



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n: 761999



EasyTV: Easing the access of Europeans with disabilities to converging media and content.

D1.1 – EasyTV User scenario and requirements definition

EasyTV Project

H2020. ICT-19-2017 Media and content convergence. – IA Innovation action.

Grant Agreement n°: 761999

Start date of project: 1 Oct. 2017

Duration: 30 months

Document. ref.: Deliverable 1.1

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4	Mediavoice SRL	MV	IT
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6	Corporació Catalana de Mitjans Audiovisuals SA	CCMA	ES
7	ARX.NET SA	ARX	GR
8	Fundación Confederación Nacional Sordos España para la supresión de barreras de comunicación	FCNSE	ES

PROGRAMME NAME:	H2020. ICT-19-2017 Media and content convergence - IA Innovation action
PROJECT NUMBER:	761999
PROJECT TITLE:	EASYTV
RESPONSIBLE UNIT:	MV
INVOLVED UNITS:	ENG, MV, UAB, CCMA, FCNSE
DOCUMENT NUMBER:	D1.1
DOCUMENT TITLE:	EasyTV User scenario and requirements definition
WORK-PACKAGE:	WP1
DELIVERABLE TYPE:	Report
CONTRACTUAL DATE OF DELIVERY:	28-02-2018
LAST UPDATE:	17-01-2018
DISTRIBUTION LEVEL:	PU

Distribution level:

PU = *Public*,

RE = *Restricted to a group of the specified Consortium*,

PP = *Restricted to other program participants (including Commission Services)*,

CO = *Confidential, only for members of the LASIE Consortium (including the Commission Services)*

Document History

VERSION	DATE	STATUS	AUTHORS, REVIEWER	DESCRIPTION
V1.0	17/01/2018	Draft	MV	First draft Table of Contents definition and document structure
V1.1	02/02/2018	Draft	MV, FCNSE	First Version with content
V1.2	19/02/2018	Final Candidate	MV, FCNSE	Executive summary Internal review
V1.3	26/02/2018	Final Candidate	MV, FCNSE	Complete and second review
				Final version

Definitions, Acronyms and Abbreviations

ACRONYMS / ABBREVIATIONS	DESCRIPTION
API	Application programming interface
C4A	Cloud for All project
CSS	Cascading Style Sheet
DoW	Description of Work
FAQ	Frequently Asked Questions
GPII	Global Public Inclusive Infrastructure
GPL	General Public License
HTML5	HyperText Markup Language
ID	Identifier
IT	Information Technology
UN	United Nations
WHO	World Health Organization
ITU	International Telecommunication Union

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Executive Summary

In this document we report all the activities done by the partners about the task 1.1 of the WP1 that concern gathering end user requirements. The aim of the task 1.1 is to identify the user scenarios and the user needs that will guide the design and development of the whole EasyTV system. During this task the partners worked intensively with “super end users” which have both final user skills and technical skills.

To gather user needs we defined a specific methodology and a process to execute the methodology tasks. In the next chapter we describe the methodology developed for EasyTV to gather user requirements and specification in order to feed the technical architecture. This will derive technical requirements from the innovation needs gathering them from final users. While in the tests (WP6) we have specified that at least 80 end users will be tested, for this task we shall only use “super end users”. This term is used because we need to find end users who, besides their condition of regular users, also have knowledge on the technologies that will be tested, since we shall request to advance their expectations to match the innovation. It would make no sense to consult end users with no knowledge or experience with neither functional diversity nor technological background since at this stage what we require is not their acceptance of the final service, but issues related to technology development.

In chapter 1 we describe the methodology adopted to gather user requirements depicting first the European situation about languages, different translation modalities (dubbing and subtitling/audio subtitling) and distribution of accessibility services by countries. In this chapter we describe the process and documentations used to define focus groups as well as a structured cross mapping table of EasyTV components that will be involved in the project, services, functionalities and sub functionalities. The table contain also information about service personalization, devices and type of disabilities that we will take into account for the project.

In chapters 2 and 3 we report the results of focus groups activities (Focus Group of blind and low vision people and Focus group of deaf and low deaf people). Finally we also suggest user profiles for visually and deaf impaired people and how to define their stories, tasks and matching functionalities to use for the next tasks of WP1.

1. EASYTV METHODOLOGY FOR GATHERING USER'S REQUIREMENTS

1.1. Considerations

To understand the methodology for gathering users' requirements, we did some consideration about different aspects of the project:

The languages

While some technological components are language agnostic, others related to user interfaces will be decisive to tag at this stage the language dependency. For this project we have the following languages to consider for both deaf and visual impaired people:

Partner languages:

- Catalan
- Greek
- Italian
- Spanish

European Community Language

- English

Since end user partners comes from Italy and Spain we will focus on Italian and Spanish language and finally we will provide also English language for user interface.

Hence language definition will be crucial to understand end user group for testing in the future.

Translation Modality and Services in Europe

In EasyTV we are under two different translation modality services: dubbing and subtitling producing two Europes (as can be seen in Fig. 1). These two translation modalities have an influence in the viewing habits of end users, but also on the approach to offer accessibility services.

For example, when watching a movie in original language (Japanese) and subtitle (Italian), audio description will also have to take into consideration the Italian subtitles (audio subtitling) otherwise you will have the Italian audio description with Japanese dialogue. Sound mix will also have to be adapted for this modality.

The following information and figures are from "EBU Access Services Pan European survey 2016" document.



Fig. 1 Main translation modalities in Europe

In relation to our project, it is worth mentioning that while in Spain and Italy dubbing is the system used, in Greece subtitling is the modality.

Accessibility services distribution by EU Country

Service distribution of accessibility services in these countries is not the same.

We shall follow the EBU 2016 study taken on the following broadcasters across Europe (see Fig. 2-7).

