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

D1.2 EasyTV system requirements specification

EasyTV Project

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

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Definitions, Acronyms and Abbreviations

ACRONYMS / ABBREVIATIONS	DESCRIPTION
API	Application programming interface
CPU	Central Processing Unit
EPG	Electronic Program Guide
EU	European Union
HBBTV	Hybrid Broadcast Broadband TV
HTTP	HyperText Transfer Protocol
IS	International Sign Language
KPI	Key Performance Indicators
LSE	Lengua de Signos Española
Obj	Objective
OCR	Optical Character Recognition
OS	Operating System
OTRS	Open-source Ticket Request System
REST	REpresentational State Transfer
SL	Sign Language
SLT	Sign-Language Tasks
SOAP	Simple Object Access Protocol
TRL	Technology Readiness Levels
TTS	Text To Speech
UCD	User Centred Design
UI	User Interface
UX	User Experience
VOD	Video on Demand
WP	Work Package
YAML	YAML Ain't Markup Language

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1. EXECUTIVE SUMMARY

The aim of the document is to describe all aspects concerning the requirements of the EasyTV system.

To fully describe the design choices carried out in the context of the requirements design, at the beginning of the document we included two sections: **Overall project description**, with the aim of contextualizing the design choices and the **Focus group findings**, to summarize the evidences emerged in the research activities carried out in Task 1.1.

Subsequently, the system requirements have been presented, subdividing them into three sections: **Functional requirements**, which describes the design of functionality, **Component specification**, which organizes in the functional macro components previously described, **Non-functional requirements**, which illustrates the non-functional constraints of the system.

In order to identify all the aspects that have an impact in terms of system requirements, we have incorporated the following two final sections: **Overall project KPI impacting the system requirements**, with the aim of identifying the Key Performance Indicators whose impact must be managed within the overall project and **Validation tools**, to highlight methodologies and tools to provide a set of approaches to the validation activities.

This document should be considered in conjunction with the deliverable D1.3.1 and D1.3.2 (Draft / final release of the EasyTV system architecture), which describe the overall architecture of the system. In this regard, to avoid duplication, in some points we refer to the D1.3.x deliverables for the description of the pretty architectural aspects.

2. OVERALL PROJECT DESCRIPTION

The main goal of EasyTV is to achieve an equal access to television and audio-visual services for people with various degrees of disabilities, especially visually or hearing impaired.

In order to allow users with disabilities to overcome their inability and difficulty to access mainstream products and services, the design process of EasyTV system started by considering different perspectives:

- Product services and components
- User needs
- Design approach

2.1. Product services and components

The EasyTV system aims firstly to ease the access to multimedia services by offering an improved user experience related to the accessibility functionalities. Furthermore, EasyTV system, focusing on the interaction of the user with disabilities with the content and also with other users, enhances interaction adapting it to the user's preferences, providing personalised content in an integrated single multi-terminal platform.

Specifically, EasyTV overall concept is based on four pillars:

a) Improved access services for enhanced multimedia visual and sound experience for people with disabilities;

b) Improved personalisation of the content experiencing and interaction, towards a hyper-personalised experience to all;

c) Novel technologies to break the sign language barrier (based on crowdsourcing techniques);

d) Improvement and development of voice and gesture/gaze recognition to control the TV set and TV applications (e.g., eye movement or head movement) in the form of a universal remote control.

Starting from these main macro-characteristics foreseen for the EasyTV system, the design process has to consider multiple devices and platforms (e.g. second screen, VoD, etc.) along with the technological tools and systems required for the commercial implementation. Moreover, have been taken into account the EasyTV platform-based service components and their respective functionality:

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

2.2. User needs

In order to make sure that the EasyTV solutions developed will serve the interest of the main end-users, and to ensure its acceptance and uptake, the collection of real needs and requirements gathering from the final users and collected by the Focus Groups (see *Deliverable 1.1 User scenario and requirements definition*) is to be considered the start point for the design process.

As better explained in Section 3 (Focus Group findings), the findings and the outcomes of the Focus Groups have been translated in users' requirements and system specification.

2.3. Design approach

EasyTV aims to guarantee a user-centred approach: end users are considered at the centre of the development, innovation and adaptation of technologies to facilitate a more cohesive and integrated media content.

Adopting this approach as a guide to the design process, a set of tools for the analysis and the identification of the functional requirements have been identified (as explained in Section 4.1 Methodological references). So that have been taken into account:

- the specific disability of the user, in a general manner.
- the user's preferences, in a more specific manner.
- the use environment.

3. FOCUS GROUP FINDINGS

The design process, and the subsequent identification of functional requirements explained in the present document, started from the evidences emerged in the research activities carried out in Task 1.1 – End user requirements gathering, and relative deliverable (D1.1 User scenario and requirements definition).

The aim of the Task 1.1 was to gather user requirements and specification, and identify the user scenarios and the users' needs in order to guide the design and development of the whole EasyTV system.

In order to achieve this objective, firstly, were involved "super end users". This term is used to define end users who, besides their condition of regular users, also have some knowledge on the technologies foreseen for the EasyTV system. The preliminary consideration was that it would make no sense to consult end users with no knowledge or experience with neither functional diversity nor technological background since the issue was related to technology development and user expectations in order to match the innovation.

The criteria adopted to select "super end users" were the following:

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 the researchers, better than others, what the final users really need.

Regarding methodologies identified in D1.1 (User scenario and requirements definition) for collecting super end users' needs and expectations, between different research techniques was selected the Focus Group, in order to have a more interactive interview and to share and exchange opinions across experts during discussions on user needs. Focus groups are typically useful for exploring arguments, especially when little is known about the question of interest. Moreover, focus groups are most commonly used at the beginning stages of a research project and they are an interesting way to share ideas, and express opinions and attitudes. Focus groups also generate ideas or gather feedback about what final users think about the discussion topic (products and/or services).

Two Focus Groups were conducted, one for each type of disabilities: visual impaired and hearing-impaired people, according to the target of EasyTV project. For these two Focus Groups were defined two groups, one of five super end users for deaf people and one of six super end users for visual impaired people that have been asked for feedback.

Therefore, the main evidences of D1.1, related mainly to the Focus Groups outcomes, have been translated in the present document into users' requirements and system specifications.

Further considerations and suggestions included D1.1 have been taken into account in D1.2, regarding:

- User Profiles
- Tasks, Stories and Functionalities

3.1. Profiles

In order to define possible users' profiles, and the subsequent creation of scenarios and stories, in D1.1 were provided the following categories and related values:

- **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.

Following these suggestions, all the categories have been taken into account in the design activity to realize more consistent users' profiles. For each category have been considered all the values. In the case of the "age group", have been selected the fundamental and the most significant values, relatives to the ages group more relevant and representative of the end users of EasyTV system (25-49; 50-64; 65-79).

3.2. Tasks, Stories and Functionalities

Further suggestions presented in D1.1 regarding Tasks, Stories and Functionalities:

- All the **Tasks** and the **Stories** must be defined in order to better understand what users 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 user and give solutions to these user needs.

These suggestions have been integrated in the design process of Scenario, Task and Stories through the following dimensions:

- **Daily Routine:** the different steps of the day of a user in which his needs must be satisfied.
- The **Watching TV habits:**
  - Device: devices used
  - Where: context of use
  - With: people present when user watch TV
  - What: favorite TV content
  - Needs: main user's needs when is watching TV

[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 a higher level of realism and consistency.

4. FUNCTIONAL REQUIREMENTS

4.1. Methodological references

The aim of this phase, that follows the previous activity of gathering user requirements through the focus groups with the super end users (D1.1), is to define precise scenarios with which to translate the results collected into a system of functional specifications, intended to subsequently feed the specifications with technological and architectural features of the EasyTV platform.

The activities executed in this phase by User Centered Design specialists were carried out by elaborating the needs gathered from the users, and by applying the indications provided in the methodology of the *User Sensitive Inclusive Design* [1]..

First of all, it should be noted that the presence in the project of the Italian Blind Union and FCNSE partners has allowed us to overcome many of the difficulties that the authors of the above methodology have listed in their studies [1]. allowing to operate in this phase on optimal assumptions: “There are some important distinctions between traditional User Centred Design with able-bodied users, and UCD when the user group either contains, or is exclusively made up of, people with disabilities. These include:

- Much greater variety of user characteristics and functionality,
- The difficulty in finding and recruiting “representative users”,
- Possible conflict of interest between accessibility for people with different types of disability,
- Conflicts between accessibility, and ease of use for less disabled people (“temporary able-bodied”), e.g. floor texture can assist blind people but may cause problems for wheel chair users,
- Situations where “design for all” is certainly not appropriate (e.g. blind drivers of motor cars),
- The need to specify exactly the characteristics and functionality of the user group,
- Provision for accessibility via the provision of additional components.”

With respect to user involvement, the selection was made with a good variety of characteristics and levels of disability, and the selection and engagement activities were carried out directly by the project partner associations, who can rely on a large population of associates.

In the groups of super end users, were involved also non-disabled people who works with people with disabilities. In this way, it was possible to collect testimonies and needs related to the experiences of cohabitation of people who adopt radically different ways of consuming television contents. Furthermore, the researchers had the opportunity to understand more in depth the different dynamics of relationship, and levels of empathy, established between disabled/non-disabled people living together, that are characterized by various levels of need.

This is because, in accordance with the methodology cited, any conflict of interest between different levels of disability or between disabled and non-disabled users have been treated as an opportunity to identify solutions able to respond, in the same context of use, to each of the needs revealed. The value of this approach is even more important when considering the role of socialization that the use of television broadcasting has in the daily life of people, both in the consumption phase (collective vision with friends and / or family members) and subsequently in conversation and exchange of ideas between people talking about variety shows, talk shows, TV series and any other kind of television content.

This approach has led designers to elaborate extremely holistic scenarios, finalizing each story in a framework that integrates different solutions from the beginning in a native way, without incurring successive overlapping operations that could only be addressed with the logic of additional components.

Furthermore, the definition work carried out at this stage also took into account another pillar of the methodology, the *Inclusive Design* whose approach is based on uses and contexts of use of projects really open to the whole world, so that elderly and disabled people can benefit from the

same products and services, even together with non-disabled users. An approach that proves to be extremely pertinent in the context of the EasyTV project, due to the already exposed peculiarities of the use of the television service.

The *Discover* methodology of the *Inclusive Design* provides the definition of problems through the understanding of the five classic dimensions of investigation: “The discovery process needs to uncover knowledge in response to the following simple questions

- **Who** are the users and other stakeholders?
- **What** tasks will the product be used to achieve?
- **Why** does the business / user want this product?
- **When** will the product be delivered?
- **Where** will the product be used” [2].

The needs emerged from the super end users involved in the focus groups were collected and managed to achieve **personas**[3] strongly characterized in the normal course of everyone's daily life.

The elaboration of personas[4] based on a deep modeling of their profile and described in narrative form, with a detailed research on their abilities, attitudes, environments and people of reference and, above all, personal goals was made according to: "Sensitive design also encourages the designer to consider the whole person, not simply their physical characteristics." [1]..

The personas elaborated not only allow to answer the questions "**Who** are the users and other stakeholders?" And "**Why** does the user want this product?", but force the designer into a creation methodology based on *putting oneself in someone's shoes*. In this way, we create an empathic relationship with the users, whose connotations lose their generality to assume more and more realistic specific features, soon transforming them into “ordinary people".

The work that was carried out by our UX designers was therefore to imagine the personas as strongly familiar figures, as if they were dear friends or close relatives with whom themselves were to spend those normal moments of the day consuming TV contents. These moments of virtual sharing were useful to define precisely:

- the contexts of use of the services, attributing them and declining them according to the profiles identified to cover the greatest number of possible needs of use (at home or on the move, alone or in company, in private or public places);
- the different modalities of coexistence, and the level of exclusivity according to the type of disability/difficulty, provided for each instrument/device of assistance to media content fruition, in order to avoid conflicts between services, but also to optimize the resources to be foreseen/processed;
- the best ways of sharing the use of the assistive service even in the presence of persons with standard or endowed with distinct levels of disability, in order to allow a satisfying experience for any type of user;
- the additional opportunities that the assistance services can offer, even to the non-disabled people, to achieve a valorization of the project results also as tools of utility towards a wider public (for example, the practicality of the use of voice commands with busy hands, the usefulness of subtitles in learning foreign languages, etc.).

The elaborated personas, once defined and verified with the project partner associations, were then used as protagonists in the preparation of scenarios, representations in which specific users pursue a certain objective in a specific context of use.

[3] **Persona** is an archetype or character that represents a potential user of the system that will be developed. In a narrative way, personas express and focus on the major needs and expectations of the user groups.

[4] Personas aid inclusive design because: Users’ goals and needs become a common point of focus for the team; The team can design for a manageable set of personas, knowing that they represent the needs of many users; Design efforts can be prioritised based on the personas; Disagreements over design decisions can be resolved by referring back to the personas; Designs can be evaluated against the personas and their capabilities. [2].

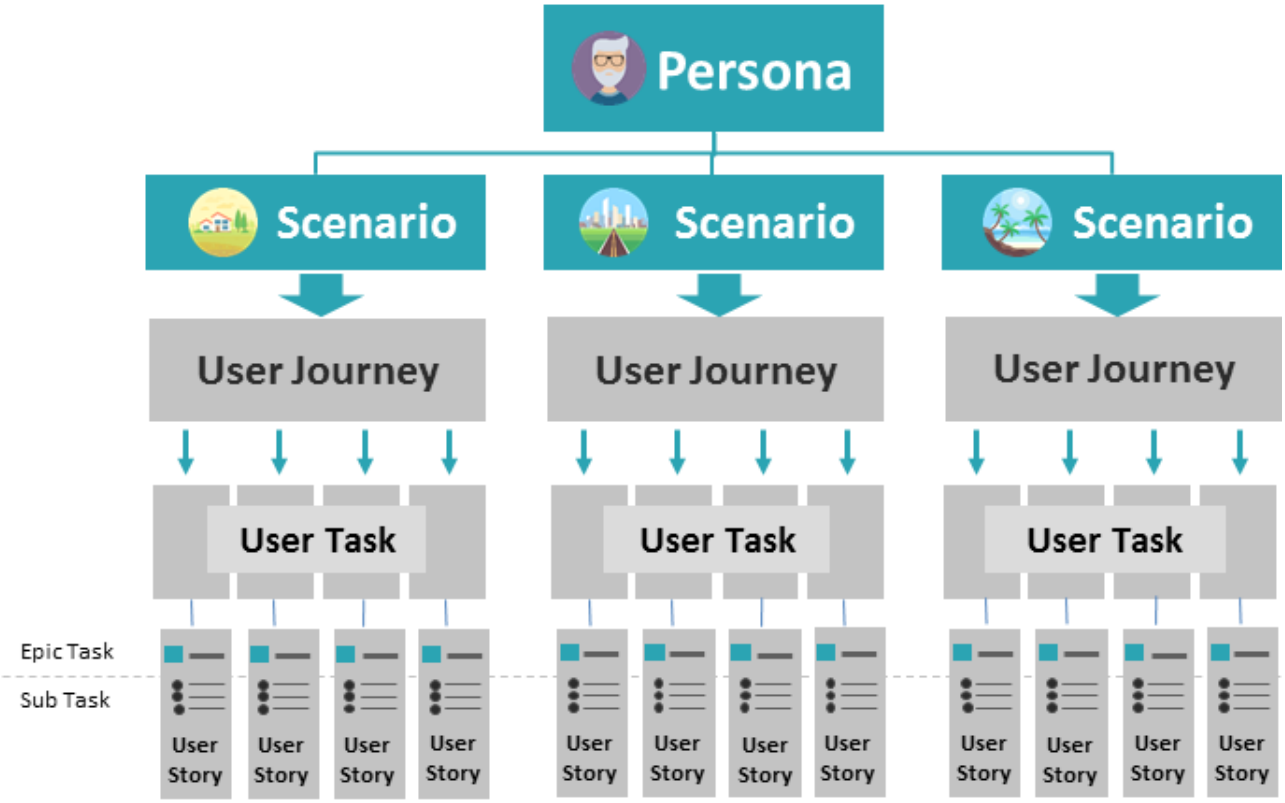

Fig. 1 Requirements design process

The **scenarios**[5] have been elaborated starting from short stories in which it is narrated an experience of complete use, as it is experienced by that specific user. The scenarios provide contextualization of different moments in different environments, to engage as many touchpoints as possible each time. The design activity was carried out with an elevated level of attention on the realism of the situations and personal experiences that have been described.

The narrative component of the scenarios is the most suitable form of description in this design phase, because this envisioning activity requiring the maximum freedom of expression from designers. This could not have been achieved with forms of representation based on more rigid and structured models. The scenarios are particularly effective because:

- offer concretion and at the same time evocative representations, able to be immediately interpreted by anyone, even outside the UCD methodologies;
- they can be easily handle allowing rapid intervention and to evolve them with extreme flexibility even in the subsequent phases of the project;
- place emphasis on people and their experiences, allowing them to identify the most useful and appropriate solutions for end users;
- the narrative form creates empathy both in the author and in the readers, facilitating the identification with the user;
- allow to define broad scenarios with a wide range of solutions.

The role that scenarios will play in the development of the whole project is well described by the methodological framework suggested by Rosson and Carroll in their *Scenario-Based Design* [3].: "The framework incorporates scenario-based analysis and design into all phases of system development, from requirements analysis through usability evaluation and iterative development. The overall process is one of usability engineering, where the scenarios support continual assessment and elaboration of the system's usefulness, ease of use, and user satisfaction. The aim is to de-

[5] **Scenario** describes a basic story of an action or goal that a user wants to accomplish in a specified context of use.

velop a rich understanding of current activities and work practices, and to use this understanding as a basis for activity transformation".

As for the personas, the scenarios have also been analyzed with the project partner associations to verify the realism of the situations described and the correspondence of the proposed solutions with respect to the needs of the user profiles considered. The subsequent activities of this phase of the work package have therefore envisaged the deepening, through the organization and systematization of the design elements arising from the scenarios elaborated. This result was achieved through progressive analysis and processing of the steps in each scenario with the aim of obtaining an increasingly fine granularity of the design elements.

First of all, the **User journey**[6] of each scenario were elaborated in order to visualize in a schematic form the description of the scenario. This is a synoptic model whose purpose is to map the main dimensions on which every single scenario operates (daily routine, context of use, interaction channel), articulating them for each set of expected tasks. In this way, a holistic representation of the user's experience is obtained, which is particularly useful to highlight the steps that take place between the devices and the technologies involved in the scenario.

The subsequent activity concerned the generation, on the basis of the agreed scenarios, of the **User tasks**[7] related to each analyzed persona. This analysis allows to define the objectives that the user is trying to achieve with the use of the EasyTV platform, the ways in which it can reach them, but also how it is influenced by the environment in which it is located and by the available technologies. Imagining this context, the user experience was deconstructed into single actions (tasks), which were then described with simple one-sentence phrases, to make them immediately perceptible.

Each of these main tasks, called the *Epic Task*, was then analyzed and decomposed into the most significant UX elements:

- the phase of the daily routine during which the task takes place;
- the scene in which the task takes place;
- the specific context of use (place and / or time of day);
- the use and / or interaction device in use;
- the primary functionality of the system used in the task.

The result of this activity will prove particularly useful in the subsequent design and development phases, when the navigation structures of the menus of each service must be organized, when the wireframes and prototypes of their interfaces are processed, and also when the tasks must be organized to be submitted to users during the usability tests.

A further step in defining the needs of the user to be satisfied was the elaboration of the **User stories**[8], continuing to work on the analysis of the results from previous analysis activities.

Each single defined task represents a high-level transition of the user experience. This level of definition has been further analyzed and decomposed into a series of sub-tasks, to specify in more detail all the micro-objectives of the user that will have to be satisfied through one or more functional features of the system.

The description of each sub-task was then elaborated with the perspective of the end user, using one of the most established models of formalization of user stories, the so-called "Connextra template" (so called by the company that first used it).

This format is organized on a construct articulated as follows:

[6] **User journey** describes the journey of a user by representing the different touchpoints that characterize his interaction with the service.

[7] **User Tasks** are steps that users currently take in order to achieve their goals.

[8] **User Stories** are a short, specific and goal-oriented descriptions of what a user will do with a part of a system. User Stories have the following structure: "As a , I want so that ".

As a [type of user] I want to [do something] So that I can [get some benefit]

This form of exposure of each sub-task has the advantage of not using a technical language and has made it easier to submit this analysis result to the verification of the project partner associations.

The sub-tasks were then collected in a display form with which the sequences of sub-tasks were collected each one under its own epic reference task.

This mode of representation, often used in the management of Agile frameworks, has the merit of organizing the maximum level of detail obtained from the analysis in an overview of the solution that is being designed, allowing a precise overview of each passage of the UX described.

4.2. Service scenario

The activities described so far, related to user research, analysis and design, have led to the definition of different **Service scenarios**.

The Service scenario is a framework that has allowed UX designers to identify and define users' potential requirement collecting the different types of design tools described previously:

- Persona
- Scenario
- User Journey
- User Task
- User stories

Consequently, a set of structured documents have been developed starting from six figures of users, referring to the following profiles:

- Blind
- Visually impaired
- Elderly
- Deaf (signer)
- Hard of hearing
- Professional non-disabled user (SL expert)

Each document is presented through a template designed to explain, in the clearest way possible, the process and the elements described in the methodology section previously illustrated.

Following is presented an overview that displays the template's structure of each document.

It is important to clarify that names, situations and life contexts described are completely fictitious and fictional. Though they are based on the analysis of the needs emerged by users in the surveys and focus groups, they are the result of a process of storytelling and envisioning realized for the EasyTV project.

The Personas Map

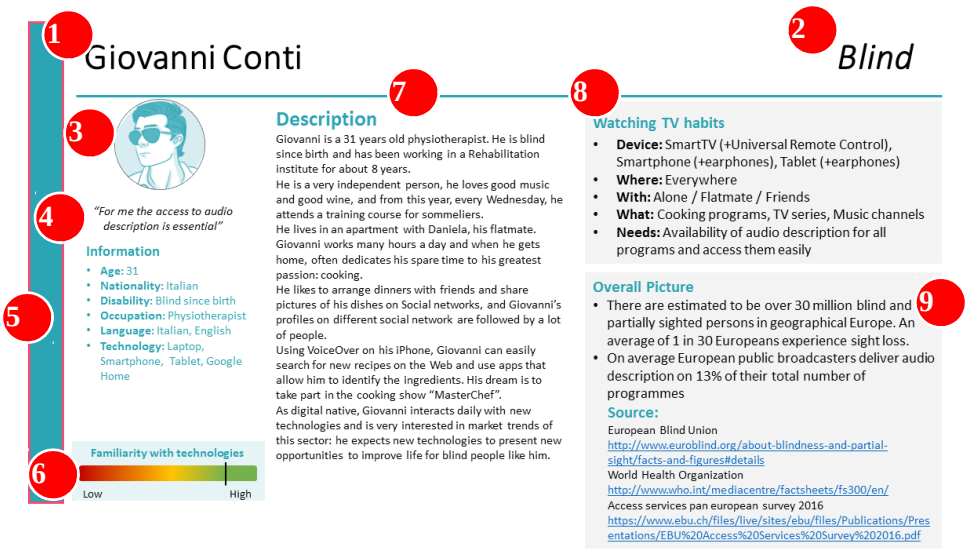

Fig. 2 Personas Map

1. Persona's Name.
2. Persona's disability.
3. Persona's visual representation.
4. Main quote: a quote that express and summarise the Persona's main needs.
5. Personal information: socio-demographic information useful to better understand the profile of each Persona.
6. Familiarity with technologies: parameter defined on a scale from *low* to *high.*
7. Narrative description of Persona's characteristics: main interests and passions, attitudes and motivations, habits and routines related the use of technologies.
8. Watching TV habits: habits and needs related to the use of television services.
9. Overall Picture: data and information (and related sources) of context that has been analyzed to define the profile of each Persona.

