The STAGE Project: Tailored Cultural Entertainment for Older Adults via Streaming Technology

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Abstract. In recent years, Ambient Assisted Living (AAL) solutions for older people have been increasingly focusing on leisure and educational activities, as opposed to healthcare assistance.

In this framework, the European research project STAGE – Streaming of Theatre and Arts for old aGe Entertainment, was recently approved and funded by the Active and Assisted Living - AAL programme, in the context of Call for Proposals 2015.

STAGE aims at developing an easy-to-use ICT platform to deliver cultural and educational content to older people via video streaming technology. This content will be provided through customized interfaces and will include events such as theatre plays, concerts, opera performances and museum exhibits.

In order to accomplish this, it will employ a co-design methodology, involving older users in the design and development of the platform from the beginning of project activities. Users will also test the platform prototype and provide feedback, in order to define a final fully customized version.

The ultimate goal of the project is to provide older people who are interested in culture but find difficulties accessing it, with a facilitated and affordable way to enjoy this type of content.

Keywords: Assisted Living · Co-design · Cultural entertainment · Video streaming · ICT platform

1 Introduction

Older people, as shown by some studies, are generally interested in participating in cultural and recreational activities [1]. This interest can also be fostered by the increased free time that is available to them as a consequence of retired life.

However, a substantial percentage of older adults in Europe find difficulties in accessing cultural events [2].

The nature of these impediments varies: they could be related to mobility, financial or health problems. As a consequence, many older people feel discouraged or are unable to attend such events.

Furthermore, cultural and social activities have been shown to be beneficial for the mental health of older people, reducing the risk of cognitive illness and contributing to a sense of active and fulfilling lifestyle [3–5].

Therefore, the possibility of attending this type of events would represent an opportunity for their personal enrichment and social engagement, and would increase the perceived level of satisfaction.

The STAGE project (*Streaming of Theatre and Arts for old aGe Entertainment*) was conceived to find a remedy to problems hindering the participation of older people in cultural events, and help them keeping an active lifestyle, through the employment of ICTs.

The main goal of the project, in fact, is to design and develop an easy-to-use, cross-device ICT platform to deliver videos of cultural events via streaming technology that can be easily accessed by older people at home or in any other context where an Internet connection is available.

The platform will provide a diverse selection of offers, by liaising with cultural associations and event providers worldwide, including (but not limited to) theatres, concert halls, opera houses and museums.

Digital tickets of events would be sold through the platform at a reduced price, and in some cases even for free, with a facilitated and secure payment system.

This will not only enable older people to enjoy culture in a comfortable and affordable way, but also give them the opportunity to access events from countries far away from where they live, which would be impossible with traditional means.

The STAGE project was approved by the Active and Assisted Living programme in 2015, and started in March 2016 [6].

It is being developed by a European research consortium led by the Construction Technologies Institute of the National Research Council of Italy (ITC-CNR). The other partners are: CEDEO and ANCS from Italy, SIVECO from Romania, ASM from Poland, MATERIA and GEORAMA from Cyprus, and PBN and Karma Interactive from Hungary.

ITC-CNR is a public research body, it will coordinate the project and assess and evaluate user requirements.

CEDEO, GEORAMA, Karma Interactive and SIVECO are ICT enterprises, in charge of developing the software platform, including interface design and implementation of user requirements.

ANCS, MATERIA and PBN are end user organizations, with the role of involving older users in the project and ensuring that privacy and ethics are respected.

ASM is an SME specialized in socio-economic surveys and analysis; marketing and business planning that will develop the business plan of the project, in addition to coordinating dissemination activities.

In its initial phase, the project is concerned with defining user requirements, which will be analyzed and implemented in the platform design and development activities.

To this end, two questionnaires were prepared and administered to selected groups of possible older users, belonging to three end user organizations from Cyprus, Hungary and Italy (MATERIA, PBN and ANCS), who volunteered to be involved in the project.