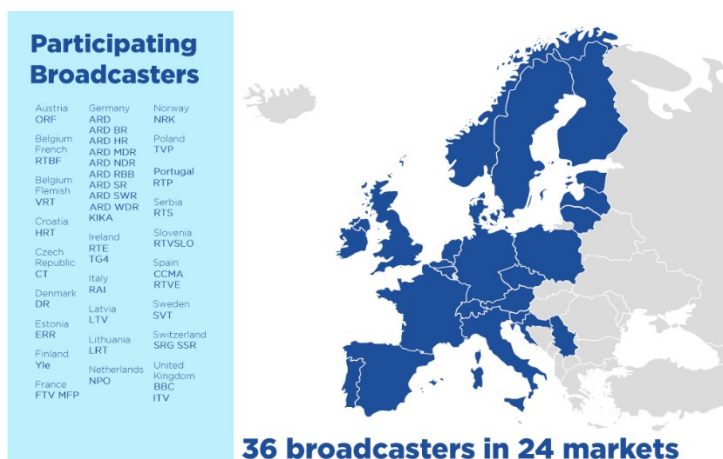


Fig. 2 Participating broadcasters

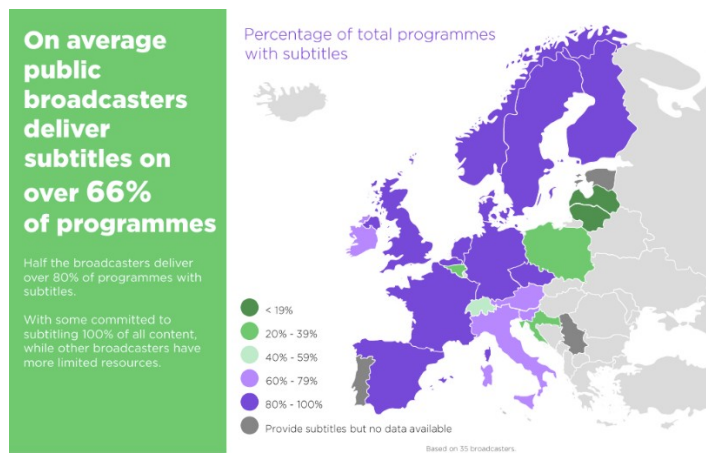


Fig. 3 Percentage of subtitling delivering by European broadcasters

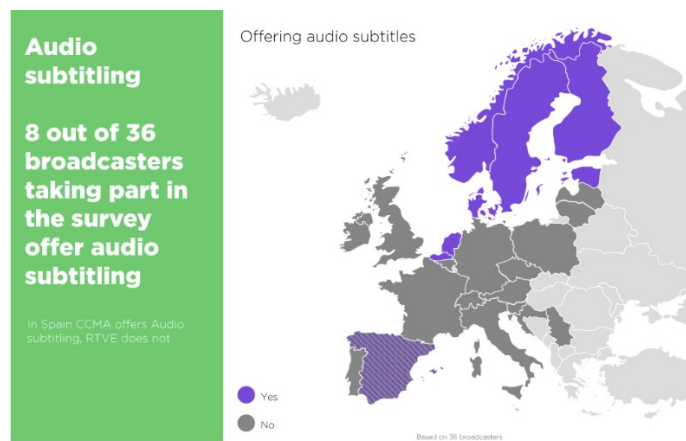


Fig. 4 European broadcasters offering audio subtitling

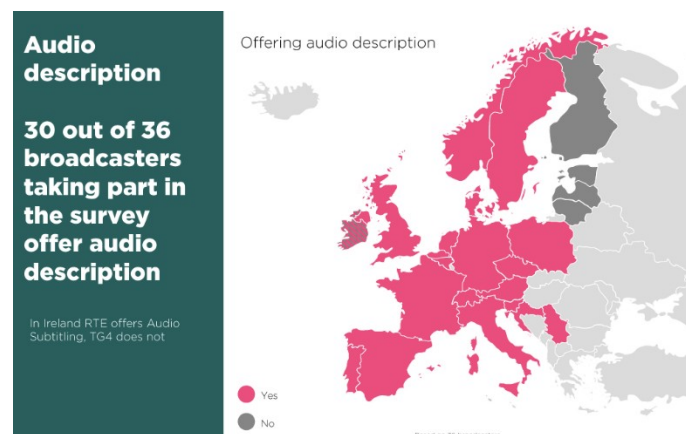


Fig. 5 European broadcasters offering audio description



Fig. 6 European broadcasters offering sign language interpretation

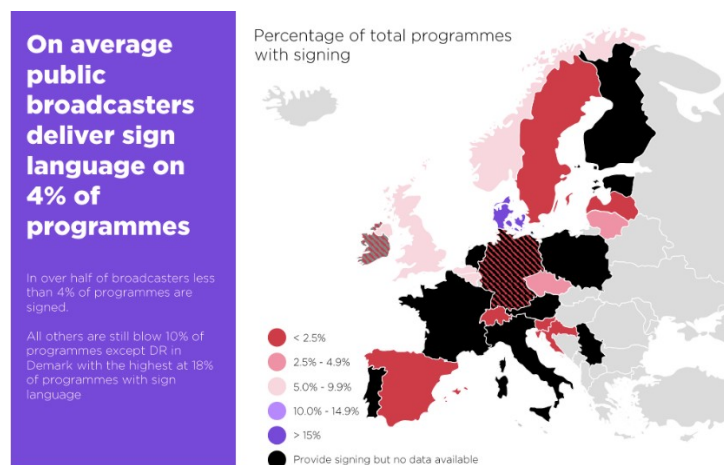


Fig. 7 Percentage of sign language interpretation delivering by European broadcasters

1.2. The methodology

To gather user needs we defined a specific methodology and a process to execute the methodology tasks. In the next chapter we describe the methodology developed for EasyTV to gather user requirements and specification in order to feed the technical architecture. This will derive technical requirements from the innovation needs gathering them from final users. While in the tests (WP6) we have specified that at least 80 end users will be tested, for this task we shall only use “super end users”. This term is used because we need to find end users who, besides their condition of regular lay users, also have some knowledge on the technologies that will be tested, since we shall request to advance their expectations to match the innovation. It would make no sense to consult end users with no knowledge or experience with neither functional diversity nor technological background since at this stage what we require is not their acceptance of the final service, but issues related to technology development.

The criteria we adopted to select “super end users” has been the following:

We selected available “super end user” which are experts regarding the world of blind and deaf people which is the target of EasyTV Project. “Super end users” don’t necessarily have to be blind

or deaf people, of course is better if they are because they are also everyday user of the technology. The important thing is that they know the technology in deep and their needs since they deal with them every day. The super end user also are everyday users of the technology because they teach the technology to their users, so they should be able to tell us, better than others, what the final users really need.

One important aspect that we have to address when gather information from super end users is the innovative aspect of technologies, this is another reason for which we involve only super end users. Existing technologies that have been already tested will not be developed further. This is also a request to partners when listing the components to be tested.

