

# Deliverable

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|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Project Acronym:        | ImmersiaTV                                                                                                                                             |
| Grant Agreement number: | 688619                                                                                                                                                 |
| Project Title:          | <i>Immersive Experiences around TV, an integrated toolset for the production and distribution of immersive and interactive content across devices.</i> |

## D4.1. Pilot Execution and Evaluation Plan

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Dissemination Level

|   |                                                                              |   |
|---|------------------------------------------------------------------------------|---|
| P | Public                                                                       | x |
| C | Confidential, only for members of the consortium and the Commission Services |   |

**Abstract:** The pilot execution and evaluation plan describes the overall pilot framework and details the different pilot activities that will be organized for each of the three pilots. These activities include user evaluations with both professional and end-users. There are three iterations of this deliverable, one for each of the pilots.

## REVISION HISTORY

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| Revision | Date       | Author               | Organisation | Description                                                              |
|----------|------------|----------------------|--------------|--------------------------------------------------------------------------|
| 0.1      |            | Joan Llobera Mahy    | I2cat        | Review of deliverable and contribution to the different pilot activities |
| 0.2      | 20/07/2016 | Mike Matton          | VRT          | Review of deliverable                                                    |
| 0.3      | 22/07/2016 | Joan Llobera Mahy    | I2cat        | Review and revision of comments                                          |
| 0.4.     | 25/07/2016 | Wendy Van den Broeck | imec         | Review and revision of comments                                          |
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| 1.4      | 25/01/2018 | Wendy Van den Broeck | imec         | Review of the deliverable                                                |
| 1.5      | 25/01/2018 | Paulien Coppens      | imec         | Review and revision of comments                                          |

#### **Disclaimer**

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#### **Statement of originality:**

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## EXECUTIVE SUMMARY

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This deliverable describes the detailed pilot execution and evaluation plan. The aim of this document is to streamline the different pilot activities for each of the three pilots in terms of specific pilot set-up and evaluation activities with both professional and end-users.

For the evaluation of the different pilots, we apply a living lab methodology with a user-centred design approach in which users are involved in each stage of the development process. A mixed method evaluation is foreseen combining both quantitative (logging data, surveys) and qualitative (observations, interviews) research methods.

This deliverable is split in three iterations, in line with the three pilots. A first version of D4.1. is foreseen in June 2016 (M6), the second version in M15 and the third version in M24. This document contains the first, second and third version of D4.1.

The deliverable is structured as follows:

1) General pilot approach

In the first generic part, we discuss the common pilot framework explaining the specific pilot scope, pilot implementation and pilot methodology, overarching the three different pilots.

2) Pilot 1: Offline content

Next, we document the different activities for the immersive documentary on a football school in Porto (pilot 1- September 2016).

For this first pilot, seven specific evaluation activities are foreseen:

1. **Evaluation of content creation toolkit (software evaluation):** iterative software development and evaluation with professional users at VRT and Lightbox.
2. **IBC evaluation activities:** evaluation with visitors of the IBC ImmersiaTV booth.
3. **Pre-test of closed pilot action (lab setting):** pre-test with users to test the set-up (test scenario and evaluation tools) of the end-user pilot evaluation.
4. **Closed pilot test in lab setting:** lab test with end-users of the documentary in Brussels.
5. **Closed pilot test at Porto University:** pilot test with end-users and professional users in cooperation with Porto University.
6. **Semi-open pilot:** online test with invited end-users that will test the documentary on their own devices.
7. **Open pilot:** open online test publicly available for everyone.

3) Pilot 2: Live content

In the third part of this deliverable, we elaborate upon the different activities for the second pilot, which will be a live production scenario for a cyclo-cross event (pilot 2 - November 2017). This pilot will be coordinated by VRT.

For this second pilot, four specific user evaluation activities are foreseen:

1. **Evaluation of the director's toolkit:** iterative software development and evaluation with professional users at VRT and Cinegy.
2. **Closed pilot test:** pilot with end-users and professional users at a cyclo-cross event in Belgium
3. **Semi-open pilot test:** online test with invited end-users that will view the content in a simulated live scenario on their own devices in their home environment.
4. **Open pilot test:** open online test publicly available for everyone

#### 4) Pilot 3: Offline content and live content

In the third iteration of the deliverable, we describe the activities for the third pilot, which consists of an enhancement of pilot 1 (offline content) and pilot 2 (live content).

