

Deliverable

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D2.2 User Requirements

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Abstract:

This document is the second and final iteration of the deliverable and presents all generated home and professional user requirements for the selected scenarios, including the results of the focus groups, the pre-pilot tests and pilot phase 1.

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EXECUTIVE SUMMARY

The ImAc project follows a user centered design approach and aims at continuous involvement of users, whose needs and requirements must be carefully transformed into technical solutions and developments. User scenarios and user needs were initially identified in D2.1. Moreover, the results of pilot phase 1 yielded newly identified user needs or refinements of already known ones, which all had to be formulated as technical requirements in order to provide the basis for the technical specification of the ImAc platform. These ImAc user requirements are presented in this deliverable D2.2.

All requirements, carefully acquired and documented here, demonstrate very clearly, that home users are new to the omnidirectional, 360° video world. They expect to find well known functionalities especially for playback and accessibility services controls, as well as customization options, all to be transferred and newly implemented for the omnidirectional presentation. At the same time user feedback led to requirements which enable completely new features, like for instance proper orientation in 360° videos. This feature specifically requires some kind of navigational hooks when displaying the accessibility service content, like arrows or a compass for subtitles or sign language overlays. Professional users are also asking for new technical possibilities for producing accessible 360° content. Working on omnidirectional media adds a new level of complexity. The addition of text, audio or sign language is no longer purely time-based, but must now include a spatial dimension, which adds a lot more efforts while navigating, authoring and reviewing accessible 360° media, all this adding a number of new, professional user requirements to D2.2 as well. The focus groups, the pre-pilot tests and pilot phase 1 were the user-oriented actions that served as sources for the technical requirements. Section 2 provides the methodology used to formalize the process of deriving requirements from these sources. Furthermore, the section explains the syntax to document the requirements, the prioritization system applied to the requirements and the approach for handling changes arising from the iterative development process used in ImAc.

Section 3 presents the ImAc user requirements. Following the differentiation of home and professional users that was made in D2.1, they are grouped into two different classes that are presented in dedicated tables. The listed requirements are mapped to the pilot activities, i.e. the user-oriented source they were deduced from, and the tables show the developments' status for each requirement. All of the compiled requirements form the starting point to deduct the ImAc system architecture in deliverable D2.3, needed to allow for the design and development of the desired technical functionalities.

Therefore this deliverable forms the link between the user needs (WP2) and the technical developments in the ImAc project (WP3 and WP4) by transforming the former into requirements that form the basis for the latter.

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CONTENTS

Revision History	1
Executive Summary	2
Contributors	3
Tables of Figures and Tables	5
List of acronyms	6
1. Introduction	7
1.1. Purpose of this document	7
1.2. Scope of this document	7
1.3. Status of this document	7
1.4. Relation with other ImAc activities	8
2. Requirements gathering methodology	9
2.1. Approach	9
2.2. Terms and definitions	10
2.2.1. Formatting	10
2.2.1.1. Type of requirement	10
2.2.1.2. System reference	10
2.2.1.3. Requirement number	12
2.2.1.4. Version number	12
2.2.2. Prioritization	12
2.2.3. Management of changes	13
3. User Requirements	14
3.1. Introduction	14
3.2. Home user requirements	15
3.3. Professional user requirements	50
4. Conclusion	70
5. References	71

TABLES OF FIGURES AND TABLES

Table 1: System reference from user scenarios.....	11
Table 2: MoSCoW prioritization	13
Table 3: Home user requirements – Interface features.....	15
Table 4: Home user requirements – Subtitle service features	21
Table 5: Home user requirements – Sign language service features.....	32
Table 6: Home user requirements – Audio description service features	41
Table 7: Home user requirements – Audio subtitling service features	48
Table 8: Professional user requirements – Accessibility service editors	50
Table 9: Professional user requirements – Subtitle editor	54
Table 10: Professional user requirements – Sign language editor.....	58
Table 11: Professional user requirements – Audio description editor	62
Table 12: Professional user requirements – Accessibility content manager	65
Table 13: Professional user requirements – Packaging and distribution.....	68
Figure 1: Diagram of relation between work packages, and its cycles (iterations)	7
Figure 2: Diagram of tasks and outcomes (deliverables)	8
Figure 3: Iterations for gathering the requirements.....	10

LIST OF ACRONYMS

Acronym	Description
GR	Generic Requirements
SR	Service Requirements
UR	User Requirements
YR	System Requirements
AD	Audio Description
AST	Audio Subtitles
ST	Subtitles
SL	Sign Language
HUR	Home User Requirement
PUR	Professional User Requirement
HMD	Head Mounted Display
VoD	Video on Demand
FoV	Field of View

1. INTRODUCTION

1.1. Purpose of this document

This deliverable presents the results of task T2.2 User Requirements of the ImAc project. The goal of this task was to extract user requirements from the focus groups and the pre-pilot tests in T2.1 as well as the demonstration pilots (phase 1) in WP5. The requirements are the basis for the technical development of the immersive platform in WP3 and the accessibility services tools in WP4.

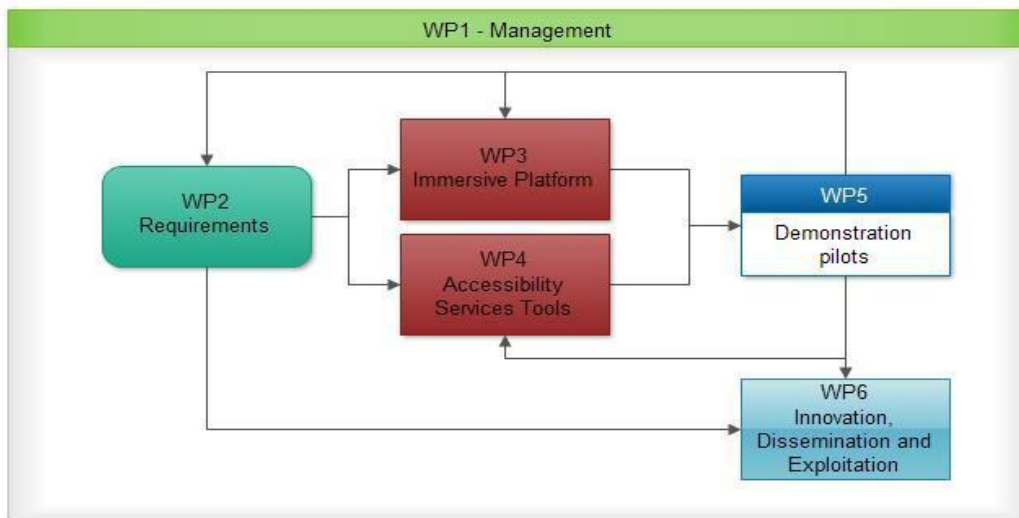


Figure 1: Diagram of relation between work packages, and its cycles (iterations)

1.2. Scope of this document

As the goal of ImAc is to make omnidirectional media services accessible, the people who will consume the services consist of a broad range of media users with a statistically proven range of impairments, henceforth called “home users”. In addition, there are users who ensure the production and enhancement of audio-visual 360° services, henceforth called “professional users”. This deliverable focuses on the requirements of both user groups.

As the ImAc project includes several regional pilots, the creation of D2.1 user scenarios and the conducting of focus groups was initially done separately for each of the pilots. However, the general requirements-gathering methodology consisted of unifying and streamlining all the results. In addition, it is crucial for any system development to clearly address and reference each requirement. To achieve this, ImAc has introduced a specific syntactical format for clustering and identifying the obtained requirements, including the ability to later adapt priorities or definitions. This approach is described in section 2 and was applied to the two main strands: gathering requirements from home users and from professional users, so that in section 3 one can find two different tables containing the deduced user requirements.