For these reasons we defined to involve five super end users for deaf people and six super end users for visual impaired people that will be asked for feedback. These end users will be consulted by the two partners of the project regarding end users, who are MV/UICI and FCNSE.

Profiling participants will be done through the first stage of the consultation as explained later in this chapter.

The methodologies which have been identified for asking super end users can be:

- Written questionnaires
- Sign language questionnaires
- Interviews
- Focus groups

We choosed Focus Groups to execute this task in order to have a more interactive interview and to share and exchange opinions across experts during discussions on user needs.

1.3. Process and documentation

To gather information, we shall follow the following process, represented in this graphic below in three stages (see Fig. 8).

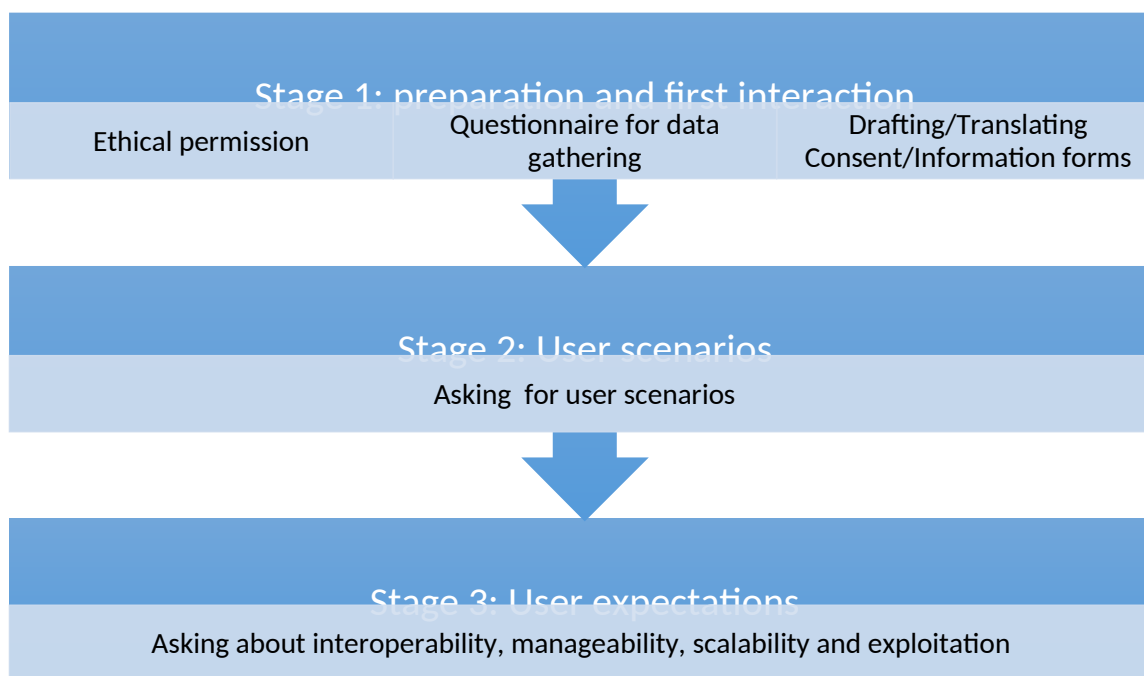


Fig. 8 Process to gather information from super end user expectations

Preparation and first interaction (Stage 1)

The first step is the preparation of documents, questionnaires and translating them in the languages for end users. One of the important thing at this stage is the Ethical permission defined by the UAB ethical committee which draft the consent form.

Consent forms and information are written in the languages for testing. For this task the languages will be Spain and Italian.

The first interaction regards the list of the components that will be developed during the project. Though we are aware of the fine granulation needed to define all the many technological developments, and the different dependencies of technologies between partners along the project, we need to start from defining what will be developed that is subject to improvement through end user consultation to fulfil the user centric design chosen for this project.

Once these components are listed, there is a need to describe in which situation will the end user will have interaction. This is crucial, since end users will only need to offer feedback on components which are not related to the system architecture, but to services that will be tested later.

To list the components and their granularity in terms of services, functionalities, devices and related disabilities we defined a cross-map tables that we present later and is attached to this document.

At this stage we defined the following document and all the instruction on how to develop the Focus Groups.

- General Information
- Consent Form (Written and Oral)
- Video Consent Form
- Focus Group Instruction (How to develop the Focus Group)
- Focus Group Procedure (Development and reporting of the Focus Group)
- Cross-Map Table of Services, devices and disabilities

SERVICE	FUNCTIONALITY	SUB FUNCTIONALITY
Hybrid Matchmaking (rule-based, statistical)	matchmaking for automatic configuration of built-in accessibility features	accessibility features turning on/off
		accessibility features adjustment
	matchmaking for GUI adaptation	adjustment of built-in settings of TV operating systems and applications
		adjustment of UI definition (using UIDLs)
	matchmaking for personalised DASH streaming services	setting the subtitle that corresponds to the end-user's language
		setting the audio that corresponds to the end-user's language

Table 1: Matchmaking Component - Services, functionalities and sub functionalities

AVATAR

SERVICE	FUNCTIONALITY	SUB FUNCTIONALITY
Avatar	sign language representation	representation of sign language using hand movements
		enhanced head movements for more realistic interaction
	multilinguality	support of various sign languages
	knowledge enrichment	real-time hand motion capturing
		real-time face motion capturing
		adding new sign language representations through crowdsourcing

Table 2: AVATAR Component - Services, functionalities and sub functionalities

CROWDSOURCING PLATFORM

SERVICE	FUNCTIONALITY	SUB FUNCTIONALITY
Crowdsourcing Platform	Creation and management of a new sign language framework	Creation of a sign language database
		Definition of users' roles/permissions
		Gathering of statistics/evaluation metrics
	Data visualization and checking	Visualization of uploaded data
		Acceptance/rejection of uploaded data
		Correction of uploaded data
	Data collection	Upload of recordings to the database
		Upload of description per recording
		Storage of logs

Table 3: CROWDSOURCING Component - Services, functionalities and sub functionalities

IMAGE MAGNIFICATION

SERVICE	FUNCTIONALITY	SUB FUNCTIONALITY
Broadcast TV	Accesibility Services	Subttles
		Sign Language Content
Broadband TV / VOD	Accesibility Services	Subttles
		Sign Language Content
HbbTV app/ Broadband content	Interface Improvement	Contrast
		Background / Foreground
		Font Size
		Color
		Element detectõn in the video (hashtag)