The Scenario Map

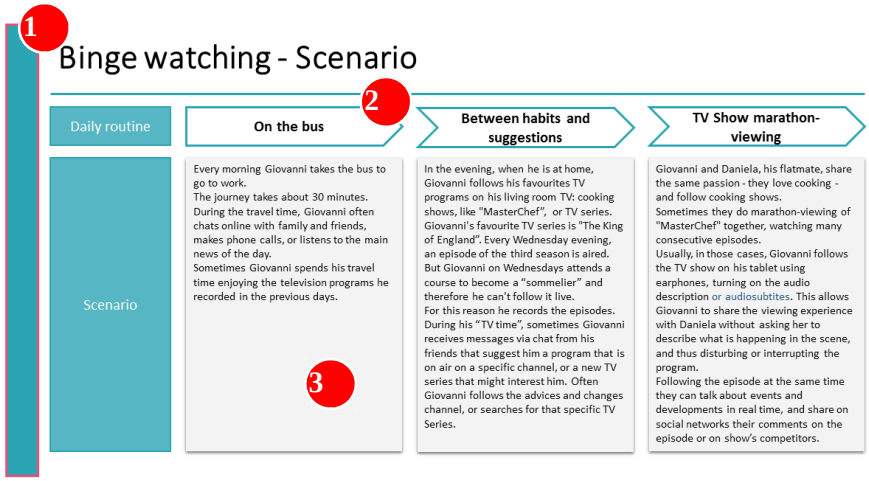

Fig. 3 Scenario Map

1. Scenario's title: it defines Persona's main area of interest and needs.
2. Daily routine: the different steps of the day of a Persona in which his needs must be satisfied.
3. Storytelling of the scenario that takes place in a context defined by the specific step of the daily routine: conditions of use, tools adopted, available time and user attitudes are some of the parameters defined that will allow to identify the specifications of the subsequent Persona's activities.

The User Journey

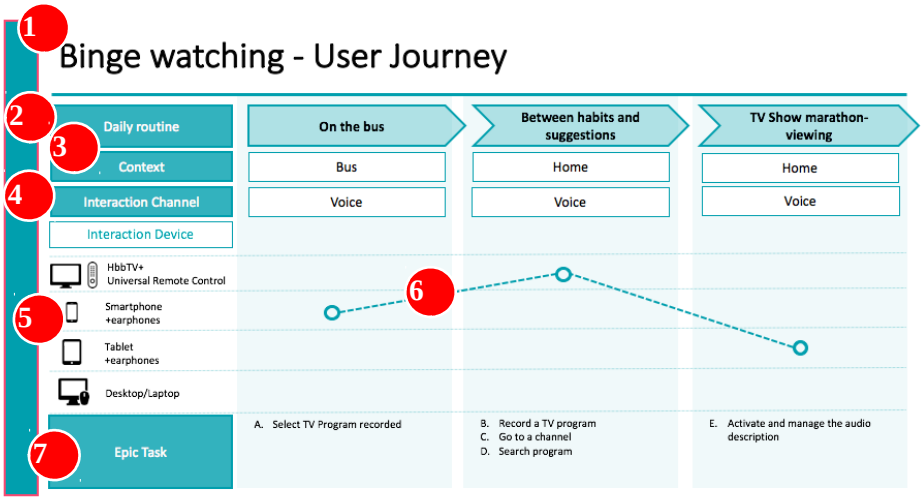

Fig. 4 User Journey

1. User Journey's title: it resumes Scenario's title.
2. Daily routine: the different steps of the day of a Persona in which his needs must be satisfied
3. Context: the specific context of use in which Persona's needs must be satisfied.

4. Interaction Channel: the interaction channel(s) used by user to access to the devices and functionalities able to satisfy his needs.
5. Interaction Device: all the interaction devices (that generate touchpoint) expected from the Scenario.
6. Flow of the user experience between the different touchpoints foreseen, during the day of the user.
7. Definition of the main tasks (*Epic Task*) performed by the user during his daily routine

The User Story

The results of the previously illustrated documents were used to proceed with the analysis of the tasks of each Scenario. This additional design activity has generated for each task a detailed list of sub-tasks with which have been defined micro-activities that the user can/must perform to satisfy their needs.

This work, carried out for each of the Scenarios, is divided into various types of panels that are illustrated below in order to present in a practical way the working methodology used.

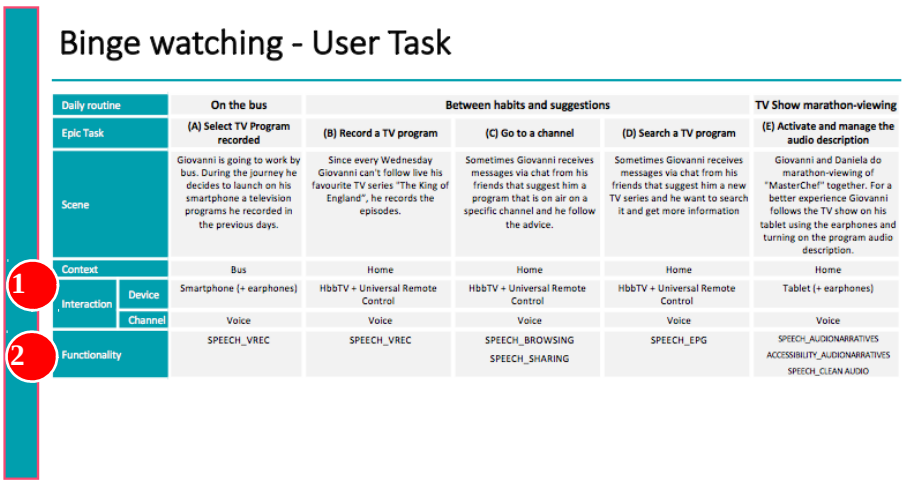

Fig. 5 User Task

This template is a view that organize the Scenario's tasks integrating in:

1. Interaction: the fundamental elements of user interaction and;
2. Functionality: introducing the areas of service functionality involved by each task.

The following panels, regarding the user stories design process, have not been collected in the present document in the same form, as it has been preferred to provide, for each group of User stories related to each service scenario, a tabular view of the elements, which organizes and rationalizes them for an easier and faster consultation. Therefore, part of the following elements are integrated into the synoptic tool presented in Section 5 (Component specifications), which collects the overall result of all the User Stories developed for all the foreseen Service Scenarios.

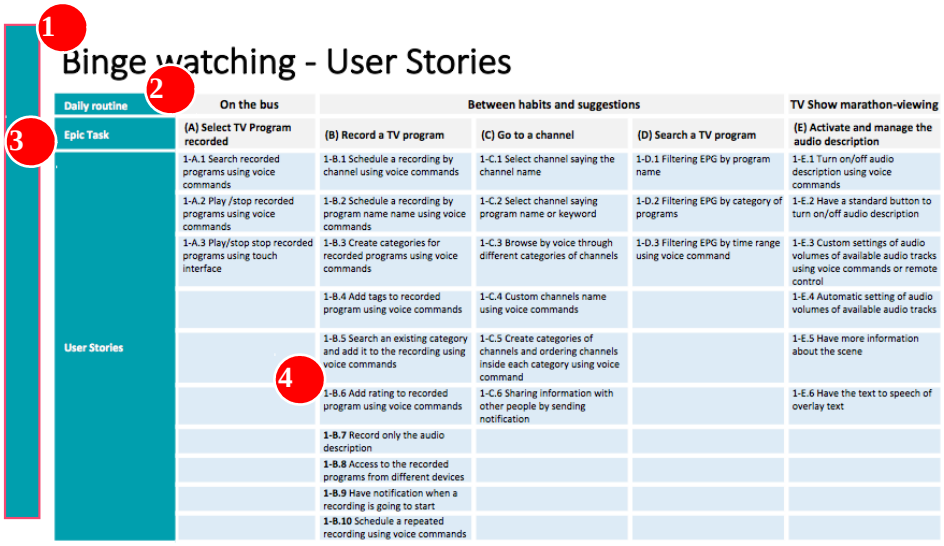

Fig. 6 User Stories Map

1. User Stories' section title: it resumes Scenario's title.
2. Daily routine: the different steps of the day of a Persona in which his needs must be satisfied.
3. Definition of the main tasks (*Epic Task*) performed by the user during his daily routine.
4. Sub-task: micro-activities in which the main task is articulated.

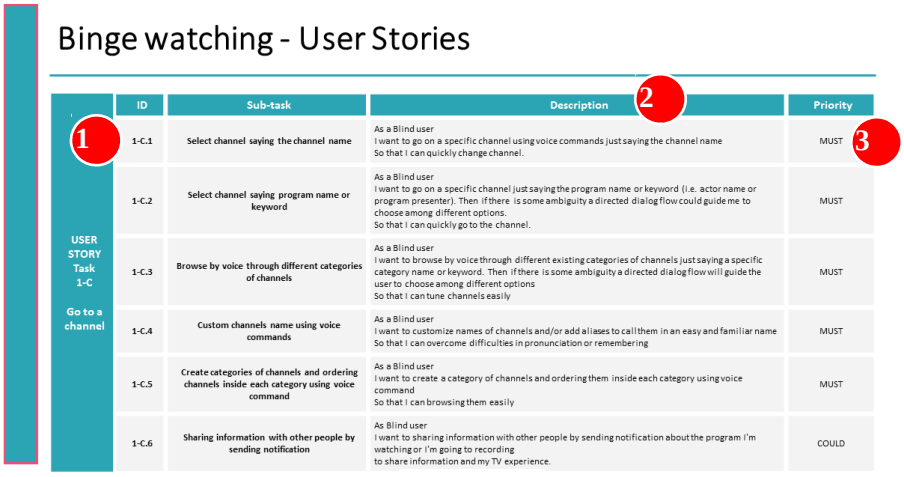

Fig. 7 User Stories section

This template shows an example of the detail developed for each task.

1. *Epic Task* performed by the user during his daily routine
2. Description: for each sub-task a functional description is provided according to the end user's perspective (in the *Connextra* template format)
3. Priority: definition of the level of importance that is held for the user, therefore its degree of priority.

4.2.1. Binge watching

4.2.1.1 Personas: Giovanni Conti, *Blind*

"For me the access to audio description is essential"

Information

Age: 31
Nationality: Italian
Disability: Blind since birth
Occupation: Physiotherapist
Language: Italian, English
Technology: Laptop, Smartphone, Tablet, Google Home

Familiarity with technologies

Low — High

Description

Giovanni is a 31 years old physiotherapist. He is blind since birth and has been working in a Rehabilitation institute for about 8 years.
He is a very independent person, he loves good music and good wine, and from this year, every Wednesday, he attends a training course for sommeliers.
He lives in an apartment with Daniela, his flatmate. Giovanni works many hours a day and when he gets home, often dedicates his spare time to his greatest passion: cooking.
He likes to arrange dinners with friends and share pictures of his dishes on Social networks, and Giovanni's profiles on different social network are followed by a lot of people.
Using VoiceOver on his iPhone, Giovanni can easily search for new recipes on the Web and use apps that allow him to identify the ingredients. His dream is to take part in the cooking show "MasterChef".
As digital native, Giovanni interacts daily with recent technologies and is very interested in market trends of this sector: he expects innovative technologies to present new opportunities to improve life for blind people like him.

Watching TV habits

Device: SmartTV (+Universal Remote Control), Smartphone (+earphones), Tablet (+earphones)
Where: Everywhere
With: Alone / Flatmate / Friends
What: Cooking programs, TV series, Music channels
Needs: Availability of audio description for all programs and access them easily

Overall Picture

There are estimated to be over 30 million blind and partially sighted persons in geographical Europe. An average of 1 in 30 Europeans experience sight loss.
On average European public broadcasters deliver audio description on 13% of their total number of programmes

Source:
European Blind Union

World Health Organization

Access services pan European survey 2016

Fig. 8 Persona: Binge watching

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4.2.1.2 Scenario

Daily routine	On the bus	Between habits and suggestions	TV Show marathon-viewing
Scenario	Every morning Giovanni takes the bus to go to work. The journey takes about 30 minutes. During the travel time, Giovanni often chats online with family and friends, makes phone calls, or listens to the main news of the day. Sometimes Giovanni spends his travel time enjoying the television programs he recorded in the previous days.	In the evening, when he is at home, Giovanni follows his favourites TV programs on his living room TV: cooking shows, like "MasterChef", or TV series. Giovanni's favourite TV series is "The King of England". Every Wednesday evening, an episode of the third season is aired. But Giovanni on Wednesdays attends a course to become a "sommelier" and therefore he can't follow it live. For this reason, he records the episodes. During his "TV time", sometimes Giovanni receives messages via chat from his friends that suggest him a program that is on air on a specific channel, or a new TV series that might interest him. Often Giovanni follows the advices and changes channel, or searches for that specific TV Series.	Giovanni and Daniela, his flatmate, share the same passion - they love cooking - and follow cooking shows. Sometimes they do marathon-viewing of "MasterChef" together, watching many consecutive episodes. Usually, in those cases, Giovanni follows the TV show on his tablet using earphones, turning on the audio description or audio subtitles. This allows Giovanni to share the viewing experience with Daniela without asking her to describe what is happening in the scene, and thus disturbing or interrupting the program. Following the episode at the same time they can talk about events and developments in real time and share on social networks their comments on the episode or on show's competitors.

Fig. 9 Scenario: Binge watching

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4.2.1.3 User Journey

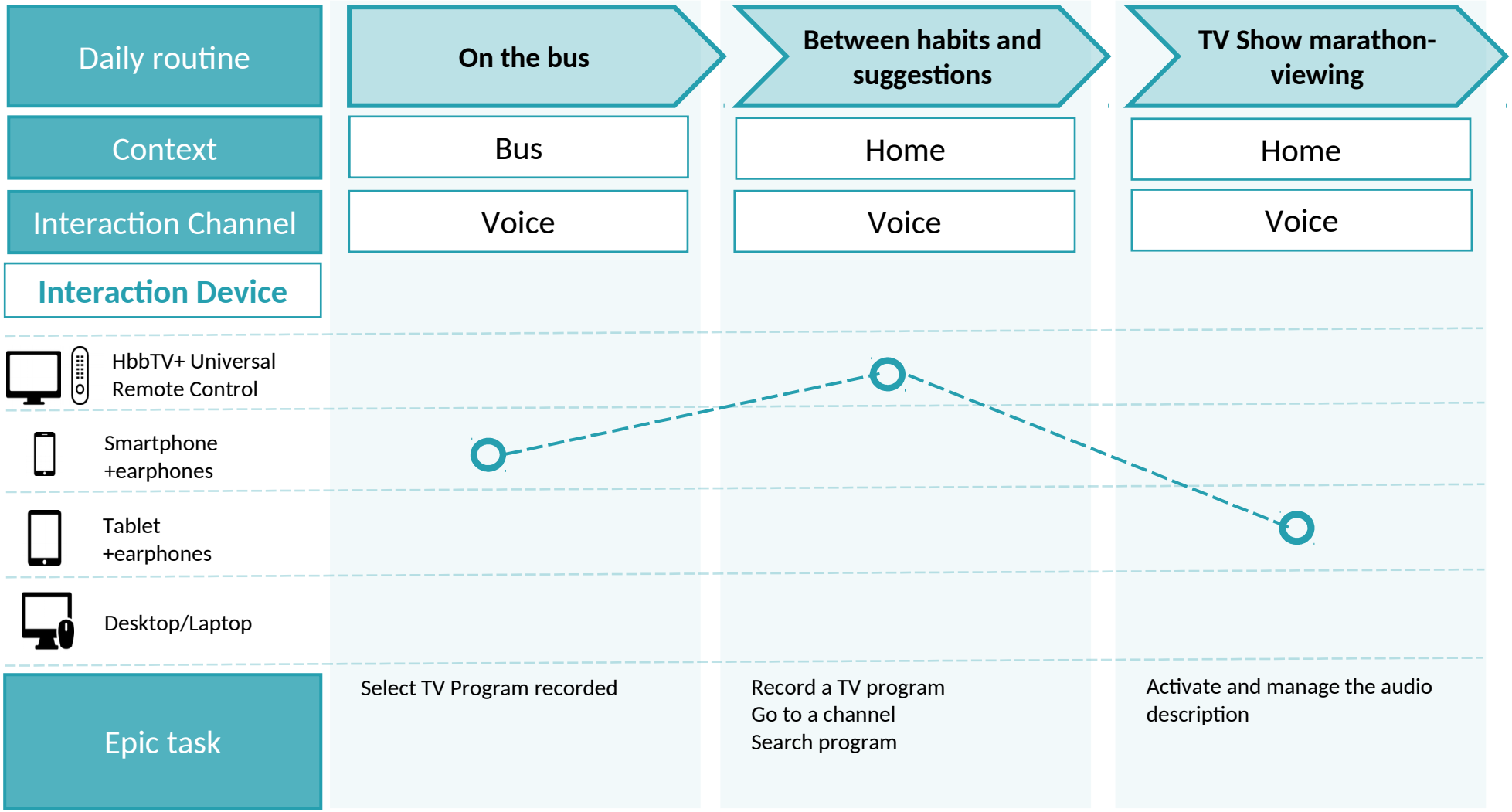

Fig. 10 User journey: Binge watching

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4.2.1.4 User Tasks

Daily routine		On the bus	Between habits and suggestions			TV Show marathon-viewing
Epic task		(A) Select TV Program recorded	(B) Record a TV program	(C) Go to a channel	(D) Search a TV program	(E) Activate and manage the audio description
Scene		Giovanni is going to work by bus. During the journey, he decides to launch on his smartphone a television programs he recorded in the previous days.	Since every Wednesday Giovanni can't follow live his favourite TV series "The King of England", he records the episodes.	Sometimes Giovanni receives messages via chat from his friends that suggest him a program that is on air on a specific channel and he follow the advice.	Sometimes Giovanni receives messages via chat from his friends that suggest him a new TV series and he want to search it and get more information	Giovanni and Daniela do marathon-viewing of "MasterChef" together. For a better experience Giovanni follows the TV show on his tablet using the earphones and turning on the program audio description.
Context		Bus	Home	Home	Home	Home
Interaction	Device	Smartphone (+ earphones)	HbbTV + Universal Remote Control	HbbTV + Universal Remote Control	HbbTV + Universal Remote Control	Tablet (+ earphones)
	Channel	Voice	Voice	Voice	Voice	Voice
Functionality		SPEECH_VREC	SPEECH_VREC	SPEECH_BROWSING SPEECH_SHARING	SPEECH_EPG	SPEECH_AUDIONARRATIVES ACCESSIBILITY_AUDIONARRATIVES SPEECH_CLEAN AUDIO

Fig. 11 User Tasks: Binge watching

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4.2.1.5 User stories

Table 1. User stories: Binge watching

ID	Epic Task	Sub-task	User Stories
1.A.1.	Select TV Program recorded	Search recorded programs using voice commands	As a Blind user, I want to search recorded programs on my mobile phone or tablet using voice commands saying the program title, the channel, the category or tag, so that I can access easily to recordings.
1.A.2.	Select TV Program recorded	Play/stop recorded programs using voice commands	As a Blind user, I want to play/stop the recorded programs using voice commands, so that I can start (or stop and resume) the recording when I want.
1.B.1.	Record a TV program	Schedule a recording by channel using voice commands	As a Blind user, I want to schedule a recording using voice commands choosing the channel to record along with the start date and time and the end date and time, so that I can quickly schedule a recording.
1.B.2.	Record a TV program	Schedule a recording by program name using voice commands	As a Blind user, I want to schedule a recording using voice commands choosing the name of the program to record along with the start date and time and the end date and time, so that I can quickly schedule a recording.
1.B.3.	Record a TV program	Create categories for recorded programs using voice commands	As a Blind user, I want to create categories for recorded programs, and order items inside the categories according to my needs and preferences, using voice commands, so that I can browse them easily.
1.B.4.	Record a TV program	Add tags to recorded program using voice commands	As a Blind user, I want to tag the recorded programs using voice commands, so that I can search them easily
1.B.5.	Record a TV program	Search an existing category and add it to the recording using voice commands	As a Blind user, I want to add the recorded programs to an existing category using voice commands, so that I can search them easily
1.B.6.	Record a TV program	Add rating to recorded program using voice commands	As a Blind user, I want to rate the recorded programs using voice commands, so that I can search them easily and according to my preferences
1.B.7.	Record a TV program	Record only the audio description using voice commands	As a Blind user, I want to record only the audio description of the TV program (only audio, not video) using voice commands, so that I can manage better the files size of recording and download it faster.
1.B.8.	Record a TV program	Sharing information about the recording timer configured using voice commands	As Blind user, I want to share information about the recording timer I configured with other people by sending notification, using voice commands, so that I can share my TV experience and give suggestions
1.B.9.	Record a TV program	Receive a vocal notification when a recording is going to start	As a Blind user, I want to receive a vocal notification when a recording is going to start, so that I can be aware that the recording will correctly start.
1.B.10.	Record a TV program	Schedule a repeated recording using voice commands	As a Blind user, I want to schedule a repeated recording using voice command, so that I can avoid repeating the recording setting each time.