1.3. Status of this document

This is the second version of D2.2. A first version of this document was delivered in M4 and contained the user requirements gathered from the focus groups conducted in the initial phase of the ImAc project. The current updated version of D2.2 also includes the requirements

deduced from the pre-pilot tests and the demonstration pilots (phase 1). Furthermore, the section describing the requirements gathering process was extended and a section was added to explain how the change of existing and addition of new requirements was documented.

Moreover, the following changes were made: The executive summary was enhanced. Guidelines for applying the different prioritization levels were added, as well as rules for changing existing requirements during the iterative process, for instance why they got updated into “obsolete” or “changed” statuses. The list of requirements was re-ordered along logical clusters.

1.4. Relation with other ImAc activities

The user requirements described in this deliverable are defined by T2.1 User Centered Design and will feed into task T2.3 Platform Specification and task T3.1 Design and Architecture. The latter is the basis for all tasks in WP3 and WP4.

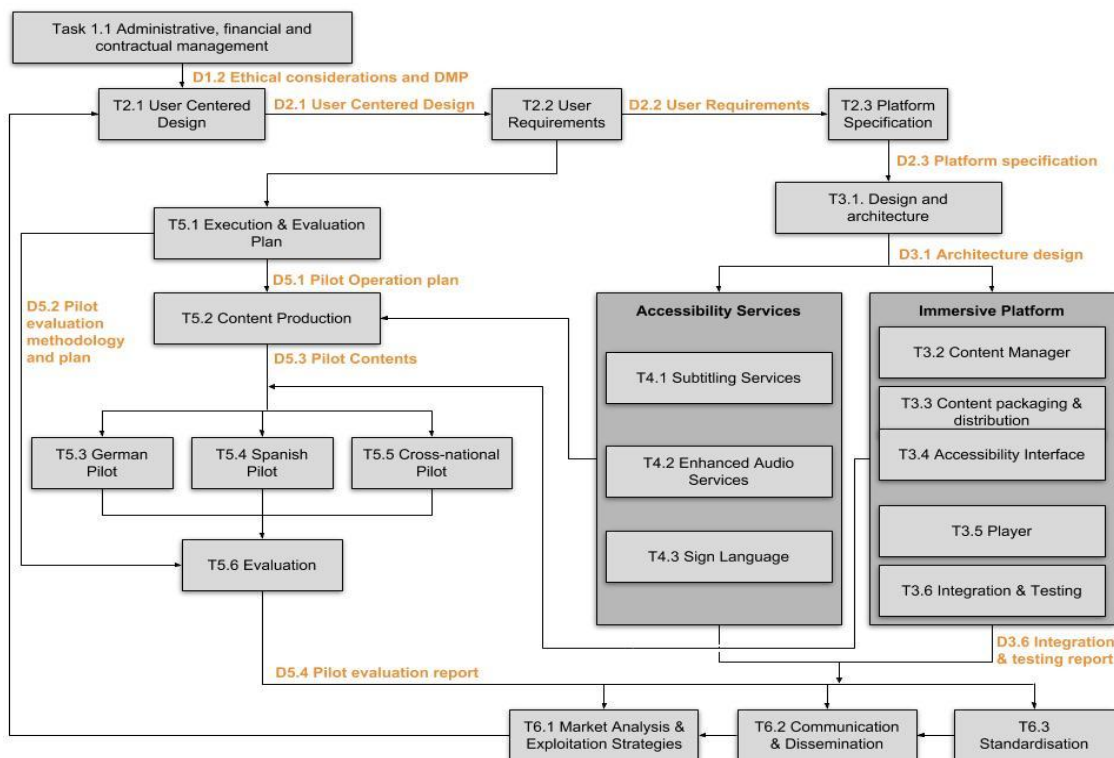


Figure 2: Diagram of tasks and outcomes (deliverables)

2. REQUIREMENTS GATHERING METHODOLOGY

This chapter describes the methodology adopted for gathering and documenting the requirements. First, the approach for deriving the ImAc requirements is explained. Then, essential terms and definitions are provided, which are necessary to differentiate and specify the manifold kinds of requirements.

2.1. Approach

The user requirements are formulated on two different levels: The home user requirements describe the functions the ImAc services expose towards an end-user. The professional user requirements describe the functions from a producer's perspective, i.e. which functions are needed on the system level for enabling the production of services described by the home user requirements. In both cases, we aim to understand the characteristics of ImAc's potential users, the environment in which the services will be used, and the actions performed by the users to reach their goals – either for production or consumption of accessible immersive media. This provides information about the needs and wishes of the targeted users, as well as specific insights into how to design, author and deliver accessible omnidirectional media experiences.

In T2.1 professional and home users were invited to workshops in the UK, Spain, Poland and Germany in order to evaluate user scenarios that had been established in the context of producing and consuming accessibility services for omnidirectional media. In T2.2 the requirements were derived from the participants' inputs on these scenarios - carefully documented in D2.1 - by taking into consideration their experience and insights. The T2.1 results were codified in natural language form output documents and were fed as plain text input into the T2.2 requirements creation process. By applying the pre-defined formatting (see section 2.2.1) and prioritization rules (see section 2.2.2) an initial set of functional and non-functional user requirements was created for D2.2, subsequently organized as an elaborated list of professional user requirements and streamlined with the help of ImAc's technology partners (all this illustrated by the red colored chain in Figure 3).

On this basis, prototypes were implemented and presented to home users in pre-pilot tests in the UK, Spain and Germany. The extensive feedback by the users led to a thorough revision of the requirements, which were subsequently extended, amended or partially deleted, all according to the pre-defined rules for versioning (see section 2.2.1.4) and managing of requirements changes (see section 2.2.3; all this illustrated by the green colored chain in Figure 3).

The third iteration of the requirements took place after the first phase of the demonstration pilots in Spain and Germany. These tests were conducted with the pilot phase 1 version of the ImAc platform and addressed both professional and home users. Their feedback on the handling of the ImAc tools and services gave rise to a number of new requirements and the refinement of many existing ones, again all being managed by the pre-defined rules for handling requirements (all this illustrated by the yellow colored chain in Figure 3). All iterations took place in close collaboration with all ImAc partners.

The fourth and last iteration of the requirements was carried out after the pre-pilot 2 tests (illustrated by the yellow colored chain in Figure 3). These user actions were conducted to evaluate certain solutions and decrease the number of options to be implemented in the final player.

As a result of the considerations described above, Chapter 3 will list all the requirements ImAc has gathered and processed according to the rules laid out below.

