic structure. Due to these phenomena and in conjunction with the accelerated population growth, it is expected that by 2050 there will be twice the number of people aged 60 and above, which translates into a growth from 962 million to 2.1 billion individuals worldwide. This growth will occur mainly in developing regions, mostly Asia. The inversion of the age pyramid, translated into the increment of older individuals in relation to younger ones, is majorly underlined by demographical aspects, social and financial, such as changes in the fertility and mortality rates and migration.

Public systems of health care, pensions, and social services will be stressed by this ageing population since it will lower every country support ratio, which designates the numbers of workers per retiree. In the specific case of Europe, it is expected that this ratio will drop from 3.3 to 2 until 2050 (United Nations, 2015, 2017).

It has not yet been defined the age associated with the concept of elderly, though it has been related to the average life expectancy. The World Health Organization considers, for developed countries, an

individual as an elder if he has more than 65 years old (World Health Organization, 2016).

Getting older is not only to reach a new age; it consists in a different way to experience the environment around us and in limitations of various kinds. These limitations will affect people in various ways depending on the individual physical changes, which have an emotional impact on individuals since it will affect daily life. The changes take different forms and do not necessarily involve the individual's intellectual capacity, but involve aspects such as hearing, eyesight, and fine motor skills. As a natural and idiosyncratic phenomenon, it affects different inter and intra individual characteristics that, when associated with the elder's informative needs and the concept of active ageing, can be aspects to consider to integrate these individuals into modern societies (Kalache and Gatti, 2002).

The concept of active ageing was adopted by the World Health Organization to identify aspects which shape the way population and individuals get older. For Kalache & Gatti (2002) it is designated as a process to optimize health opportunities which start becoming crucial as physical, cognitive and social losses start being perceived on the senior. In such manner, it conveys aspects of physical, social and mental wellbeing which are required for good quality of life levels which in turn relate with the objectives of the splash screen for iTV applications that will be

discussed in this paper (Kalache and Gatti, 2002). The splash screen, used as starting screen of a TV application, aims to orient elder individuals on a time frame, providing information about the weather, time, date and season, and to offer important services, such as the nearest taxi and pharmacy, by displaying their name and contact information.

There are three fundamental components associated with ageing: biological, psychological and social. In the context of this study, the psychological component is taken into consideration since time orientation is one key aspect that reinforces it (Crockett *et al.*, 2009). Time orientation helps to establish proper responses to an event since it allows individuals to evaluate them according to a defined time frame (Crockett *et al.*, 2009), thus it is essential to seniors considering they are affected by time disorientation and misperception. According to Iwamoto & Hoshiyama (2012), there are two different clinical concepts of time recognition: perception and orientation. Perception changes are, reportedly, related to age and dementia, while orientation, commonly tested under the context of a Mini-Mental State Examination (MMSE), is correlated with a state of dementia (Iwamoto and Hoshiyama, 2012).

In order for technologies and digital interfaces to be accessible to senior's literacy needs it is required for them to be developed acknowledging and understanding the consumption habits seniors have had through their entire lifespan and taking into account their digital literacy, as well as their sensory, physical and cognitive constraints (Silva *et al.*, 2016). Because most of them are unaware of how to use much of the modern Information and Communication Technologies (ICT), due to their own constraints and the technologies level of complexity, the majority of seniors tend to be affected by the phenomenon of info-exclusion. In order to overcome this phenomenon, amongst other premises, comes the +TV4E project, which uses the television, a common medium, to deliver information about public and social services to the elderly. Being the nearest technology *Portuguese elderly spend more than 21 hours per week in front of their TV sets* (Silva *et al.*, 2016) it is seen as an imperative medium to distribute information. According to Silva *et al.* (2016), it can be helpful by providing remote assistance features, providing healthcare and medical information and/or distributing information about public and social services.

In line with this the +TV4E project is being developed, a Portuguese action-research project headed by the University of Aveiro, that proposes an

iTV platform that delivers personalized informative contents, through video spots, about social and public information for Portuguese seniors. The global aim of this project is to promote the info-inclusion of Portuguese older people with informative content in this field, through video spots injected during the linear TV broadcasting. When new information is available, the regular TV broadcast is locally paused and resumed after the presentation of the informative video.

Globally the developed prototype is composed by three main features/components: (1) splash screen; (2) video spots injected during the linear TV broadcast and (3) a video library, where the videos generated on the last five days, categorized as seen and unseen, are aggregated (Silva *et al.*, 2016; C. Silva *et al.*, 2017;).

The splash screen, under analysis in this study, corresponds to an important component of the +TV4E project, which serves as an initial screen presented to the user when the platform is launched. The main objective of this feature focuses on orientating the user concerning essential areas of daily life, like season, open pharmacy and TAXI service.