Pilot 3 will take advantage of the insights gained in the previous pilots in terms of audiovisual language and content production tools as well as with regards to user requirements. It consists of two different production pilots:

- *Pilot 3 - offline content:* The offline scenario of pilot 3 introduces the exploration mode. Contrary to broadcast mode as applied in pilot 1, the end-user experience is no longer fully synchronized across devices. Instead the TV experience on the one hand and mobile devices (HMD, tablet) experiences on the other hand follow each other in non-overlapping time intervals, allowing the viewer to freely explore in HMD and/or tablet without losing track of the flow of the story. Pilot 3 stages a multi-device fiction “whodunit” scenario, in which users look for clues to solve a crime. Each device plays its specific role: the main storyline is developed on TV, the exploration mode in HMD, and examination of facts and characters on the tablet.
- *Pilot 3 - Live content:* The live scenario of pilot 3 extends pilot 2 by adding new features. In the refined iteration of a live event, an improved experience for the audience will be secured, not only by integrating a better delivery infrastructure, but by refining the live introduction of multiple simultaneous user viewpoints as well as a refined user interaction with the portals. Compared to live pilot 2, the focus also shifts from offering the director’s choice on all devices to the viewer towards a free use exploration of live events.

The following specific user evaluation activities are foreseen for the pilot 3 offline content scenario:

1. **Evaluation of content creation toolkit (software evaluation):** software development and evaluation with professional users at Lightbox and i2cat.
2. **Closed pilot test:** a small-scale lab test with end-users of the content in Brussels.
3. **Open pilot test:** a large-scale open online test for end-users that will view the content in their home environment. For this pilot we target international users in different countries.

The following specific user evaluation activities are foreseen for the pilot 3 live content scenario:

1. **Evaluation of the enhanced live director’s toolkit:** Software development and evaluation with professional users at VRT and Cinegy.
2. **Closed pilot test:** a small scale lab test with end-users of the (simulated) live broadcast in Brussels.
3. **Open pilot test:** open online test for end-users that will view the simulation of live content in their home environment. Also for this pilot, we target an international audience.

The approach for each of these evaluation activities is detailed and all evaluation material (questionnaires, topic lists, observation forms) can be found in annex of the deliverable. The results of the pilot evaluation activities are described in D4.4. Possible deviations to the planning of the pilot activities, are also described in D4.4. The first iteration of D4.4 (M11) described the user evaluation of pilot 1 and the second iteration (M25) the user evaluation of pilot 2. The third and final iteration of this deliverable is foreseen for M30.

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## LIST OF ACRONYMS

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| Acronym | Description               |
|---------|---------------------------|
| SWR     | Software release          |
| HMD     | Head-Mounted Display      |
| DoA     | Description of the Action |
| VR      | Virtual Reality           |

# 1 INTRODUCTION

---

## 1.1 Purpose of this document

The WP4 pilots are a vital part of the ImmersiaTV project. The aim of this deliverable is to draft a pilot execution and evaluation plan, to ensure a common execution and evaluation approach for the different pilots. This plan will be used for all pilot activities. We will use the living lab framework as a guideline and we will apply a user-centered design approach, including both end-users and professional users in the development and evaluation of the pilots.

## 1.2 Scope of this document

This deliverable starts with a **general section**, describing the common pilot framework. This will include the following sections:

- **Pilot scope:** in this section we will describe the pilot aims and outline the pilot framework (why 3 different pilots, aim of each pilot phase).
- **Pilot implementation:** this section describes the general timeline of the pilots including the different planned activities, responsibilities of each involved partner and the key resources needed for a successful pilot.
- **Pilot evaluation criteria:** describes a general approach and methodology to evaluate and assess the success of the pilot implementation. This will be detailed per pilot in part 2 of the deliverable. Also the type of data that is collected in each pilot is included (objective user data (logging & monitoring), subjective user data).

In the second part of the deliverable, the **three pilots will be planned in detail**. For each pilot, the different pilot activities will be described including:

- Aim of the specific pilot activity
- Setting of the pilot activity
- Timing of the pilot activity
- Participants and user recruitment
- Evaluation methods

In this version of the document, the seven pilot evaluation activities that relate to the first pilot are central, as well as the 3 activities that relate to the second pilot.

## 1.3 Status of this document

This is the third and final version of D4.1. with delivery foreseen in M24. Earlier versions of this document were delivered in M6 (pilot 1) and M15 (pilot 2).