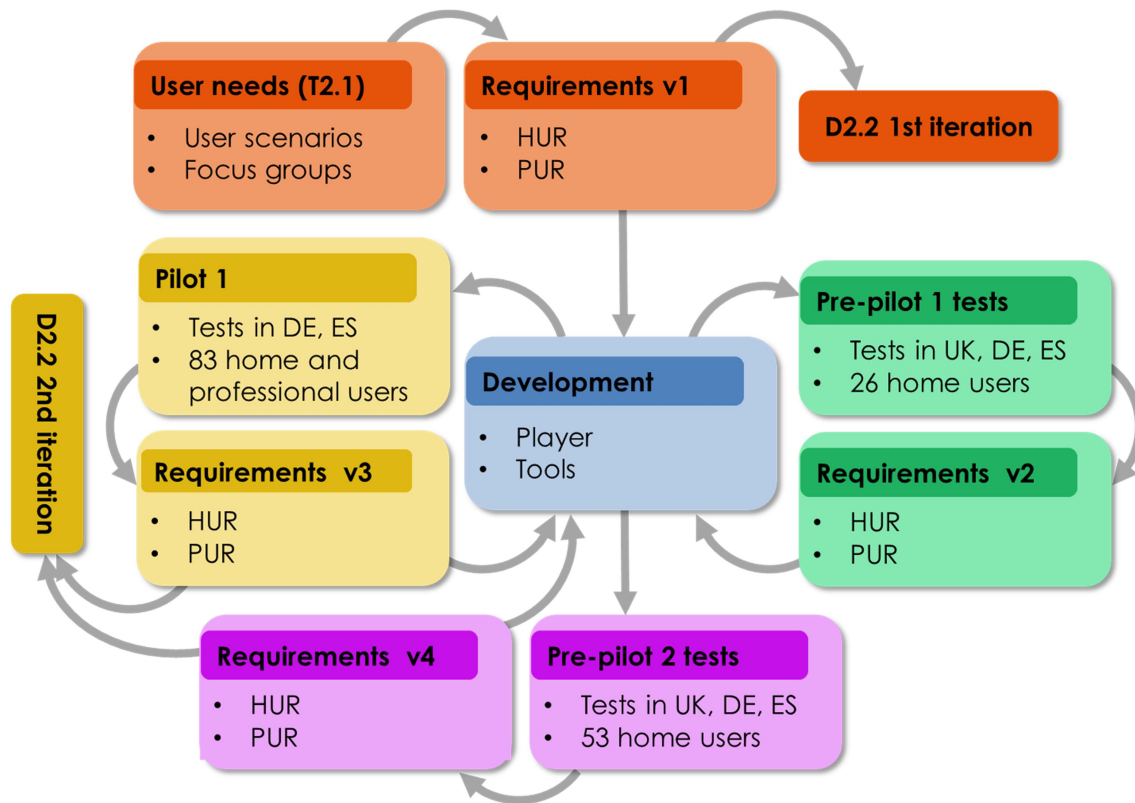


Figure 3: Iterations for gathering the requirements

2.2. Terms and definitions

2.2.1. Formatting

Each requirement has a certain type, is attributed to a specific part of the future system and follows a numbering system with type definition. In particular, we use the following system for labelling the requirements:

[TYPE OF REQUIREMENT].[SYSTEM REFERENCE].[REQ NUMBER].[VERSION NUMBER]

2.2.1.1. Type of requirement

As ImAc aims at gathering home and professional user requirements in D2.2, two different types are introduced here: home user (HUR) and professional user requirements (PUR).

2.2.1.2. System reference

The user requirements are based on the user scenario compilation in deliverable D2.1, separated into home users and professional users, and the corresponding results of the focus groups, pre-pilot tests and pilot phase 1.

The system reference for the user requirements are categorised following the stakeholders:

01: Editor Tools

02: Player / User Device

03: Other

ImAc has 17 references defined in deliverable D2.1. The table below lists and maps them to the three categories for the system reference used for the user requirements:

System reference from D2.1 tables on user scenarios	Mapping to user requirements
Audio production tools	01: Editor Tools
Audio reception tools	01: Editor Tools
Subtitling Tools	01: Editor Tools
Sign Language Editor	01: Editor Tools
Player for preview in editor tools	01: Editor Tools
Content Management	01: Editor Tools
Multiplatform Player for desktop, mobile phone, TV, head mounted display	02: Player / User Device
Accessibility interface Subtitles	02: Player / User Device
Accessibility interface Audio Description / Audio Subtitles	02: Player / User Device
Accessibility interface Sign Language	02: Player / User Device
Content packaging and distribution	03: Other
Interface – the signalization of accessibility services in the content stream	03: Other
Interface - handling presentation settings from different layers	03: Other
Interface - providing access to accessibility services	03: Other
Integration and testing	03: Other

Table 1: System reference from user scenarios

2.2.1.3. Requirement number

The numbering for the requirements is simply incremental within each system reference category.

2.2.1.4. Version number

As WP2 applies an iterative approach of gathering input, there is a clear need for keeping track and documenting possible changes in definition or prioritization of requirements (see section 2.1.3).

2.2.2. Prioritization

The description of a requirement must contain one of the following terms to define the prioritization of the requirement: “must”, “should” or “could”. The definition of these terms has been adopted from the MoSCoW prioritization [1]. The following table shows the definition for each category as well as the criteria for including user needs as technical requirements in the respective category.

MUST	<p>Requirements labelled as MUST have to be included in the solution to be a success. Think of MUST as the Minimum Usable SubseT.</p> <p>Requirements were assigned this category if they</p> <ul style="list-style-type: none">• are necessary to guarantee the technical functioning of the system component they refer to and/or• are necessary to guarantee the appropriate presentation of ImAc content and/or• are necessary to guarantee the appropriate production of ImAc content and/or• are necessary to guarantee the interaction of different elements of the ImAc platform and/or• address basic personalization options in the player, since these were regarded as a key element for ImAc.
SHOULD	<p>SHOULD requirements are as important as MUST, although SHOULD requirements are often not as critical or have workarounds, allowing another way of satisfying the requirement. They are important and of high value to the user.</p> <p>Requirements were assigned this category if they</p> <ul style="list-style-type: none">• were formulated as user needs by a number of users and/or• were identified as highly important by users in order to make the interaction with one or more elements of the ImAc platform usable to them.
COULD	<p>Requirements labelled as COULD are less critical and often seen as “nice to have”.</p> <p>Requirements were assigned this category if they</p> <ul style="list-style-type: none">• were formulated as user needs by a few users and/or• were identified as desirable by users in order to make the interaction with one or more elements of the ImAc platform even more usable to them.

Table 2: MoSCoW prioritization

Negative requirements from [1] such as “should not” and “shall not” are omitted, as they are not common in software development. It may be necessary to add them based on the project’s experiences when the ImAc platform is taken towards standardization.

2.2.3. Management of changes

The following rules were adopted to document and apply changes in the list of requirements:

- New requirements:
 - Applies when: A user need meets one of the criteria in Table 2 and has not been formulated as ImAc requirement yet
 - Documentation: Add a new row with a new number
- Additions to an existing requirement:
 - Applies when: An existing requirement needs to be amended or refined
 - Documentation: Write a new version in an extra row and do not delete the older version
- Updated requirements:
 - Applies when: An existing requirement needs to be completely reformulated
 - Documentation: Strike through the old requirement and write a new version in an extra row
- Obsolete requirements (or parts of requirements):
 - Applies when a requirement
 - Needs to be reformulated or
 - Should better be subdivided into two or more requirements or
 - Is no longer assessed worthy for development because better solutions were found to meet the user needs (this was the case for just a few options initially envisaged for AD)
 - Documentation: Do not delete but strike through
- Always add the date of change in the respective column

3. USER REQUIREMENTS

3.1. Introduction

Requirements are defined as individually documented needs that a particular design, product or process must be able to perform. In this sense, in deliverable D2.2 the user requirements describe the high-level insights of

- how professionals would use tools to produce accessibility content to enhance omnidirectional media and prepare the respective files for distribution and
- how home users would use mobile or head-mounted devices to consume accessible omnidirectional media.

In order to get a good overview of the requirements, they are ordered along logical clusters in the following tables.