The current paper will first approach the context of seniority, with a focus in Portugal, scrutinizing about their demography as well as their cognitive and information needs. This theoretical framework opens the door to the user tests about the splash screen under study, where the methodology used and the results are analyzed. The final remarks comprise a discussion about the results as well as prospects about how similar systems may be useful in a nearby future.

## 2 THEORETICAL FRAMEWORK

In order to adequately develop new technologies that address the senior populace needs and limitations, it is vital to first understand this target demographic. With this goal, the following section will address the current state of the senior population in Portugal, the cognitive problems that naturally appear with old age, the isolation that currently afflicts this group, as well as their information needs.

### 2.1 Seniors in Portugal

Looking at Portugal it is possible to observe that it follows the global trend concerning the rapid increase of the elderly population. By 2080 it is predicted that there will be an inversion of the ageing pyramid (Carrilho, 2015), which means that there will be more

seniors than children. Data from the Portuguese National Institute of Statistics reveals that in 2012 there were 2,032,606 senior citizens (at least 65 years old) and predictions foresee that this number will increase to 3,343,987 by the end of 2060 (PORDATA, 2016). These predictions are a result of many factors, namely higher life expectancy, lower fertility rates and emigration. Given these trends, it is paramount that, looking into the future, society evolves in such way that can accommodate these imminent changes and guarantee the quality of life of seniors.

## 2.2 Senior's Cognitive Problems

There is strong indication that it is possible to resort to modern technologies, such as the internet, to promote active ageing and thus slowing the ageing process altogether. However, these newer technologies require some degree of digital literacy to be utilized, therefore when developing technologies for the elderly it is required to consider the cognitive problems associated with ageing.

Getting older causes a decline of intelligence, which translates in difficulties in solving day-to-day problems, this is being greatly influenced by various factors namely beliefs, the physical and social context, motivations or emotions (Figueiredo, 2007). Although there is not a consensus regarding the motives that lead to the decay of mental skills associated with ageing, there are three cognitive aspects that seem to be related to the decline of cognitive functions. These are the reduction of information processing speed, the loss of memory and the decreases in visual and auditory acuity. Memory loss can become notably crippling, especially in diseases like Alzheimer's, since short-term memory is fundamental when performing tasks, retaining information, making decisions or solving problems (Figueiredo, 2007).

Considering all these limitations, it is essential that when creating technology for this age group researchers are careful to avoid complex systems that dissuade the users and instead build them accordingly to these constraints (Stojmenova *et al.*, 2013a).

## 2.3 Isolation of Seniors

Humans are at their core social beings, therefore social relationships are a vital part of an individual's mental and physical well-being. Seniors tend to become isolated from the outside world due to a loss of social support (Rönnerberg, 1998).

The term "isolation" can be sometimes mixed up with the term "loneliness", however, these are two different concepts. On one hand, isolation can be referred as a "separation from social or familial contact, community involvement, or access to services" (AgeUK, 2011). On the other hand, loneliness comes from the individual's own perception of lacking all these things. Thus, it is indeed possible for a senior to be isolated but not be lonely if, for example, he is living by himself and not having much social contact, without any feelings of loneliness. However, one can also be isolated while not being lonely if the individual lives among others, for instance in a senior home, but this physical proximity with others is not enough to satisfy their companionship needs.

Social isolation translates in low amounts of contact with others and it has become a big problem for many older adults. The ageing process comes with a natural loss of cognitive and motor abilities which in turn impair one's ability to socialize. In the end, all this leads to the aggravation of the individual's health and can lead to a higher mortality risk (Age Uk, 2011).

Cognitive degradation paired with sensory limitations, notably hearing loss, in seniors plays a big role in promoting their own isolation, mostly because they become obstacles to the people around them. Conditions such dementia can be especially hard to deal with, making it very hard to communicate with the senior.

The English Longitudinal Study of Ageing divides the concept of isolation into four key elements: feeling lack of companionship, feeling left out, feeling isolated from others and feeling in tune with people (Demakakos, 2006). While it might not yet be possible to use technological solutions to solve all these issues, the +TV4E project aims to target the feeling of being left out, by providing relevant news content, thus contextualizing the senior in current society events and avoiding that he feels 'out of the loop'.

## 2.4 Senior's Information Needs

As referred before, the +TV4E project comes as a proposal to suppress seniors' information needs that naturally come with old age. The main goal of the project is to deliver high-value information to the seniors via an iTV application.

Information is essential for individuals to participate actively in today's society since it enables the individual to make informed decision (Silva, Caravau and Campelo, 2017), it also enables him to

maintain his autonomy and independence, thus improving his overall quality of life (Kalache and Gatti, 2002). Portugal is one of the countries in Europe with the best levels of availability, usability, and ease when it comes to information regarding public and social services (Barroso and Vasconcelos, 2016). The ability to access this information is directly related to individual's quality of life, as well as to the quality of life of those who are close and dependent on them. However, seniors are at a clear disadvantage when it comes to accessing the available information because it is centralized in online platforms, which seniors still are not used to.