## 1.4 Relation with other ImmersiaTV activities

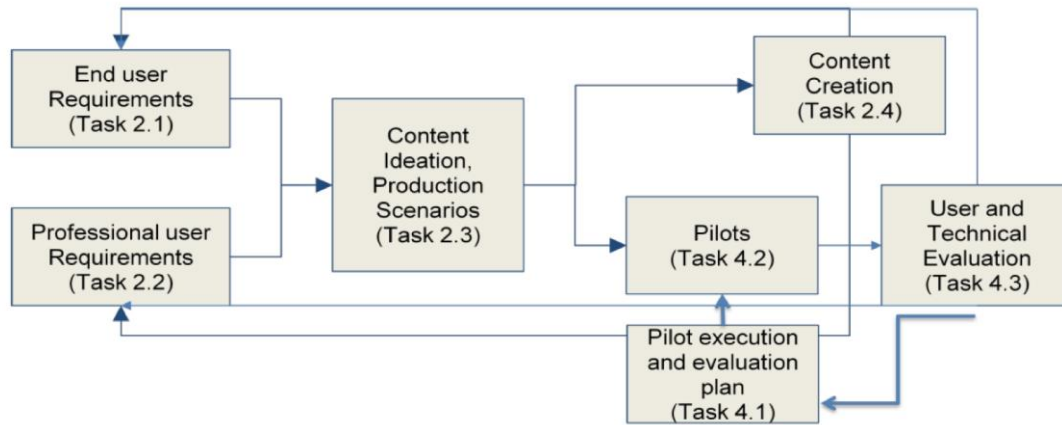


Figure 1: Relation with other ImmersiaTV activities

## 2 COMMON PILOT FRAMEWORK

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In this section we describe the common pilot framework in general, over the three pilots. Focus is on the pilot scope, pilot implementation and the pilot evaluation methodology.

### 2.1 Pilot scope

The aim of the ImmersiaTV project is to *“pilot an innovative end-to-end system covering the entire audiovisual value chain to enable a novel form of creative audiovisual storytelling based on omnidirectional video. The project will encompass immersive production tools, support for omnidirectional cameras, including ultra-high definition and high dynamic range images, adaptive content coding and distribution mechanisms, and immersive (HMD) & second screen visualisation. ImmersiaTV will demonstrate via a set of live and pre-produced pilots its deployability in a real production and distribution platform”* (project proposal objectives and scope, pg. 3).

Therefore the ImmersiaTV project will set-up and execute three specific demonstration pilots between M8 (August 2016) and M29 (May 2018) of the project. Each pilot will apply a synchronous multi-device approach. While the focus of the first pilot is on the offline production scenario (documentary), the focus of the second pilot is on a live production scenario (live sports event). In the third pilot iteration, both pilots will be further refined in two advanced pilot scenarios: advanced immersive documentary and advanced immersive sports.

The pilots are literally described as follows in the ImmersiaTV DoA, section 1.3.3., pg. 103-104:

#### ***“Pilot 1: Immersive documentary***

This pilot will demonstrate the on-demand delivery of an immersive experience based on omnidirectional video, delivered across household devices: a head mounted display, a television and second screens. We have pre-selected a documentary of the football school of the FC Porto. This scenario has been selected because omnidirectional video will allow end-users to feel like being in places where the access is very restricted. In addition, producing content around the football school and its students allows to build a narrative with characters with which people can easily identify. This pilot will give us insight in the effectiveness of the new kind of audiovisual language and in how users want to experience immersive documentary content, as well as on ways to better elaborate and distribute this new format.

#### ***Pilot 2: Immersive live sports event***

This pilot will demonstrate the live delivery of an immersive experience. We have pre-selected cyclo-cross as a case. Of all live sports coverage available, we selected cyclo-cross because it provides the opportunity to show the sport as if you were on the track with the athletes, or as one of the spectators at the race. Cyclo-cross uses a looped track, which allows for fixed omnidirectional camera positions at the most spectacular points on the track. Cyclo-cross is a very spectacular sport with thousands of spectators at the race and hundreds of thousands watching it on TV and online. This pilot will provide us with insights in how and when to use omnidirectional video and sound and will also give us some first directions on how to combine it with basic interaction and layering, e.g. to provide more information and background. The complexity of the live event will allow us to test real-time production tools and will teach us what works and what doesn't as far as user perception, basic interaction and storytelling is concerned.

### ***Pilot 3: Advanced immersive sports event and advanced immersive documentary***

The third pilot demonstration will be defined with the lessons learnt in the 2 previous ones, together with improvements in the different components of end-to-end distribution chain. It will consist of 2 sub-pilots: a refined iteration of the offline documentary targeted in the first iteration, and a refined iteration of the live broadcast targeted in the second iteration. Both will be delivered with refined codecs and stitching methods, as well as improved distribution mechanisms and receptor response and usability. In both cases, it will take advantage of the insight gained in the previous pilots in terms of audio-visual language and content production tools. There are also some specificities for each of the 2 sub-pilots:

Pilot 3.1 Refined Immersive Documentary Pilot: In this refined iteration, the content will enable a richer interactive experience within the storyline. The exploration mode will be fully implemented: the end-user will be able to explore different paths, and the order of scenes and timing of events will change depending on his actions.