1.C.1.	Go to a channel	Select channel saying the channel name	As a Blind user, I want to go on a specific channel using voice commands just saying the channel name, so that I can quickly change channel.
1.C.2.	Go to a channel	Select channel saying program name or keyword	As a Blind user, I want to go on a specific channel just saying the program name or keyword (i.e. actor name or program presenter). Then if there is some ambiguity a directed dialog flow could guide me to choose among different options, so that I can quickly go to the channel
1.C.3.	Go to a channel	Browse by voice through different categories of channels	As a Blind user, I want to browse by voice through different existing 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, so that I can tune channels easily
1.C.4.	Go to a channel	Customize channels name using voice commands	As a Blind user, I want to customize names of channels and/or add aliases to call them in an easy and familiar name, so that I can overcome difficulties in pronunciation or remembering
1.C.5.	Go to a channel	Create categories of channels and ordering channels inside each category using voice commands	As a Blind user, I want to create a category of channels and ordering them inside each category using voice command, so that I can browsing them easily
1.C.6.	Go to a channel	Sharing information about current program using voice commands	As Blind user, I want to share information with other people about the program I'm watching by sending notification, using voice commands, so that I can share my TV experience and give suggestions
1.D.1.	Search a TV program	Filtering EPG by program name using voice command	As a Blind user, I want to ask by voice to filter the EPG by program name (or keyword) and receive audio feedback, so that I can have more information on the program (channel, duration, plot, episode etc.) and I can select the program I'm searching for.
1.D.2.	Search a TV program	Filtering EPG by category of programs using voice command	As a Blind user, I want to ask by voice to filter the EPG by category of programs (TV series, movies, cartoons, adventure, and so on) and receive audio feedback, so that I can select the program I'm searching for.
1.D.3.	Search a TV program	Filtering EPG by time range using voice command	As a Blind user, I want to ask by voice to filter the EPG by time range (i.e. "now", "morning", "prime time", "tomorrow" etc.) and receive audio feedback, so that I can be aware of what is on air on TV in different time range.
1.E.1.	Activate and manage the audio description	Turn on/off audio description using voice commands	As a Blind user, I want to turn on/off audio description using voice commands, so that I can easily and quickly enable/disable audio description.
1.E.2.	Activate and manage the audio description	Have a standard button to turn on/off audio description	As a Blind user, I want to have a standard button to activate/deactivate audio descriptions, so that I can turn on/off audio description easily
1.E.3.	Activate and manage the audio description	Set up volume of different audio tracks using voice commands	As a Blind user, I want to set up the volume of the different audio tracks (i.e. voices, audio description, audio subtitle, Text To Speech etc.), so that I can manage volume of the available audio tracks according to my needs.
1.E.4.	Activate and manage the audio	Save volume settings and make them available for all content, using	As a Blind user, I want to save the volume settings (for different audio tracks) I have set up and make them available for all TV contents, so that I can avoid modifying them each time

	description	voice commands	
1.E.5.	Activate and manage the audio description	Save volume settings and make them available for specific type of content, using voice commands	As a Blind user, I want to save the volume settings (for different audio tracks) I have set up and make them available for a specific type of content (i.e. News, Movies, Sports, etc.), so that I can avoid modifying them each time
1.E.6.	Activate and manage the audio description	Select an automatic volume setting of different audio tracks using voice commands	As a Blind user, I want to select an automatic volume setting of different audio tracks using voice commands, so that I can choose easily between different settings according to contents.
1.E.7.	Activate and manage the audio description	Turn on/off additional audio information using voice commands	As a Blind user, I want to turn on/off additional audio information related to content in the images (i.e. contextual information during the silent time etc.), using voice commands, so that I can access to information about scene that I'm not able to see
1.E.8.	Activate and manage the audio description	Turn on/off the Text To Speech (TTS) of overlay text using voice commands	As a Blind user, I want to turn on/off the Text To Speech (TTS) of overlay text using voice commands, so that I can access to contents that I'm not able to see

4.2.2. My needs first

4.2.2.1 Personas: Maria Bianchi, *Visually impaired*

"I want to see beyond my disease"

Information

Age: 42
Nationality: Italian
Disability: Low vision due to Glaucoma
Occupation: Consultant
Language: Italian, English
Technology: PC Desktop, Tablet, Smartphone, Gaming console

Familiarity with technologies

Description

Maria is 42 years old. After the divorce, she lives with her son Michele who is 7 years old.
In 2012, Maria was diagnosed with Glaucoma and due to the disease, her visual field is partially restricted, and it will continue progressively.
After the divorce, despite some difficulties, she has found a job as a consultant and she spends a lot of time away from home.
During the weekend, Maria love to stay with Michele: they usually watch cartoon together, play videogames and go to playground.
Maria has a very busy life and her smartphone is very helpful in her daily routine, especially to organize meeting and work activities and to be in contact with Michele's babysitter.
But except for instant messaging apps and Facebook app on her smartphone, Maria doesn't use recent technologies frequently.
Since the disease began, Maria with some difficulties tried to adapt the interfaces of her technology devices according to her new needs. She's not always able to set up correctly settings of the devices she uses. Often accessibility features are not available or difficult to use.

Watching TV habits
Device: TV HbbTV, Tablet
Where: At home
With: Alone / Her son
What: Talent show, Reality, Cartoon
Needs: Be able to see more clearly everything on the Television screen

Overall Picture
Women are more at risk of becoming blind or partially sighted than men. In the world 55% of moderate or severely vision impaired people are women
The average unemployment rate of blind and partially sighted persons of working age is over 75 percent.
More women are unemployed than men.

Source:
European Blind Union

The International Agency for the Prevention of Blindness

Fig. 12 Persona: My needs first

4.2.2.2 Scenario

Daily routine	Me and my son	Overcoming my daily difficulties	Multi-platform needs
Scenario	Because of his work Maria spends a lot of time away from home. For this reason, as soon as she can, Maria tries to stay with her son Michele of 7 years old. In the evening, when she comes home, they love to watch TV together. To find a program to follow together, usually Maria consults the Electronic Program Guide (EPG) and searches Michele's favourite programs, or anyway suitable for a child of his age. If Maria has planned with his son to watch a program together, but another program that Maria would like to watch is scheduled at the same time, she records it. She often sets up the recording using voice command so that it is easier for her that have some reading difficulties. After setting up the recording, Maria and Michele start to watch the program they were waiting to see together.	Maria's favourite program is "X Factor Italia" a talent show based on a music competition. Maria likes the program not only for music: she likes to get all the show details and then comment about them on the social networks (i.e. judging panel and competitors style, the choreography, etc.). Because of her visual difficulties, however, she needs to be able to improve the visualization of the graphic elements on the screen and magnify the images according to her needs. When during the program there are overlay texts for Maria it is very useful to slow down the speed of images, so she has more time available to read; sometimes at the same time she turns on the Text To Speech (TTS) of the text to overcome her difficulties and well understand everything. Maria also follows the UK version of “X Factor" through the subtitles and, since she cannot easily read them, she turns on Audio subtitling.	For most of her day Maria is at office or moving between her office and other places for meetings. Sometimes, during the launch break or travel time, she watches television programs on her tablet. Because of his difficulties, even on her mobile devices Maria needs to manage and customize the display settings and be able to magnify the images to better follow her favourite programs.

Fig. 13 Scenario: My needs first

4.2.2.3 User Journey

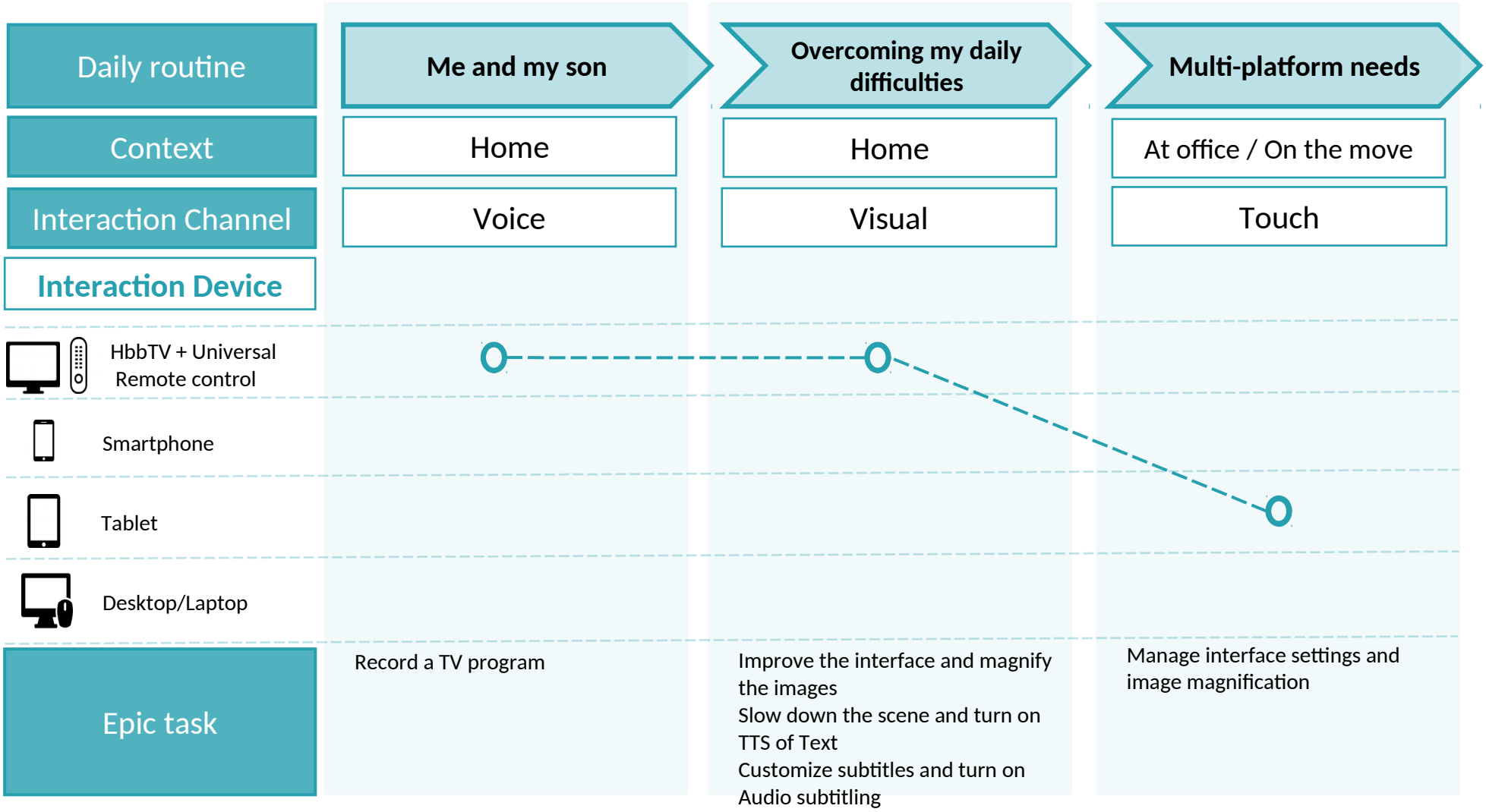

Fig. 14 User Journey: My needs first

4.2.2.4 User Tasks

Daily routine		Me and my son	Overcoming my daily difficulties			Multi-platform needs
Epic task		(A) Record a TV program	(B) Improve the interface and magnify the images	(C) Slow down the scene and turn on TTS of Text	(D) Customize subtitles and turn on Audio subtitling	(E) Manage interface settings and image magnification [Use case: Tablet]
Scene		Maria often sets up recording using voice command so that it is easier for her and then keeps watching TV with her son.	Because of her visual difficulties Maria needs to be able to improve the visualization of the graphic elements on the screen and magnify the images according to her needs.	When there are overlay texts for Maria it is very useful to slow down the speed of images, so she has more time available to read; sometimes at the same time she turns on the Text To Speech (TTS) of the text to overcome her difficulties and well understand everything.	Maria follows the UK version of “X Factor" through the subtitles and, since she cannot easily read them, she turns on Audio subtitling.	Because of his difficulties, even on her mobile devices Maria needs to manage and customize the display settings and be able to magnify the images to better follow her favourite programs.
Context		Home	Home	Home	Home	Home
Interaction	Device	HbbTV + Universal Remote control	HbbTV	HbbTV	HbbTV	Tablet
	Channel	Voice	Visual	Visual	Visual	Touch
Functionality		SPEECH_EPG VREC_BROWSING	IMAGE MAGNIFICATION_INTERFACE IMPROVEMENT	ACCESIBILITY_SLOW TV ACCESSIBILITY_TTS	ACCESIBILITY_SUBTITLES ACCESSIBILITY_AUDIOSUBTITLES	IMAGE MAGNIFICATION_INTERFACE IMPROVEMENT

Fig. 15 User Tasks: My needs first

4.2.2.5 User Stories

Table 2. User stories: My needs first

ID	Epic Task	Sub-task	User Stories
2.A.1.	Record a TV program	Start a recording by filtering EPG through channel using voice command	As a Visually impaired user, I want to start a recording of a specific program filtering EPG by channel using voice commands, so that I can quickly start a recording and overcome reading difficulties.
2.A.2.	Record a TV program	Start a recording by filtering EPG through program title or title keyword using voice command	As a Visually impaired user, I want to start a recording of a specific program filtering EPG by program title or keyword (i.e. keywords of program title, actor, presenter and so on) using voice commands, and then I select the specific program if more than one is matched supported by a dialog flow, so that I can quickly start a recording and overcome reading difficulties.
2.A.3.	Record a TV program	Start a recording by filtering EPG through the category of the program using voice command	As a Visually impaired user, I want to start a recording of a specific program filtering EPG by the category of the program and then I select the specific program and channel supported by a dialog flow, so that I can quickly start a recording and overcome reading difficulties.
2.A.4.	Record a TV program	Set up start/stop time of a recording by EPG using voice commands	As a Visually impaired user, I want to set up the start/stop time of a recording using voice commands when I start a recording by EPG, so that I can set timing appropriately and avoid compromising the recording if EPG scheduling times are wrong.
2.A.5.	Record a TV program	Have the EPG existing category automatically added to the program recorded	As a Visually impaired user, I want to have the EPG existing category of a program automatically added as a tag when I record it, so that I can use this category/tag for searching the recording.
2.A.6.	Record a TV program	Watch any different program when a recording is in progress	As a Visually impaired user, I want to watch any different program when a recording is in progress (browsing channel using voice commands), so that I can follow other channels.
2.B.1.	Improve the interface and magnify the images	Customize graphical parameters of the interfaces	As a Visually impaired user, I want to customize graphical parameters of the interfaces: contrast, color, font size, font background/foreground colors combination, graphic objects size etc., so that I can be able to see more clearly all the texts and the graphic elements on the screen (i.e. overlay text, icon, menu, guide etc.).
2.B.2.	Improve the interface and magnify the images	Save graphical parameters settings and make them available for specific device	As a Visually impaired user, I want to save the graphical parameters of the interfaces I have set up and make them available for specific device (i.e. current device, TV, Tablet, smartphone etc.), so that I can avoid selecting it each time.
2.B.3.	Improve the interface and magnify the images	Zoom in/out the images on the screen	As a Visually impaired user, I want to zoom in/out the images to magnify a specific portion of the screen and navigate through magnified content, so that I can be able to recognize and see all the details of the images.
2.B.4.	Improve the interface and magnify the images	Turn on/off automatic magnification of specific content	As a Visually impaired user, I want to turn on/off automatic magnification of specific sections of the frame related to specific type of content (i.e. faces, subtitles etc.), so that I can be able to see more clearly the main details of a scene.

2.B.5.	Improve the interface and magnify the images	Select type of content(s) for automatic magnification	As a Visually impaired user, I want to set the type of content that will be automatically magnified when it is present in a section of a frame, so that I can select the type of content according to my needs and preferences.
2.C.1.	Slow down the scene and turn on TTS of Text	Slow down the speed of the scene	As a Visually impaired user, I want to slow down the speed of the scene and adjust the speed of audio and video images, so that I have time to watch better the scene or read text.
2.C.2.	Slow down the scene and turn on TTS of Text	Turn on/off the Text To Speech (TTS) of overlay text	As a Visually impaired user, I want to turn on/off the Text To Speech (TTS) of overlay text on the screen, so that I can be supported by audio when I have reading difficulties.
2.D.1.	Customize subtitles and turn on Audio subtitling	Customize subtitles: foreground and background colors	As a Visually impaired user, I want to customize the combination of foreground and background colors of subtitles, so that I can read subtitles more easily.
2.D.2.	Customize subtitles and turn on Audio subtitling	Customize subtitles: font size and style	As a Visually impaired user, I want to customize the font size and/or the font style of subtitles text, so that I can read subtitles more easily.
2.D.3.	Customize subtitles and turn on Audio subtitling	Customize subtitles: position on the screen	As a Visually impaired user, I want to customize the position on the screen of subtitles text, so that I can read subtitles more easily.
2.D.4.	Customize subtitles and turn on Audio subtitling	Save subtitles settings and make them available for all content	As a Visually impaired user, I want to save the subtitles settings I have set up and make them available for all TV contents, so that I can avoid selecting it each time.
2.D.5.	Customize subtitles and turn on Audio subtitling	Save subtitles settings and make them available for specific type of content	As a Visually impaired user, I want to save the subtitles settings I have set up and make them available for a specific type of content (i.e. News, Movies, Sports, etc.), so that I can avoid selecting it each time.
2.D.6.	Customize subtitles and turn on Audio subtitling	Save subtitles settings and make them available for specific device	As a Visually impaired user, I want to save the subtitles settings I have set up and make them available for specific device (i.e. current device, TV, Tablet, smartphone etc.), so that I can avoid selecting it each time.
2.D.7.	Customize subtitles and turn on Audio subtitling	Turn on/off the audio subtitling	As a Visually impaired user, I want to turn on/off the audio subtitling, so that I can be supported by audio when I have reading difficulties.
2.D.8.	Customize subtitles and turn on Audio subtitling	Turn on/off the audio subtitling using voice commands	As a Visually impaired user, I want to turn on/off the audio subtitling using voice commands, so that I can be supported by audio when I have reading difficulties.
2.E.1.	Manage interface settings and image magnification [Use case: Tablet]	Customize graphical parameters of the interfaces	As a Visually impaired user, I want to customize graphical parameters of the interfaces: contrast, color, font size, font background/foreground colors combination, graphic objects size etc., so that I can be able to see more clearly all the texts and the graphic elements on the screen (i.e. overlay text, icon, menu, guide etc.).
2.E.2.	Manage interface settings and image	Save graphical parameters settings and make them	As a Visually impaired user, I want to save the graphical parameters of the interfaces I have set up and make them available for specific device (i.e. current device, TV, Tablet, smartphone

	magnification [Use case: Tablet]	available for specific device	etc.), so that I can avoid selecting it each time.
2.E.3.	Manage interface settings and image magnification [Use case: Tablet]	Zoom in/out the images on the screen	As a Visually impaired user, I want to zoom the images to magnify a specific portion of them and navigate through magnified content on the screen, so that I can be able to recognize and see all the details of the images.

4.2.2.6

4.2.3. A lot of time in front of the TV

4.2.3.1 Personas: Vasiliki Alexopoulos, *Elderly*

"My TV is my best friend"

Information

Age: 75
Nationality: Greek
Disability: Low vision due to cataract
Occupation: Retired
Language: Greek
Technology: PC Desktop (outdated); basic mobile phone

Familiarity with technologies

Description

Vasiliki is 75 years old and she taught literature in secondary schools for 28 years.
Since she is a widow, she lives alone and does everything to be independent.
Vasiliki is a "super grandmother": she has a very large family composed by 3 sons and 7 grandchildren who are between 3 and 24 years old. They often go to visit the grandmother and keep her company.
She often says that young people today "use the phone too much", but Vasiliki is a grandmother who is very interested in recent technologies.
She has an outdated computer that she uses above all to make video calls on Skype with her son Alexis who lives in Sweden and seldom come back to Greece.
In recent times, Vasiliki is increasingly interested in smartphones, sometimes asks to her nephew Nicolas how they work: she would like to learn how to use them to video call her relatives more easily.
Over the years Vasiliki has begun to have problems of sight and hearing, typical of older people. For last birthday, the family gave her a 40-inch Television, so she can enjoy her favourite shows.

Watching TV habits

Device: TV HbbTV (+Universal Remote Control)
Where: Home
With: Alone / Her daughters, sons or grandchildren
What: Film, TV series, Talk show
Needs: Search easily her favourite channels and watch them as best as possible

Overall Picture

Age-related eye conditions are the most common cause of sight loss in Europe. Eyesight in seniors may be affected by conditions such as macular degeneration or cataracts. One in three senior citizens over 65 faces sight loss. 90% of visually impaired persons is over the age of 65
In the world, approximately one third of people over 65 years of age are affected by disabling hearing loss
90% of EU people over 55 years old watch television on a TV set everyday/almost everyday

Source:
European Blind Union

World Health Organization

EU Publications

Fig. 16 Persona: A lot of time in front of the TV

4.2.3.2 Scenario

Daily routine	Easy zapping	Do it by myself	Timeshifting
Scenario	Vasiliki, like many people of her same age, spends a lot of time watching TV at home, especially in the afternoon. She habitually watches the same few channels and programs every day. To switch from one channel to another, Vasiliki usually says the channel name or the position number of the channel she wants to watch. To avoid difficulties with the standard broadcaster's channel position, Vasiliki customize the position for the channel she watches more often setting the easiest position numbers to remember for her.	During the afternoon television programming, there are many advertisements and teleshopping. Sometimes Vasiliki is interested in products for sale, but often she has not enough time to read because the overlays, that indicate the price and the phone number for the purchase, are too fast. Then Vasiliki stop the images to watch better. In addition, the nephew taught her that she can zoom in and zoom out easily with voice commands, to watch the TV screen more clearly. Moreover, during the advertising breaks, sometimes Vasiliki hears announcements of programs she would like to see that are scheduled for the next days. Considered her age, Vasiliki often forgets these things, then immediately set a reminder for that program using voice commands. Thanks to the reminder she has set, Vasiliki will get a notification video and audio on her TV screen before the program goes on air. For Vasiliki voice interaction is very useful but she could have some difficulties when she must set up something like an alert. It is very helpful for her listen again the last vocal message if she not understands it or is distracted by something like her little nephew. Vasiliki moreover finds useful a vocal help that in automatic way, or invoked, suggests to Vasiliki what to say in the right way.	Every evening, at 7 pm on Channel4 is on "My Secrets", Vasiliki's favourite TV series. She has been following it for years and does not miss an episode. Sometimes, however, it happens that a call or her nephews interrupt Vasiliki when she's watching the daily episode. So Vasiliki pause the program and continue as soon as she can. Other times, when Vasiliki turn on the TV and the episode has already started, then she restarts it from the beginning. Because of her hearing problems caused by aging, when Vasiliki is not able to understand what the characters are saying, she rewinds the scene.