In short, providing a way to convey pertinent information to the senior population can positively contribute to an active ageing and promote independence from their caretakers.

### 2.5 Similar Projects

Alongside +TV4E, there are other projects with similar objectives which focus on gerontechnology that improve the quality of life of the senior population. The TITI project (Barrigão Gonçalves and Cristina Santos, 2013) proposes a solution to integrate the elderly into the information society, helping them to acquire the necessary digital and informational literacy, in order to make it easier for people who are geography distant to stay in touch. In the scope of iTV it is also important to highlight three projects, Med-Reminder which notifies users to remind them to take their medication and allows users to make emergency phone calls to medical professionals (Stojmenova *et al.*, 2013b); VitalMind (Miotto, Lessiter and Freeman, 2009) that has the objective of promoting physical and cognitive activity in senior, to slow their ageing and improving their well-being; and iNeighbourTV (Abreu, Almeida and Silva, 2013) a project with similar objectives to the previous examples, but with the added functionality of allowing the users to create social networks between friends and neighbours.

## 3 INFORMATIVE SPLASH CONCEPT

All components in this platform were developed taking the target public needs into consideration. Age-related changes at a biological, physical and psychological level reflect, among other aspects, on particular needs that were taken into account when developing the splash screen included in the +TV4E

prototype. Design guidelines were followed to conceive the visual aspect of this component (T. Silva, Reis, *et al.*, 2017) and essential information was integrated in order to orientate the users about their position in time and space. It should be noted that, in this phase, the followed line of action considered individuals that did not present pathological deviations as they do not integrate this platform's target audience.

The splash screen works as an introduction screen before starting the linear television broadcast and it is the first layer of informative content shown to the user in the +TV4E platform (Silva *et al.*, 2016). It can be divided into six components: (1) weather information; (2) time display; (3) a greeting message integrated with the date and the season; (4) contact of the nearest taxi service; (5) name and contact of the nearest pharmacy; (6) contextual background image.

Currently this screen appears every time the set-top box (STB) is booted (the STBs are running the application of the +TV4E project) or in case it is already connected it is displayed when the television is turned on. This solution was achieved by implementing an HDMI listener in the android application which is running on the STB. When the television is turned off or on, the JAVA application running on the set-top box listens to these events and, using a web socket connection, notifies the iTV application (a web application), to display the splash screen to the user for a total of 30 seconds. This behaviour can be seen in more detail in the following **Error! Reference source not found..**



Figure 1: Splash screen behaviour in context of use.

At the time of the tests described in this paper the duration of the splash screen was set to 30 seconds. This value was determined considering the amount of information on display in order to give time for seniors to perceive the information. Previously this time was set to 10 seconds, but preliminary tests, carried out with a small group of seniors, showed it was not sufficient.

To gather data for the splash screen, two different web services (API) and JavaScript methods were used as shown on Figure 2.



Figure 2: Splash Screen Used Services.

The data is gathered by providing these webservices with the STB coordinates. On the case of google API a radius of 10km was also set to retrieve the nearest open pharmacy.

A simple layout was designed keeping in mind seniors visual impairments, therefore the chosen font was Tiresias, created specifically to be used in the context of seniority (Abbott, 2007). The contextual background images are used to visually represent the aspect of the current weather and where chosen in order not to affect text legibility. To reinforce this criterion a layer of black colour with opacity was also applied.

The following section describes the process used to test the splash screen validity.

## 4 USER TESTS

To better understand the usefulness and usability of the high-fidelity prototype developed that contains the splash screen, field tests were carried out with some participants in their natural context (home environment) over five weeks, as well as tests implemented under controlled conditions. This last category of tests, which are reported in the present article, is characterized by the high degree of experimentation and observation, which allowed to perceive the participants' reaction in their first moment of interaction with the splash screen.

The tests described further, developed under precise conditions, aimed to analyze the utility and usability of the +TV4E project high-fidelity prototype components, most importantly the splash screen. These tests were conducted by two members of the

+TV4E research team, the responsible researcher, and an observer, and took place between September 20<sup>th</sup> and 27<sup>th</sup>.

### 4.1 Methodology

To begin, the study was explained to the participants, going over the objectives and aspects related to the data being collected, giving to the participants freedom to request additional information and to quit the study at any time. Following this procedure, an information sheet was given to each participant. Afterwards, everyone gave their approval to participate in the study by signing a and dating an informed consent.