The first questionnaire aimed at outlining a general user profile by collecting data about personal information, health conditions, education level, attitudes and cultural interests. The second one concerned users' preferences in reference to the STAGE application graphical user interface (GUI). It was administered jointly with mock-up images of the GUI, developed by GEORAMA.

Older users were asked to answer specific questions about the layout and the intelligibility of the interface elements, as well as to suggest improvements where needed.

An outline of the platform characteristics, together with a detailed description of the questionnaires and an analysis of the obtained answers will be provided in the following sections.

2 Project Scope and ICT Platform for Streaming Events

The ICT platform the project intends to develop will be able to run on the majority of technological devices, such as PC/laptop, tablet, smartphone and Smart TV. Therefore, it will be compatible with most popular operating systems, such as Windows, Mac OS, Android, iOS and WebOS.

In addition to the main video streaming feature, the STAGE solution will also include eLearning elements with informative content about the events being viewed or scheduled, and a dedicated social network. This latter will allow users to exchange comments and opinions about events, as well as to engage in online conversations. All the features of the platform will be designed and implemented according to accessibility principles (such as WCAG – Web Content Accessibility Guidelines [7]), using an approach based on co-design. (Co-design, or participatory design, is a methodology based on involving end users and other stakeholders in the conception and design of a product or technology targeting them [8]).

The interface will be initially translated at least into three of the five languages spoken in the consortium – i.e., Greek, Hungarian and Italian –, plus English.

A facilitated payment procedure to purchase event tickets will also be included.

The first prototype of the platform will be tested with volunteer users – involved through informed consent – during a one year-long pilot trial. This trial will be instrumental in collecting a significant amount of user feedback, in order to produce a final version of the platform responding to their needs and requirements as much as possible.

2.1 The Video Streaming Platform

The STAGE video streaming platform is a Java-based Web application offering a range of services exposed by API (Application Programming Interface): content management, import/export, show time, live streaming, trading and payment.

Each service is organized, by means of suited APIs, into a number of sub-services. For instance, the Showtime API includes:

- List Videos;
- Detail Video;
- Post Video;
- Remove Video;

while the Live streaming API includes:

- Create Event;
- List Events;
- Stream Event;
- EPG (Electronic Program Guide).

The platform runs a number of docker containers that ensure flexibility and scalability. (A docker container is a software that allows running an application within a self-contained environment, ensuring interoperability, regardless of the hosting platform [9]). The docker containers are used for content ingestion, transcoding, database management, scheduled services, payment, streaming, statistics and log aggregation.

The video streaming platform forms the main server-side component on which the STAGE software is based.

2.2 The Service Platform

The STAGE service platform will be built under Drupal 7 CMF (Content Management Framework). Drupal 7 is an open source content management platform powering millions of websites and applications. It is built, used and supported by an active and diverse community of people around the world and offers high delivery performance, stability and high security features when using its API [10].

The used database is MySQL, one of the most popular open source database management systems.

Drupal CMF accepts load balancing between application servers using a MySQL database. Load balancing is the practice of evenly distributing work among multiple computers.

This technique provides several important benefits, including:

- reducing load on individual systems and minimizing response time;
- increasing network utilization and maximizing throughput;
- improving reliability;
- facilitating scaling.

The STAGE software is based on the interoperation of a server-side platform and a client-side application. This latter, in addition to the GUI specifically designed for older people, will have another interface for cultural event providers.

This will be managed through Drupal 7, which will be used as the client side platform where cultural institutions will have the possibility to interact with the video streaming platform (that is, the server side).

The interoperability of the two platforms will be assured by secured Web services and will allow the following actions:

- connect to an account on the streaming platform;
- upload, describe and publish new videos;
- set access conditions for each published video (free, creative commons, pay per view);
- given a list of videos, publish those of choice on your website;
- insert videos anywhere on the page;
- choose the skin and the size of the video player;
- choose whether to make videos visible to everyone or only to certain users;
- create a new video playlist and publish it on the pages and posts of the site;
- create live streaming events to be published on the pages of your site;
- record videos of live events that have already been broadcasted;
- synchronize videos with your streaming platform account (if you posted a video with some conditions, these are also updated on the streaming platform);
- control and monitor access analytics for your content.