3.2. Home user requirements

3.2.1. Interface features

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	6	0	access/ control	Multiplatform player for desktop, mobile phone (cardboard supported, gyroscope sensor based), TV, head mounted display	The user can start, pause, resume, forward or rewind the omnidirectional media with a graphical user interface.	MUST	Implemented		x	x	x	x	x				
HUR	2	54	0	access/ control	Volume control of interface	The user can control the volume of the main content with a graphical user interface.	MUST	Implemented		x	x	x	x	x				01.06.18

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	57	0	access/ control	Personalization options for interface	The user can activate/deactivate different personalization settings with a graphical user interface.	MUST	Implemented		x	x	x	x	x				01.06.18
HUR	2	58	0	personalization	Language selection for interface	The user can select the language of the graphical user interface (categories, options, icons/abbreviations for accessibility services).	MUST	Implemented		x	x	x	x	x				01.06.18
HUR	2	62	0	access/ control	Progress bar	The user can monitor the progress of the video via a progress bar and can jump to a specific point in time by clicking on that point in the progress bar	MUST	Implemented		x	x	x	x			x		30.10.18
HUR	2	63	0	access/ control	Access to interface	The user is informed how to open the interface via a banner display once a video starts playing	MUST	Implemented		x	x	x	x			x		30.10.18
HUR	2	4	0	access/ control	Access to Audio Description	The player should enable zoom or enlargement of any and all visual menus.	SHOULD	Obsolete	New version in HUR.2.4.1			x		x				30.05.18

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	4	1	access/ control	Access to Audio Description	The user can use a visual menu to access the service. It should be large, with a black background and white text for the highest possible contrast. Yellow will be used to highlight the choice of the user.	SHOULD MUST	Implemented				x						30.05.18
HUR	2	52	0	access/ control	Access to Audio Subtitling	The user can use a visual menu to access the service. It should be large, with a black background and white text for the highest possible contrast. Yellow will be used to highlight the choice of the user.	SHOULD MUST	Implemented					x					30.05.18
HUR	2	10	0	access/ control	Player support for “screen reader functionality”	The player provides spoken feedback of playback all interface controls (play, pause, skip forward, skip backward and stop) and of main volume and audio description volume controls.	SHOULD MUST	Pending		x	x	x	x	x				31.05.18, 01.06.18

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	10	1	access/ control	Player support for “screen reader functionality”	The user can control the volume of the spoken feedback	SHOULD	Pending		x	x	x	x	x				30.10.18
HUR	2	10	1	access/ control	Player support for “screen reader functionality”	The player should provide spoken feedback for audio subtitling volume controls.	SHOULD	Obsolete	Divided into HUR.2.10.0 and HUR.2.10.1				x					30.05.18, 01.06.18
HUR	2	11	0	access/ control	Voice commands	The player may allow the user to control playback using voice commands. This should enable play, pause, skip forward, skip backward, stop, main volume and the audio description volume.	SHOULD	Obsolete	Reformula- ted in HUR.2.59.0	x	x	x	x	x				01.06.18
HUR	2	59	0	access/ control	Voice commands	The user can control all interface settings with voice commands.	MUST	Pending		x	x	x	x	x				01.06.18
HUR	2	12	0	access/ control	Remote control	The player enables playback and/or volume controls via a remote control or gamepad.	COULD	Pending		x		x		x				

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	13	0	personalization	User settings persistence and transfer between devices	The player retains user preferences between users and application interface customization are transferred within different user devices (personal and non-personal devices for example TV in hotel).	SHOULD	Implemented		x	x	x	x	x				10.10.18
HUR	2	14	0	access/control	Companion Screen as interface	The user can use a companion screen to interact with a HbbTV 2.0 device and customize the user preferences.	COULD	Obsolete	New version in HUR.2.14.1	x				x				28.10.18
HUR	2	14	1	access/control	Companion Screen as interface	It is possible to use a companion screen to control the video as well as user preferences running on a HbbTV 2.0 device.	COULD	Pending		x	x	x	x	x				28.10.18
HUR	2	38	0	access/control	Interface adapted to user device	The user interface is adapted to the device used by the user	MUST	Implemented		x	x	x	x			x		16.11.18

Type	System reference		Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
	No.									ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	61	0	presentation modes	Accessibility interface - speaker location indicator	When using the radar speaker location indicator, the user has the possibility to return to the main action of the video by clicking on a specific point on the radar icon.	SHOULD	Pending		x	x					x		30.10.18
HUR	2	66	0	presentation modes	Accessibility interface - speaker location indicator	The radar as speaker location indicator provides information on the position of the speaker in terms of depth	COULD	Pending		x	x					x		16.11.18
HUR	2	68	0	access/control	Support of stereoscopic videos	The user is able to watch stereoscopic videos with the player	COULD	Pending		x	x					x		20.11.18
HUR	2	70	0	access/control	Simultaneous services	The player enables the simultaneous use of the visual services (ST & SL) and the audio services respectively (AD & AST)	MUST	Implemented		x	x	x	x				x	12.07.19

Table 3: Home user requirements – Interface features

3.2.2. Subtitle service features

Type	System reference			Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
	No.	Version								ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	4	0	access/ control	Access to subtitles	The user shall be able to activate or deactivate subtitles and to open the personalization options with a graphical user interface.	MUST	Obsolete	Divided into HUR.2.24.0 and HUR.2.26.0	x				x				01.06.18
HUR	2	8	0	access/ control	Subtitles always on Main Screen	Subtitles are always presented on the main screen, i.e. users do NOT want the subtitles to be delivered on an additional (companion) screen when accessing content	MUST SHOULD	Implemented		x				x				
HUR	2	24	0	access/ control	Switch on/off subtitles	The user has the possibility to switch on/off subtitles with a graphical user interface.	MUST	Implemented		x				x				
HUR	2	26	0	access/ control	Selection of Personalization options for subtitles	The user has the possibility to activate and deactivate different personalization options with a graphical user interface.	MUST	Implemented		x				x				

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	25	0	personalization	Select subtitle tracks	The user has the possibility to select different subtitle tracks with a graphical user interface.	MUST	Implemented		x				x				
HUR	2	27	0	presentation modes	Accessibility interface for subtitles - basic presentation mode	The subtitles are always visible in the user’s field of view in the middle slightly below eye line, two-lined and each speaker has its own color.	MUST	Implemented		x				x				
HUR	2	27	1	personalization	Accessibility interface for subtitles – presentation mode	The user can personalize the way subtitles are presented – either always visible in the field of view or fixed to the video	COULD	Obsolete	Dropped due to user feedback in pre-pilot 2	x							x	30.10.18; 12.07.19
HUR	2	27	2	presentation modes	Accessibility interface for subtitles - presentation mode	The number of characters displayed is automatically adapted to the size of the screen. The reading speed is not affected by this.	COULD	Pending		x								30.10.18

Type	System reference		Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
		No.								ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	28	0	personalization	Accessibility interface for subtitles - position in viewing field	The user can select between a predefined set of positions in the viewing field (top, bottom) with a graphical user interface.	MUST	Implemented		x				x				
HUR	2	29	0	personalization	Accessibility interface for subtitles - size	The user can select between a predefined set of sizes (small, medium, and large) with a graphical user interface.	SHOULD MUST	Implemented		x				x				
HUR	2	30	0	personalization	Accessibility interface for subtitles - background	The user can select between a predefined set of backgrounds (semi-transparent box, outline, scaled down video area with ST below) with a graphical user interface.	SHOULD MUST	Implemented		x				x				17.09.18

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	50	0	personalization	Accessibility interface for subtitles - comfort field of view	Users have the possibility to personalize the comfort field of view according to their preferences. Recommended are three levels in a 16:9 area (50%, 60%, 70%) according to the pre-pilot tests.	SHOULD	Implemented		x					x			16.05.18
HUR	2	50	1	personalization	Accessibility interface for subtitles - comfort field of view	The user gets a visual feedback (dotted line) when selecting a new comfort field of view	SHOULD	Implemented		x								30.10.18
HUR	2	31	0	presentation modes	Accessibility interface for subtitles – position notices icons	The subtitles are always visible in the field of view (basic presentation mode and/or selected position) and an arrow or a compass indicates the position of the speaker. It will disappear as soon as the user has changed her/his orientation to the speaker.	SHOULD	Obsolete	New version in HUR.2.31.1	x					x			01.06.18

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	31	1	personalization	Accessibility interface subtitles-position notices icons-speaker location indicator	The subtitles are always positioned in the user’s field of view according to personalization settings and an arrow left or right indicates the position of the current speaker. It will disappear as soon as the user has changed her/his orientation to the speaker.	SHOULD	Implemented		x								01.06.18
HUR	2	31	2	presentation modes	Accessibility interface subtitles-position notices icons-speaker location indicator	The subtitles are always positioned in the user’s field of view according to personalization settings and a compass/radar interactively indicates the position of the speaker by positioning a dot inside the radar field in relation to the viewer's orientation. It will disappear as soon as the user has changed her/his orientation to the speaker.	SHOULD	Implemented		x								01.06.18, 13.06.18