Table 4: IMAGE MAGNIFICATION Component - Services, functionalities and sub functionalities

AUDIO NARRATIVES

SERVICE	FUNCTIONALITY	SUB FUNCTIONALITY
Broadcast TV	Accesibility Services	Clean Audio (Object Based Audio)
		Audiodescriptõn
Broadband TV / VOD	Accesibility Services	Clean Audio (Object Based Audio)
		Audiodescriptõn

Table 5: AUDIO NARRATIVES Component - Services, functionalities and sub functionalities

SPEECH AND GESTURE/GAZE

SERVICE	FUNCTIONALITY	SUB FUNCTIONALITY
Live TV	browsing channels	by channel number/name
		by program name / keyword
		by category
	easy tuning	channels grouping and ordering
		channels custom naming
VREC	scheduling	channel name, date and time
		program name
	recorded	searching
		grouping and ordering
EPG	browsing	by channel
		by program name / keyword
		by date /time / range
		by category
	recording	by channel
		by program name / keyword
		by category
VOD	browsing	by video title / keyword
		by category
	rental / purchasing	
MY AUDIO/VIDEOS	recorded	searching
		grouping and ordering
Broadcasters Services	Accessibility Services	Subtling
		Audio Subtling
		Audio description
		Signed Programmes
APPS	all	

Table 6: Speech Component - Services, functionalities and sub functionalities

SIGN LANGUAGE CAPTURING

SERVICE	FUNCTIONALITY	SUB FUNCTIONALITY
Sign language capturing module	Data Recording	Real-time motion capturing
		Storage of the recorded data
	Annotation of the recorded data	Semi-automatic annotation
		Manual annotation
		Storage of the annotated data

Table 7: SIGN LANGUAGE CAPTURING Component - Services, functionalities and sub functionalities

Speech Interface

SERVICE	FUNCTIONALITY	SUB FUNC.TY	SSCENARIO
Live TV	browsing channels	by channel number/name	the user asks to go to a specific channel just saying his number or name
		by program name / keyword	the user asks to go to a specific channel just saying a program name or keyword. Then if there is some ambiguity a directed dialog flow will guide the user to choose among different options.
		by category	the user browse by voice through different categories of channels just saying a specific category name or keyword. Then if there is some ambiguity a directed dialog flow will guide the user to choose among different options.
	easy tuning	channels grouping and ordering	the user can tune all channels or single channel and grouping them creating categories and ordering them inside each category so that they can be browsed easily
		channels custom naming	the user can customize/change names of channels and/or add aliases to call them in an easy and familiar name
VREC	scheduling	channel name, date and time	the user can schedule a recording choosing the channel to record along with the start date and time and the end date and time.
		program name	the user can schedule a recording just saying the name of the program to record. if there is some ambiguity a directed dialog flow will guide the user to choose among different options.
	recorded	searching	the user can search recorded programs using a smart search voice queries. The speech system will list recordings according with the meanings of the query. The user can set different views of the results, grouped by category, title names, channels...
		grouping and ordering	The user can create groups and order items inside groups/categories according to his needs and then browse them easily
EPG	browsing	by channel	the user can ask by voice to view the EPG filtering by channel name or number and read information by date, time or by query programs by name/keywords/category
		by program name / keyword	the user can ask by voice to view the EPG filtering by program name or keyword and read filtered information browsing channel EPG or date and time range.
		by date /time / range	
		by category	the user can ask by voice to view the EPG filtering by category of programs (movies, cartoons, adventure, and so on) and read filtered information browsing channel EPG or date and time range.
	recording	by channel	the user can record a specific program starting choose the channel and then he will be directed by a

			dialog flow to choose the start and stop date and time.
		by program name / keyword	the user can record a specific program starting choose the program title or title keyword and then he will be directed by a dialog flow to select the specific program if more than one is matched.
		by category	the user can record a specific program starting choose the category of the program and then he will be directed by a dialog flow to select the specific program and channel if more than one is matched.
VOD	browsing	by video title / keyword	the user can browse the catalogue by video title or keyword. Then a directed dialog will guide the user to choose among different options if there are more results...
		by category	the user can browse the catalogue by video category. Then a directed dialog will guide the user to choose among different videos of the category using a sub category or year or other parameters
	rental / purchasing		the user can purchase or rent a specific video and he will be guided through the purchasing process...
MY AUDIO/VIDEOS	recorded	searching	the user can search his own videos using a smart search voice queries. The speech system will list videos according with the meanings of the query. The user can then set different views of the results, grouped by category, titles, date and time. he will be also guided using a specific dialog flow to choose the item he is searching.
		grouping and ordering	The user can create groups and order items inside groups/categories according to his needs and then browse them easily
Broadcasters Services	Accessibility Services	Subtitling	Only for deaf and low deaf people
		Audio Subtitling	The system reads aloud the subtitles and the user will be able to control the volume an activation of the specific audio track
		Audio description	The system reads aloud the subtitles and the user will be able to control the volume an activation of the specific audio track
		Signed Programmes	Only for deaf and low deaf people
APPS	all	all	the user will have a specific dialog flow for each third party application implemented using the EasyTV Speech SDK that will provide tools to define dialog flow, voice commands and prompts for each functionality of the application.

Table 9: Speech Component –functionalities and scenarios

Attached to this document can be found the clear and complete Spreadsheet file of all components defined for the project.

2. FOCUS GROUP DEFINITION

2.1. Blind and Low Vision Groups

2.1.1. Introduction

For Blind and Low Vision people we defined a Focus Group of six people.