Fig. 17 Scenario: A lot of time in front of the TV

4.2.3.3 User Journey

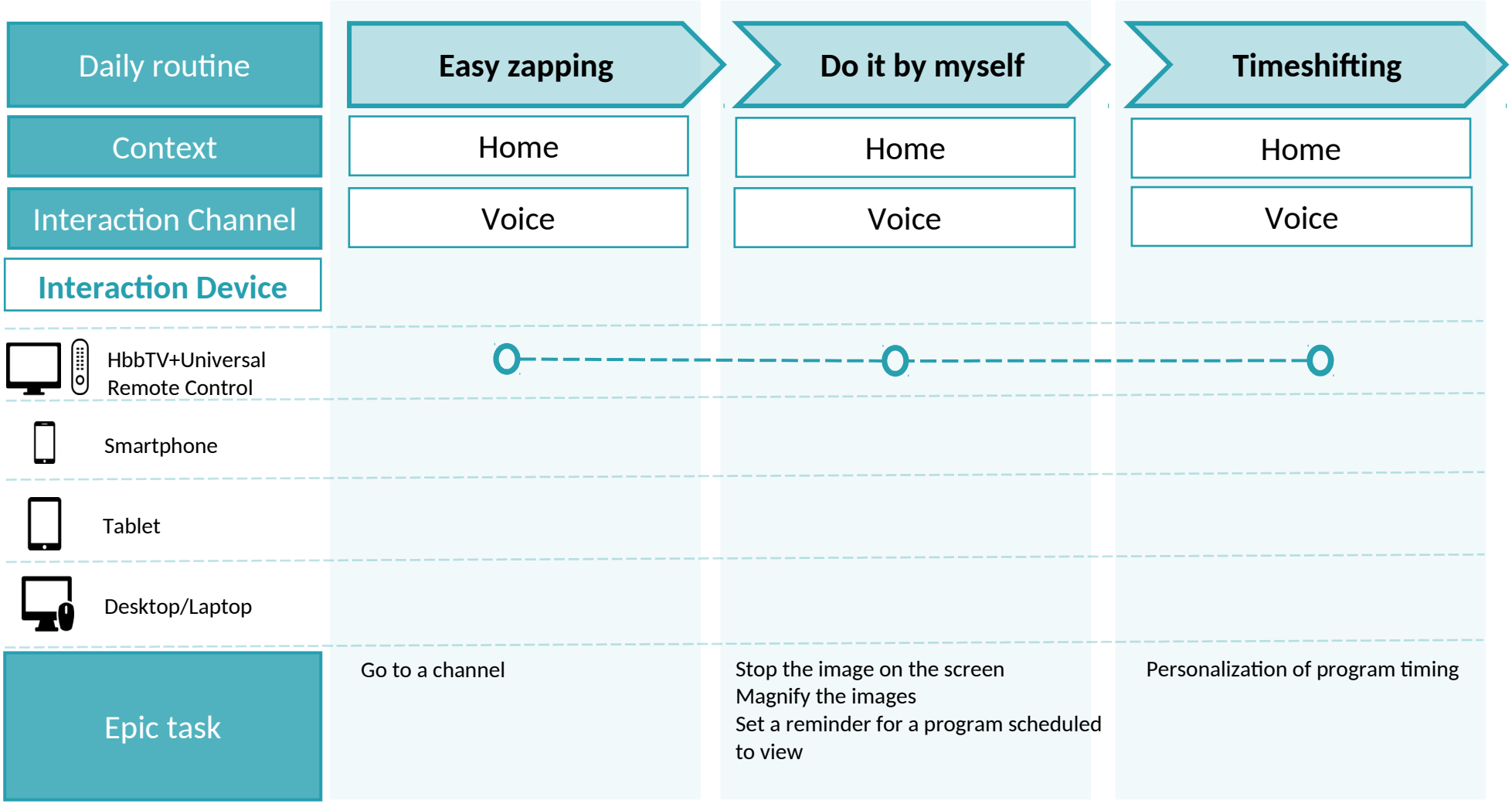

Fig. 18 User Journey: A lot of time in front of the TV

4.2.3.4 User Tasks

Daily routine		Easy zapping	Do it by myself			Timeshifting
Epic task		(A) Go to a channel	(B) Stop the image on the screen	(C) Magnify the images	(D) Set a reminder for a program scheduled to view	(E) Personalization of program timing
Scene		To switch from one channel to another, Vasiliki usually says the channel name or the position number of the channel she wants to watch. To avoid difficulties with the standard broadcaster's channel position, Vasiliki customize the position for the channel she watches more often setting the easiest position numbers to remember for her.	Sometimes Vasiliki is interested in products for sale during the TV teleshopping, but often she has not enough time to read because the overlays, that indicate the price and the phone number for the purchase, are too fast. Then Vasiliki stop the images to watch better.	Vasiliki's nephew taught her that she can zoom in and zoom out to watch the TV screen more clearly.	During the advertising breaks, sometimes Vasiliki hears announcements of programs she would like to see that are scheduled for the next days. Considered her age, Vasiliki often forgets these things, then immediately set a reminder for that program using voice commands.	Sometimes it happens that a call or her nephews interrupt Vasiliki when she's watching the daily episode of her favourite TV series. So Vasiliki pause the program and continue as soon as she can. Other times, when Vasiliki turn on the TV and the episode has already started, then she restarts it from the beginning. Because of her hearing problems caused by aging, when Vasiliki is not able to understand what the characters are saying, she rewinds the scene.
Context		HOME	HOME	HOME	HOME	HOME
Interaction	Device	HbbTV+ Universal Remote Control	HbbTV+ Universal Remote Control	HbbTV+ Universal Remote Control	HbbTV+ Universal Remote Control	HbbTV+ Universal Remote Control
	Channel	Voice	Voice	Voice	Voice	Voice
Functionality		SPEECH_BROWSING	SPEECH_TIMESHIFTING	SPEECH_IMAGE MAGNIFICATION	SPEECH_SET REMINDER SPEECH_HELP	SPEECH_TIMESHIFTING

Fig. 19 Users Tasks: A lot of time in front of the TV

4.2.3.5 User Stories

Table 3. User Stories: A lot of time in front of the TV

ID	Epic Task	Sub-task	User Stories
3.A.1.	Go to a channel	Select channel saying the position number	As an Elderly user, I want to go on a specific channel using voice commands just saying the channel position number, so that I can quickly change channel.
3.A.2.	Go to a channel	Select channel saying the channel name	As an Elderly user, I want to go on a specific channel using voice commands just saying the channel name, so that I can quickly change channel.
3.A.3.	Go to a channel	Customize channels position number using voice commands	As an Elderly user, I want to set and personalize channels position number using voice commands, so that I can go to a specific channel without too much memory effort.
3.B.1.	Stop the image on the screen	Stop/Play the scene using voice commands	As an Elderly user, I want to stop the images on the screen using voice commands So that I can stop the scene on the screen and have more time to see better the details or read text.
3.C.1.	Magnify the images	Zoom in/out the images on the screen using voice command	As an Elderly user, I want to zoom in/out the images to magnify a specific portion of the screen using voice commands, so that I can be able to recognize and see all the details of the images.
3.D.1.	Set a reminder for a program scheduled to view	Set a reminder for the start of a program using voice command	As an Elderly user, I want to set an alert for a specific program using voice commands through a dialog flow, so that I can receive a visual/audio notification displayed on my TV screen when selected program is about to start.
3.D.2.	Set a reminder for a program scheduled to view	Customize the reminder for the start of a program using voice commands	As an Elderly user, I want to customize the reminder for a specific program setting hours/days before the event and number of repetition, using voice commands through a dialog flow, so that I can receive a visual and/or audio notification according to my needs.
3.D.3.	Set a reminder for a program scheduled to view	Repeat last vocal message delivered by the system using voice commands	As an Elderly user, I want to repeat the last vocal message delivered by the system, using voice commands, so that I can listen again the message if I didn't understand it or I was distracted.
3.D.4.	Set a reminder for a program scheduled to view	Receive an automatic "vocal help" by the system	As an Elderly user, I want to receive an automatic "vocal help" by the system after some attempts of interaction, so that I can receive suggestions about the right commands to give to the system.
3.D.5.	Set a reminder for a program scheduled to view	Activate/deactivate "vocal help" using voice commands	As an Elderly user, I want to activate/deactivate "vocal help" using voice commands and ask information, so that I can receive suggestions about my issues and be aware of the right commands to give to the system
3.E.1.	Personalization of program timing	Pause/resume a program using voice commands	As an Elderly user, I want to pause a program I'm following and resume it when I want after some time, using voice commands, so that I can interrupt the program and resume it from the same point avoiding miss part of it.
3.E.2.	Personalization of program timing	Rewind a program using voice commands	As an Elderly user, I want to rewind a program using voice commands So that I can watch it from the beginning or review scenes.

4.2.4. Sharing the TV experience

4.2.4.1 Personas: José Luis García, *Deaf (Signer)*

"Spanish Sign Language is my first language"

Information

Age: 45
Nationality: Spanish
Disability: Deaf since birth
Occupation: Engineer
Language: LSE (Lengua de Signos Española), IS (International Sign Language) Spanish, English
Technology: PC Desktop, Laptop, Tablet, Smartphone, Smartwatch

Familiarity with technologies

Description

José is 45 years old and has been deaf since birth.
Like many people who learned LSE as their first language, José prefers Sign Language as primary way of communication, but he can also read text in different languages.
José is an IT engineer expert and project manager in an important company.
He is married to Manuela and they have a 3 years old son, Pedro.
For José disability has never been a limitation: he had a brilliant academic and job career.
When he must communicate with his team or has meetings with clients, José counts on his assistant and Sign Language translator, Gloria.
José is a bit "geek", always trying out new tools, looking for something new: devices, apps, etc.
Whenever possible, he tries to share online or offline his expertise.
José wants to support the deaf community to guarantee a better life for all, for this reason he is also a member of a cultural association that promotes projects for deaf people.

Watching TV habits

Device: TV (HbbTV), Smartphone, Laptop
Where: At home
With: His wife
What: Movie, Documentary
Needs: Watch TV programs translated in Sign Language

Overall Picture

An estimated 1 person in 1,000 uses a national sign language as their first language - i.e. about 500,000 people EU-wide. Others may use sign language as a second or third language, for example the family and friends of deaf and hearing-impaired people.
On average European public broadcasters deliver sign language on 4% of programmers

Source:

European Commission

Access services pan European survey 2016

Fig. 20 Persona: Sharing the TV experience

4.2.4.2 Scenario

Daily routine	Dinner time	Enjoy a movie in the living room	Watching TV on my laptop
Scenario	Usually, during the dinner, José and his wife Manuela talk about the events of the day and organize things to do in the following day. The TV in the kitchen is always on and both watch it distractedly (subtitles are turned on for José). The TV (HbbTV) screen in the kitchen is small (24") and watching the sign language translation window beside TV program video it is not comfortable for him. When José watch programs interesting for him, he activates on his tablet the sign language translation of the program and put it close the television to better follow the program.	Although José don't like kinds of TV program preferred by his wife, they sometimes watch TV together on the sofa in the living room. In the living room the TV (HbbTV) has a large enough screen (40 ") and then José activates the video of the sign language translation that goes alongside the video of the program. Sometimes, to better follow the action, José changes the position of the translation video window. When necessary, José also changes the settings of the sign language video's window, for example the size.	Very often José watches his favourites TV programs on his laptop at home. José find very useful to give commands performing specific gestures to: browse channel or VOD catalogue, turn on/off mute sound, scheduling and searching recordings, activate the Electronic Program Guide (EPG). Alternatively, he has the possibility to give the same commands by gaze.

Fig. 21 Scenario: Sharing the TV experience

4.2.4.3 User Journey

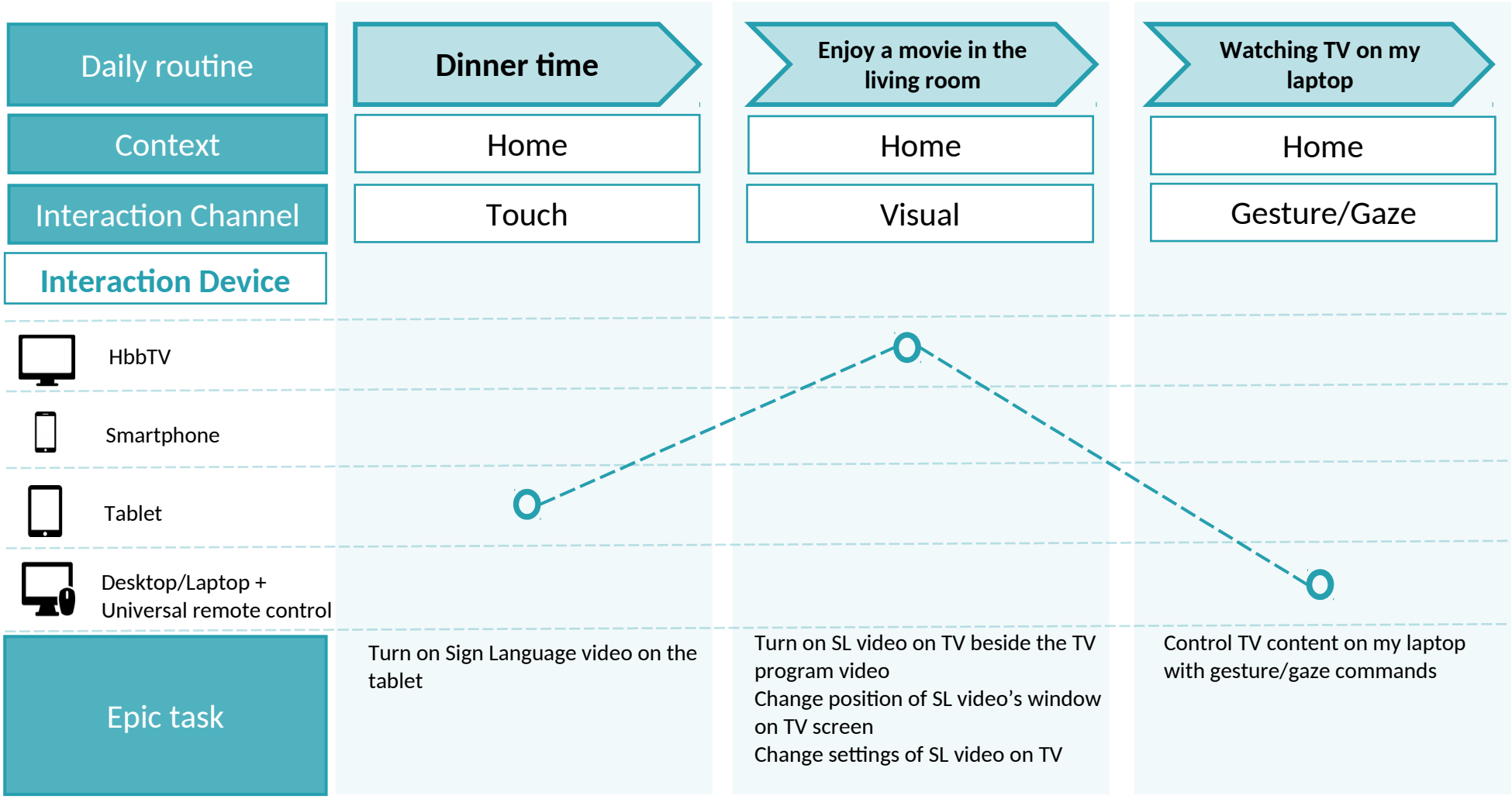

Fig. 22 User Journey: Sharing the TV experience

4.2.4.4 User Tasks

Daily routine		Dinner time	Enjoy a movie in the living room			Watching TV on my laptop
Task		(A) Turn on sign language video on the smartphone	(B) Turn on SL video on TV beside the TV program video	(C) Change position of SL video's window on TV screen	(D) Change settings of SL video on TV	(E) Control TV content on my laptop with gesture/gaze commands
Scene		The TV (HbbTV) screen in the kitchen is small (24") and when José watch programs really interesting for him, he activates on his tablet the sign language translation of the program and put it close to television to follow the program better.	In the living room the TV (HbbTV) has a large enough screen (40") and then José activates the video of the sign language translation that goes alongside the video of the program.	Sometimes, to better follow the action, José changes the position of the translation video window.	When necessary, José also changes the settings of the sign language video's window, for example the size.	José find very useful to give commands performing specific gestures to: browse channel or VOD catalogue, turn on/off mute sound, scheduling and searching recordings, activate the Electronic Program Guide (EPG). Alternatively, he has the possibility to give the same commands by gaze.
Context		Home	Home	Home	Home	Home
Interaction	Device	Tablet	HbbTV	HbbTV	HbbTV	PC Laptop + Universal Remote control
	Channel	Touch	Visual	Visual	Visual	Gesture/Gaze
Functionality		ACCESSIBILITY_SIGN LANGUAGE CONTENT	ACCESSIBILITY_SIGN LANGUAGE CONTENT	ACCESSIBILITY_SIGN LANGUAGE CONTENT	ACCESSIBILITY_SIGN LANGUAGE CONTENT	GESTURE/GAZE

Fig. 23 User Tasks: Sharing the TV experience

4.2.4.5 User Stories

Table 4. User stories: Sharing the TV experience

ID	Epic Task	Sub-task	User Stories
4.A.1.	Turn on sign language video on the tablet	Turn on/off Sign Language translation video	As a Deaf (SL) user, I want to watch Sign Language translation video on my mobile devices synchronized with the program that is on air on my TV, so that I can enjoy the program in every context and situation.
4.A.2.	Turn on sign language video on the tablet	Customize the visual settings of Sign Language translation video	As a Deaf (SL) user, I want to customize the visual settings of Sign Language translation video (Contrast, Color, etc.), so that I can see well the SL video and understand clearly all the signs.
4.A.3.	Turn on sign language video on the tablet	Set up the language of Sign Language translation video	As a Deaf (SL) user, I want to set up and configure the language of Sign Language translation that correspond to my language, so that, when I turn on the Sign Language translation, I can avoid selecting it each time.
4.A.4.	Turn on sign language video on the tablet	Change language of Sign Language translation video	As a Deaf (SL) user, I want to change the language of Sign Language translation video, so that I can learn/compare my Sign language to another Sign language.
4.A.5.	Turn on sign language video on the tablet	Save Sign Language translation video settings and make them available for specific device	As a Deaf (SL) user, I want to save the Sign Language translation video settings I have set up and make them available for specific device (i.e. current device, TV, Tablet, smartphone etc.), so that I can avoid selecting it each time.
4.B.1.	Turn on SL video on TV beside TV program video	Switch on/Switch off sign Language translation window	As a Deaf (SL) user, I want to Switch on/Switch off Sign Language translation video, so that I can choose to have or not SL translation according to my needs.
4.B.2.	Turn on SL video on TV beside TV program video	Set up the language of Sign Language translation video	As a Deaf (SL) user, I want to set up and configure the language of Sign Language translation that correspond to my language, so that, when I turn on the Sign Language translation, I can avoid selecting it each time.
4.B.3.	Turn on SL video on TV beside TV program video	Change language of Sign Language translation video	As a Deaf (SL) user, I want to change the language of Sign Language translation video, so that I can learn/compare my Sign language to another Sign language.
4.C.1.	Change position of SL video's window on the screen	Customize the position on the screen of the Sign Language translation window	As a Deaf (SL) user, I want to customize the position on the screen of Sign Language translation window, so that I can improve the vision experience for me or for who is watching TV program with me.
4.D.1.	Change settings of SL video on TV	Customize the size of Sign Language translation window	As a Deaf (SL) user, I want to customize the size of Sign Language translation window on the screen, so that I can see well the SL video and understand clearly all the signs.
4.D.2.	Change settings of SL video on TV	Customize the visual settings of Sign Language translation window	As a Deaf (SL) user, I want to customize the visual settings of Sign Language translation window (Contrast, Color, etc.), so that I can see well the SL video and understand clearly all the signs.
4.D.3.	Change settings of SL video on TV	Save Sign Language translation video settings and make them	As a Deaf (SL) user, I want to save the Sign Language translation video settings I have set up and make them available for specific device (i.e. current device, TV, Tablet, smartphone

		available for specific device	etc.), so that I can avoid selecting it each time.
4.E.1.	Control TV content on my laptop with gesture commands	Select channel using gesture	As a Deaf (SL) user, I want to to go to a specific channel by depicting its number using gestures, so that I can quickly change channel.
4.E.2.	Control TV content on my laptop with gaze commands	Select channel using gaze	As a Deaf (SL) user, I want to go to a specific channel by gazing at it from a menu/list of available channels/initial letters, so that I can quickly change channel.
4.E.3.	Control TV content on my laptop with gesture commands	To turn on/off mute sound and increase/decrease volume using gesture	As a Deaf (SL) user, I want to turn on/off mute sound and increase/decrease volume through a set of gestures, so that I can avoid disturbing other people around me.
4.E.4.	Control TV content on my laptop with gaze commands	To turn on/off mute sound and increase/decrease volume using gaze	As a Deaf (SL) user, I want to turn on/off mute sound and increase/decrease volume by gazing on-screen buttons, so that I can avoid disturbing other people around me.
4.E.5.	Control TV content on my laptop with gesture commands	Browse between channels using gestures	As a Deaf (SL) user, I want to go to next or previous channels using gestures, so that I can browsing easily.
4.E.6.	Control TV content on my laptop with gaze commands	Browse between channels using gaze	As a Deaf (SL) user, I want to go to next or previous channels by gazing at specific buttons So that I can browsing easily.
4.E.7.	Control TV content on my laptop with gesture commands	Customize/change names of channels using gesture	As a Deaf (SL) user, I want to customize/change names of channels and/or add aliases by selecting letters of an alphabet using gesture, so that I can call them easily.
4.E.8.	Control TV content on my laptop with gaze commands	Customize/change names of channels using gaze	As a Deaf (SL) user, I want to customize/change names of channels and/or add aliases by selecting letters of an alphabet using gaze, so that I can call them easily.
4.E.9.	Control TV content on my laptop with gesture commands	Schedule a recording using gesture	As a Deaf (SL) user, I want to schedule a recording selecting the name of the program or choosing the channel to record (along with the start/end date and time) through a set of gesture operations, so that I can quickly schedule a recording.
4.E.10.	Control TV content on my laptop with gaze commands	Schedule a recording using gaze	As a Deaf (SL) user, I want to schedule a recording selecting the name of the program or choosing the channel to record (along with the start/end date and time) through a set of gaze operations, s that I can quickly schedule a recording.
4.E.11.	Control TV content on my laptop with gesture commands	Search recorded programs using gestures	As a Deaf (SL) user, I want to search recorded programs by moving through a drop-down list using gestures. The drop-down list may contain all recorded programs or programs filtered by category, initial letter of title name, channel, date, so that I can easily select a recorded program.
4.E.12.	Control TV content on	Search recorded programs using	As a Deaf (SL) user, I want to search recorded programs by moving through a drop-down

	my laptop with gaze commands	gaze	list using gaze. The drop-down list may contain all recorded programs or programs filtered by category, initial letter of title name, channel, date, so that I can easily select a recorded program.
4.E.13.	Control TV content on my laptop with gesture commands	Consult and browse the EPG using gestures	As a Deaf (SL) user, I want to consult the Electronic Program Guide (EPG) and browse between channels, channel's programs and view program details, performing specific gestures, so that I can easily browse the EPG and read information about programs.
4.E.14.	Control TV content on my laptop with gaze commands	Consult and browse the EPG using gaze	As a Deaf (SL) user, I want to consult the Electronic Program Guide (EPG) and browse between channels, channel's programs and view program details, by gazing at specific buttons, so that I can easily browse the EPG and read information about programs.
4.E.15.	Control TV content on my laptop with gesture commands	Filter the EPG using gestures	As a Deaf (SL) user, I want to ask through gesture to view the Electronic Program Guide (EPG) filtering by channel name/number or program name or by category of programs (movies, cartoons, adventure, and so on), so that I can read filtered information browsing channel EPG or date and time range.
4.E.16.	Control TV content on my laptop with gaze commands	Filter the EPG using gaze	As a Deaf (SL) user, I want to ask through gaze to view the Electronic Program Guide (EPG) filtering by channel name/number or program name or by category of programs (movies, cartoons, adventure, and so on), so that I can read filtered information browsing channel EPG or date and time range.
4.E.17.	Control TV content on my laptop with gesture commands	Browse the VOD catalogue by video title using gestures	As a Deaf (SL) user, I want to browse the Video on Demand (VOD) catalogue by video title or initial letter of title. The results will be narrowed down to a single choice through a gesture flow network, so that I can find easily a video on demand.
4.E.18.	Control TV content on my laptop with gaze commands	Browse the VOD catalogue by video title using gaze	As a Deaf (SL) user, I want to browse the Video on Demand (VOD) catalogue by video title or initial letter of title. The results will be narrowed down to a single choice through a gaze flow network, so that I can find easily a video on demand.
4.E.19.	Control TV content on my laptop with gesture commands	Browse the VOD catalogue by video category using gestures	As a Deaf (SL) user, I want to browse the Video on Demand (VOD) catalogue by video category. Then a gesture flow network will be employed to filter results based on various criteria (e.g. year, channel, video name, etc.), so that I can find easily a video on demand.
4.E.20.	Control TV content on my laptop with gaze commands	Browse the VOD catalogue by video category using gaze	As a Deaf (SL) user, I want to browse the Video on Demand (VOD) catalogue by video category. Then a gaze flow network will be employed to filter results based on various criteria (e.g. year, channel, video name, etc.), so that I can find easily a video on demand.