Pilot 3.2 Refined Immersive Live Event Pilot: In the refined iteration of a live sports event, ImmersiaTV will secure an improved experience for the audience, not only integrating a better delivery infrastructure, but also through the insights gained in the previous pilots, refining the live introduction of multiple simultaneous user viewpoints and a refined user interaction with the portals.”

Each pilot will consist of different evaluation activities. These activities will be detailed in this deliverable.

## 2.2 Pilot implementation

This section describes the general timeline of the pilots including the different planned activities and the key resources needed for a successful pilot.

The timeframe for pilot 1, 2 and 3 are as follows:

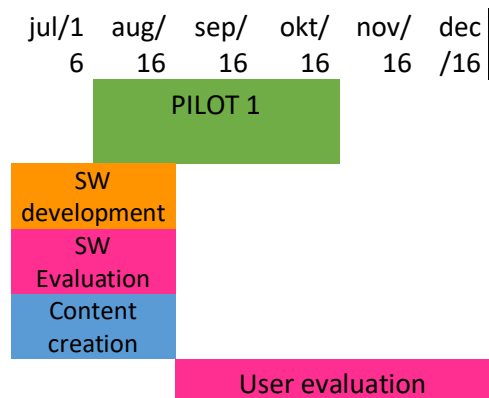


Table 1: Timeline pilot 1

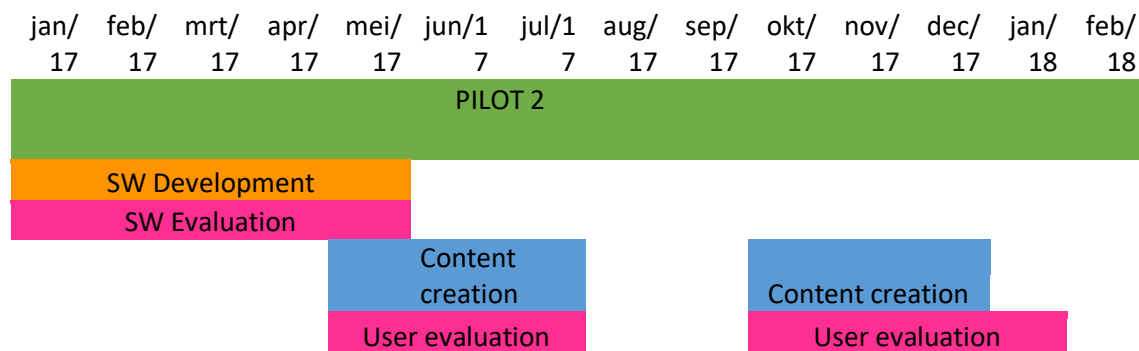


Table 2: Timeline pilot 2

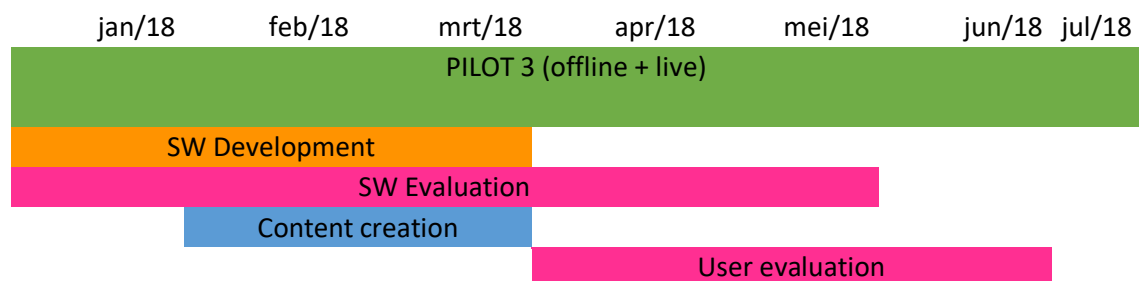


Table 3: Timeline pilot 3

## 2.3 Pilot approach and methodology

In this section we will describe the general approach and methodology to evaluate and assess the success of the pilot implementation. This will be further detailed per pilot in section 3 of the deliverable.

### 2.3.1 Generic methodological approach: Living lab

The overall methodological approach for the pilot evaluation is the living lab methodology. This methodology is a user-centred design approach and involves all relevant stakeholders throughout the development process, ensuring a bottom-up approach. A living lab allows researchers to experiment, monitor, explore, discover, identify, validate, demonstrate and create.

It can be defined as *“a research and experimentation environment to investigate **large groups** of users over a **longer period** within their **natural ‘use context’** in **interaction** with innovations<sup>1</sup>”*.

Central in this definition is that large groups of users are involved in the evaluation process and that the evaluation takes place over a longer period of time instead of one moment in time. This implies that there is an **iterative approach** with multiple evaluative moments after which feedback is immediately integrated in the development process. This enables a real-time validation of the developed prototypes.