See Fig. 1 for a schematic representation of the service platform.
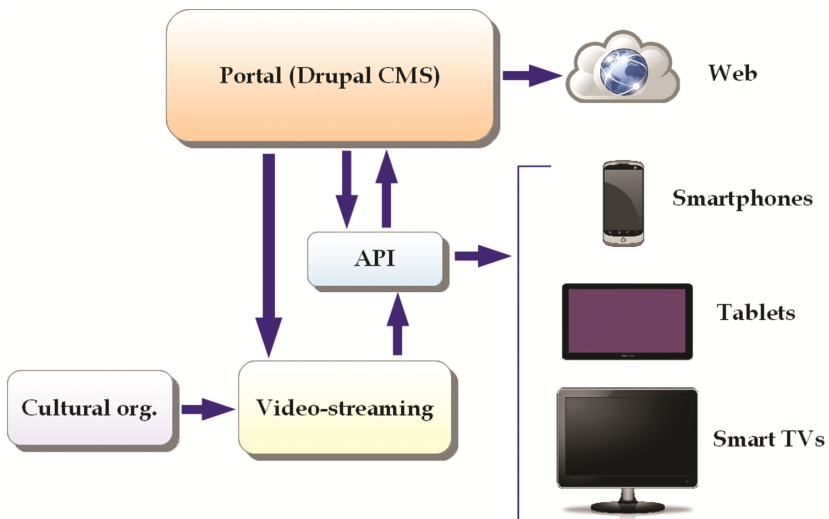
Fig. 1. Diagram of the STAGE service

3   User Involvement and Co-design Methodology

As mentioned above, a central element of the project's research approach is the active role of users in the design and implementation of the platform.

To this purpose, the very first phase of STAGE concerned the involvement of older people in the project activities, on the basis of informed consent.

This was accomplished with the help of end user partner organizations, which organized meetings with older persons who previously expressed an interest in the project. These meetings had the purpose of better explaining the project's aims and expected results, as well as to administer dedicated questionnaires to explore their preferences and requirements.

The user sample participating in these meetings, in addition to the prerequisite of willingness and interest, was also selected according to the following criteria:

- being 65+ years old;
- not having serious cognitive diseases (though mild cognitive impairment was not excluded);
- being of varied social and cultural background;
- being gender balanced.

Two sets of meetings were organized in three partner countries (Cyprus, Hungary and Italy), involving a total of 71 participants.

In the first meeting, users provided answers to a questionnaire targeting their personal and social profile, cultural and recreational interests and preferences, as well as a first survey of their opinions about the perspectives offered by the STAGE platform.

The level of confidence and skills with technological devices and the Internet was also explored.