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	31	3	presentation modes	Accessibility interface subtitles-forced perspective speaker location indicator	The subtitles are always positioned in the user's field of view according to personalization settings. When a speaker talks for the first time in a scene, the field of view is automatically changed towards that speaker by the video player ("forced perspective""automatic speaker location indicator"). Afterwards the user can change the direction he/she wants to look.	SHOULD	Obsolete	Dropped due to user feedback in intermediate pilot actions (UAB)	x								17.09.18; 12.07.19

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	34	0	presentation modes	Accessibility interface for subtitles—angle-based positioning mechanisms for subtitles placement	The subtitles are always visible in the field of view and the player placed the subtitles at the right or left edge of the current field of view to indicate the position of the speaker, taking into account the shortest way. The subtitles will move to the centre of the field of view as soon as the user sees the speaker in her/his field of view.	MUST	Obsolete	Dropped due to user feedback in pre-pilot 1	x				x				30.05.18

Type	System reference		Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
		No.								ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	39	0	personalization	Change color of subtitles	The user is able to adapt the color of the subtitles to his/her needs.	SHOULD	Obsolete	Dropped because will lead to non-compliance with standards and EasyTV results show that standard colours are good enough	x						x		16.11.18; 01.07.19
HUR	3	2	0	content	Accessibility interface for subtitles - notices for dramaturgically-significant sounds	The user gets written translations of dramaturgically-significant sounds which are important for the plot.	MUST	Implemented		x				x				

Type	System reference		Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
	No.									ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	32	0	presentation modes	Accessibility interface for subtitles – icons represent audio events	There are icons shown, when an audio event is happening, e.g. music, explosion...	MUST, COULD	Obsolete	Dropped due to user feedback in pre-pilot 2	x				x				01.06.18; 01.07.19
HUR	2	33	0	presentation modes	Customization of immersive subtitle icons	There is not a concrete position preferred for icons or similar indication elements, so customization must allow the user to customize this position	MUST, COULD	Obsolete	Dropped due to user feedback in pre-pilot 2	x				x				01.06.18; 01.07.19
HUR	3	3	0	content	immersive subtitle icons list	A list of icons proposal to illustrate non-speech information would help production to standardize and use the same icons for different productions.	SHOULD COULD	Obsolete	Dropped due to user feedback in pre-pilot 2	x				x				12.06.18; 12.07.19
HUR	3	10	0	presentation modes	Visual display of audio content	Audio events in the main audio content such as music can be visually displayed. e.g. as time-variant spectrogram	COULD	Pending		x	x					x		16.11.18

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	35	0	presentation modes	Accessibility interface for subtitles—adaptable subtitles speed	Immersive Subtitles speed must be adaptable while keeping in synchronization with video (to different user profiles).	SHOULD	Obsolete	Dropped in favour of maintaining level of immersion (lack of research in slowing down immersive video content)	x				x				06.06.18
HUR	2	64	0	presentation modes	Display of stereoscopic subtitles	In the case of stereoscopic video content, the subtitles are displayed at a comfortable depth in relation to the speaker	COULD	Pending		x						x		30.10.18
HUR	2	67	0	presentation modes	Display of subtitles	The player supports the display of individually formatted words within a subtitle frame	COULD	Pending		x						x		19.11.18

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	3	4	0	content	Simplified Subtitles	Simplified subtitles may be useful for users with the need of easy-to-read texts.	COULD SHOULD	Implemented		x				x				
HUR	3	5	0	presentation modes	Immersive Subtitles information	Subtitles are always visible somewhere on the screen, whether the object they represent is visible on the screen or not.	MUST	Implemented		x				x				
HUR	3	11	0	content	Suppression of speaker location indicator - Subtitles	If a the duration of a subtitle frame is below a given amount of time (threshold to be specified) the speaker location indicator for that frame is suppressed automatically by the player	SHOULD	Pending		x						x		16.11.18

Table 4: Home user requirements – Subtitle service features

3.2.3. Sign language service features

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	3	1	0	access/ control	Sign Language Service	Sign Language Service must also be considered, appearing simultaneously to the person speaking.	MUST	Implemented			x			x				
HUR	2	2	0	access/ control	Access to signer	The user shall be able to activate or deactivate signer and to open the personalization options with a graphical user interface.	MUST	Obsolete	Divided into HUR.2.16.0 and HUR.2.17.0		x			x				01.06.18
HUR	2	16	0	access/ control	Switch on/off signer	The user has the possibility to switch on/off the signer with a graphical user interface.	MUST	Implemented			x			x				
HUR	2	17	0	access/ control	Selection of personalization options for signer	The user has the possibility to activate and deactivate different personalization options with a graphical user interface.	MUST	Implemented			x			x				
HUR	2	60	0	personalization	Accessibility interface signer - language	The user has the possibility to select different languages of the signer	MUST	Implemented			x							17.09.18

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	18	0	presentation modes	Accessibility interface signer - basic presentation mode	There is one basic presentation mode for the signer, which is always available for the user on any device. This mode presents it as follows: The signer video has a fixed position on the bottom right area of the field of view and the user decides what direction he/she wants to look.	MUST	Implemented			x			x				
HUR	2	19	0	personalization	Accessibility interface signer - position in viewing field	The user can select between a predefined set of different horizontal and vertical positions for the signer in the “basic presentation mode”.	MUST	Implemented			x			x				16.05.18
HUR	2	20	0	personalization	Accessibility interface signer - size	The user can select between a predefined set of sizes for the signer.	COULD	Implemented			x			x				

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	49	0	personalization	Accessibility interface for signer - comfort field of view	Users have the possibility to personalize the comfort field of view according to their preferences. Recommended are three levels (40%, 50%, 60%) in a 16:9 area according to the pre-pilot tests.	SHOULD	Implemented			x				x			16.05.19
HUR	2	49	1	personalization	Accessibility interface for signer - comfort field of view	The user gets a visual feedback (dotted line) when selecting a new comfort field of view	SHOULD	Implemented			x							30.10.18

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	21	0	presentation modes	Accessibility interface signer position notices icons speaker location indicator	The signer is always positioned in the user’s field of view according to personalization settings and an arrow under the signer window and/or the name or description of the speaker indicates the position of the current speaker, so that the user can turn around towards the speaker.	SHOULD	Implemented			x			x				30.05.18

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	22 21	0 1	presentation modes	Accessibility interface signer -position notices icons speaker location indicator	Forced perspective on the speaker: Initially, The signer is always positioned in the user's field of view according to personalization settings. When a speaker talks for the first time in a scene, the field of view is automatically changed towards that speaker by the video player ("forced perspective""automatic speaker location indicator"). Afterwards the user can change the direction he/she wants to look.	COULD	Obsolete	Dropped due to user feedback in interme- diate pilot actions (UAB)		x			x				19.11.18; 12.07.19

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	21	2	presentation modes	Accessibility interface signer - forced perspective speaker location indicator	The signer is always positioned in the user’s field of view according to personalization settings and a compass/radar interactively indicates the position of the speaker by positioning a dot inside the radar field in relation to the viewer's orientation. It will disappear as soon as the user has changed her/his orientation to the speaker.	SHOULD	Implemented			x					x		30.10.18

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	23	0	presentation modes	Accessibility interface signer –angular-based positioning mechanisms for signer placement	Angular-based positioning mechanisms for signer placement: There is a presentation mode available for the user to select, that presents the signer video as follows: The signer video is presented at the position on the field of view that is closest to the object that is associated with the signer. For example: If the signer represents a person that is to the left of the users viewing direction and outside of the field of view, the signer video would be presented at the left edge of the field of view.	COULD	Obsolete	Dropped due to user feedback in pre-pilot 1		x			x				30.05.18