The performed test consisted of the following phases: (1) application of a sociodemographic questionnaire for sample characterization and TV consumption habits analysis; (2) a list of tasks, described in the task script, to be completed by the participants, with verbal orientation of one of the researcher and the completion of an evaluation grid by a second researcher (observer); (3) application of the Post-Study System Usability Questionnaire (PSSUQ) to assess the usability of the system by the researcher; (4) application of a questionnaire defined to assess the usefulness that the +TV4E platform represents to the participant; (5) administration of a final questionnaire with the objective of gathering all the participants' opinions concerning the video recommendation system.

This study sample was selected by convenience (Carmo and Ferreira, 2008), amongst seniors who attend an adult day care centre, located in Aveiro region. For the sample selection, the inclusion criteria considered were, having an age over 60 years; watching television regularly; knowing how to read and providing an informed consent. Exclusion criteria were all the other conditions or circumstances which, in the opinion of the researchers, could compromise the subject's ability to take part in the study.

The total sample was composed of 11 seniors: seven females (63,6%) and four males (36,4%), with an average age of 84,4 years (SD=7,3). Concerning their education level, the majority of the sample had completed the 4<sup>th</sup> grade (previously the mandatory education in Portugal) (54,5%), followed by 18,2% who knew how to read and write (n=2), one individual with the 9<sup>th</sup> educational grade (9,1%) and one participant with higher education (9,1%). On average, each individual watched 3,3 hours of TV per day and 54,5% have paid TV services. The most-watched programs categories are: news (n=11), entertainment (n=8), and soap operas/TV series

(n=6). Only two participants (18,2%) reported that they needed some help from another person when watching television.

Along with the global tests it was possible to analyze data related specifically to the splash screen area. After the splash screen appearance, it was requested for the participant to “Check the current temperature and the pharmacy”. Being the splash screen displayed for 30 seconds it is expected that the user locates the information on the screen and respond to the request, within the given time frame.

Also, in the final questionnaire, it was assessed the usefulness of the splash screen feature through a closed-ended and an open-ended question. “Do you consider useful the daily information available on the splash screen (time, the day of the week and day of the month, season, weather, pharmacy and taxi contact)?” was the applied question. If the participant refers that the splash screen is not useful, he should mention what he/she think that should be improved.

## 4.2 Results

During the execution of the task of checking the current temperature and pharmacy info, around 54,5% of the sample accomplished it with success. Only two participants (18,2%) made mistakes during the execution of the task. One of the participants who failed understood the requested task but did not find on time the requested information. The remaining 27,3% accomplished the task, but with some help of the researchers. In Table 1 (that depicts the results of the test) this 27,3% were considered as failure.

Table 1: Results of the Splash Screen Task in the evaluation of performance (n=11).

	n	%
Success	6	54,5
Failure	5	45,5
Number of errors		
0	9	x
1	2	x
Execution time in seconds (average)	16,8	x

In the final questionnaire, all the seniors referred that the splash screen is a very useful feature because often they did not know basic elements of time orientation, as for example the day of the week and month. Despite this overall positive evaluation the results seems to indicate that the information on the splash was not clearly understood.

## 5 FINAL REMARKS

Considering seniors television consumption habits, an iTV application can be considered as a prime medium to deliver information to seniors and help to promote active ageing. However, there are some limitations respecting the experience and ease on which seniors, from different age groups, interact with iTV applications. Trying to overcome these limitations the +TV4E project iTV interfaces have been developed within sessions of participatory design in order to deliver the best user experience to their target audience.

### 5.1 Splash screen potential

The preliminary tests carried out with the target audience revealed that the splash screen has potential when it comes to contextualizing the senior population regarding basic environmental information. The success rate of usage of the splash screen related task was slightly higher than the failure rate, which points out that some work still has to be done concerning the layout of information on the screen and the amount of time it is shown to the viewer. The display time of the splash screen was not yet completely tuned, therefore in further studies it is required to fully assess what is the most adequate display time that allows the user to take in all the information displayed (time, weather, season, taxi and pharmacy services).

Another facet yet to be tested is the potential of splash screen to promote levels of information of seniors. This topic refers, for example, to the way messages are presented to the senior, and the way a personalized greeting can be implemented considering some specific characteristic of the user in front of the TV, in order for an emotional bond to be developed.

### 5.2 Future work

In order too fully validate the potential of the splash screen it is important to run tests with a larger sample and in a home environment since this will be the setting where most of our target demographic will use the system. Despite being a small step for the +TV4E project, the splash screen proved to be very important helping to reach the final goal of creating a platform that conveys information to the Portuguese seniors improving their overall well-being. The research team looks forward to fine tune this component of the +TV4E project thus improving the quality of the overall solution.

## ACKNOWLEDGEMENTS

The research leading to this work has received funding from Project 3599 – Promover a Produção Científica e Desenvolvimento Tecnológico e a Constituição de Redes Temáticas (3599-PPCDT) and European Commission Funding FEDER (through FCT: Fundação para a Ciência e Tecnologia I.P. under grant agreement no. PTDC/IVC-COM/3206/2014).

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