4.2.5. Easy solutions for easy life

4.2.5.1 Personas: Carlos Diego Martín, *Hard of Hearing*

"I want to have a normal life"

Information

Age: 55
Nationality: Spanish
Disability: Neurosensory hypoacusis
Occupation: Unemployed
Language: Spanish
Technology: PC Desktop, Smartphone, Tablet

Familiarity with technologies

Description

Carlos is 55 years old.
He is Spanish but has been living in France for a few months.
His wife Vivienne is French.
After living for 25 years in Granada, they moved to Marseille, Vivienne's hometown, with Martin, their 18 years old son.
Up until 5 years ago, Carlos was an accountant, but then he was fired and had difficulty finding a new job.
Carlos hopes that in Marseilles he can finally find an excellent job, but first he must learn French.
For about 4 years, because of a Neurosensory Hypoacusis, Carlos has a reduced hearing ability.
He perceives some sounds with difficulty and makes a considerable effort to understand the words spoken in a low tone of voice.
Carlos's hearing difficulties make even more complicated learn French for him and find a new job.
Carlos is a "Sport lover" and he is a huge fan of Real Madrid. He follows all the match of his football team with his son Martin.

Watching TV habits

Device: SmartTV (+Remote Control), Tablet (+earphones)
Where: Home
With: Alone / His family
What: Sports, Films
Needs: Hear TV audio more clearly and be supported by subtitles

Overall Picture

People who are hard of hearing usually communicate through spoken language and can benefit from hearing aids, cochlear implants, and other assistive devices as well as captioning.
People with disabilities are often unemployed or underemployed. More than 50 % of the one million deaf people in Europe are unemployed, and those who are employed are often in low-skilled and low-paid jobs.

Source:
World Health Organization

Community Research and development information service

Fig. 24 Persona: Easy solutions for easy life

4.2.5.2 Scenario

Daily routine	Enjoy a football match on TV	Improving the TV experience	Watch TV with my family
Scenario	Follow the football matches on TV is a weekly ritual for Carlos and his son Martin. They don't miss a match of Real Madrid, their favourite football club. Usually Carlos and Martin watch it on the sofa in the living room. Carlos for his hearing problems has difficulty in distinguishing sounds. When there is a match on TV Carlos cannot turn up TV audio volume too much because he could disturb his son who is watching television with him and his wife who is in the next room. Then Carlos changes the volume of the different tracks like voices and environmental sound. This allow him to hear clearly the commentary and lower the noise of the stadium.	Due of his difficulties in listening in addition to managing the audio volume, to better follow the television programs, Carlos needs subtitles. Using these accessibility features daily, Carlos has customized and saved audio and subtitle settings so that he can turn they on or off and have them available whenever he needs. Often, however, the subtitles available are lack of contextual information or characteristic of spoken but these elements are essential to understand what happens on the screen. Therefore, Carlos needs that this kind of information must to be available. Also, sometimes for Carlos it is difficult to understand who is speaking in the scene because it happens that subtitles are not synchronized with the audio, especially for live programs. In this case Carlos manages the delay of image so that it would end up synchronizing with the subtitle.	Carlos often watches TV with his wife and his son and, to try to not influence their habits in watching television, he usually follows the programs with his tablet. In addition, since they moved to France, Vivienne and Martin watch television in French and Carlos still doesn't speak this language well. On his tablet Carlos can both have subtitles in the language he prefers and customize their settings. Furthermore, at the same time, on the tablet Carlos can also manage the audio level that suits his needs.

Fig. 25 Scenario: Easy solutions for easy life

4.2.5.3 User Journey

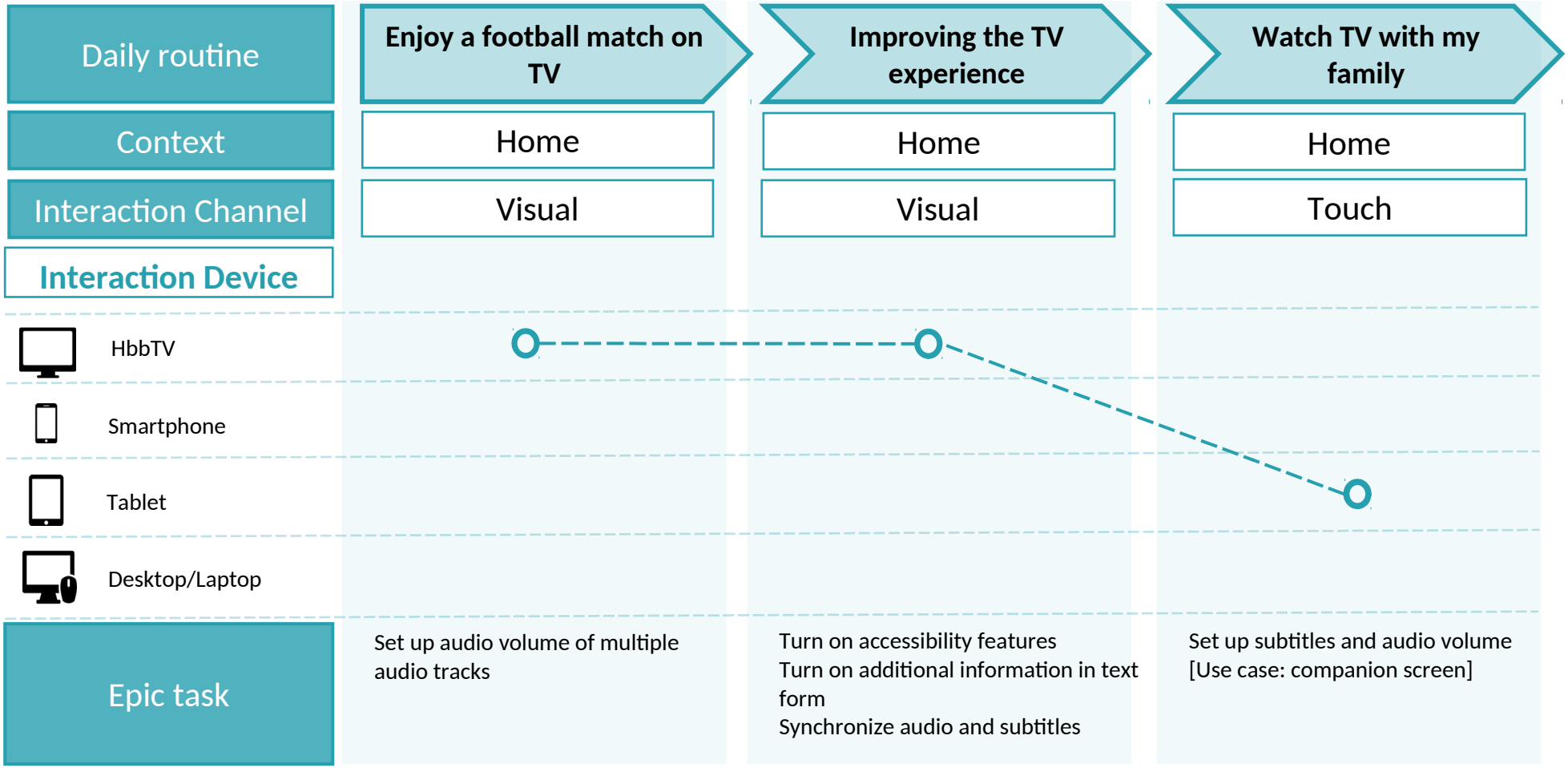

Fig. 26 User Journey: Easy solutions for easy life

4.2.5.4 User Tasks

Daily routine		**Enjoy a football match on TV**	**Improving the TV experience**			**Watch TV with my family**
Epic task		**(A) Set up audio volume of multiple audio tracks**	**(B) Turn on accessibility features**	**(C) Turn on additional information in text form**	**(D) Synchronize audio and subtitles**	**(E) Set up subtitles and audio volume [Use case: companion screen]**
Scene		Carlos changes the volume of the different tracks like voices and environmental sound. This allow him to hear clearly the commentary and lower the noise of the stadium.	Carlos has customized and saved audio and subtitle settings so that they are available for Carlos whenever he needs	Often, however, the subtitles available are lack of contextual information or characteristic of spoken but these elements are essential to understand what happens on the screen. Therefore, Carlos needs that these kinds of information must to be available.	Sometimes for Carlos it is difficult to understand who is speaking in the scene because it happens that subtitles are not synchronized with the audio, especially for live programs. In this case Carlos manages the delay of image so that it would end up synchronizing with the subtitle.	On his tablet Carlos can both have subtitles in the language he prefers and customize their settings. Furthermore, at the same time, on the tablet Carlos can also manage the audio level that suits his needs.
Context		HOME	HOME	HOME	HOME	HOME
Interaction	**Device**	HbbTV	HbbTV	HbbTV	HbbTV	Tablet
	Channel	Visual	Visual	Visual	Visual	Tablet
Functionality		ACCESSIBILITY_CLEN AUDIO	ACCESSIBILITY_SUBTITLES ACCESSIBILITY_CLEN AUDIO	ACCESSIBILITY_SUBTITLES	ACCESSIBILITY_SUBTITLES	ACCESSIBILITY_SUBTITLES ACCESSIBILITY_CLEN AUDIO

Fig. 27 User Tasks: Easy solutions for easy life

4.2.5.5 User Stories

Table 5. User stories: Easy solutions for easy life

ID	Epic Task	Sub-task	User Stories
5.A.1.	Set up audio volume of multiple audio tracks	Set up volume of different audio tracks	As a Hard of hearing user, I want to set up the volume of the different audio tracks (i.e. voices, environmental sound, etc.), so that I can manage volume of the available audio tracks according to my needs.
5.A.2.	Set up audio volume of multiple audio tracks	Save volume settings and make them available for all content	As a Hard of hearing user, I want to save the volume settings (for different audio tracks) I have set up and make them available for all TV contents, so that I can avoid modifying them each time.
5.A.3.	Set up audio volume of multiple audio tracks	Save volume settings and make them available for specific type of content	As a Hard of hearing user, I want to save the volume settings (for different audio tracks) I have set up and make them available for a specific type of content (i.e. News, Movies, Sports, etc.), so that I can avoid modifying them each time.
5.A.4.	Set up audio volume of multiple audio tracks	Save volume settings and make them available for specific device	As a Hard of hearing user, I want to save the volume settings (for different audio tracks) I have set up and make them available for specific device (i.e. current device, TV, Tablet, smartphone etc.), so that I can avoid modifying them each time.
5.B.1.	Turn on accessibility features	Turn on/off subtitle configuration saved	As a Hard of hearing user, I want to turn on/off subtitle configurations saved, so that I can manage accessibility features according to my needs.
5.B.2.	Turn on accessibility features	Turn on/off audio configuration saved	As a Hard of hearing user, I want to turn on/off audio configurations saved, so that I can manage accessibility features according to my needs.
5.C.1.	Turn on additional information in text form	Turn on/off additional informa-tion in text form	As a Hard of hearing user, I want to turn on/off additional information in text form related to content in the audio (i.e. contextual information, silence or human voices, characteristic of spoken, etc.), so that I can access to information about scene that I'm not able to hear.
5.D.1.	Synchronize audio and subtitles	Synchronize audio and subti-tles	As a Hard of hearing user, I want to synchronize audio and subtitles, so that I can follow the dialogue and don't confuse who is speaking in that moment.
5.E.1.	Set up subtitles and audio volume [Use case: companion screen]	Customize subtitles: foreground and background colors	As a Hard of hearing user, I want to customize the combination of foreground and background colors of subtitles, so that I can read subtitles according to my needs.
5.E.2.	Set up subtitles and audio volume [Use case: companion screen]	Customize subtitles: font size and style	As a Hard of hearing user, I want to customize the font size and/or the font style of subtitles text, so that I can read subtitles according to my needs.
5.E.3.	Set up subtitles and audio volume [Use case: companion screen]	Set up the language of subtitles	As a Hard of hearing user, I want to set up and configure the language of subtitles that corresponds to my language, so that, when I turn on the Subtitles, I can avoid selecting it each time.

5.E.4.	Set up subtitles and audio volume [Use case: companion screen]	Save subtitles settings and make them available for all content	As a Hard of hearing user, I want to save the subtitles settings I have set up and make them available for all TV contents, so that I can avoid selecting it each time.
5.E.5.	Set up subtitles and audio volume [Use case: companion screen]	Save subtitles settings and make them available for specific type of content	As a Hard of hearing user, I want to save the subtitles settings I have set up and make them available for a specific type of content (i.e. News, Movies, Sports, etc.), so that I can avoid selecting it each time.
5.E.6.	Set up subtitles and audio volume [Use case: companion screen]	Save subtitles settings and make them available for specific device	As a Visually impaired user, I want to save the subtitles settings I have set up and make them available for specific device (i.e. current device, TV, Tablet, smartphone etc.), so that I can avoid selecting it each time.
5.E.7.	Set up subtitles and audio volume [Use case: companion screen]	Set up volume of different audio tracks	As a Hard of hearing user, I want to set up the volume of the different audio tracks (i.e. voices, environmental sound, etc.), so that I can manage volume of the available audio tracks according to my needs.
5.E.8.	Set up subtitles and audio volume [Use case: companion screen]	Save volume settings and make them available for all content	As a Hard of hearing user, I want to save the volume settings (for different audio tracks) I have set up and make them available for all TV contents, so that I can avoid selecting it each time.
5.E.9.	Set up subtitles and audio volume [Use case: companion screen]	Save volume settings and make them available for specific type of content	As a Hard of hearing user, I want to save the volume settings (for different audio tracks) I have set up and make them available for a specific type of content (i.e. News, Movies, Sports, etc.), so that I can avoid selecting it each time.
5.E.10.	Set up subtitles and audio volume [Use case: companion screen]	Save volume settings and make them available for specific device	As a Hard of hearing user, I want to save the volume settings (for different audio tracks) I have set up and make them available for specific device (i.e. current device, TV, Tablet, smartphone etc.), so that I can avoid modifying them each time.

4.2.6. Learning with the Television

4.2.6.1 Personas: Inés Carmen Álvarez, *Professional user (SL expert)*

"I am a teacher, but I want to learn something by my TV"

Information

Age: 38
Nationality: Spanish
Disability: No disabilities
Occupation: Researcher and SL teacher
Language: Spanish, Catalan, English, French, German, LSE (Lengua de Signos Española)
Technology: Laptop, Tablet, Smartphone

Familiarity with technologies

Description

Inés Carmen Álvarez is 38 years old.
She has a Ph.D. in Linguistics and teaches Spanish Sign Language at the Faculty of Languages and Literatures of the University of Granada.
She lives with her husband Julio and her 11 years old daughter Rebecca.
Inés loves travelling with her family all over the world and is very often around Europe for conferences.
Inés collaborates with a Deaf association where give a course on Spanish Sign Language, teaching this language to deaf or hearing-impaired people and their family members, educators and social workers.
Inés is also involved in many other research projects as an expert in linguistics and sign language.
She has a passion for Cinema because her uncle was a director and Inés thanks to him starts to watch movies since she was a child.
Whenever possible Inés watch movies on her TV or on mobile devices. In the last years, thanks to the Internet, the opportunities to access to movies have multiplied and Inés has always been very active in communities and forums on these topics since the beginning of the Web.

Watching TV habits

Device: TV (HbbTV), Tablet
Where: During travel/At home
With: Family
What: Film, TV series, Talk show
Needs: Watch TV programs subtitled in other languages

Overall Picture

Sign languages are an important part of Europe's multilingual diversity. Based on gesture, they are as rich as spoken languages in terms of grammar, structure, syntax, and lexicon. Broadly speaking, each spoken language in the European Union (EU) has a counterpart sign language.
To enable deaf people to work and learn in their preferred language, the Commission, together with the European Parliament, promotes sign languages and supports action to give them official status.
Source:
European Commission

Fig. 28 Persona: Learning with the Television

4.2.6.2 Scenario

Daily routine	Improving language skills	Working at Deaf Association's Lab	Contribute to subtitle translation
Scenario	Inés speaks fluently many languages and for her it's very important that her daughter Rebecca learn to speak as many languages as possible. Inés uses with Rebecca a method to help her improving language skills: at least once a week they watch a movie, or episodes of television series, with audio in the original language; then Inés activates subtitles in their mother tongue, Spanish. Inés thinks that this exercise is very useful for her too, to increase and refine her linguistic vocabulary. For this reason, often, she uses subtitles for different languages even when she watches movies on his laptop or tablet during her travels.	As an expert signer and a linguistic expert, Inés is involved in many research projects at the Deaf association. For one of these, Inés contributes in the creation of a sign language repository by providing recordings of sign language gestures. Through access to a crowdsourcing platform, Inés can carry out task(s) assigned by platform's moderator(s) and accomplish the task uploading the sign language gesture recording. Platform's moderator(s), that previously defines and distributes the tasks to other users of the platform like Inés, validates the loaded data. The crowdsourcing platform collect data from many sign language experts and associations, for different sign languages. The aim of the project is to make available these kinds of data for TV accessibility tools and learning purpose.	Thanks to her linguistics skills, Inés sometimes collaborates with a team of "subbers" or subtitles translators. Through the crowdsourcing platform Inés working as a moderator for translation of subtitles content. Inés manages and deals with the subtitles translators of movies and TV series that are in other languages. Broadcasters make available audio-video material and/or subtitles and then several teams of experts collaborate for translations of subtitles that are uploaded on the crowdsourcing platform after this process.

Fig. 29 Scenario: Learning with the Television

4.2.6.3 User Journey

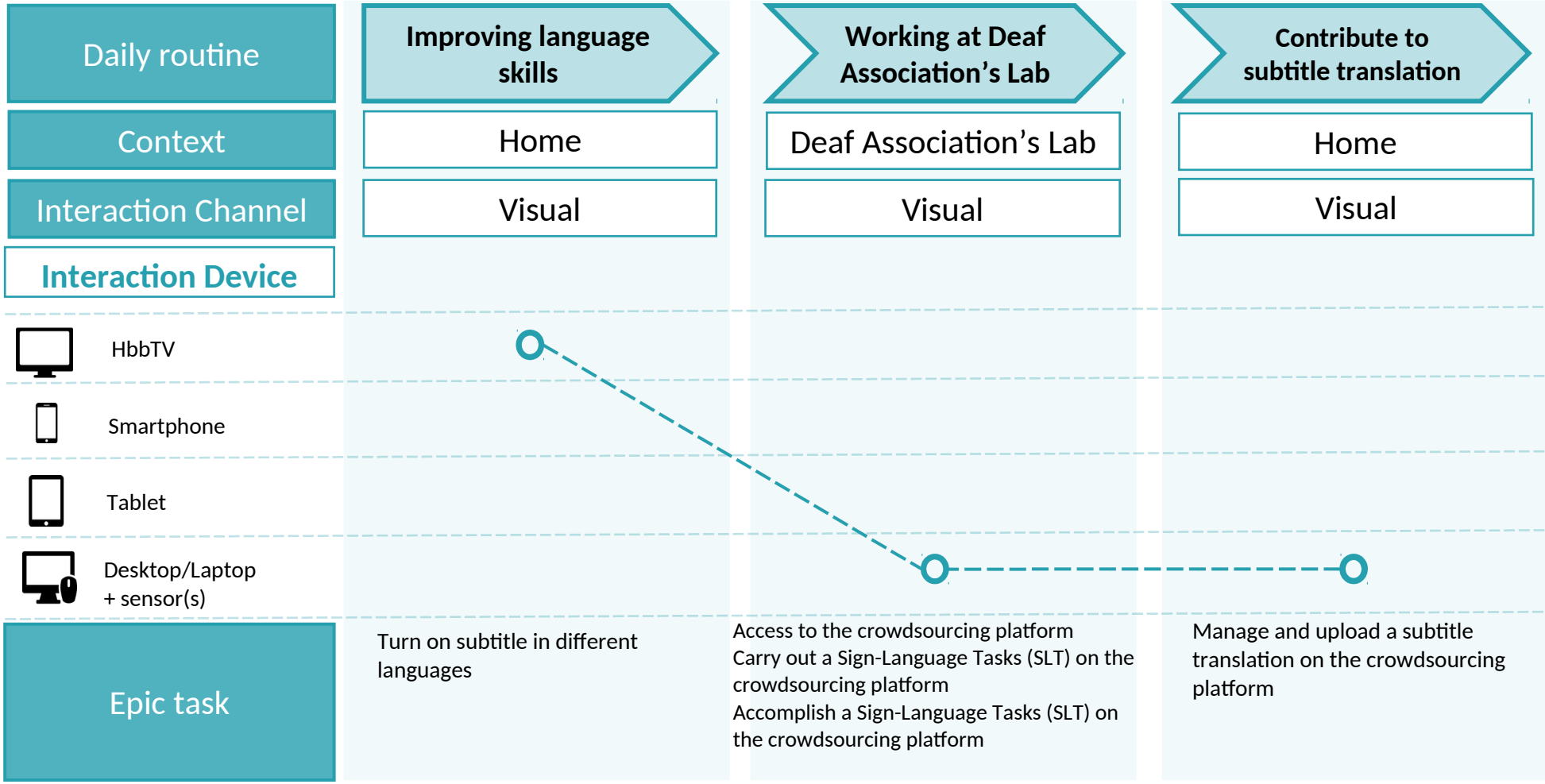

Fig. 30 User Journey: Learning with the Television

4.2.6.4 User Tasks

Daily routine		Improving language skills	Working at Deaf Association's Lab			Contribute to subtitle translation
Epic task		(A) Turn on subtitle in different languages	(B) Access to the crowdsourcing platform	(C) Carry out a Sign-Language Tasks (SLT) on the crowdsourcing platform	(D) Accomplish a Sign-Language Tasks (SLT) on the crowdsourcing platform	(E) Manage and upload a subtitle translation on the crowdsourcing platform
Scene		Inés and Rebecca once a week watch a movie, or episodes of television series, with audio in the original language; then Inés activates subtitles in their mother tongue.	Inés through a crowdsourcing platform contributes in the creation of a sign language repository by providing recording of signs performance.	Inés carries out task(s) assigned by platform's moderator(s) about sign language gesture to be collected.	Inés accomplishes the task uploading on the crowdsourcing platform the sign language gesture recording. Platform's moderator(s) then validates the loaded data.	Inés through the crowdsourcing platform working also as a moderator for translation of subtitles content. Inés manages and deals with the subtitles translators of movies and TV series that are in other languages.
Context		Home	Deaf Association's Lab	Deaf Association's Lab	Deaf Association's Lab	Home
Interaction	Device	HbbTV	Desktop/Laptop + sensor(s)	Desktop/Laptop + sensor(s)	Desktop/Laptop + sensor(s)	Desktop/Laptop
	Channel	Visual	Visual	Visual	Visual	Visual
Functionality		ACCESSIBILITY_SUBTITLES	CROWDSOURCING PLATFORM	CROWDSOURCING PLATFORM	CROWDSOURCING PLATFORM	CROWDSOURCING PLATFORM