The second meeting aimed at surveying participants' preferences in terms of the application's GUI. This was presented and explained to them by project staff with the support of mock-up pictures of several screens, prepared by the Cypriot partner GEORAMA (Figs. 2 and 3).
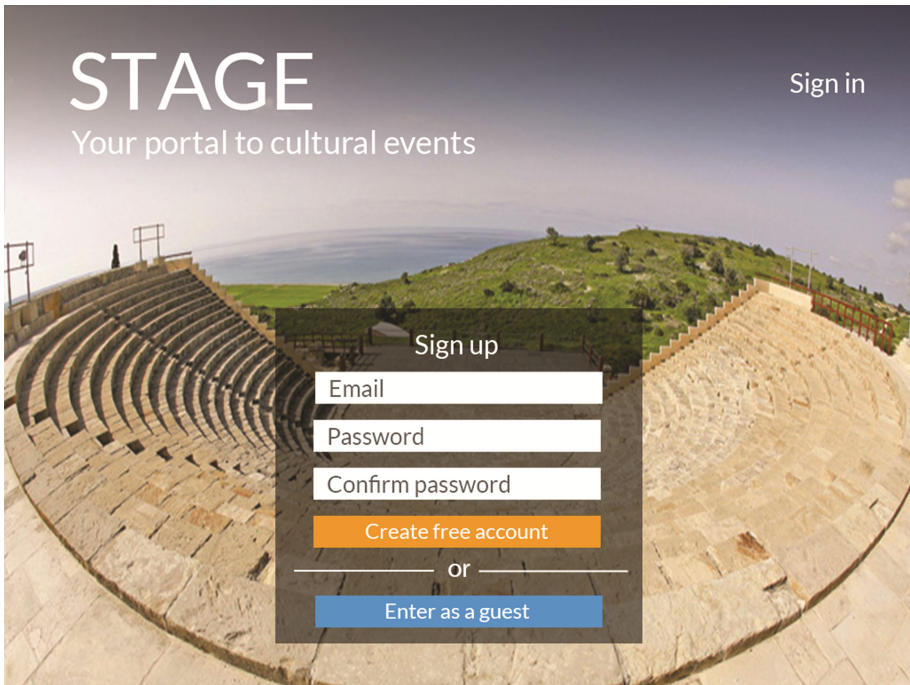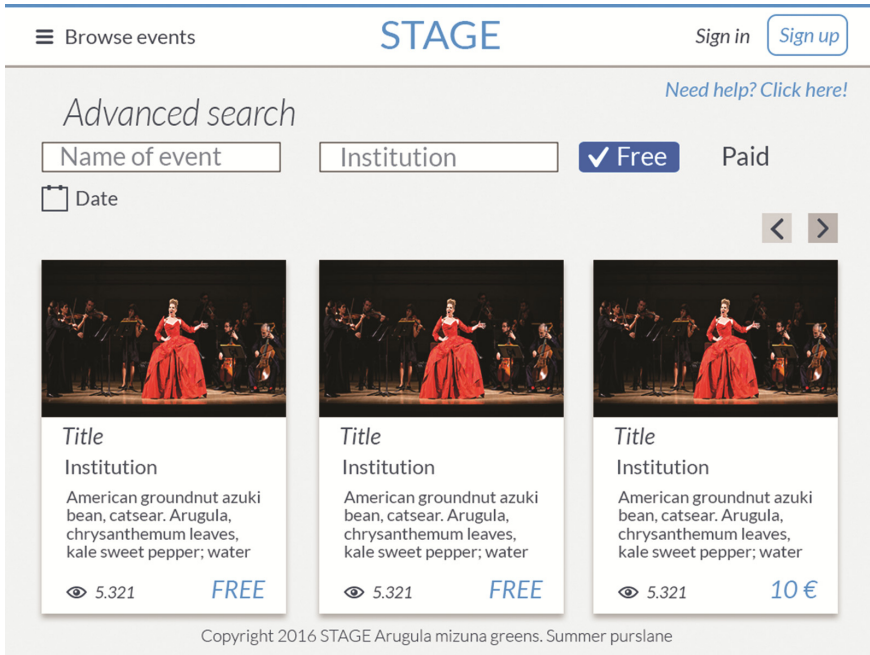
Fig. 2. STAGE application GUI mock-up: home page

The questions were focused on the intelligibility of text, color contrast, layout, font size and clarity of purpose, structure and size of buttons and menus.

The questionnaire allowed users to suggest improvements where they found shortcomings in the way the mock-up interface was designed.

These suggestions will be used to define and implement the first version of the actual GUI of the STAGE platform, thus complying with co-design principles.

This approach will be also adopted on a larger scale when the pilot trials with users will start, based on the first prototype that will be released in early 2017.

Fig. 3. STAGE application GUI mock-up: search for events

4   First Outcomes of the Survey on End Users

The sample of 71 involved volunteers that took part in the survey were on average 72 years old; 47.89% of them were females and the remaining 52.11% males (Fig. 4 shows the distribution of users by age groupings).

Data were gathered through two paper questionnaires filled out by users, that were later anonymized. The first one was formed by five main sections focused on different topics:

- residence information (4 questions);
- personal information (6 questions);
- social participation and recreational activities (15 questions);
- STAGE platform preferences (6 questions);
- technical information (5 questions).