The natural use context refers to the fact that the innovation is eventually tested in the **natural setting** of the use case. In the case of ImmersiaTV, this is for example the end-users’ own living room where people test and interact with the developed content on their own devices, including a TV-set and a tablet as is foreseen in the open pilot activities. For the professional users, this is for example their usual editing desk. Of course this is not always possible from the early stages of the development process. Therefore the following phases are typically integrated in a co-creative living lab approach, leading to a gradual approach of the testing.

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<sup>1</sup> iMinds living labs, 2015

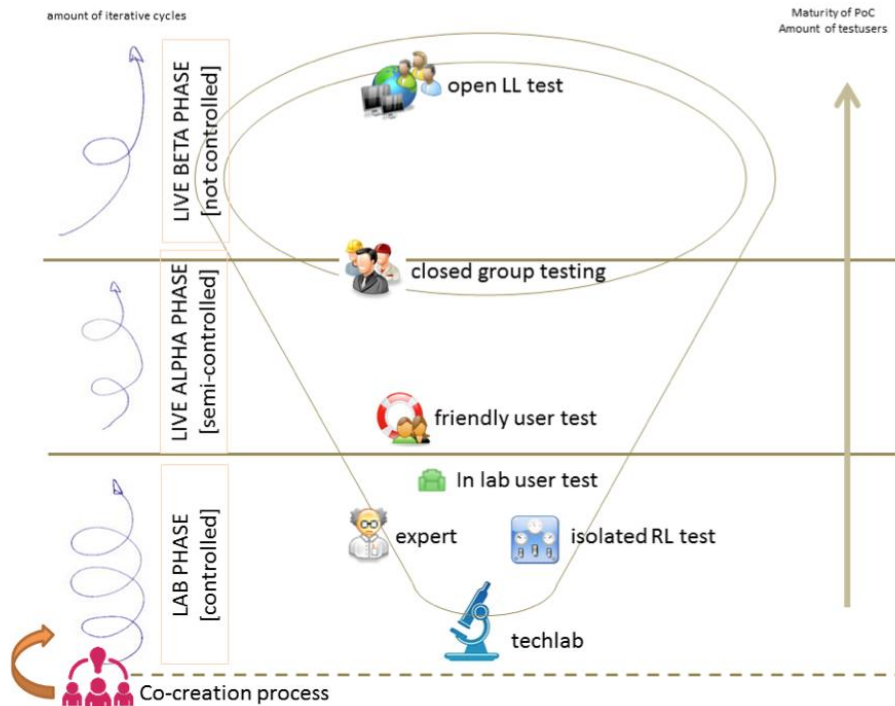


Figure 2: Living lab research cycle (Lievens & Kilpi, 2013)

In a first phase testing typically takes place within a **controlled lab setting**, as the developed prototype is often too immature to test in a more open setting. A second phase is the **semi-controlled setting** in which friendly user tests (often people with a certain connection to the project) and closed group testing takes place (a larger group of selected respondents can test in a semi-controlled environment). The final phase is the **open LL test**, where the proof of concept is much more mature and a test with a large group of users can take place. For our pilot activities we will apply a similar set-up of the different iterations, going from controlled lab tests, over semi-controlled testing to an open pilot. Each phase will have its specific aim and focus as is described in the specific pilot activities.

The user is core in the research process. Within the ImmersiaTV project, two different user groups are involved. A first group of users are the so-called **end-users**, residential users that will evaluate and use the developed immersive content experience. A second main category of users is the **professional user**, including content creators, creative professionals and editors. These user profiles will use and evaluate the different developed creative tools.

The user research is a continuous activity throughout the whole development process and aims to provide in-depth insight in the users via a multi-stakeholder approach combining different research methods. The goal is to go beyond the initial adoption, focusing on domestication processes or the question how an innovation is fitted into people's everyday practices. In the case of ImmersiaTV this can be translated in the following questions:

- 1) How will the ImmersiaTV experience fit within viewers' current TV-practices?
- 2) How will professional users integrate the developed ImmersiaTV tool chain in their current workflow?

The research findings are translated in direct actionable feedback on different layers including technical, business and usability aspects.

## 2.3.2 Data collection

For the different pilot, we will gather three main types of data:

- Objective user data
- Subjective user data
- Specific Quality of Experience metrics

### Objective user data

While most of the user feedback will be gathered by means of subjective user feedback via qualitative and quantitative research methods, also objective user data will be gathered and analysed. This objective data will also be further discussed in the qualitative research activities and more in particular as part of the interviews with end-users, where we can discuss the specific experience and motivations related to the logged behaviour. For example, if logging data shows that there is limited head-movement while wearing a HMD, this can be further discussed with the end-user in order to understand the specific behaviour.