Fig. 31 User Tasks: Learning with the Television

4.2.6.5 User Stories

Table 6. User stories: Learning with the Television

ID	Epic Task	Sub-task	User Stories
6.A.1.	Turn on subtitle in different languages	Turn on subtitles and select subtitle language	As a consumer user, I want to turn on subtitle and select subtitles language between different languages available, so that I can choose the subtitles language according to my needs.
6.B.1.	Access to the crowdsourcing platform	Sign in/Sign up on the Crowdsourcing Platform	As an expert signer user, I want to Sign in/Sign up on the Crowdsourcing Platform and create/delete my profile also selecting the specific Sign Language in which I'm expert and the role for which I'm proposing, so that I can have access to the Crowdsourcing Platform and a role assigned.
6.B.2.	Access to the crowdsourcing platform	Log in/Log out on the Crowdsourcing Platform and manage task(s) assigned	As an expert signer user, I want to Log in/Log out on the Crowdsourcing Platform, so that I can manage open/personal Sign-Language Tasks (SLT) assigned to me by a Crowdsourcing Platform moderator.
6.B.3.	Access to the crowdsourcing platform	Log in/Log out on the Crowdsourcing Platform and select by myself the task(s)	As an expert signer user, I want to Log in/Log out on the Crowdsourcing Platform, so that I can manage open/personal Sign-Language Tasks (SLT) that I've selected between others on the Crowdsourcing Platform. My selection has to be confirmed by the moderator.
6.C.1.	Carry out a Sign-Language Tasks (SLT) on the crowdsourcing platform	Perform and record Sign Language gesture	As an expert signer user, I want to perform and record a sign language gesture, so that I can carry out the Sign-Language Task (SLT) assigned to me by the moderator.
6.C.2.	Carry out a Sign-Language Tasks (SLT) on the crowdsourcing platform	Edit the recording of the Sign Language gesture	As an expert signer user, I want to edit my recording of a sign language gesture (i.e. splitting, segmenting), so that I can manage the recording before I upload it.
6.D.1.	Accomplish a Sign-Language Tasks (SLT) on the crowdsourcing platform	Upload the recording of the Sign Language gesture to database	As an expert signer user, I want to upload the recording of the Sign Language to a database, so that I can submit it for the moderator validation.
6.D.2.	Accomplish a Sign-Language Tasks (SLT) on the crowdsourcing platform	Upload a description of the Sign Language gesture recording	As an expert signer user, I want to upload a description of the recordings of sign language gesture, so that I can describe my recordings.
6.D.3.	Accomplish a Sign-Language Tasks (SLT) on the crowdsourcing platform	Have a semi-automatic description of the Sign Language recording	As an expert signer user, I want to have a semi-automatic description of the recorded data, so that I can accomplish the task faster and make sure there is a description.
6.D.4.	Accomplish a Sign-Language Tasks (SLT) on the crowdsourcing platform	Receive notification/message if moderator accepting/rejecting the uploaded data	As an expert signer user, I want to receive notification if moderator accepting/rejecting the uploaded data of recordings. If moderator rejects them I want to receive his comments and suggestions to improve my work and starting a

			conversation with him, so that I can understand if my work is well done or how I can improve it.
6.E.1.	Manage and upload a subtitle translation on the crowdsourcing platform	Sign in/Sign up on the Crowdsourcing Platform	As a Crowdsourcing Platform moderator, I want to Sign in/Sign up on the Crowdsourcing Platform and create/delete my profile also selecting the specific Language(s) in witch I'm expert and the role for which I'm proposing, so that I can have access to the Crowdsourcing Platform with the "moderator role" assigned by the admin.
6.E.2.	Manage and upload a subtitle translation on the crowdsourcing platform	Log in/Log out on the Crowdsourcing Platform	As a Crowdsourcing Platform moderator, I want to Log in/Log out on the Crowdsourcing Platform, so that I can manage different type of tasks: to be defined, to be assigned and to be validated.
6.E.3.	Manage and upload a subtitle translation on the crowdsourcing platform	Define tasks to accomplish on the Crowdsourcing Platform	As a Crowdsourcing Platform moderator, I want to define the tasks for the subtitles translations, so that I can manage the tasks that users have to accomplish on the Crowdsourcing Platform.
6.E.4.	Manage and upload a subtitle translation on the crowdsourcing platform	Distribute and assign tasks to the Crowdsourcing Platform users	As a Crowdsourcing Platform moderator, I want to distribute and assign tasks to the Crowdsourcing Platform users, so that I can manage each task to accomplish on the Crowdsourcing Platform.
6.E.5.	Manage and upload a subtitle translation on the crowdsourcing platform	Access to the loaded data on the Crowdsourcing Platform	As a Crowdsourcing Platform moderator, I want to access to the database of loaded data for visualization purposes, so that I can check the accomplished tasks on the Crowdsourcing Platform.
6.E.6.	Manage and upload a subtitle translation on the crowdsourcing platform	Accept/reject/comment the loaded data on the Crowdsourcing Platform	As a Crowdsourcing Platform moderator, I want to accept/reject the loaded data on the Crowdsourcing Platform and, I want to comment them, so that I can validate the loaded data on the Crowdsourcing Platform and eventually ask to the user who uploaded them to make necessary corrections.
6.E.7.	Manage and upload a subtitle translation on the crowdsourcing platform	Upload the "definitive version" on the Crowdsourcing Platform	As a Crowdsourcing Platform moderator, I want to upload the "definitive version" of the subtitle translation on the Crowdsourcing Platform, so that I can close the task and make subtitle translation available.

5. COMPONENT SPECIFICATIONS

This Section describes each component of the EasyTV system involved in the end user experience. The constraints change according to the type of disability of the end user, however they all share these characteristics:

Table 7. Characteristics of foreseen devices

Smart TV	Compliant HbbTV 2.0.1
Android tablet (second screen)	Android ver. 6.x or later
Internet connection	7Mb download, 1Mb upload
Personal computer	Windows 7 or later, MacOs 10.12 or later
Browser	Edge 41 or later Firefox 58 or later Chrome 64 or later Safari 11 or later

The section is organized in order to displays components and functionalities as follows:

1. **SPEECH & VREC**
    1. Select TV Program recorded
    2. Record a TV program
2. **SPEECH & SHARING**
    1. Record a TV program
    2. Go to a channel
3. **SPEECH & BROWSING**
    1. Go to a channel
4. **SPEECH & EPG**
    1. Search a TV program
    2. Record a TV program
5. **SPEECH & AUDIONARRATIVES**
    1. Activate and manage the audio description
6. **ACCESSIBILITY & AUDIONARRATIVES**
    1. Activate and manage the audio description
7. **SPEECH & CLEAN AUDIO**
    1. Activate and manage the audio description
8. **VREC & BROWSING**
    1. Record a TV program
9. **IMAGE MAGNIFICATION & INTERFACE IMPROVEMENT**
    1. Improve the interface and magnify the images

2. Manage interface settings and image magnification

10. ACCESSIBILITY & SLOW TV

1. Slow down the scene and turn on TTS of Text

11. ACCESSIBILITY & Text To Speech (TTS)

1. Slow down the scene and turn on TTS of Text

12. ACCESSIBILITY & SUBTITLES

1. Customize subtitles and turn on Audio subtitling
2. Turn on accessibility features
3. Turn on additional information in text form
4. Set up subtitles and audio volume
5. Turn on subtitle in different languages

13. ACCESSIBILITY & AUDIO SUBTITLES

1. Customize subtitles and turn on Audio subtitling

14. SPEECH & TIMESHIFTING

1. Stop the image on the screen
2. Set a reminder for a program scheduled to view

15. SPEECH & IMAGE MAGNIFICATION

1. Magnify the images

16. SPEECH & SET REMINDER

1. Set a reminder for a program scheduled to view

17. SPEECH & HELP

1. Set a reminder for a program scheduled to view

18. ACCESSIBILITY & SIGN LANGUAGE CONTENT

1. Turn on sign language video on the Tablet
2. Turn on SL video on TV beside TV program video
3. Change position of SL video's window on the screen
4. Change settings of SL video on TV

19. GESTURE & BROWSING

1. Control TV content on my laptop with gesture commands

20. GAZE & BROWSING

1. Control TV content on my laptop with gaze commands

21. GESTURE & VOICE TUNING

1. Control TV content on my laptop with gesture commands

22. GAZE & VOICE TUNING

1. Control TV content on my laptop with gaze commands

23. GESTURE & VREC

1. Control TV content on my laptop with gesture commands

24. GAZE & VREC

1. Control TV content on my laptop with gaze commands

25. GESTURE & EPG

1. Control TV content on my laptop with gesture commands

26. GAZE & EPG

1. Control TV content on my laptop with gaze commands

27. GESTURE & VOD

1. Control TV content on my laptop with gesture commands

28. GAZE & VOD

1. Control TV content on my laptop with gaze commands

29. ACCESSIBILITY & CLEAN AUDIO

1. Set up audio volume of multiple audio tracks
2. Turn on accessibility features
3. Set up subtitles and audio volume

30. CROWDSOURCING PLATFORM

1. Access to the crowdsourcing platform
2. Carry out a Sign-Language Tasks (SLT) on the crowdsourcing platform
3. Accomplish a Sign-Language Tasks (SLT) on the crowdsourcing platform
4. Manage and upload a subtitle translation on the crowdsourcing platform

Each functionality is described in a table that present the following items:

- **ID:** the identification number of the User Story; in that way, each functionality is linked to a specific user story to better explain the context of use and the features that will to be take in account to develop the whole EasyTV system. When a lowercase letter is present (i.e. “a”, “b”, etc.) it means that the same functionality is foreseen for multiple interaction devices.
- **Functionality Detail:** the detailed description of the functionality.
- **Interaction device:** type of device considered; furthermore, are indicated further devices when the user needs more support related to the context of use or the task to accomplish.
- **Interaction channel:** type of User Interface (UI) considered.
- **Priority:** priority level of each component-functionality

In order to define the priority level of each component-functionality, it have been adopted the MoSCoW method[9]. It represents a technique for helping to understand priorities related to the system’s requirements. The letters stand for:

- **M**ust Have: are the requirements which must be included in the final solution.
- **S**hould Have: requirements important to project success which should be included in the solution if it is possible
- **C**ould Have: desirable or nice to have requirements, based on the time & resource availability for the project
- **W**on’t Have: requirements that are either the last-critical or not appropriate at that time

It’s important to highlight that the priority level selected for each component represents a suggestion which can led and facilitate the development phase. It is not to be considered as a constraint because the functionalities are “technology dependent” and their actual implementation depends on what the technologies will allow during the development phase.

[9] This prioritization method was developed by Dai Clegg in D. Clegg, R. Barker, Case Method Fast-Track: A RAD Approach, Addison-Wesley Professional, 1994.

5.1. Component: SPEECH & VREC

5.1.1. Functionality: Select TV Program recorded

Table 8. SPEECH & VREC: Select TV Program recorded

ID	Functionality detail	Interaction device	Interaction channel	Priority
1.A.1.	Search recorded programs using voice commands	Smartphone (+ earphones)	Voice	Must

5.1.2. Functionality: Record a TV program

Table 9. SPEECH & VREC: Record a TV program

ID	Functionality detail	Interaction device	Interaction channel	Priority
1.B.1.	Schedule a recording by channel using voice commands	HbbTV + Universal Remote Control	Voice	Must
1.B.2.	Schedule a recording by program name using voice commands	HbbTV + Universal Remote Control	Voice	Must
1.B.3.	Create categories for recorded programs using voice commands	HbbTV + Universal Remote Control	Voice	Must
1.B.4.	Add tags to recorded program using voice commands	HbbTV + Universal Remote Control	Voice	Must
1.B.5.	Search an existing category and add it to the recording using voice commands	HbbTV + Universal Remote Control	Voice	Must
1.B.6.	Add rating to recorded program using voice commands	HbbTV + Universal Remote Control	Voice	Must
1.B.7.	Record only the audio description using voice commands	HbbTV + Universal Remote Control	Voice	Must
1.B.9.	Receive a vocal notification when a recording is going to start	HbbTV + Universal Remote Control	Voice	Must
1.B.10.	Schedule a repeated recording using voice commands	HbbTV + Universal Remote Control	Voice	Must

5.2. Component: SPEECH & SHARING

5.2.1. Functionality: Record a TV program

Table 10. SPEECH & SHARING: Record a TV program

ID	Functionality detail	Interaction device	Interaction channel	Priority
1.B.8.	Sharing information about the recording timer configured using voice commands	HbbTV + Universal Remote Control	Voice	Could

5.2.2. Functionality: Go to a channel

Table 11. SPEECH & SHARING: Go to a channel

ID	Functionality detail	Interaction device	Interaction channel	Priority

1.C.6.	Sharing information about current program using voice commands	HbbTV + Universal Remote Control	Voice	Could

5.3. Component: SPEECH & BROWSING

5.3.1. Functionality: Go to a cannel

Table 12. SPEECH & BROWSING: Go to a channel

ID	Functionality detail	Interaction device	Interaction channel	Priority
1.C.1.	Select channel saying the channel name	HbbTV + Universal Remote Control	Voice	Must
1.C.2.	Select channel saying program name or keyword	HbbTV + Universal Remote Control	Voice	Must
1.C.3.	Browse by voice through different categories of channels	HbbTV + Universal Remote Control	Voice	Must
1.C.4.	Customize channels name using voice commands	HbbTV + Universal Remote Control	Voice	Must
1.C.5.	Create categories of channels and ordering channels inside each category using voice commands	HbbTV + Universal Remote Control	Voice	Must
3.A.1.	Select channel saying the position number	HbbTV + Universal Remote Control	Voice	Must
3.A.2.	Select channel saying the channel name	HbbTV + Universal Remote Control	Voice	Must
3.A.3.	Customize channels position number using voice commands	HbbTV + Universal Remote Control	Voice	Must

5.4. Component: SPEECH & EPG

5.4.1. Functionality: Search a TV program

Table 13. SPEECH & EPG: Search a TV program

ID	Functionality detail	Interaction device	Interaction channel	Priority
1.D.1.	Filtering EPG by program name using voice command	HbbTV + Universal Remote Control	Voice	Should
1.D.2.	Filtering EPG by category of programs using voice command	HbbTV + Universal Remote Control	Voice	Should
1.D.3.	Filtering EPG by time range using voice command	HbbTV + Universal Remote Control	Voice	Must

5.4.2. Functionality: Record a TV program

Table 14. SPEECH & EPG: Record a TV program

ID	Functionality detail	Interaction device	Interaction channel	Priority
2.A.1.	Start a recording by filtering EPG through channel using voice command	HbbTV + Universal Remote Control	Voice	Must

2.A.2.	Start a recording by filtering EPG through program title or title keyword using voice command	HbbTV + Universal Remote Control	Voice	Must
2.A.3.	Start a recording by filtering EPG through the category of the program using voice command	HbbTV + Universal Remote Control	Voice	Should
2.A.4.	Set up start/stop time of a recording by EPG using voice commands	HbbTV + Universal Remote Control	Voice	Must
2.A.5.	Have the EPG existing category automatically added to the program recorded	HbbTV + Universal Remote Control	Voice	Must

5.5. Component: SPEECH & AUDIONARRATIVES

5.5.1. Functionality: Activate and manage the audio description

Table 15. SPEECH & AUDIONARRATIVES: Activate and manage the audio description

ID	Functionality detail	Interaction device	Interaction channel	Priority
1.E.1.	Turn on/off audio description using voice commands	Tablet (+ earphones) Companion Screen	Voice	Should
1.E.1.b	Turn on/off audio description using voice commands	HbbTV + Universal Remote Control	Voice	Must
1.E.1.c	Turn on/off audio description using voice commands	Mobile	Voice	Should
1.E.7.	Turn on/off additional audio information using voice commands	Tablet (+ earphones) Companion Screen	Voice	Should
1.E.7.b	Turn on/off additional audio information using voice commands	HbbTV + Universal Remote Control	Voice	Must
1.E.8.	Turn on/off the Text To Speech (TTS) of overlay text using voice commands	Tablet (+ earphones) Companion Screen	Voice	Should
1.E.8.b	Turn on/off the Text To Speech (TTS) of overlay text using voice commands	HbbTV + Universal Remote Control	Voice	Must

5.6. Component: ACCESSIBILITY & AUDIONARRATIVES

5.6.1. Functionality: Activate and manage the audio description

Table 16. ACCESSIBILITY & AUDIONARRATIVES: Activate and manage the audio description

ID	Functionality detail	Interaction device	Interaction channel	Priority
1.E.2.	Have a standard button to turn on/off audio description	Tablet (+ earphones) Companion Screen	Touch	Could
1.E.2.b	Have a standard button to turn on/off audio description	HbbTV	Visual	Must

5.7. Component: SPEECH & CLEAN AUDIO

5.7.1. Functionality: Activate and manage the audio description

Table 17. SPEECH & CLEAN AUDIO: Activate and manage the audio description

ID	Functionality detail	Interaction device	Interaction channel	Priority
1.E.3.	Set up volume of different audio tracks using voice commands	Tablet (+ earphones) Companion Screen	Voice	Should
1.E.3.b	Set up volume of different audio tracks using voice commands	HbbTV + Universal Remote Control	Voice	Must
1.E.4.	Save volume settings and make them available for all content, using voice commands	Tablet (+ earphones) Companion Screen	Voice	Could
1.E.4.b	Save volume settings and make them available for all content, using voice commands	HbbTV + Universal Remote Control	Voice	Could
1.E.5.	Save volume settings and make them available for specific type of content, using voice commands	Tablet (+ earphones) Companion Screen	Voice	Could
1.E.5.b	Save volume settings and make them available for specific type of content, using voice commands	HbbTV + Universal Remote Control	Voice	Could
1.E.6.	Select an automatic volume setting of different audio tracks using voice commands	Tablet (+ earphones) Companion Screen	Voice	Should
1.E.6.b	Select an automatic volume setting of different audio tracks using voice commands	HbbTV + Universal Remote Control	Voice	Must

5.8. Component: VREC & BROWSING

5.8.1. Functionality: Record a TV program

Table 18. VREC & BROWSING: Record a TV program

ID	Functionality detail	Interaction device	Interaction channel	Priority
2.A.6.	Watch any different program when a recording is in progress	HbbTV + Universal Remote Control	Voice	Must
2.A.6.b	Watch any different program when a recording is in progress	HbbTV	Visual	Must

5.9. Component: IMAGE MAGNIFICATION &INTERFACE IMPROVEMENT

5.9.1. Functionality: Improve the interface and magnify the images

Table 19. IMAGE MAGNIFICATION & INTERFACE IMPROVEMENT: Improve the interface and magnify the images

ID	Functionality detail	Interaction device	Interaction channel	Priority
2.B.1.	Customize graphical parameters of the interfaces	HbbTV	Visual	Must
2.B.2.	Save graphical parameters settings and make them available for specific device	HbbTV	Visual	Should
2.B.3.	Zoom in/out the images on the screen	HbbTV	Visual	Must
2.B.4.	Turn on/off automatic magnification of specific content	HbbTV	Visual	Could
2.B.5.	Select type of content(s) for automatic magnification	HbbTV	Visual	Could

5.9.2. Functionality: Manage interface settings and image magnification

Table 20. IMAGE MAGNIFICATION & INTERFACE IMPROVEMENT: Manage interface settings and image magnification

ID	Functionality detail	Interaction device	Interaction channel	Priority

2.E.1.	Customize graphical parameters of the interfaces	Tablet	Touch	Could
2.E.2.	Save graphical parameters settings and make them available for specific device	Tablet	Touch	Could
2.E.3.	Zoom in/out the images on the screen	Tablet	Touch	Could
2.E.3.b	Zoom in/out the images on the screen	Companion Screen	Touch	Could

5.10. Component: ACCESSIBILITY & SLOW TV

5.10.1. Functionality: Slow down the scene and turn on TTS of Text

Table 21. ACCESSIBILITY & SLOW TV: Slow down the scene and turn on TTS of Text

ID	Functionality detail	Interaction device	Interaction channel	Priority
2.C.1.	Slow down the speed of the scene	HbbTV	Visual	Could
2.C.1.b	Slow down the speed of the scene	Mobile	Touch	Could

5.11. Component: ACCESSIBILITY & Text To Speech (TTS)

5.11.1. Functionality: Slow down the scene and turn on TTS of Text

Table 22. ACCESSIBILITY & Text To Speech (TTS): Slow down the scene and turn on TTS of Text

ID	Functionality detail	Interaction device	Interaction channel	Priorit
2.C.2.	Turn on/off the Text To Speech (TTS) of overlay text	HbbTV	Visual	Must
2.C.2.b	Turn on/off the Text To Speech (TTS) of overlay text	Mobile	Touch	Could
2.C.2.c	Turn on/off the Text To Speech (TTS) of overlay text	Companion Screen	Touch	Could

5.12. Component: ACCESSIBILITY & SUBTITLES

5.12.1. Functionality: Customize subtitles and turn on Audio subtitling

Table 23. ACCESSIBILITY & SUBTITLES: Customize subtitles and turn on Audio subtitling