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	7	0	access/ control	Consumption of signer video in HoloLense[2]	The user is able to use the signer in the HoloLens synchronized to the video content on the TV.	SHOULD, COULD	Pending			x			x				30.05.18
HUR	2	15	0	access/ control	Multiplatform player for HoloLens	The user is able to start, pause, resume, forward or rewind the signer video while using a HoloLens device.	COULD	Pending			x			x				
HUR	2	65	0	presentation modes	Display of stereoscopic signer	In the case of stereoscopic video content, the signer video is displayed at a comfortable depth in relation to the speaker	COULD	Pending			x					x		30.10.18
HUR	3	9	0	content	Sign Language Service	Body shift that is traditionally used by signers to indicate a change of speaker is avoided because it makes no sense for 360° content	MUST	Implemented			x				x			21.09.18

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	3	12	0	content	Suppression of speaker location indicator - Signer	If a the duration of a signer segment is below a given amount of time (threshold to be specified) the speaker location indicator for that segment is suppressed automatically by the player	SHOULD	Pending			x					x		16.11.18
HUR	2	69	0	presentation modes	Non-continuous signer video	The user is able to select a non-continuous display of the signer video (personalization option). In this presentation mode, the signer video is only displayed if something is being translated.	MUST	Implemented			x						x	12.07.19
HUR	2	71	0	presentation modes	Speaker identification	The name of the current speaker is displayed below the signer video	MUST	Implemented			x						x	12.07.19

Table 5: Home user requirements – Sign language service features

3.2.4. Audio description service features

Type	System reference			Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
	No.	Version								ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	3	0	access/ control	Access to Audio Description	The user can activate or deactivate Audio Description and can use the personalization options with voice commands.	MUST	Obsolete	Divided into HUR.2.36.0, HUR.2.37.0 and HUR.2.59.0			x	x					01.06.18
HUR	2	36	0	access/ control	Switch on/off audio description and audio subtitles	The user has the possibility to switch on/off audio description and/or audio subtitles (see also requirements to HUR.02.10.0, HUR.02.11.0 and HUR.02.12.0).	MUST	Implemented				x	x					29.05.18, 01.06.18
HUR	2	9	0	access/ control	Playback of audio description	The player enables the audio description to be synchronized with the main audio track	MUST	Implemented				x	x					

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	37	0	access/ control	Selection of Personalization options for audio description and audio subtitles	The user has the possibility to activate and deactivate different personalization options (see also requirements HUR.02.10.0, HUR.02.11.0 and HUR.02.12.0).	MUST	Obsolete	New version in HUR.2.37.1			x		x				29.05.18, 01.06.18
HUR	2	37	1	personalization	Selection of Personalization options for audio description	The user has the possibility to select different languages of the service and different audio description modes (see also requirements HUR.3.40.1, HUR 3.42.1 and HUR.3.8.0)	MUST	Implemented				x		x				30.05.18
HUR	2	55	0	access/ control	Volume control of audio description	The user can control the volume of the AD (independently of the main volume) with a graphical user interface.	MUST	Implemented				x		x				01.06.18
HUR	2	40	0	access/ control	Accessibility interface for Audio Description	Sound should be immersive so that users can position themselves and identify where action is happening.	SHOULD	Obsolete	Divided into HUR.3.40.1 and HUR.3.6.0			x		x				29.05.18

Type	System reference		Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2 3	40	1	presentation modes	Presentation mode for Audio Description	The user can select the following persentation mode as alternatvie to "Voice of God" (personalisation option): AD placed on the action (privilege of sound) - AD moves were the action is	SHOULD	Implemented				x			x			29.05.18; 12.07.19
HUR	2	42	0	presentation modes	Accessibility interface for Audio Description— mapped to event	AD position must be linked to event being described.	MUST	Obsolete	Reformula- ted in HUR.3.40.1			x		x				01.06.18
HUR	2 3	42	1	presentation modes	Presentation mode for Audio Description	The user can select the following persentation mode as alternatvie to "Voice of God" (personalisation option): AD anchored to soundscape (1st person past tense) - the AD sitting next to you (left or right)	MUST SHOULD	Implemented				x			x			29.05.18; 12.07.19

Type	System reference		Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
		No.								ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	41	0	presentation modes	Accessibility interface for Audio Description – headlines approach	Volume should allow to differentiate relevant information: information could be given as “headlines” and then, if users are interested, they turn their head to that area and the volume then increases.	SHOULD	Obsolete	Reformulated in HUR.3.7.1			x		x				29.05.18
HUR	2	43	0	presentation modes	Accessibility interface for Audio Description – choose different audio description tracks	Users should have access to a main audio description of the main action (so that they can follow the plot), and also be able to choose different secondary audio descriptions for additional action.	SHOULD	Obsolete	Reformulated in HUR.3.7.1			x		x				

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	44	0	presentation modes	Accessibility interface for Audio Description – audio description only for viewing field	The action happening outside the view of the user is not described unless specific action is taken by the user (moving the head).	SHOULD, COULD	Obsolete	Reformulated in HUR.3.7.1			x		x				29.05.18; 30.10.18
HUR	2	45	0	presentation modes	Accessibility interface for Audio Description – identify position	A specific sound effect (“beep”) is used so that users are able to position themselves and know they are back to the main action.	SHOULD, COULD	Obsolete	New version in HUR.2.45.1			x		x				29.05.18
HUR	2	45	1	presentation modes	Accessibility interface for Audio Description - identify position	When there is an interesting secondary AD utterance the player places an audio beacon (beep) in that direction. Pressing the pause or “listen to beacon” button pauses the main audio and plays the AD for that object.	SHOULD	Pending				x		x				30.10.18

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	46	0	presentation modes	Accessibility interface for Audio Description – change volume according to action	Main action could be suggested by higher volume.	SHOULD	Obsolete	Dropped in favour of HUR.2.45.1			x		x				29.05.18
HUR	2	48	0	presentation modes	Accessibility interface for Audio Description – “guide me” option	Users are guided through the main action if they choose ‘guide me’ option.	SHOULD, COULD	Obsolete	Dropped in favour of HUR.3.7.1			x		x				29.05.18; 30.10.18
HUR	3	6	0	content	Playback of 3D audio	Audio is presented as “3D audio”. This may be e.g: via a suitable surround sound speaker system (preferably including height speakers) or via a binaural signal played back via headphones	MUST	Implemented				x		x				

Type	System reference			Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
	No.	Version								ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	3	7	0	content	Different voices for main and secondary actions	Two voices are used: one for the main action and one for the secondary actions.	SHOULD, COULD	Obsolete	New version in HUR.3.7.1			x	x				29.05.18	
HUR	3	7	1	content	Different voices for main and secondary actions	The main AD track keeps playing and as the user moves their head secondary AD tracks can be played depending on the direction the user is looking. These tracks would not overlap and should use different voices for the main and secondary audio tracks.	SHOULD	Pending				x	x				30.10.18	
HUR	2	47	0	access/control	Accessibility interface for Audio Description – stop content automatically	There could be a sensor that detects when user closes his or her eyes (or moves his or her head because the content provokes disgust or anxiety) and audio description should be then stopped automatically.	COULD	Obsolete	Dropped due to the lack of necessary sensors in consumer HMDs			x	x				29.05.18	

Table 6: Home user requirements – Audio description service features

3.2.5. Audio subtitling service features

Type	System reference			Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
	No.	Version								ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	5	0	access/ control	Access to Audio Subtitling	The user can activate or deactivate Audio Subtitling and to open the personalization options with voice commands.	MUST	Obsolete	Divided into HUR.2.51.0, HUR.2.53.0 and HUR.2.59.0				x	x				30.05.18, 01.06.18
HUR	2	51	0	access/ control	Switch on/off audio subtitling	The user has the possibility to switch on/off audio subtitling (see also requirements to HUR.02.10.0, HUR.02.11.0 and HUR.02.12.0) in parallel or separately to audio description.	MUST	Implemented					x	x				29.05.18, 01.06.18
HUR	2	53	0	personali- zation	Selection of Personalization options for audio subtitling	The user has the possibility to select different languages of the service	MUST	Implemented					x	x				31.05.18