In the following document report the results of this Focus Group

Procedure and development of Focus Group

- T1.1_EASYTV_FOCUS GROUP_procedure_BLIND_LV 11122017_Compiled

Super End User Profile

- T1.1 EASYTV_GENERALQUESTIONNAIRE_FINAL_IT - DAL CAROBBO
- T1.1 EASYTV_GENERALQUESTIONNAIRE_FINAL_IT – DI MANNO
- T1.1 EASYTV_GENERALQUESTIONNAIRE_FINAL_IT - FRITTELLI
- T1.1 EASYTV_GENERALQUESTIONNAIRE_FINAL_IT - IOMETTI
- T1.1 EASYTV_GENERALQUESTIONNAIRE_FINAL_IT - LEONARDO
- T1.1 EASYTV_GENERALQUESTIONNAIRE_FINAL_IT – REMOLI

Cross-Map Table Compiled

- T1.1 - Disability Mapping with Services and Devices_CERTH MV UPM FINAL Compiled

Focus Group Discussion

After general information on the project and Ethical Form reading we started developing the core of the focus group. We described the whole project and its objectives and talked a lot about the new technologies and standards that are spreading in Europe. We have then investigated the HBBTV topic, Companion Screen and Media Synchronization feature (Second Screen) and finally we described the components of the system that we are going to design that is:

- Matchmaking
- Avatar
- Crowdsourcing platform
- Image magnification
- Audio Narratives
- Speech Interface
- Gesture/Gaze Interface
- Sign Language capturing technology

After all these topics have been discussed we started asking specific questions about components services and all functionalities and sub functionalities according to the cross-map table we defined for this aim.

General Questions about current use of the TV have been asked as well as questions about Image Magnification, Audio Narratives, Speech Interface which are the core features for Blind and low vision people.

We defined a general structure of the questions but we also left people interact and let them ask specific details:

2.1.2. General Questions about current use of TV

Regarding the general question they have been very interesting to understand how blind uses the tv functionalities today and which are their frustrations on using it.

- **How is now your current experience using TV?**
 - o Not easy to access the TV
 - o Very difficult to use the remote control
- **Which are the modalities you interact with the TV?**
 - o Using the remote control but is very difficult without audio feedbacks
- **Do you have frustrations advised?**
 - o Not enough audio description available, only few programs are described.
 - o Since some year ago we listened the audio description through a radio channel now something is changing.
 - o Very difficult to change and tune to the specific audio channel
 - o For some tv (smart tv) there is the yellow button to activate audio descriptions with one of the Italian broadcaster.
 - o It would be useful to have also only audio description on mobile devices (have audio on mobile to listen, on the move). Listening a movie with audio description (only audio to limit bandwidth)
 - o It would be useful to have a standard button on the remote to activate/deactivate audio descriptions
 - o Audio description are not useful for all programs. for music programs we don't need to hear what is happening we only want to listen music.
 - o Teletext is not accessible. It cannot be read. Would be useful to read teletext.
 - o Overlay text during live programs/adv/movie are not read. It's very interesting to read aloud this information.
 - o It will be very useful to manage audio and video playback. Manage volume differently on every audio track. For example lower the audio of the movie and increase the audio level of the description (text to speech) and so on.
 - o It would be useful to slow the scrolling text and let the system read with a text to speech engine giving time to the user to understand.
 - o Possibility to save the screen image or to stop the image on the screen to read well what the user with low vision is looking at the moment.
- **Are you alone?**
 - o Users are both alone or with family
- **Do you use home automation devices or wearable devices**
 - o some people use already these technology
 - o it would be useful to create scenario for example when we are going to watch a movie we can just say "movie time" and the home automation system does everything (close windows, low lightning and so on...)

2.1.3. Specific questions related to services and technologies

The following questions has been proposed to the super end users for each component and for each service/functionality/sub functionality

The replies have been mapped to the excel tables and some comments and considerations has been reported for each argument.

S=Service F=Functionality SF= Sub Functionality

1. Show component services (S) functionalities (F) and sub functionalities (SF):
2. For each sub functionality, where applicable, make the following questions:
 - a. Is the F+SF useful for the service S?
 - b. Is this F+SF innovative with the use of a kind of speech technology interaction?
 - c. Could be useful to share some info/object about this F+SF?
 - d. Could be useful to give the user the possibility to customize this F+SF? How?
 - e. in which devices you find it useful to have this F+SF? (HBBTV/CS, DESKTOP, ANDROID TV, TABLET, SMARTPHONE)

2.1.3.1 Component Image Magnification

For image magnification two important things have been clear:

- It would be useful to magnify specific portion of the screen for example objects that need to be recognized or overlay text that is not clear so we need to read them better.
- It's important to stop playing to let us magnify the screen or portion of it.

2.1.3.2 Component Audio Narratives

For Audio Narratives the following features are considered crucial for blind and low vision persons:

- It is useful to have this service both automatically without user interaction and manually (using the remote control or speech commands) to manage audio volumes of available audio tracks.
- For example when listening OPERA we are interested only to music so we should be able to low the audio description volume.
- During live programs is very useful to know what is happening and what the TV is showing during silent time. When we are with family they tell us something but when we are alone nothing can be done!

2.1.3.3 Component Speech Interface

Regarding the Speech Interface to control TV functionalities Blind people consider very important to control them by voice or have audio feedbacks when using the remote control. Is very important also to export content (audio and video) on a mobile device.

We report their considerations considering the service functionalities and sub functionalities and grouping sometimes these considerations where possible if related to more subfunctionalities.

We list them in the form of SERVICE → FUNCTIONALITY → SUB FUNCTIONALITY

Followed by a list of considerations from upper end users.

Live TV → Browsing channels → by name/position/number

- Very useful to tune channels just saying his name or position
- Sometime users don't remember the position
- Useful to personalize the name where it is difficult to pronounce
- Useful to create channel playlists/groups by voice.

Live TV → Browsing channels → by program name/keyword

- changing channel by program name or using one of its keyword or actor name or program presenter names is very useful.

Live TV → Browsing channels → by category

- Useful to ask a category name, to tune channels, for example I would like to say "do you have some classical music?" and the TV shows me the list of channels where currently music or classical music is playing or is going to start playing
- TV devices is the main device to consider for the live TV (not main device for streaming or broadband TV).
- Other devices are very important to have more possibilities.

Live TV → Easy Tuning -> channel grouping and ordering

Live TV → Easy Tuning → channel custom naming

- Yes is useful to create groups, categories and custom orders of TV channels.
- The possibility to create channel playlists is very interesting.

VREC → Scheduling → channel name, date and time

VREC → Scheduling → program name

- Provide functionality to record programs choosing channel name and date time (begin time and end time).
- Could be important to let us configure scheduling repeated (series) or just record configure a repeated timer.
- Often happen that program EPG scheduling times are wrong so we need to set choose time appropriately

- We need also to export recorded programs for other devices and in standard formats to be viewed cross devices.
- It's also important sharing the configured timer with other people
- VERY IMPORTANT: to record also or only the audio description.
- It's very important to customize recording of a specific program changing begin time and end time because often they don't start or end according to the program guide.