ID	Functionality detail	Interaction device	Interaction channel	Priority
2.D.1.	Customize subtitles: foreground and background colors	HbbTV	Visual	Must
2.D.1.b	Customize subtitles: foreground and background colors	Mobile	Touch	Could
2.D.2.	Customize subtitles: font size and style	HbbTV	Visual	Must
2.D.2.b	Customize subtitles: font size and style	Mobile	Touch	Could
2.D.3.	Customize subtitles: position on the screen	HbbTV	Visual	Must
2.D.3.b	Customize subtitles: position on the screen	Mobile	Touch	Could
2.D.4.	Save subtitles settings and make them available for all content	HbbTV	Visual	Could
2.D.4.b	Save subtitles settings and make them available for all content	Mobile	Touch	Could
2.D.5.	Save subtitles settings and make them available for specific type of content	HbbTV	Visual	Could
2.D.5.b	Save subtitles settings and make them available for specific type of content	Mobile	Touch	Could
2.D.6.	Save subtitles settings and make them available for specific device	HbbTV	Visual	Could
2.D.6.b	Save subtitles settings and make them available for specific device	Mobile	Touch	Could

5.12.2. Functionality: Turn on accessibility features

Table 24. ACCESSIBILITY & SUBTITLES: Turn on accessibility features

ID	Functionality detail	Interaction device	Interaction channel	Priority
5.B.1.	Turn on/off subtitle configuration saved	HbbTV	Visual	Should

5.12.3. Functionality: Turn on additional information in text form

Table 25. ACCESSIBILITY & SUBTITLES: Turn on additional information in text form

ID	Functionality detail	Interaction device	Interaction channel	Priority
5.C.1.	Turn on/off additional information in text form	HbbTV	Visual	Must

5.12.4. Functionality: Set up subtitles and audio volume

Table 26. ACCESSIBILITY & SUBTITLES: Set up subtitles and audio volume

ID	Functionality detail	Interaction device	Interaction channel	Priority
5.E.1.	Customize subtitles: foreground and background colors	Tablet Companion Screen	Touch	Could
5.E.2.	Customize subtitles: font size and style	Tablet Companion Screen	Touch	Could
5.E.3.	Set up the language of subtitles	Tablet Companion Screen	Touch	Could
5.E.4.	Save subtitles settings and make them available for all content	Tablet Companion Screen	Touch	Could
5.E.5.	Save subtitles settings and make them available for specific type of content	Tablet Companion Screen	Touch	Could
5.E.6.	Save subtitles settings and make them available for specific device	Tablet Companion Screen	Touch	Could

5.12.5. Functionality: Turn on subtitle in different languages

Table 27. ACCESSIBILITY & SUBTITLES: Turn on subtitle in different languages

ID	Functionality detail	Interaction device	Interaction channel	Priority
6.A.1.	Turn on subtitles and select subtitle language	HbbTV	Visual	Must
6.A.1.b	Turn on subtitles and select subtitle language	Mobile	Touch	Must

5.13. Component: ACCESSIBILITY & AUDIO SUBTITLES

5.13.1. Functionality: Customize subtitles and turn on Audio subtitling

Table 28. ACCESSIBILITY & AUDIO SUBTITLES: Customize subtitles and turn on Audio subtitling

ID	Functionality detail	Interaction device	Interaction channel	Priority

2.D.7.	Turn on/off the audio subtitling	HbbTV	Visual	Must
2.D.7.b	Turn on/off the audio subtitling	Mobile	Touch	Could
2.D.7.c	Turn on/off the audio subtitling	Companion Screen	Touch	Could
2.D.8.	Turn on/off the audio subtitling using voice commands	HbbTV + Universal Remote Control	Voice	Must
2.D.8.b	Turn on/off the audio subtitling using voice commands	Mobile	Voice	Could
2.D.8.c	Turn on/off the audio subtitling using voice commands	Companion Screen	Voice	Could

5.14. Component: SPEECH & TIMESHIFTING

5.14.1. Functionality: Stop the image on the screen

Table 29. SPEECH & TIMESHIFTING: Stop the image on the screen

ID	Functionality detail	Interaction device	Interaction channel	Priority
3.B.1.	Stop/Play the scene using voice commands	HbbTV + Universal Remote Control	Voice	Must

5.14.2. Functionality: Set a reminder for a program scheduled to view

Table 30. SPEECH & TIMESHIFTING: Personalization of program timing

ID	Functionality detail	Interaction device	Interaction channel	Priority
3.E.1.	Pause/resume a program using voice commands	HbbTV + Universal Remote Control	Voice	Must
3.E.2.	Rewind a program using voice commands	HbbTV + Universal Remote Control	Voice	Could

5.15. Component: SPEECH & IMAGE MAGNIFICATION

5.15.1. Functionality: Magnify the images

Table 31. SPEECH & IMAGE MAGNIFICATION: Magnify the images

ID	Functionality detail	Interaction device	Interaction channel	Priority
3.C.1.	Zoom in/out the images on the screen using voice command	HbbTV + Universal Remote Control	Voice	Should

5.16. Component: SPEECH & SET REMINDER

5.16.1. Functionality: Set a reminder for a program scheduled to view

Table 32. SPEECH & SET REMINDER: Set a reminder for a program scheduled to view

ID	Functionality detail	Interaction device	Interaction channel	Priority
3.D.1.	Set a reminder for the start of a program using voice command	HbbTV + Universal Remote Control	Voice	Must
3.D.2.	Customize the reminder for the start of a program using voice commands	HbbTV + Universal Remote Control	Voice	Could

5.17. Component: SPEECH & HELP

5.17.1. Functionality: Set a reminder for a program scheduled to view

Table 33. SPEECH & HELP: Set a reminder for a program scheduled to view

ID	Functionality detail	Interaction device	Interaction channel	Priority
3.D.3.	Repeat last vocal message delivered by the system using voice commands	HbbTV + Universal Remote Control	Voice	Could
3.D.4.	Receive an automatic “vocal help” by the system	HbbTV + Universal Remote Control	Voice	Could
3.D.5.	Activate/deactivate “vocal help” using voice commands	HbbTV + Universal Remote Control	Voice	Could

5.18. Component: ACCESSIBILITY & SIGN LANGUAGE CONTENT

5.18.1. Functionality: Turn on sign language video on the Tablet

Table 34. ACCESSIBILITY & SIGN LANGUAGE CONTENT: Turn on sign language video on the Tablet

ID	Functionality detail	Interaction device	Interaction channel	Priority
4.A.1.	Turn on/off Sign Language translation video	Tablet Companion Screen	Touch	Should
4.A.2.	Customize the visual settings of Sign Language translation video	Tablet Companion Screen	Touch	Could
4.A.3.	Set up the language of Sign Language translation video	Tablet Companion Screen	Touch	Could
4.A.4.	Change language of Sign Language translation video	Tablet Companion Screen	Touch	Could
4.A.5.	Save Sign Language translation video settings and make them available for specific device	Tablet Companion Screen	Touch	Could

5.18.2. Functionality: Turn on SL video on TV beside TV program video

Table 35. ACCESSIBILITY & SIGN LANGUAGE CONTENT: Turn on SL video on TV beside TV program video

ID	Functionality detail	Interaction device	Interaction channel	Priority
4.B.1.	Switch on/Switch off sign Language translation window	HbbTV	Visual	Must
4.B.2.	Set up the language of Sign Language translation video	HbbTV	Visual	Should
4.B.3.	Change language of Sign Language translation video	HbbTV	Visual	Could

5.18.3. Functionality: Change position of SL video's window on the screen

Table 36. ACCESSIBILITY & SIGN LANGUAGE CONTENT: Change position of SL video's window on the screen

ID	Functionality detail	Interaction device	Interaction channel	Priority
4.C.1.	Customize the position on the screen of the Sign Language translation window	HbbTV	Visual	Must

5.18.4. Functionality: Change settings of SL video on TV

Table 37. ACCESSIBILITY & SIGN LANGUAGE CONTENT: Change settings of SL video on TV

ID	Functionality detail	Interaction device	Interaction channel	Priority
4.D.1.	Customize the size of Sign Language translation window	HbbTV	Visual	Must
4.D.2.	Customize the visual settings of Sign Language translation window	HbbTV	Visual	Should
4.D.3.	Save Sign Language translation video settings and make them available for specific device	HbbTV	Visual	Should

5.19. Component: GESTURE & BROWSING

5.19.1. Functionality: Control TV content on my laptop with gesture commands

Table 38. GESTURE & BROWSING: Control TV content on my laptop with gesture commands

ID	Functionality detail	Interaction device	Interaction channel	Priority
4.E.1.	Select channel using gesture	PC Laptop + Universal Remote control	Gesture	Could
4.E.5.	Browse between channels using gestures	PC Laptop + Universal Remote control	Gesture	Could
4.E.7.	Customize/change names of channels using gesture	PC Laptop + Universal Remote control	Gesture	Could

5.20. Component: GAZE & BROWSING

5.20.1. Functionality: Control TV content on my laptop with gaze commands

Table 39. GAZE & BROWSING: Control TV content on my laptop with gaze commands

ID	Functionality detail	Interaction device	Interaction channel	Priority
4.E.2.	Select channel using gaze	PC Laptop + Universal Remote control	Gaze	Could
4.E.6.	Browse between channels using gaze	PC Laptop + Universal Remote control	Gaze	Could
4.E.8.	Customize/change names of channels using gaze	PC Laptop + Universal Remote control	Gaze	Could

5.21. Component: GESTURE & VOICE TUNING

5.21.1. Functionality: Control TV content on my laptop with gesture commands

Table 40. GESTURE & VOICE TUNING: Control TV content on my laptop with gesture commands

ID	Functionality detail	Interaction device	Interaction channel	Priority
4.E.3.	To turn on/off mute sound and increase/decrease volume using gesture	PC Laptop + Universal Remote control	Gesture	Could

5.22. Component: GAZE & VOICE TUNING

5.22.1. Functionality: Control TV content on my laptop with gaze commands

Table 41. GAZE & VOICE TUNING: Control TV content on my laptop with gaze commands

ID	Functionality detail	Interaction device	Interaction channel	Priority
4.E.4.	To turn on/off mute sound and increase/decrease volume using gaze	PC Laptop + Universal Remote control	Gaze	Could

5.23. Component: GESTURE & VREC

5.23.1. Functionality: Control TV content on my laptop with gesture commands

Table 42. GESTURE & VREC: Control TV content on my laptop with gesture commands

ID	Functionality detail	Interaction device	Interaction channel	Priority
4.E.9.	Schedule a recording using gesture	PC Laptop + Universal Remote control	Gesture	Could
4.E.11.	Search recorded programs using gestures	PC Laptop + Universal Remote control	Gesture	Could

5.24. Component: GAZE & VREC

5.24.1. Functionality: Control TV content on my laptop with gaze commands

Table 43. GAZE & VREC: Control TV content on my laptop with gaze commands

ID	Functionality detail	Interaction device	Interaction channel	Priority
4.E.10.	Schedule a recording using gaze	PC Laptop + Universal Remote control	Gaze	Could
4.E.12.	Search recorded programs using gaze	PC Laptop + Universal Remote control	Gaze	Could

5.25. Component: GESTURE & EPG

5.25.1. Control TV content on my laptop with gesture commands

Table 44. GESTURE & EPG: Control TV content on my laptop with gesture commands

ID	Functionality detail	Interaction device	Interaction channel	Priority
4.E.13.	Consult and browse the EPG using gestures	PC Laptop + Universal Remote control	Gesture	Could
4.E.15.	Filter the EPG using gestures	PC Laptop + Universal Remote control	Gesture	Could

5.26. Component: GAZE & EPG

5.26.1. Functionality: Control TV content on my laptop with gaze commands

Table 45. GAZE & EPG: Control TV content on my laptop with gaze commands

ID	Functionality detail	Interaction device	Interaction channel	Priority
4.E.14.	Consult and browse the EPG using gaze	PC Laptop + Universal Remote control	Gaze	Could
4.E.16.	Filter the EPG using gaze	PC Laptop + Universal Remote control	Gaze	Could

5.27. Component: GESTURE & VOD

5.27.1. Functionality: Control TV content on my laptop with gesture commands

Table 46. GESTURE & VOD: Control TV content on my laptop with gesture commands

ID	Functionality detail	Interaction device	Interaction channel	Priority
4.E.17.	Browse the VOD catalogue by video title using gestures	PC Laptop + Universal Remote control	Gesture	Could
4.E.19.	Browse the VOD catalogue by video category using gestures	PC Laptop + Universal Remote control	Gesture	Could

5.28. Component: GAZE & VOD

5.28.1. Functionality: Control TV content on my laptop with gaze commands

Table 47. GAZE & VOD: Control TV content on my laptop with gaze commands

ID	Functionality detail	Interaction device	Interaction channel	Priority
4.E.18.	Browse the VOD catalogue by video title using gaze	PC Laptop + Universal Remote control	Gaze	Could
4.E.20.	Browse the VOD catalogue by video category using gaze	PC Laptop + Universal Remote control	Gaze	Could

5.29. Component: ACCESSIBILITY & CLEAN AUDIO

5.29.1. Functionality: Set up audio volume of multiple audio tracks

Table 48. ACCESSIBILITY & CLEAN AUDIO: Set up audio volume of multiple audio tracks

ID	Functionality detail	Interaction device	Interaction channel	Priority
5.A.1.	Set up volume of different audio tracks	HbbTV	Visual	Must
5.A.1.b	Set up volume of different audio tracks	Mobile	Touch	Could
5.A.2.	Save volume settings and make them available for all content	HbbTV	Visual	Could
5.A.2.b	Save volume settings and make them available for all content	Mobile	Touch	Could
5.A.3.	Save volume settings and make them available for specific type of content	HbbTV	Visual	Could
5.A.3.b	Save volume settings and make them available for specific type of content	Mobile	Touch	Could
5.A.4.	Save volume settings and make them available for specific device	HbbTV	Visual	Should
5.A.4.b	Save volume settings and make them available for specific device	Mobile	Touch	Could

5.29.2. Functionality: Turn on accessibility features

Table 49. ACCESSIBILITY & CLEAN AUDIO: Turn on accessibility features

ID	Functionality detail	Interaction device	Interaction channel	Priority

5.B.2.	Turn on/off audio configuration saved	HbbTV	Visual	Should

5.29.3. Functionality: Set up subtitles and audio volume

Table 50. ACCESSIBILITY & CLEAN AUDIO: Set up subtitles and audio volume

ID	Functionality detail	Interaction device	Interaction channel	Priority
5.E.7.	Set up volume of different audio tracks	Tablet Companion Screen	Touch	Could
5.E.8.	Save volume settings and make them available for all content	Tablet Companion Screen	Touch	Could
5.E.9.	Save volume settings and make them available for specific type of content	Tablet Companion Screen	Touch	Could
5.E.10.	Save volume settings and make them available for specific device	Tablet Companion Screen	Touch	Could

5.30. Component: CROWDSOURCING PLATFORM

5.30.1. Functionality: Access to the crowdsourcing platform

Table 51. CROWDSOURCING PLATFORM: Access to the crowdsourcing platform

ID	Functionality detail	Interaction device	Interaction channel	Priority
6.B.1.	Sign in/Sign up on the Crowdsourcing Platform	Desktop/Laptop + sensor(s)	Visual	Must
6.B.2.	Log in/Log out on the Crowdsourcing Platform and manage task(s) assigned	Desktop/Laptop + sensor(s)	Visual	Must
6.B.3.	Log in/Log out on the Crowdsourcing Platform and select by myself the task(s)	Desktop/Laptop + sensor(s)	Visual	Could

5.30.2. Functionality: Carry out a Sign-Language Tasks (SLT) on the crowdsourcing platform

Table 52. CROWDSOURCING PLATFORM: Carry out a Sign-Language Tasks (SLT) on the crowdsourcing platform

ID	Functionality detail	Interaction device	Interaction channel	Priority
6.C.1.	Perform and record Sign Language gesture	Desktop/Laptop + sensor(s)	Visual	Must
6.C.2.	Edit the recording of the Sign Language gesture	Desktop/Laptop + sensor(s)	Visual	Must

5.30.3. Functionality: Accomplish a Sign-Language Tasks (SLT) on the crowdsourcing platform

Table 53. CROWDSOURCING PLATFORM: Accomplish a Sign-Language Tasks (SLT) on the crowdsourcing platform

ID	Functionality detail	Interaction device	Interaction channel	Priority
6.D.1.	Upload the recording of the Sign Language gesture to database	Desktop/Laptop + sensor(s)	Visual	Must
6.D.2.	Upload a description of the Sign Language gesture recording	Desktop/Laptop + sensor(s)	Visual	Must
6.D.3.	Have a semi-automatic description of the Sign Language recording	Desktop/Laptop + sensor(s)	Visual	Could
6.D.4.	Receive notification/message if moderator accepting/rejecting the uploaded data	Desktop/Laptop + sensor(s)	Visual	Must

5.30.4. Functionality: Manage and upload a subtitle translation on the crowdsourcing platform

Table 54. CROWDSOURCING PLATFORM: Manage and upload a subtitle translation on the crowdsourcing platform

ID	Functionality detail	Interaction device	Interaction channel	Priority
6.E.1.	Sign in/Sign up on the Crowdsourcing Platform	Desktop/Laptop	Visual	Must
6.E.2.	Log in/Log out on the Crowdsourcing Platform	Desktop/Laptop	Visual	Must
6.E.3.	Define tasks to accomplish on the Crowdsourcing Platform	Desktop/Laptop	Visual	Must
6.E.4.	Distribute and assign tasks to the Crowdsourcing Platform users	Desktop/Laptop	Visual	Must

6.E.5.	Access to the loaded data on the Crowdsourcing Platform	Desktop/Laptop	Visual	Must
6.E.6.	Accept/reject/comment the loaded data on the Crowdsourcing Platform	Desktop/Laptop	Visual	Must
6.E.7.	Upload the “definitive version” on the Crowdsourcing Platform	Desktop/Laptop	Visual	Must

6. NON FUNCTIONAL REQUIREMENTS

This Section provides a general introduction to the different non-functional requirements that will be applied into the EasyTV platform. A non-functional requirement is a specification that will mainly describe the system's general properties, operation and functionalities.

Specifications such as performance, design, security, platform compatibility, availability, scalability, capacity, interoperability, reliability, maintainability and integration are described, regarding distinct aspects of the project itself and the sub components of the platform.

A most common conception is that functional requirements explain what the system will do, while non-functional requirements describe how the actual system will work. However, both are required to be specified to provide a detailed view of the system's capabilities and purpose.

Table 55. Non-functional Requirements

Name	Description	Approach
Performance	The EasyTV platform should be able to support the availability specifications of the system sub components and response in an acceptable time frame. Acceptable time frame will be defined based on the kind of interaction (vocal, visual, etc.), the device (HbbTV, tablet, etc.) and the capacity.	Improvement of the response time will be achieved by checking and monitoring for any performance regressions that may occur, improving the speed of database queries, CPU and memory inspection.
Design	Design of the end user application shall achieve compatibility for different platforms, such as mobile phones, tablets, desktop computers and HbbTV smart TV screens. Different language sets shall be able to be shown as the main language of the application without creating any obstacles on the operations such as word wrapping and other space issues.	Design compatibility will be achieved by modifying the content size and use of responsive techniques during the development. Also, the design should allow different languages (Greek, Italian, Spanish) to be shown, without affecting the general layout and operations.
Security	Permission rules should be clearly defined for each part, based on the operation access. Also, all the stored data (user profiles, other sensitive data) of the platform should be secured.	There will be different type of permissions for system administrators and different permissions for professional end users etc. Any sensitive data should be stored encrypted. In this case Encryption is the most effective strategy.
Platform Compatibility	System must be compatible with different kind of data types and technologies based on the ones used on each of the existent sub components of the EasyTV platform. The end user applications should be compatible with different configuration (for example device settings such as power saving mode) and types of devices (different operating system types and	Standard and specific OS versions will be used and tested during the development of the platform.

	versions).	
Availability	The Easy TV platform should be available for all parts (Broadcasters, professional end users, final users etc.) for an acceptable time period.	Network, external services and internal applications should always be operational. It is mandatory to implement fault tolerant clusters with automatic failover capabilities and fault tolerant measures, such as server-class hardware, advanced storage solutions, and service redundancy.
Scalability and Capacity	The EasyTV platform should properly handle an increasing amount of work (such as new user registries, new services and new contents) and can be improved and evolved to support such kind of growth. Furthermore, it should properly handle addition of new sub components in the platform. The EasyTV platform architecture should be able to develop proportionally by increasing hardware capacity based on the organization's volume projections. For example, response time, requests per second, customers online etc. Furthermore, the architecture should provide sufficient capacity with multiple nodes with a similar configuration to meet the capacity needs of the platform.	Methodology that will be used for capacity planning will be either a match strategy (adding/lowering capacity bit by bit in response to changing demand) or an adjustment strategy (adding/lowering capacity in such amounts that will respond to consumer's demands or major changes to the system's architecture).
Interoperability	The system should can use different data formats and handle them with the same protocols. It should, also, allow exchanging of information between different systems and organizations (such as broadcasters).	This data will be shared in a structured data exchange degree. Therefore, interoperability testing is the methodology that is required. This testing can be either manual and/or automated. Each test case will receive a unique identification code, an in-depth description/analysis of the process followed in the test and finally the outcome of the test.
Reliability	There should be appropriate mechanisms to safely, efficiently and quickly prevent system failure (such as data loss, update failures, server overheating). Those mechanisms should never affect any other operation of the sub component in the system, under any circumstance.	Backup servers, regular software updates and regular hardware maintenance of the system will be performed.
Maintainability	The EasyTV platform should be able to support and adjust to any new requirements-improvements for them to	To ensure the safety of the system the security mechanisms should always be updated to the latest version. Also, to

	maximize efficiency, reliability, and safety of the platform.	ensure the efficiency and reliability there should be regular checking routines regarding the technical parts of the system in order to prevent malfunctions.
Integration	Third party's services and systems should achieve easy integration with the rest of the services of the EasyTV platform and its sub components.	To meet integration requirements a methodology using star integration (each system is interconnected to each of the remaining subsystems) can be used or a horizontal integration (a specific subsystem is used for establishing communication between subsystems).

6.1. External interface requirements

6.1.1. User interfaces

In order to guarantee to the final users an easy access to EasyTV system, and respective accessibility services for multimedia contents, a variety of different channels of interaction (according to the devices) will be adopted.

Consequently, various types of User Interface (UI) have been considered:

- *Visual*: interaction through a Graphical User Interface
- *Voice*: control user interfaces through speech interaction
- *Touch*: control user interfaces through touch interaction (Mobile devices)
- *Gesture*: control user interfaces through hands movement
- *Gaze*: control user interfaces through eyes movement

6.1.2. Hardware Interfaces

The hardware required for the project is various with different functions depending on the intended users. Content creators have different needs from users depending on their type of disability. The same content creators must have computers and equipment that differ according to the content they are supposed to produce. Refer to Section 3 of Deliverable 1.3.1 for further details.