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
HUR	2	56	0	access/ control	Volume control of audio subtitling	The user can control the volume of the AST (independently of the main volume) with a graphical user interface.	MUST	Implemented					x	x				01.06.18

Table 7: Home user requirements – Audio subtitling service features

3.3. Professional user requirements

3.3.1. Accessibility service editors

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	1	1	0	editors	Watch low-res preview content	The user is able to watch the preview content in low quality as flat folded or flat unfolded view	MUST	Implemented		x	x	x		x				30.10.18
PUR	1	1	1	editors	Watch low-res preview content	The user is able to watch the preview content in low quality as flat unfolded view	SHOULD	Pending		x	x	x		x				30.10.18
PUR	1	2	0	editors	Watch hi-res preview content	The user is able to watch the preview content in high quality as HMD view	MUST	Pending		x	x	x		x				03.05.19
PUR	1	3	0	editors	Navigate preview content by angle	The user is able to watch content and to navigate around it with the help of keyboard shortcuts, scroll wheel and input fields by angle.	MUST	Implemented		x	x	x		x				

Type	System reference		Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
	No.									ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	1	4	0	editors	Navigate preview content by frame	The user is able to watch content and to navigate around it with the help of keyboard shortcuts, scroll wheel and input fields by frame number.	MUST	Implemented		x	x	x		x				
PUR	1	5	0	editors	Navigate preview content by time	The user is able to watch content and to navigate around it with the help of keyboard shortcuts, scroll wheel and input fields by time code.	MUST	Implemented		x	x	x		x				
PUR	1	5	1	editors	Navigate preview content by time	The user can add and subtract a given amount of time to the input field for timecode	MUST	Implemented		x	x	x		x				03.05.19
PUR	1	15	0	access content	Create a new ImAc file	It is possible to create a new accessibility file by using an existing accessibility file as template	MUST SHOULD	Implemented		x	x	x				x		03.05.19
PUR	1	16	0	editors	Edit shortcuts	The user can change the shortcuts used in the editor tools for the ImAc content	MUST SHOULD	Implemented		x	x	x				x		

Type	System reference		Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
		No.								ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	1	17	0	editors	Edit and preview mode for ImAc files	There are two different modes for editing and previewing ImAc content. The preview mode allows a few editing options.	MUST	Implemented		x	x	x				x		
PUR	1	22	0	editors	Navigate preview content by defined number of frames	The user is able to navigate content by a customizable amount of frames for forward/backward jump	MUST SHOULD	Implemented		x	x	x				x		
PUR	1	23	0	editors	Listen to audio content while navigating by frame	The user is able to listen to the main audio content while navigating the video content frame by frame	COULD	Pending		x	x	x				x	30.10.18	
PUR	1	24	0	editors	Visual display of audio content	The user can monitor the main audio content via a visual display of the sound wave	MUST	Implemented		x	x	x				x	03.05.19	

Type	System reference			Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
		No.									ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	3	10	0	editors	Defining speaker location indicator options	The user is able to define the speaker location indicator options which are offered to the home user	SHOULD	Implemented			x	x			x				23.05.19

Table 8: Professional user requirements – Accessibility service editors

3.3.2. Subtitle editor

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	1	8	0	ST editor	File operations	The user is able to produce subtitle texts by (1) inserting text with keyboard, (2) symbols from a library and adding it all to the video with the following ordered steps: 1) defining vertical and horizontal position and font size 2) defining timecode and duration 3) defining font color 4) defining viewing angle position of speaker (given as horizontal angle)	MUST	Implemented		x				x				
PUR	1	8	1	ST editor	Add subtitle text	The user is able to create ST frames that are not related to a specific angle	MUST	Implemented		x					x			16.05.18

Type	System reference		Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
	No.									ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	1	8	2	ST editor	Add subtitle text	It is possible to define two viewing angles to define the position of the speaker. The idea is that the guiding stops when the complete face of the speaker is in the field of view. The player should stop when both angles are in the field of view.	SHOULD	Obsolete	Reformulated in PUR.1.8.2	x					x			16.05.18; 10.10.18
PUR	1	8	2	ST editor	Add subtitle text	The user is able to define the width of a "security angle" that covers a speaker. The speaker location indicators only disappear once the center of the FoV is within the security angle. The center of this security angle is the position of the speaker defined as the viewing angle.	MUST SHOULD	Pending		x					x			29.10.18

Type	System reference			Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
	No.	Version								ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	1	8	3	ST editor	Add subtitle text	The user is able to add missing spatial information to legacy subtitles, which were imported	MUST	Implemented		x				x				01.06.18
PUR	1	8	4	ST editor	Add subtitle text	The user is able to define frames in which the automatic speaker location indicator will change the field of view (this is typically done when a new scene starts or a speaker changes his position)	MUST	Pending		x						x		30.10.18
PUR	1	8	5	ST editor	Add subtitle text	The user is able to define the relative depth of each speaker	COULD	Pending		x						x		16.11.16
PUR	1	18	0	ST editor	Add subtitle text	The user can format single words in a subtitle frame	COULD	Pending		x						x		30.10.18
PUR	1	19	0	ST editor	Add subtitle text	The user can monitor the reading speed via numeric display	MUST	Implemented		x						x		03.05.19
PUR	1	20	0	ST editor	Add subtitle text	The user can monitor the number of characters per line via numeric display	MUST	Implemented		x						x		03.05.19

Type	System reference		Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
	No.									ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	1	21	0	ST editor	Add subtitle text	The user has the option to activate an automatic separation of subtitle frames by a defined amount of video frames	MUST SHOULD	Implemented		x						x		
PUR	1	25	0	ST editor	Add subtitle text	The user can create subtitle frames with overlapping timecode	MUST	Implemented		x						x		
PUR	3	11	0	ST editor	Speaker introduction	Each speaker is introduced in the subtitles (e.g. by name or "man"/"woman") when speaking for the first time	MUST	Implemented		x					x			16.05.18

Table 9: Professional user requirements – Subtitle editor

3.3.3. Sign language editor

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	1	9	0	SL editor	Add sign language video	The user is able to add sign language video with the following ordered steps: 1) separating specific SL segments if necessary 2) defining dimensions of SL video 3) defining vertical and horizontal position 4) defining timecode 5) defining viewing angle position of speaker (given as horizontal angle)	MUST	Implemented			x			x				
PUR	1	9	1	SL editor	Add sign language video	The user is able to create SL segments that are not related to a specific angle	MUST	Implemented			x				x			16.05.18

Type	System reference			Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
	No.	Version								ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	1	9	2	SL editor	Add sign language video	It is possible to define two viewing angles to define the position of the speaker. The idea is that the guiding stops when the complete face of the speaker is in the field of view. The player should stop when both angles are in the field of view.	SHOULD	Obsolete	Reformulated in PUR.1.9.2		x				x			16.05.18; 10.10.18
PUR	1	9	2	SL editor	Add sign language video	The user is able to define the width of a "security angle" that covers a speaker. The speaker location indicators only disappear once the center of the FoV is within the security angle. The center of this security angle is the position of the speaker defined as the viewing angle.	MUST SHOULD	Pending			x				x			29.10.18

Type	System reference		Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
	No.									ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	1	9	3	SL editor	Add sign language video	The user is able to add missing spatial information to legacy SL videos, which were imported	MUST	Implemented			x			x				29.10.18
PUR	1	9	4	SL editor	Add sign language video	The user is able to define frames in which the automatic speaker location indicator will change the field of view (this is typically done when a new scene starts or a speaker changes his position)	MUST	Pending			x					x		30.10.18
PUR	1	9	5	SL editor	Add sign language video	The user is able to define the relative depth of each speaker	COULD	Pending			x					x		16.11.16
PUR	1	31	0	SL editor	Set in/out points for non-continuous display	The user is able to define the timecode for in- and out-points of the signer video to enable a non-continuous display of the video in the player	MUST	Pending			x						x	12.07.19