These questions were conceived with the purpose of defining a general user profile that would be the basis for the project use cases and scenarios. For this reason, users' personal information and data on their level of social participation and engagement were collected.

Specific questions on STAGE platform preferences were drafted to probe the average interest on cultural activities, as well as users' preferences regarding the type of cultural content to be provided by the project.

Technical information gathered by means of the questionnaire, instead, will be central in the development of the first prototype of the software platform.

Its design, in fact, will have to take into account users' requirements concerning technological devices and their average ability and confidence when using them.

The questionnaires were digitized and the data were transferred into an Excel database file to be subsequently analyzed.

According to the results, over half of users (55.71%) had a primary or intermediate education level, while 30% have attended either high school or a trade/technical/vocational training; 14.29% of them achieved a higher degree.

As mentioned above, the STAGE platform was conceived to bring cultural entertainment to older adults' homes: indeed, some data collected in the first questionnaire have highlighted the necessity of this type of service as people grow older.

In fact, 18.84% of surveyed users live alone and 59.42% with a partner (only 21.74% live with two or more people).

Older people living alone can in general be prone to boredom and exposed to the risk of loneliness [11, 12], while those who live in couple might wish - more than people living in bigger families - to find new activities to do with their partner.

Moreover, though more than 50% of them declared to be healthy, 46.48% suffer from minor disabilities (motor, hearing, visual or multiple) and only 2.82% of major ones. This kind of issues is likely to inhibit older people to leave their houses for a long time and especially by night (the time of the day when most cultural events - such as theatre shows and concerts - take place).

Indeed, when potential end users were asked to specify the frequency of engaging in 17 selected leisure activities, it turned out that the most frequent activities (done at least once a week) are all indoor or home activities, such as watching TV, reading or watching movies.

Activities qualified as "cultural" (i.e. attending conferences, cinema shows, theatre plays, concerts, opera and museum exhibits) appear to be carried out less than twice a month and some, such as going to the opera, tend to never be carried out (Fig. 5).

According to these results, it can be assumed that the possibility of attending various and heterogeneous cultural events and happenings which take place worldwide - ranging from pop music to opera concerts, from theatre shows to guided tours and museum exhibits - thanks to streaming technologies, would constitute a major improvement in users' quality of life. It is not just a matter of entertainment, but rather a way to keep the mind active by providing users with knowledge in various forms - visual and textual contents -, and making them interact with a multimedia environment. When directly asked about the relevance of such a possibility, the large majority of the users (85%) showed their interest.

As the STAGE platform is being developed to work on devices such as smart TVs, tablets, smartphones, desktop PCs and laptops, one possible weakness could concern the lack of technological skills in older adults.

The IT literacy level of end users was investigated as well. The data show that they are distributed in three categories: 39.13% of respondents regularly use the main social networks and Web applications, 21.74% know them - though are not familiar with them - and 39.13% do not use them at all.

The most used devices for online activities are, in decreasing order: computers, smartphones, tablets and laptops. Furthermore, 53% of the interviewees do not feel confident handling tablets (just 6% do feel very confident), and 28% feel confident or even very confident in using smartphones. This data indicates the tendency of the target STAGE user to approach this kind of devices, but also their difficulties when facing complex user interfaces. It will be therefore essential to design a simple, linear and intelligible interface in order to optimize the platform usability and make users feel confident while browsing it.

This is why the second questionnaire, whose data are currently being analyzed, was based on mock-ups of the interface which is being developed through a co-design approach.

The analysis of the most used social networks and Web apps provided another significant result: Facebook is the most frequently used one - on average once a week; this means that users are already familiar with its graphics and functionalities. Since one of the features of the STAGE platform will be a dedicated social network where users could exchange information and opinions on the cultural contents they have already enjoyed - or want to enjoy -, it would be clearly sensible to build an environment along the lines of Facebook - though of course not identical to it, in order to avoid ambiguity.