The specific objective data will be gathered via logging. A specific software module will be implemented to log both device-specific data and session-specific data, understanding by session-specific data the data that is shared between the different devices (for example, details regarding video play out). The specific architecture of such data logging is detailed in deliverable D3.1 Architecture.

If logging of the data is not possible, it will be replaced by specific observations during the pilot activities in a lab setting.

| Data type                                    | Measurement of                                                                                                                                                                                          | logging | observation |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------------|
| Head-movement while wearing HMD              | <ul style="list-style-type: none"> <li>- frequency</li> <li>- direction/ °</li> </ul>                                                                                                                   | x       |             |
| Switching viewing angle in HMD               | <ul style="list-style-type: none"> <li>- frequency</li> <li>- which content?</li> </ul>                                                                                                                 | x       |             |
| Switching viewing angle on tablet/smartphone | <ul style="list-style-type: none"> <li>- frequency</li> <li>- which content?</li> </ul>                                                                                                                 | x       |             |
| Multi-device usage                           | <ul style="list-style-type: none"> <li>- which devices are used in combination?</li> <li>- how often do people switch between devices?</li> <li>- length of each interaction?</li> <li>- ...</li> </ul> |         | x           |
| Use of portals                               | <ul style="list-style-type: none"> <li>- which portals are being shown?</li> <li>- What user input has triggered some interactive</li> </ul>                                                            | x       |             |

|  |                                     |  |  |
|--|-------------------------------------|--|--|
|  | behavior of<br>portals?<br>-<br>... |  |  |
|--|-------------------------------------|--|--|

Table 4: Overview objective user data

## Subjective user data

To gather the user feedback, a mixed method user research approach will be applied, combining qualitative and quantitative research methods. Even though mixed methods have been criticised because of their combination of methods originating from different research paradigms, each with their own epistemological and ontological principles (Bryman, 2008), we do consider this approach particularly suitable because of the specific advantages of the combined approach. Since the early 2000's, mixed methods have become very common in social science research, acknowledging the strengths of combining the data collection and data-analysis of both qualitative and quantitative research methods.

Mixed methods can be classified according to the priority that is given to each method and the sequence of the data gathering, as is shown in figure 2.

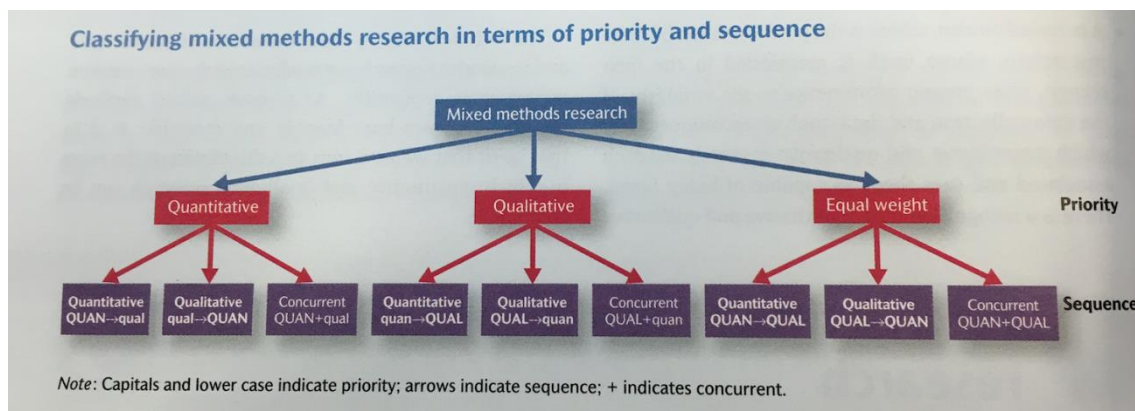


Figure 2: Classifying mixed methods research in terms of priority and sequence (Bryman, 2008: 632)

Bryman (2008: 633-634) argues that there are different motivations for combining quantitative and qualitative research methods. Within the ImmersiaTV project our motivations can be situated as follows in Bryman's classification: *triangulation* or obtaining greater validity in the research data by combining methods, *offset* or the fact that by combining quantitative and qualitative methods, weaknesses of each method can be overcome, *explanation* in which for example qualitative research methods are used to understand more quantitative research findings in-depth and *confirm and discover* in which quantitative research is used to test hypothesis generated via qualitative research on a wider scale.

In the different pilot activities below, we will clearly indicate the rationale behind the different applied methods in each phase of the research. Applied research methods include surveys and logging data analysis as part of the collected quantitative research data and in-depth interviews, focus group interviews, co-creation sessions and observations as part of the applied qualitative research methods.

As we apply an iterative approach, the different methods will be combined over time, leading to sequential mixed methods research designs (with one method applied after the other) or

concurrent mixed methods research designs in which both are combined as is for example the case in the lab experiments.