Type	System reference		Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from			Date of change
		No.								ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	
PUR	1	32	0	SL editor	Speaker identification	The user is able to define the names of the speakers that are translated in the signer video	MUST	Pending			x					x	12.07.19

Table 10: Professional user requirements – Sign language editor

3.3.4. Audio description editor

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	1	6	0	AD editor	Navigate preview content by audio	The user is able to hear 360° audio together with graphical elements that inform about the orientation of the current view	MUST	Pending				X		x				30.10.18
PUR	1	10	0	AD editor	Create AD preview content	The user is able to feed a written AD script and start a text-to-speech process.	MUST	Implemented				x		x				03.05.19
PUR	1	11	0	AD editor	Add AD preview audio to video	The user is able to add a text-to-speech AD result to a video as additional audio asset.	MUST	Implemented				x		x				12.07.19
PUR	1	12	0	AD editor	Preview video and AD audio	The user is able to preview the video together with the added speech-to-text AD asset.	MUST	Implemented				x		x				12.07.19

Type	System reference			Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
	No.	Version								ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	1	13	0	AD editor	Add audio description	The user is able to add a number of simultaneous audio descriptions to different sections of the visual scene.	MUST	Pending				x		x				
PUR	1	14	0	AD editor	Prelisten 3D audio content	The user is able to pre-listen immersive audio content together with immersive AD	SHOULD	Pending				x				x		29.10.18
PUR	1	26	0	AD editor	Edit audio description script	The user can split and merge AD script files	MUST	Implemented				x				x		12.07.19
PUR	1	27	0	AD editor	Edit audio description script	The user can split and merge AD audio files	COULD	Implemented				x				x		12.07.19
PUR	1	28	0	AD editor	Display of AD assets in space and time	The user monitor where in space and time he/she added AD assets to the video content	COULD	Implemented				x				x		12.07.19
PUR	1	29	0	AD editor	Monitor recording of AD	The user gets a visual feedback on the start and stop of the recording of an audio file	MUST	Implemented				x				x		12.07.19

Type	System reference			Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
	No.	Version								ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	1	30	0	AD editor	Define fading level of main audio	The user can choose between several levels of fading for the main audio	MUST	Implemented				x			x		03.05.19	
PUR	3	15	0	AD editor	Export AD script as text file	The user is able to export an AD script as text file	SHOULD	Pending				x			x		16.11.18	

Table 11: Professional user requirements – Audio description editor

3.3.5. Accessibility content manager

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	1	7	0	access content	File operations	The user is able to perform file operations such as import or export files (video and ImAc files)	MUST	Implemented		x	x	x		x				
PUR	1	7	1	access content	File operations	The user is able to import subtitle files (STL, WebVTT (later on), EBU-TT-D (Phase 1))	MUST	Pending		x				x				01.06.18
PUR	1	7	2	access content	File operations	The user is able to import sign language video files (mp4)	MUST	Pending			x							12.07.19
PUR	3	1	0	access content	Accessing content for ImAc enrichment	The user uses a GUI for accessing omnidirectional (video) and ImAc content files (ST, SL video, AD) for selecting and uploading/downloading files.	MUST	Implemented		x	x	x		x				

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	3	2	0	access content	Checking content for ImAc enrichment	The user is able to check ImAc media regarding: file name, file size, content type, integrity, assignment	SHOULD	Implemented		x				x				
PUR	3	3	0	access content	Assigning content for ImAc enrichment	The user is able to assign ImAc files to omnidirectional media files	SHOULD MUST	Implemented		x				x				
PUR	3	12	0	assess content	Web interface for high-resolution file upload	The user can access a simple web interface to provide metadata about high-res content that he/she uploaded to the SFTP. This metadata will trigger the automatic generation of low-res content on ACM.	SHOULD	Implemented		x	x	x				x		12.07.19
PUR	3	13	0	editors	Assign users to edit ImAc files	The user can assign one or more subtitlers at a time to edit ImAc files.	MUST	Implemented		x	x	x				x		03.05.19

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	3	14	0	access content	Define thumbnail for display of omnidirectional media	The user can define the thumbnail shown in the GUI as preview for an omnidirectional media file in the list of files.	MUST SHOULD	Implemented		x	x	x				x		03.05.19

Table 12: Professional user requirements – Accessibility content manager

3.3.6. Packaging and distribution

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	3	4	0	packaging, distribution	Triggering content packaging and distribution	The user is able to trigger and monitor the packaging of open and closed ST, SL and AD enhanced media items	MUST	Implemented		x	x	x		x				11.10.18
PUR	3	5	0	packaging, distribution	Checking state of content packaging and distribution	The user is able to check the state of packaging of enhanced media items.	SHOULD	Implemented		x	x	x		x				
PUR	3	6	0	packaging, distribution	Locally retrieving the packaging result	The user is able to direct the packaged ImAc result as local retrieval.	MUST	Pending		x	x	x		x				
PUR	3	7	0	packaging, distribution	Directing the packaging result to a different resource	The user is able to direct the packaged ImAc result forwarded to a different remote resource.	MUST	Pending		x	x	x		x				19.11.18
PUR	3	8	0	signalization	Configure the signalization of ImAc services	The user is able to configure signalization of ImAc content for distribution and playback.	SHOULD	Pending		x	x	x		x				

Type	System reference	No.	Version	Category	Title	Description	Prioritization	Status	Reason for deleting (if applicable)	Service				Input from				Date of change
										ST	SL	AD	AST	D2.1 - 1st iteration	Pre-pilot test 1	Pilot phase 1	Pre-pilot test 2	
PUR	3	9	0	signalization	Monitor the signalization of ImAc services	The user is able to monitor signalization of ImAc content for distribution and playback.	SHOULD	Pending		x	x	x		x				

Table 13: Professional user requirements – Packaging and distribution

4. CONCLUSION

For omnidirectional media services to be accessible, they must fit into the established media consumption behaviour and the environment of the home users. Besides, professional users have experiences and best practices gained while producing accessible services. They expect their established workflows to be continued and complemented by any necessary steps when working with 360° videos.

By looking closely at how people use omnidirectional media, we identified that they are not yet very familiar with it, and tend to ask for multiple options for adapting the accessible content. One thing is clear: home users want to find the accessibility functionality, including adaptation options, that they already know from linear TV and VoD, and they don't want to be overwhelmed during the already very rich omnidirectional media experience. However, they must be aware of where things are happening in the scene, e.g. where speakers are positioned in the video, so that they can easily turn around and keep track. They want to be immersed, but do not want to feel lost or overwhelmed by added information.

The requirements of home users have naturally the most important influence on how services must be created. Looking at the workflows of access services producers, we can clearly see a well-established order of activities to produce and enhance audio-visual media towards more accessibility. Adding subtitles, audio description or sign language interpretation to audio-visual media is in principle not uncharted territory, but in the case of omnidirectional variants it adds a new level of high complexity to the work of professional users. The addition of text, audio or sign language is no longer purely time-based, but now includes a spatial dimension that adds a lot more work while navigating, authoring and reviewing accessible 360° media.

The requirements that are listed in this deliverable were derived in several iterations that involved all ImAc partners and that followed the user centered design approach that is central to the ImAc project. The first version of requirements was based on focus groups in which the user scenarios created by the ImAc partners were evaluated by professional and home users. The second iteration of requirements was conducted after the pre-pilot tests, where prototypes of accessible immersive media content were presented to the target group of home users. In this way, more extensive feedback on specific issues could be gathered and the home user requirements were subsequently fine-tuned. The final iteration of requirements took place after the demonstration pilots (phase 1) which involved both professional and home users. The resulting list of final requirements provides the basis for the further development and quality assurance of the ImAc platform.

5. REFERENCES

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