6.1.3. Software Interfaces

As the hardware, software is also expressed in many shape, depending on the function it is called to perform. The platforms used in the project are many and very varied, with different technologies at the base. Each partner will define the details of their own software interfaces. However, the general architecture is described in subsection 3.3 within Deliverable 1.3.1.

6.1.4. Communications Interfaces

Given the heterogeneous nature of the platforms and frameworks used for the development of the EasyTV project, and the need to be usable and manageable in the cloud, the communication between these tools should be assure by the use of REST APIs and WebSockets. Each partner will create APIs that are able to read/write information for the own environments. The communication standard is also defined in the system architecture in Section 3 of Deliverable 1.3 and in the architecture diagrams in the EasyTV System Architecture document.

6.2. Broadcaster requirements for crowdsourcing multilanguage subtitling service

In this section, we describe specific broadcaster requirement related to the crowdsourcing multilanguage subtitling service:

- the registration of new users in the platform requires the gathering of a minimum of information (through a form or a similar mechanism) that shall collect at least the following information: broadcasters that the user is interested in collaborating with, languages in which the user is competent indicating its level (native, official degrees...);

- the platform shall allow to each broadcaster to manage different user's trust levels to manage content rights and quality. Collaborative editor users can be divided in four levels: low, medium, high and professional. Each user level has a degree of revision before it's work can be published. The professional user level is also necessary for managing those contents with strong right limitations, so this kind of users has a professional relation with the broadcaster.

- also, a broadcaster reviewer/moderator user profile is needed for revision and acceptance of the work due by the users before its publication. The platform shall assist the reviewer/moderator in accordance with the trust level of the author user of the translation;

- the broadcaster will upload contents with subtitles in its original language into the EasyTV platform with the required metadata for process management: original language, desired translation languages, minimum trust level required for editor users, identification of the program, etc. Once the translated material is ready, the broadcaster will be able to download it. Neither the original nor the translated content cannot be made public available directly from the EasyTV platform due to rights management, the publication of these content will be performed exclusively by the broadcaster over its own publication platform;

- the EasyTV platform shall provide alert messages to the users when additional content to be translated is uploaded, and to the broadcaster when a translation work is finished.

7. OVERALL PROJECT KPI IMPACTING THE SYSTEM REQUIREMENTS

The Key Performance Indicators (KPIs) presented in this document focus on the monitoring of the progress of the project's development, providing a formal method for assessing the fulfilment of its objectives. The sections below define a set of different KPIs related to the objectives and work packages to be applied.

7.1. Usage and design of KPI

In the testing phase (WP6), the performance of the EasyTV approach will be validated and evaluated by setting up and conducting users testing sessions in different scenarios. Hence, the success of the project will be determined not only by the correct performance of the technical solution, but also by its impact and acceptance among different user groups with various degrees of disabilities. Therefore, a mechanism for enabling continuous evaluation of the deployments through measurement of a set of indicators that can enhance the validation of the approach is needed. To this end, this Section focuses on the design of suitable KPI based on existing literature ([1]., [5].). Later on, next Section will be in charge of presenting a set of specific KPIs that fit into the context of the project.

In the design process is vital to be clear on what the KPI is exactly indicating and which processes are defining to measure it. In this regard, the EasyTV KPI will be compliant with the five specific conditions derived from the "keep your KPI SMART" rule [6].:

- Specific: the definition and interpretation of what the KPI is exactly going to measure has to be clear for all the actor in order to obtain the same conclusions while analysing the results.
- Measurable: the measure of the KPI must be easily quantified.
- Achievable: the KPI must be realistic to obtain
- Relevant: the KPI must provide important information about the performance, because an irrelevant KPI is useless. It has to be practical and pragmatic.
- Time-related: it has to be defined when the results can be achieved.

Having in mind this rule, and considering the context of the EasyTV, the KPIs defined for this project has seven attributes:

- ID: a code for identifying each KPI
- Name: the name of the KPI.
- Type: it describes how the KPI is designed, i.e. as a numeric value, ordinal scale or a ratio scale.
- Objective: what the KPI is evaluating for.
- Method of measurement: how the KPI is measure.
- Related project objectives/WP: it defines to what aims of the project (and work package) is related each KPI.
- Expected result: the desired value of the KPI at the end of the measurement period.

Moreover, a measure for the non-compliance of the KPI expected result is defined in case it has to be applied. Specifically, deviation in percentage, that can be calculated as follows:

$$deviation \in \% = \frac{expected\,result - actual\,value}{expected\,result}$$

After describing the general structure of the KPIs, in the following section a list of specific Key Performance Indicators chosen to evaluate the performance of the EasyTV project is presented.

7.2. EasyTV KPIs regarding functionalities, objectives, WPs

Taking into consideration the above perspectives, the following list presents a set of quantitative KPIs related to the objectives, services and WPs of the EasyTV project along with the information proposed in their design.

7.2.1. **KPI1: Number of improved access services**

7.2.1.1 Description

This KPI measures the number of access services for the digital television that has been improved thanks to the EasyTV's developments through a multi terminal technical platform, with the aim of easing the access to multimedia content for people with specific disabilities (blind/low vision, deaf/hard of hearing). These access services will focus (not only but especially) on the improvement of the image adaptation and on the enhancement of the content audio description.

7.2.1.2 KPI design:

- ID: KPI-1
- Name: Number of improved access services
- Type: numeric value
- Objective: content access enhancement
- Method of measurement: tracking the development of new/improved access services
- Related project objectives/WP: Obj1 ("Provide innovative improved access services for improved multimedia viewing and hearing and description")/WP2 ("Improved access services for improved multimedia viewing, hearing and description")
- Expected result: 8 (subtitling, audio subtitling, sign-language video, audio description, avatar, image magnification, clean audio, screen reader).

7.2.2. **KPI2: Improvement of the image adaptation**

7.2.2.1 Description

This KPI is in charge of evaluating the approval of the improvement in quality and functionalities of the image adaptation by measuring the user perception during the validation phase of the project. It is focused on establishing how the new image adaptation level can help colour-blind people and people with visual impairments to access multimedia content.

7.2.2.2 KPI Design

- ID: KPI-2
- Name: Improvement of the image adaptation
- Type: percentage
- Objective: image adaptation enhancement
- Method of measurement: evaluating the user perception (focus group, final user satisfaction surveys, etc. –to be selected in WP6-).
- Related project objectives/WP: Obj1 /WP2
- Expected result: 20%.

7.2.3. **KPI3: Improvement of the content description**

7.2.3.1 Description

In the same way than the previous one, this KPI oversees evaluating the approval of the improvement in quality and functionalities of the content description by measuring the user perception during the validation phase of the project. It is focused on establishing how the additional content description developments can help deaf and hard of hearing people to access multimedia content.

7.2.3.2 KPI Design

- ID: KPI-3
- Name: Improvement of the content description
- Type: percentage
- Objective: content description enhancement
- Method of measurement: evaluating the user perception (focus group, final user satisfaction surveys, etc. –to be selected in WP6-).
- Related project objectives/WP: Obj1/WP2
- Expected result: 20%.

7.2.4. **KPI4: Number of user profiles in the project repository**

7.2.4.1 Description

This KPI will focus on analysing the number of user profiles in the repository that will help in the definition of user disabilities, functional limitations and preferences. Besides, this information will lead to a self-learning system that evolves and enhances its personalisation capabilities, providing a higher quality of experience for the user.

7.2.4.2 KPI Design

- ID: KPI-4
- Name: Number of user profiles in the project repository.
- Type: numeric value
- Objective: personalisation enhancement
- Method of measurement: tracking the number of users logged into the system.
- Related project objectives/WP: Obj2 (“Hyper personalisation of the content experience and interaction”)/WP4 (“Improved personalisation”).
- Expected result: 80 (divided in a balanced way according to the different user’s profiles contemplated).

7.2.5. **KPI5: Number of sign languages to capture**

7.2.5.1 Description

This KPI oversees evaluating in which different sign languages the EasyTV capturing developments will be able to detect signs. This is directly related to the multilingual dimension of the solution.

7.2.5.2 KPI Design

- ID: KPI-5
- Name: Number of sign languages to capture.
- Type: numeric value
- Objective: interaction enhancement by breaking the language barrier
- Method of measurement: tracking the number of sign languages.
- Related project objectives/WP: Obj3 (“Novel technologies for the interaction with content and users thus breaking the language barriers for people with disabilities”)/ WP2, WP3 (“Novel technologies for the interaction with content and users thus breaking the language barriers for people with disabilities”), WP5 (“EasyTV component-based system”)
- Expected result: 5.

7.2.6. **KPI6: Sign avatar user acceptance**

7.2.6.1 Description

This KPI is focused on measuring the acceptance of the signer avatar by the deaf users, based on the improvement of its realism.

7.2.6.2 KPI Design

- ID: KPI-6
- Name: Sign avatar user acceptance.
- Type: percentage
- Objective: to evaluate the possible adoption of this solution by the deaf community.
- Method of measurement: evaluation by questionnaires during the validation phase
- Related project objectives/WP: Obj3 / WP2, WP3, WP5.
- Expected result: 30%.

7.2.7. **KPI7: Sign avatar realism perception**

7.2.7.1 Description

This KPI oversees assessing the perception of the sign avatar realism animation thus the development is going to consider both hand and face motion. This will help the final acceptance of the solution by the deaf users, since the major complain about this technology is its lack of realism.

7.2.7.2 KPI design

- ID: KPI-7
- Name: Sign avatar realism perception.
- Type: percentage
- Objective: to evaluate the perception of the final user about the sign avatar developed.
- Method of measurement: evaluation by questionnaires during the validation phase
- Related project objectives/WP: Obj3 / WP2, WP3, WP5
- Expected result: 50% of approval.

7.2.8. **KPI8: User satisfaction**

7.2.8.1 Description

This KPI is directly related to the perception of the final user about the EasyTV developed platform and services and gives an idea of the impact of the solution among the final users.

7.2.8.2 KPI design

- ID: KPI-8
- Name: User satisfaction.
- Type: percentage
- Objective: to evaluate the satisfaction of the final user about the conclusive results.
- Method of measurement: evaluation by questionnaires during the validation phase.
- Related project objectives/WP: Obj4 (“Implement a technical platform which is able to integrate different services…”)/ WP5 (“EasyTV component-based system”)
- Expected result: 75% of approval (75% of users satisfied by the EasyTV platform-based services on the total number of user testing it).

7.2.9. **KPI9: TRL improvement**

7.2.9.1 Description

This KPI will focus on the evaluation of the TRL level of the different components of the solution to justify their evolution and correct development.

7.2.9.2 KPI Design

- ID: KPI-9
- Name: TRL improvement.
- Type: numeric value

- Objective: to evaluate the evolution of the developments of the EasyTV components.
- Method of measurement: TRL analysis.
- Related project objectives/WP: Obj4 / WP5
- Expected result: 2 levels.

7.2.10. KPI10: Number of testing users

7.2.10.1 Description

Since EasyTV will follows a user centric design approach, the evaluation with final users represents an important milestone for the project. Moreover, to obtain a statistical validity of the evaluation it is vital to consider a high number of user to take part of the assessment process. This KPI oversees analysing this number of users in order to confirm its relevance.

7.2.10.2 KPI Design

- ID: KPI-10
- Name: Number of testing users.
- Type: numeric value
- Objective: to evaluate the number of users that take part in the validation process.
- Method of measurement: tracking the number of attendees to the testing sessions.
- Related project objectives/WP: Obj5 ("Validate EasyTV resulting technologies with a relevant number of users and coherent methodology")/ WP2, WP3, WP4, WP5
- Expected result: 80 users (divided in a balanced way according to the different user's profiles contemplated).

7.2.11. KPI11: Number of feedbacks

7.2.11.1 Description

This KPI oversees showing the number of results feedbacks obtained from the users of the platform that can help to improve it by taking into account the users' opinion, perception and ideas.

7.2.11.2 KPI Design

- ID: KPI-11
- Name: Number of feedbacks.
- Type: numeric value
- Objective: to evaluate the number of users' feedback that can help enhancing the EasyTV development.
- Method of measurement: tracking the number of questionnaires to the users that provides valuable information to return to the project in the feedback form.
- Related project objectives/WP: Obj5 / WP2, WP3, WP4, WP5
- Expected result: 30 feedbacks.

7.2.12. KPI12: Number of meetings with EU accessibility bodies

7.2.12.1 Description

This KPI is focused on evaluating how the information of the project is shared with the different standards agencies for accessibility in Europe. This will indicate the level of the EasyTV impact.

7.2.12.2 KPI Design

- ID: KPI-12
- Name: Number of meetings with EU accessibility bodies.
- Type: numeric value

- Objective: To evaluate the level of the project dissemination (impact) among EU bodies related to accessibility.
- Method of measurement: tracking the number of meetings.
- Related project objectives/WP: Obj6 (“Liaise with relevant European accessibility bodies and create needed impact) / WP2, WP7 (“Dissemination and Exploitation”), WP8 (“Project management and impact creation”)
- Expected result: 3 meetings/year.

7.2.13. KPI13: Number of technical publications

7.2.13.1 Description

This KPI oversees providing feedback about the technical impact of the EasyTV developments among specific publications. All the partners must collaborate to maximize the dissemination of the project via top peer-reviewed journals and international conferences.

7.2.13.2 KPI Design

- ID: KPI-13
- Name: Number of technical publications.
- Type: numeric value
- Objective: To evaluate the level of dissemination among technical community.
- Method of measurement: tracking the number of publications
- Related project objectives/WP: Obj6 / WP2, WP7, WP8.
- Expected result: 4 papers per year.

7.2.14. KPI14: Number of external events

7.2.14.1 Description

This KPI is focused on the evaluation of the project’s impact by counting the number of external key events where it is shown to let the community know about the implemented and integrated technologies and to establish collaboration with other projects to set up synergies.

7.2.14.2 KPI design

- ID: KPI-14
- Name: Number of externa events.
- Type: numeric value
- Objective: To evaluate the level of dissemination through the participation in key events.
- Method of measurement: tracking the number of attended events.
- Related project objectives/WP: Obj6 / WP2, WP7, WP8.
- Expected result: 6.

7.3. EasyTV KPIs Summarizing Table

Once the KPIs have been defined, the following table include all the related information:

Table 56. Set of EasyTV KPIs

ID	Name	Type	Objective	Method of measure-ment	Related objectives/ WPs	Expected result
KPI-1	Number of improved access services	Num.	content access enhancement	tracking the development of new/improved access services	OBJ1/WP2	8
KPI-2	Improvement of the image adaptation	Perc.	image adaptation enhancement	evaluating the user perception	OBJ1/WP2	20%
KPI-3	Improvement of the content description	Perc.	Content description enhancement	Evaluating the user perception	OBJ1/WP2	20%
KPI-4	Number of user profiles in the project repository	Num.	Personalisation enhancement	Tracking the number of user logged into the system	OBJ2/WP4	80
KPI-5	Number of sign languages to capture	Num.	interaction enhancement by breaking the language barrier	tracking the number of sign languages	OBJ3/WP2, WP3, WP5	3
KPI-6	Sign avatar user acceptance	Perc.	To evaluate the possible adoption of this solution by the deaf community	Evaluation by questionnaire	OBJ3/WP2, WP3, WP5	30%
KPI-7	Sign avatar realism perception	Perc.	To evaluate the perception of the final users about the sign avatar	Evaluation by questionnaire	OBJ3/WP2, WP3, WP5	50%
KPI-8	User satisfaction	Perc.	To evaluate the satisfaction of the final user about the final results	Evaluation by questionnaire	OBJ4/WP5	75%
KPI-9	TRL	Num.	To evaluate the	TRL analysis	OBJ4/WP5	2 levels

	improvement		evolution of the development of the EasyTV components			
KPI-10	Number of testing users	Num.	To evaluate the number of users that take part in the validation process	Tracking the number of attendees	OBJ5/WP2, WP3, WP4, WP5	80
KPI-11	Number of feedbacks	Num.	To evaluate the number of users' opinion that returns to the EasyTV development	Tracking the number of questionnaire that return	OBJ5/WP2, WP3, WP4, WP5	30
KPI-12	Number of meetings with EU accessibility bodies	Num.	To evaluate the level of the project dissemination among EU bodies	Tracking the number of meetings	OBJ6/WP2, WP7	3 (per year)
KPI-13	Number of technical/scientific publications	Num.	To evaluate the level of dissemination among technical community	Tracking the number of publications	OBJ6/WP2, WP7. WP8	4 (per year)
KPI-14	Number of external events	Num.	To evaluate the level of dissemination through the participation in key events	Tracking the number of events	OBJ6/WP2, WP7, WP8	2 (per year)

8. VALIDATION TOOLS

The following section will oversee presenting the most common validation techniques in order to decide the ones to be applied in EasyTV later on.

8.1. Requirements validation techniques in EasyTV

There are several techniques for requirement validation. In the following list the most common ones are presented:

- Simple checks: it can be done using traceability techniques such as given the requirements document, verify that all the elicitations are covered or tracing between various levels of requirements. Developing a traceability matrix is very useful to ensure whether all the requirements have been considered and that everything in the specification is justified. This technique will be implemented in the EasyTV project by the partners involved in each development.

- Prototyping: this technique is excellent for validation by users and customers, since it is more accessible than specification and can help to discover problems. In this case, it is important to choose scenarios or use cases for elicitation session. The validation steps in this technique are:
    - Choosing the prototype testers among the final users, trying to consider different profiles.
    - Developing the test scenarios by a careful planning.
    - Executing these test scenarios
    - Documenting the results and giving them back to the developers (feedback).

  In the EasyTV environment this technique will be consider since the developments are going to be evolutive and the deployment process will be improved by several feedbacks from the users for a fine-tuning of the system.

- Functional test design: this is a vital activity that must be performed along the development process and it is based on the specification document. In it, each requirement should have an associated test and designing these tests may reveal important errors in the specification such as missing or ambiguous information.
  These tests will be implemented during the development processes of the EasyTV project.

- User Manual development: as the previous one, this is also a very important activity to consider because it forces a detailed look at the requirements and can help to reveal problems. The typical information to include in this kind of manual is the description of the functionality, an explanation about how to get out of trouble and how to install and get started with the system.
  EasyTV will be very careful in this aspect, providing a user manual of each implemented service.

- Reviews and inspections: finally, this technique, like the first one, is based on the work of a group of people that reads and analyse the requirements, looks for potential problems, meets to discuss the problems and agrees on a list of action to address them. There are diverse types of review with varying degrees of formality such as reading the document, reading and approval, walkthroughs and formal inspections. This technique is not going to be applied as it is in the project since each partner oversees checking the correctness of their developments. Nevertheless, once the integration is done, a set of different kind of test will be done to confirm the fulfilment of the requirements, such as integration and system testing.

8.2. Validation tools in EasyTV

For the EasyTV project is vital to check and test the developments to help ensure that they fulfil the requirements, so it cannot be afforded lightly. For this reason, we propose a complete validation schema that comprises different dimension of the development process just to consider every step in it. The following table shows the main aspects to be validated along with the main open source or free tools to be considered for each aspect. The selection of the final tool to be used will depend on the type of solution and technology to be validated.

Table 57. Main aspects for validation and related free tools

Functional	Purpose:	It oversees verifying a development by testing it against its specification with a black-box automated testing schema.
	Tools:	- Selenium (web and desktop applications) [7]. - Robotium (android applications) [8]. - SoapUI (REST & Soap) [7]. - Httest (HTTP tests) [10]. - Appium (mobile applications –iOS, Android, Windows-) [11].
Integrity	Purpose	This kind of validation is focused on checking the code quality when a continuous integration schema is applied. It is very useful to avoid errors for being integrated into the software, making it unusable.
	Tools	- Jenkins (developed in Java) [12]. - Buildbot (developed in Python) [13]. - Strider (developed in Node.JS and JavaScript) [14]. - Integrity (developed in Ruby, it works with Git only) [15].
Scalability/ Stress	Purpose	This validation is focused on checking the stability of a system beyond normal operational capacity. They provide load tests for measuring the system performance.
	Tools	- Jmeter (developed in Java) [16]. - Taurus (to write the test in YAML) [17]. - The grinder (developed in Java) [18]. - Tsung (multiprotocol) [19]. - Locust (for mainly web sites) [20].
Management	Purpose	The objective of this validation is to evaluate the project evolution. In this regard, the related tools allow defining tasks, assigning them to specific developers and checking their progress in real time.
	Tools	- Bugzilla (written in Perl, compatible with multiple databases) [21].. - Fossil [22]. - Lean Testing (SaaS) [23]. - OTRS (written in Perl, runs on Linux and Unix) [24].

9. CONCLUSION

In this document are described all aspects concerning the requirements of the EasyTV system subdivided into three sections: *Functional requirements*, which describes the design of functionality, *Component specification*, which organizes in the functional macro components previously described, *Non-functional requirements*, which illustrates the non-functional constraints of the system.

The present document has a considerable impact on the whole EasyTV project: the requirements identified will guide the system specification and the design of the technical platform which will deliver different services that will be further implemented in different Work Packages (WPs).

The following summary displays the WPs and the main Tasks involved by the release of D1.2.

Table 58. Impact of D1.2 on EasyTV WPs

WP	Task
WP1 - Requirements, specification and technical architecture	• Task 1.3 - Technical architecture development
WP2 - Improved access services for improved multimedia viewing, hearing and description	• Task 2.1 – Image adaption: Automatic contrast/edge enhancement or magnification and color Highlighting • Task 2.2 – Automatic, descriptive narratives of relevant visual information and Object Based Sound (improved clean speech) adaptive engine • Task 2.3 - Screen reader (OCR, text-to-speech) services for other-language subtitles content • Task 2.4 - Automatic realistic avatar presentation of sign language
WP3 - Novel technologies for the interaction with content and users for breaking the language barrier for people with disabilities	• Task 3.1 - Sign language capturing technology • Task 3.2 - Enrichment of a multilingual ontology with a set of recognizable signs and translation into different languages • Task 3.3 - Universal and accessible remote control with speech recognition development to manage the TV set and TV applications for blind and visually impaired people • Task 3.4 - Universal and accessible remote control with gesture/gaze recognition to manage the TV set and TV applications, according to the abilities (e.g., eye movement or head movement) • Task 3.5 - Device interoperability
WP4 - Improved personalisation	• Task 4.1 – Adaptive menus and graphical interface using user models • Task 4.2 – Adaptation of level of content description using standardised DASH streaming services • Task 4.3 – Personalised services for people with disabilities, including self-adaptive and tailored services, which can learn from users' actions to improve the accuracy of the personalisation
WP5 - EasyTV component-based system	• Task 5.1 – Multi terminal technical platform to operate the EasyTV services • Task 5.2 – Creation of the multilingual crowdsourcing sign language platform and repository • Task 5.3 - EasyTV Service Registry and Catalogue • Task 5.4 - EasyTV Service Development Kit • Task 5.5 - Integration and technical testing
WP6- Testing with users and feedback	• Task 6.1 – Planning of testing and methodology

	development • Task 6.2 – Testing and results gathering • Task 6.3 – Feedback and improvement proposal

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