The next chapter will describe the different detailed pilot activities for each specific pilot phase.

### 3 PILOT 1: OFFLINE CONTENT

#### 3.1 Pilot aim

This first pilot focuses on the creation of offline content for HMD television sets and second screens. The specific content for this first pilot is a documentary on the life of David, a young student attending a football school in Porto. The complete scenario of the documentary and the envisioned interaction between the different devices is described in Deliverable 2.4.

The pilot involves the following specific actions:

- **Iterative development and testing of a content creation toolkit (software).** This activity is in line with the specific pilot aim to provide insight *“on ways to better elaborate and distribute this new format”*.
- **Creation and testing of offline content with end-users: immersive documentary.** This allows us to focus on the *“effectiveness of the new kind of audiovisual language and in how users want to experience immersive documentary content”*.

These actions are translated in different pilot evaluation activities as discussed in the next section.

#### 3.2 Pilot activities

The following 7 pilot evaluation activities are foreseen for this first pilot.

| N°    | Activity                                                     | Timing                                        | Target group                                                                 | Location                              |
|-------|--------------------------------------------------------------|-----------------------------------------------|------------------------------------------------------------------------------|---------------------------------------|
| P1.1. | Evaluation of content creation toolkit (software evaluation) | June 15 2016<br>(1st SW release) -<br>October | Professional<br>users                                                        | VRT (Brussels)<br>Lightbox<br>(Porto) |
| P1.2. | IBC evaluation activities                                    | September 8-<br>12, 2016                      | Visitors IBC<br>Immersia TV<br>boot<br>(professional<br>users/end-<br>users) | Amsterdam                             |
| P1.3. | Pre-test of closed pilot action (lab<br>setting)             | September<br>2016                             | End-users                                                                    | Brussels                              |
| P1.4. | Closed pilot test in lab setting                             | October 2016                                  | End-users                                                                    | Brussels                              |
| P1.5. | Closed pilot test                                            | October 2016                                  | End-users/<br>professional<br>users                                          | Porto                                 |

|       |                               |                        |           |                    |
|-------|-------------------------------|------------------------|-----------|--------------------|
| P1.6. | Semi-open pilot (online test) | November-December 2016 | End-users | Brussels/<br>Porto |
| P1.7. | Open pilot (open online test) | Jan-June 2017          | End-users | Barcelona          |

Table 5: Overview of pilot 1 activities

### 3.2.1 P1.1. Evaluation of content creation toolkit with professional users

The ImmersiaTV content creation toolkit will be developed in an iterative way and intermediate professional user feedback will be incorporated in each iteration of the software. The aim of this activity is to create a software toolkit that is in line with the specific professional requirements and expectations. There will be as many iterations as needed to develop a stable version of the software that is in line with the professional user requirements.

The evaluation of the content creation toolkit will focus on the following specific questions:

- Is the developed software in line with the formulated software requirements as part of WP2 research activities?
- How can we maximize the user friendliness and satisfaction with the developed software?

#### Setting

The software will be tested by professional users at VRT and at Lightbox. They will use the software to create 360° content on their own infrastructure. A specific ImmersiaTV plug-in for Adobe is distributed to Lightbox and VRT together with a manual to install the plug-in.

For this software test, a standard video-editing environment, together with the latest version of Adobe Creative Cloud will be used. Specific details for the installation and a tutorial will be part of the release.

The evaluation will incorporate specific feedback as input for the different software iterations. Therefore, in the evaluation, the professional users will also be able to give specific feedback on the different functionalities, in order to adapt the software and add possible new requirements for the toolkit.

Also the following more generic elements will be evaluated:

- Usability or ease of use of the toolkit
- Perceived usefulness of the toolkit
- Satisfaction with the toolkit

For this user evaluation, we will make use of the USE questionnaire as developed by Lund (2001). This questionnaire consists of 30 questions focusing on usefulness, ease of use, ease of learning and satisfaction.

For the functional evaluation, we will make use of the specific requirements that were defined before the start of the creation of the toolkit and documented in D2.2. and D2.3. This list of requirements will be checked by two project collaborators and they will indicate which of the requirements are already incorporated in the main software release (v1.0). Deliverable 4.4 will report on which requirements are finally implemented in the software.