Vaguely evoking features, graphics and mechanisms people already know - or at least have already approached - is a way to speed up the initial learning curve, to let the users handle the platform easily and to make them have fun using it, which means engaging and motivating them to come back [13].
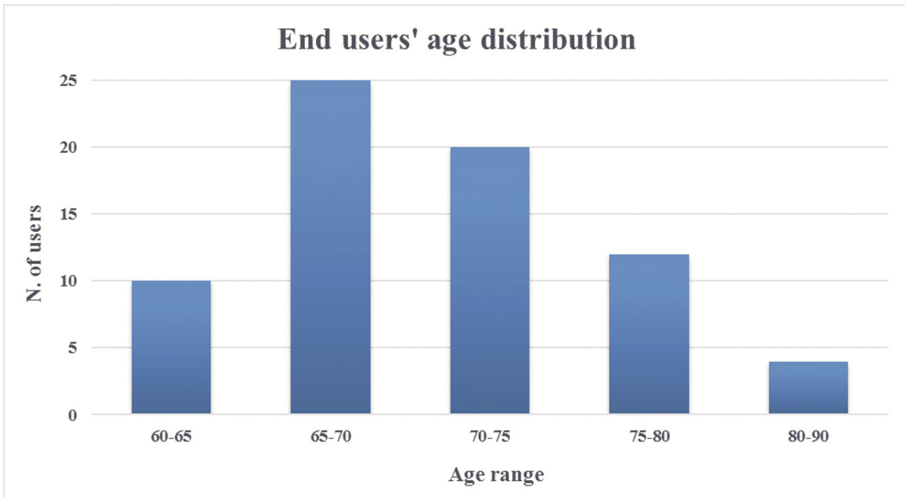
Fig. 4. Age distribution of respondents
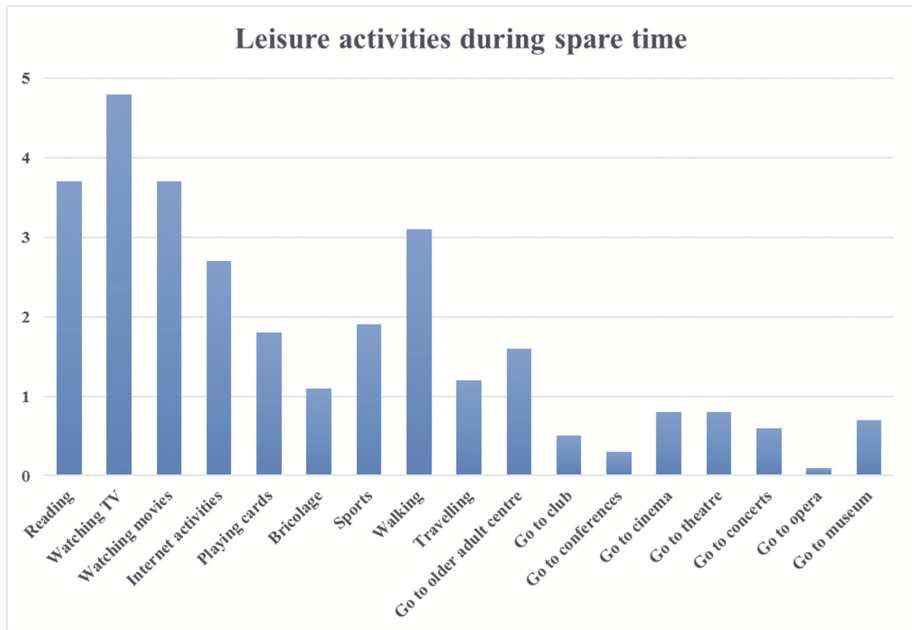
Fig. 5. Frequency of leisure activities done by end users; the frequency scale is: 0 = "never", 1 = "less than two times a month", 2 = "twice a month", 3 = "once a week", 4 = "three/five times a week" and 5 = "everyday"

5 Future Directions and Scenarios

The next phases of the project will concern mainly the development and implementation of the first prototype of the ICT platform, along with the involvement of cultural organizations as event providers.