VREC → Recorded → searching

VREC → Recorded → grouping and ordering

- It would be useful to search by category name or just saying the title or one of its keyword (kwd of program title, actor, presenter and so on)
- It would be useful defining tags for search reason also when set timers or record from the program guide.
- TV EGP already have sometimes the category but often is not what we expect. Anyway this category can be used too.
- It's useful to let users tagging and set categories and rate the recorded programs.

EPG → Browsing → by channel

EPG → Browsing → by program name/keyword

VOD → Browsing → by video title/keyword

- It's important to brows EPG using time ranges (morning, afternoon, evening and so on)
- Need to know what is on the TV now.
- It's important to have notifications when a program is going to start (programs that we comment or programs choosed to be notified)
- It would be useful to send notifications about programs to other users sharing is very interesting.
- Personalization of sharing information could be good (starting info, comments, invitations to watch it and so on)

EPG → Recording → by channel

EPG → Recording → by program name/keyword

- Recording using channel name or program name or keywords is very important (kwd of program title, actor, presenter and so on)
- It's important to let the user watch any different channel even when a recording is in progress.

- It's important to have notifications when a program is going to start recording.

VOD → Rental/Purchasing

- Rental purchasing simply by voice commands is mandatory.

MYVIDEO → Recorded → searching

MYVIDEOS → Recorded → grouping and ordering

- It would be useful to search by category name or just saying the title or one of its keyword
- It would be useful defining tags for search reasons
- It's useful to let users tagging and set categories and rate videos.

Broadcasters Services → Accessibility → Subtitling

Broadcasters Services → Accessibility → Audio Subtitling

- Audio subtitles should be provided and the user should be able to change
 - o Color, Contrast, font size, position of subtitles on the screen.

Broadcasters Services → Accessibility → Audio Descriptions

- Look at general question for info about audio descriptions.

Other Considerations

- Watching videos/recorded programs in general would be important to listen only the audio channels included on the video and exporting only audio to listen from a mobile device
- Timeshifting in live TV is also very important.

2.2. Deaf and Low Deaf Groups

2.2.1. Introduction

For Deaf and Low Deaf we defined a Focus Group of five people

In the following document report the results of this Focus Group

Procedure and development of Focus Group

- Results Focus Group Superusers Spain Final-Ing-22-01-18

Super End User Profile

- Naiara Larrakoetxea Forms
- Nadia Marcos Guerrero Forms
- Jorge Sánchez Solano Forms
- David Sánchez Moreno Forms
- Adán Sánchez Gimeno Forms

Cross-Map Table Compiled

- T1.1 - Disability Mapping with Services and Devices_CERTH MV UPM FINAL Compiled

2.2.2. General questions about current use of TV

- **How is now your current experience using TV?**
 - o In general they talk about the subtitle quality. In this respect, they indicate the following problems: there is not subtitles, there is not contextual information and characteristic spoke information, absence of contextual information and characteristics of speak, lack of literality and the reject the adjustment of the spoken content, there are delays in the live subtitles, the subtitles disappear in news programs when they connect with external journalists, there are synchronization problems between audio and subtitle that confuse a viewer about who is speaking.
 - o Also they remark that there is few Spanish sign language on the TV. With regard to the emission in signs language, they speak about the following problems: the quality of the linguistic interpretation of the sign language is lower than the desired one (probably due to an incorrect professional selection), incorrect placement of the window or overlapping with on-screen signs.
 - o From all of which, it is concluded that the fulfillment by the television operators of some minimum quality requirements is necessary.
- **Which are the modalities you interact with the TV?**
 - o All agree that they interact only with the remote control
- **Do you have frustrations advises?**
 - o Once again, they remark the spoken problems which generate frustrations. This problems are related to the delay and synchronization in subtitles, the small size of the signs language interpreter window, the lack of sign language interpretation or subtitle in emergency emissions (e.g. snowstorm or terrorist attacks), the lack of subtitles in small TV companies, the lack of subtitle on-demand TV in internet, the impossibility of switch on-off the signs language window, the need to use more

devices than the rest of the user.

- o When we asked them whether they would like to make television accessible through an avatar they said that They find it unworkable because there are nuances of sign language that are not possible today to translate using an avatar, such as the expression of emotions, intonation or various linguistic components. It is a problem of translation rather than technology.
- **Are you alone?**
 - o Alone or accompanied
- **Do you use home automation devices or wearable devices**
 - o Nobody uses domotic devices at home

2.2.3. Specific questions related to services and technologies

2.2.3.1 Component Matchmaking

Matchmaking hybrid based on rules and statistics

That is, preferences are established for the user based on rules and statistics that indicate which characteristics are the most used.

Hybrid Matchmaking → Matchmaking for automatic configuration of built-in accessibility features → accessibility features turning on/off

- The activation and deactivation of accessibility functions should be allowed according to the needs and contents. You may want to see the news in a different way than I do when watching a movie or other type of program.

Hybrid Matchmaking → Matchmaking for automatic configuration of built-in accessibility features → accessibility features adjustment

- It should, even adapting the configuration to the content according to the needs of the user. You may want to see the news in a different way than you do when watching a movie or other type of program.

Hybrid Matchmaking → Matchmaking for GUI adaptation → adjustment of built-in settings of TV operating systems and applications

Hybrid Matchmaking → Matchmaking for GUI adaptation → adjustment of UI definition (using UIDLs)

- Convenient and also adaptable

Hybrid Matchmaking → Matchmaking for personalised DASH streaming services → setting the subtitle that corresponds to the end-user's language

Hybrid Matchmaking → Matchmaking for personalised DASH streaming services → setting the audio that corresponds to the end-user's language

Dynamic Adaptive Streaming over HTTP (DASH), also known as MPEG-DASH, is an adaptive bit rate transmission technique that allows the transmission of media content over high-quality Internet from conventional HTTP web servers

- That is convenient in audio and subtitle.

2.2.3.2 Component Avatar

Note: Evaluate only for Android platform, tablet and smartphone

Avatar → Representation in signs language → representation of sign language using hand movements.

Avatar → Representation in signs language → enhanced head movements for more realistic interaction

- They think that a greater development is necessary and that nowadays it does not respond to the needs of the users, as mentioned above. There is a fear that an advance in development may be considered for its generalized implementation when in fact it is not yet responding to the needs of users.

Avatar → Multilingual → support of various sign languages

Avatar → knowledge enrichment → real-time hand motion capturing

- It is interesting but not essential for deaf and hard of hearing people. It could be implemented as an option of the user's choice.

Avatar → knowledge enrichment → real-time face motion capturing

- Although initially it is not seen as necessary, it is possible that if this service is offered, its use will be extended little by little.
- In any case, due to the shortage of time to develop the project, it is better to devote the effort to research aspects or services most needed.

Avatar → knowledge enrichment → adding new sign language representations through crowdsourcing

- It is not a known sub functionality on television by the participants. However, there is some reticence as to how the content could be managed, which, in any case, should be done by experts.

2.2.3.3 Component Crowdsourcing platform

SERVICE: Crowdsourcing platform

Crowdsourcing platform → Admin → User with administrator profile.

1. Opinion about the administrator creating the new signs language through the administrator user interface (UI).
2. Opinion about the administrator defining the moderator (s) by sign language.
3. Opinion about the administrator creating new users by sign language.
4. Opinion about the administrator having access to different statistics and evaluation metrics per user / sign language / project.

Crowdsourcing platform → Moderator → By sign language.

1. Opinion about the moderator defining a project / task for each user.
2. Opinion about the moderator checking the loaded data.
3. Opinion about the moderator accepting / rejecting the loaded data.

Crowdsourcing platform → User → Subfunctionalities

1. Opinion about each user being assigned to a sign language / project / task.
 2. Opinion about the user verifying the recordings (for example, video, skeletal data).
 3. Opinion about the user uploading a recording (video, skeletal data) to the system. The recording is stored in a database.
 4. Opinion about the user providing information (description) about the recording.
 5. Opinion about all the activity of the user / user being registered and stored in a database.
- These last three sub-functions have been widely discussed above. Although it is still debated, they consider that a platform for the storage of signs would be interesting for a particular use of the user and if it were shared, with a high degree of control as discussed above.

2.2.3.4 Component Gesture Gaze

LIVE TV → Browsing → By channel

The user asks to go to a specific channel by depicting its number using gestures

In what devices do you find it useful?

- Desktop PC: gestures /gaze
- Android TV: gestures
- HBBTV: gestures

LIVE TV → Browsing → by program name / initial letter

The user asks to go to a specific channel by gazing at it from a menu/list of available channels

initial letters or by using gestures.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
- Android TV: gestures
- HBBTV: gestures

LIVE TV → Browsing → by category

The user browses by gazing through different categories of channels (or by using gestures). The channels that belong to each category will then be depicted and the user can select a specific channel.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
- Android TV: gestures
- HBBTV: gestures

LIVE TV → Browsing → by order

The user can go to next or previous channels using gestures or by gazing at specific buttons.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
- Android TV: gestures
- HBBTV: gestures

- All the sub functionalities of Browsing are interesting although it does not seem a priority for deaf people. The following points are added: the control with the gaze is not necessary for deaf and hard of hearing people, control with gestures is not necessary in mobile devices, they consider it interesting to use finger movements in the air simulating the pointer, it seems complicated to develop a system for organizing channels using signs.

LIVE TV → voice tuning → increase/decrease volume and mute sound through a set of gestures or by gazing on-screen buttons.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
- Android TV: gestures
- HBBTV: gestures

- They consider it useful.

LIVE TV → easy tuning → channels grouping and ordering

The user can tune a channel, create custom channel categories and add a channel in a category through gaze or gestures so that they can be browsed

In what devices do you find it useful?

- Desktop PC: gestures /gaze
 - Android TV: gestures
 - HBBTV: gestures
- They consider the use of sign language and sign language useful. The use of the gaze is considered more necessary for people with reduced mobility.

LIVE TV → easy tuning → channels custom naming

The user can customize/change names of channels and/or add aliases to call them easily by selecting letters of an alphabet using gaze or gesture.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
 - Android TV: gestures
 - HBBTV: gestures
- They consider the use of sign language and sign language useful. The use of the gaze is considered more necessary for people with reduced mobility.

VREC → scheduling → date and time

The user can schedule a recording choosing the channel to record along with the start date and time and the end date and time through a set of gaze or gesture operations.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
 - Android TV: gestures
 - HBBTV: gestures
- They consider it interesting, especially for deaf older people.

VREC → scheduling → program name

The user can schedule a recording by selecting the name of the program to record from a list using a gaze or gesture.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
 - Android TV: gestures
 - HBBTV: gestures
- They consider it interesting.

VREC → Recorded → Searching

The user can search recorded programs by moving through a drop-down list using gaze or

gestures. The drop-down list may contain all recorded programs or programs filtered by category, initial letter of title name, channel, date.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
 - Android TV: gestures
 - HBBTV: gestures
- They consider it interesting.

VREC → Recorded → Grouping and ordering

The user can create groups and order items inside groups/categories according to his needs and then browse them easily.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
 - Android TV: gestures
 - HBBTV: gestures
- They consider it interesting. At this point, a participant recalls that before such a large number of functionalities, it would be necessary to develop user manuals accessible in sign language.

EPG → Browsing → By chanel

The user can ask by gazing at a specific button or performing a specific gesture to view the EPG filtering by channel name or number and read information by date, time or query programs by name/category/initial letter.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
 - Android TV: gestures
 - HBBTV: gestures
- They consider it interesting.

EPG → Browsing → By program name / keyword

The user can ask through gaze or gesture to view the EPG filtering by program name and read filtered information browsing channel EPG or date and time range.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
- Android TV: gestures
- HBBTV: gestures

- They consider it interesting, as well as other options such as brightness control or contrast. The gaze is still discarded.

EPG → Browsing → By category

The user can ask through gaze or gesture to view the EPG filtering by category of programs (movies, cartoons, adventure, and so on) and read filtered information browsing channel EPG or date and time range.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
- Android TV: gestures
- HBBTV: gestures

- They consider it interesting, again with the exception of the gaze.

EPG → Recording → By channel

The user can record a specific program choosing the channel and then he will be directed by a gesture or gaze flow network to choose the start and stop date and time.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
- Android TV: gestures
- HBBTV: gestures

EPG → Recording → By program name / keyword

The user can record a specific program choosing the program title or initial letter of title and then he will be directed by a gesture or gaze flow network to select the specific program if more than one is matched.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
- Android TV: gestures
- HBBTV: gestures

EPG → Recording → By category

The user can record a specific program choosing the category of the program and then he will be directed by a gesture or gaze flow network to select the specific program and channel if more than one is matched.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
- Android TV: gestures
- HBBTV: gestures

- All these last EPG functionalities seem interesting to them.