In fact, before the beginning of pilot trials with users, it will be necessary to recruit content providers on a voluntary basis.

At the moment, two cultural associations have been involved in Italy, by signing a letter of support.

These organizations will provide video streaming of cultural events, both live and recorded, that will be available to users through the platform. These will be free events for the entire duration of the project.

When the final version of the platform will be released, it is expected that it will represent a working example of a customized ICT application, fully tailored to older users' needs and preferences. It could also be considered as a successful implementation of co-design principles in the specific field of video streaming platform, and generally web-based applications.

To ensure that the STAGE service will operate successfully after the project end, resources are planned as well to perform detailed market analysis and elaborate the most suitable and effective business model for this type of innovation.

The primary target of STAGE application is the older adults which constitute a vast market given the trends related to longevity, aging population (the share of the elderly in the total population of the EU-28 is projected to increase from 18.5% - or 93.9 million elderly persons - in 2014 to 28.7% - or 149.1 million elderly persons - by 2080 [14]) as well as an increase in the level of arts engagement and Internet usage by older people. Mainly people 55+ and retired persons (typically 65+) in EU are perceived as a strong group of potential clients for the STAGE service which means an estimated market of ca. up to 6.2 million users in the European Union in 2020.

(The STAGE Consortium claims up to 5% of the 65+ population as a realistic estimation of the potential market for cultural web streaming services dedicated to older people).

Moreover, even though the primary target of the STAGE application are older adults, we argue that it can have a far larger impact in the future not necessarily limited to elderly people. The service could be of interest not only to people with reduced abilities but also to young people who are very fond of using ICT tools in their daily life, and adults who are often very busy with work and family commitments and thus are unable to attend the events physically.

To research these target groups, draft their profile and refine the market potential research methodology including desk research, surveys and interviews are planned with the end user as well as stakeholders. Furthermore, it will be also necessary to analyse usage data and distribution statistics of the platform, as well as possibly conduct surveys to assess the satisfaction of users in terms of usability, accessibility and quality of the cultural offer.

As a result, carefully planned market and stakeholder's analysis will ensure that the new service will be implemented in the market effectively and older adults could start benefiting from it within two years after the project end.

6   Conclusions

In this paper the European research project STAGE - Streaming of Theatre and Arts for old aGe Entertainment, recently approved and funded by the AAL Programme, is presented. It is devoted to the development of an easy-to-use ICT platform for streaming cultural and educational events, like concerts, theatre shows, conferences and museum visits, to older people.

A co-design methodology is being employed for developing the platform, in order to meet the specific needs of the users and be as much user-friendly as possible.

For this reason, the very first phase of the project concerned the involvement of older people in the design phase by selecting groups of possible users in three partner countries. Two questionnaires were delivered to the selected users, one concerning social profile, interests and confidence level with technological devices, the second investigating user preferences with respect to the application's GUI.

The main outcomes of this initial phase are the following:

- both older persons living alone and with a partner may wish to find new activities for entertainment;

- though more than 50% of the involved older people declared to be healthy, 49% experience some degree of disability, which may prevent them from having an active life out of their houses;
- the most frequent activities performed by the potential users are indoor activities (watching TV, reading, bricolage). Out-of-home cultural activities are rarely carried out.

According to the survey outcomes, it turns out that the possibilities offered by the STAGE project can yield a major improvement for the quality of life of older people.

Of course, it will be essential to design an easy-to-use and accessible platform, in order to make users feel comfortable when using it.

Also the feature of endowing the STAGE platform with a dedicated social network for exchanging information and opinions on the cultural contents appear to be a very interesting and promising opportunity for the potential users.

The next phase of the project will be the development of the first platform prototype, and the recruitment of event providers on a voluntary basis for testing the platform with the selected user sample.

Furthermore, a detailed market analysis will be conducted, by considering the possibility of extending STAGE to other categories of users, in addition to older people.

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