VOD → Browsing → By video title / keyword

The user can browse the catalogue by video title or initial letter of title. The results will be narrowed down to a single choice through a gesture or gaze flow network.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
- Android TV: gestures
- HBBTV: gestures

VOD → Browsing → By category

The user can browse the catalogue by video category. Then a gesture or gaze flow network will be employed in order to filter results based on various criteria (e.g. year, channel, video name, etc).

In what devices do you find it useful?

- Desktop PC: gestures /gaze
- Android TV: gestures
- HBBTV: gestures

- All these last VOD (Video On Demand) functionalities seem interesting to them.

VOD → rental / purchasing

The user can purchase or rent a specific video and he will be guided through the purchasing process.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
- Android TV: gestures
- HBBTV: gestures

- Some participants express their concern about the control of the purchase or rental process and that by means of sign language purchases or accidental rents could be made.

My videos → Recorder → Searching

The user can search his own videos by navigating in a drop-down list using gaze or gestures. The user can also apply filters, such as video category, initial letter of video name, date in order to locate the desired video.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
- Android TV: gestures
- HBBTV: gestures

My videos → Recorder → grouping and ordering

The user can create groups and order items inside groups/categories according to his needs and then browse them easily.

In what devices do you find it useful?

- Desktop PC: gestures /gaze
 - Android TV: gestures
 - HBBTV: gestures
- These last two sub functionalities seem interesting to them and point to the interest of being able to search for a sign contained in the title of a program or movie.

Broadcasters Services → Accessibility Services → Subtitling

In what situations would it be convenient to use subtitling and audio subtitling?

In what devices do you find it useful?

- Desktop PC: gestures /gaze
- Android TV: gestures
- HBBTV: gestures

Broadcasters Services → Accessibility Services → Signs language

In what situations would it be convenient to use signs language?

In what devices do you find it useful?

- Desktop PC: gestures /gaze
- Android TV: gestures
- HBBTV: gestures

Broadcasters Services → Accessibility Services → Audio Subtitling

In what situations would it be convenient to use the process of moving from Audio Subtitling?

In what devices do you find it useful?

- Desktop PC: gestures /gaze
 - Android TV: gestures
 - HBBTV: gestures
- Regarding the last three sub-functionalities it would be interesting to be able to choose between any of the functions depending on the user and independent of the content. Primarily sign language and subtitling would be used. The difference between subtitling and voice-to-text is that in the subtitle information about ambient sounds is added and the person who is speaking at each moment differentiates.
 - In voice to text, a literal transfer of what is being said without attending to external sounds or differentiation of people is made

Broadcasters Services → Accessibility Services → Signed programs

What programs would it be convenient to sign?

In what devices do you find it useful?

- o Desktop PC: gestures /gaze
 - o Android TV: gestures
 - o HBBTV: gestures
- Regarding the last sub-functionalities, all programs should be signed, especially the news programs. The area of music would be the most difficult to interpret, although now there are more and more deaf people interested in that subject.
 - In general, there is a reluctance regarding automatic subtitling in terms of quality and correspondence between subtitling and content.
 - A very interesting option would be the possibility of delaying the image for a few seconds so that it would end up synchronizing with the subtitle in the event that the latter had a delay on the audio.

Apps → All → Third-party-applications

Would it be possible for any third-party application that uses EasyTV SDK to navigate through its menus and lists through the use of signs?

In what devices do you find it useful?

- o Desktop PC: gestures /gaze
- o Android TV: gestures
- o HBBTV: gestures

CONSIDERATIONS ABOUT DEPENDENCIES OF THE LANGUAGE

The signs language used must be the language corresponding to each country.

- All consider these last two sub functionalities interesting.

Broadcast/Broadband Services → Accessibility Services → Other Considerations

1. Opinion about the subtitle.
2. Opinion about the content in signs language.

- Everyone considers it interesting.

Broadcast/Broadband Services → Accessibility Services → Interface improvement

Opinion about the improvement of:

1. Contrast
2. Background / close-up
3. Font size
4. Color
5. Detection of elements in the video (hashtag)

- We inform that tools are being developed that allow obtaining accessibility through another device (for example, watching a movie on TV and subtitles with the settings that the user wants on my Tablet), participants consider that this option is not acceptable. It could be considered an extra, but accessibility has to be on television, not on an external device.

Final questions

In a Likert Scale (1 not much 5 Very much) for each component, how do you see?

- Interoperability: everybody 5
- Manageability: everybody 5
- Scalability: everybody 5
- Exploitation: they do not see clear to generate a business model because it should not be commercialized with accessibility.

3. USER SCENARIOS AND STORIES

3.1. Profiles

The following categories, and related values, provide suggestions for the definition of possible user profiles and the subsequent creation of scenarios and stories:

- **Gender:** all;
- **Age group (years)**¹: 15-24; 25-49; 50-64; 65-79; 80+;
- **Nationality**²: Italian; Spanish; Greek;
- **Education level:** Less than Secondary education; Secondary education, University Degree, Post graduate education;
- **Disability:** Blind, Visually Impaired, Deaf (Sign language preferred), Deaf (Oral language preferred); Hard of Hearing;
- **Familiarity with technologies:** high confident with technology; enough confident with technology; not so confident with technology;
- **Living arrangement:** living alone; living with partner; living with family; living with non-relatives;

3.2. Tasks, Stories and Functionalities

All the tasks and the stories must be defined in order to better understand what Personas really need when they access to television in their “daily routine”: usual activities, habits at home and on the move, device used and preferences.

Tasks and functionalities of the system should match the corresponding need of the persona and give solutions to these user needs.

3.3. User test consideration

Regarding the final test (WP6) we will also evaluate the possibility to consider the recommendation from UN ITU agency about using a social model for profiling persons with disabilities, rather than or along with the medical model from UN WHO³.

¹ Following the Eurostat age groups segmentation of european population <http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tps00010&plugin=1>

² Nationalities selected are representative of all countries of partners involved in the EASY TV Project, so that the examples of user profiles can be designed with an higher level of realism and consistency.

³ Question 7/1: Access to telecommunication/ICT services by persons with disabilities and with specific needs - Refinement for the draft final Report of Q7/1 on accessibility