The specific software requirements not specified in the previous table are not within the scope of pilot 1.

| N°                                                           | Requirement                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Professional user requirements (From deliverable 2.2)</b> |                                                                                                                                                                                                                                                                                                                                                                           |
| R.2.1.21                                                     | Simplify the post-production workflow and minimize the required manual steps and used tools. This includes <ul style="list-style-type: none"> <li>- 2.21.1: Stitching</li> <li>- 2.21.2: Editing and compositing for 360 scenarios</li> <li>- 2.21.3: Adding interactivity and portals</li> <li>- 2.21.4: Synchronous multi-platform content (TV, HMD, tablet)</li> </ul> |
| R.2.1.22                                                     | Preview capabilities in post-production, including HMD and ImmersiaTV Player output viewing.                                                                                                                                                                                                                                                                              |
| R.2.1.23                                                     | Better findability and searchability of own produced VR content provided by a user-friendly VR app                                                                                                                                                                                                                                                                        |
| R.2.1.24                                                     | Custom developed play-out solution that supports interactivity and synchronisation scenarios.                                                                                                                                                                                                                                                                             |
| R.2.1.25                                                     | Automated way of exporting to different platforms.                                                                                                                                                                                                                                                                                                                        |
| <b>US3. Edition and Compositing (From deliverable 2.3)</b>   |                                                                                                                                                                                                                                                                                                                                                                           |
| R-EDIT-1                                                     | The content creator can visualize the raw material across the different end-user devices                                                                                                                                                                                                                                                                                  |
| R-EDIT-2                                                     | The content creator can use a standard editing software (Adobe Premiere, Final Cut, or other), and avoid, for simple projects, using advanced compositing software                                                                                                                                                                                                        |
| R-EDIT-3                                                     | In the editing software, the content creator can edit content for TV and for omnidirectional video in such a way that the timings of the content for the 2 targeted devices is visible constantly                                                                                                                                                                         |
| R-EDIT-4                                                     | The content creator can use Windows and OS X                                                                                                                                                                                                                                                                                                                              |
| R-EDIT-5                                                     | The content creator can make use of an advanced mode in a compositing software (Nuke, Adobe After Effects)                                                                                                                                                                                                                                                                |
| R-EDIT-6                                                     | The content creator can introduce interactivity within the editor timeline through <i>conditional transitions</i> between shots and scenes                                                                                                                                                                                                                                |
| R-EDIT-7                                                     | The content creator can select, within the editor timeline, which video assets are visible within the TV, the tablet and the HMD                                                                                                                                                                                                                                          |
| R-EDIT-8                                                     | The content creator can also create <i>ImmersiaTV scene typologies</i> , i.e., interaction between devices, through <i>conditional transitions</i> within the editor timeline                                                                                                                                                                                             |

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R-EDIT-9                                            | In pilot 1, the end user will experience the content with a common timing between devices (HMD, TV, tablet), it will be continuous and have no jumps                                                                                                                                                                                                                                                                                                                                                                                                                    |
| R-EDIT-10                                           | The content editor, using either a classic video editor or an advanced one, will easily define transitions between omnidirectional videos using black and white video MATTE.                                                                                                                                                                                                                                                                                                                                                                                            |
| R-EDIT-11                                           | The content editor will be able to add a <i>beauty layer</i> to the interactive transition which, unfolding synchronously with the black and white video matte, will add borders and eventually other visual content needed for the transition                                                                                                                                                                                                                                                                                                                          |
| R-EDIT-12                                           | The content creator will allow seeing omnidirectional content both in projected and non-projected views by using Previsualisation tools integrated in the content editor.                                                                                                                                                                                                                                                                                                                                                                                               |
| R-EDIT-13                                           | The content creator will be able to visualize transitions and interactive transitions will be visible within the editing software                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| R-EDIT-14                                           | The content creator will be able to visualize synchronized playout between 2 devices, for example, to see how TV and HMD content fit in timing.                                                                                                                                                                                                                                                                                                                                                                                                                         |
| R-EDIT-15                                           | An <i>export button</i> will generate a set of videos and metadata that is ready to distribute content across devices. The video exporter will have several specificities:                                                                                                                                                                                                                                                                                                                                                                                              |
| R-EDIT-16                                           | The export functionality will accept sequences involving different aspect ratios, due to differences in omnidirectional and traditional video formats (most likely solved through nested sequences).                                                                                                                                                                                                                                                                                                                                                                    |
| R-EDIT-17                                           | The common cutting points between devices will be visualized putting the content for the different devices in 2 sequences, one on top of one another.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| R-EDIT-18                                           | It will be possible to define a label specifying the destination for each sequence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| R-EDIT-19                                           | The outcome should be:<br>1) A set of videos in the highest resolution possible. The videos should have a shared timestamp. This means that the timestamp introduced at the frame level is common to all the different fluxes. For example, the first frame of a video introduced exactly at second 12 of the broadcast should have its first frame with a timestamp set at 12.<br>2) A metadata file detailing how the different videos have to be organised to compose an omnidirectional scene. This file should be compatible with broadband distribution standards |
| <b>US4. Content Playback (From deliverable 2.3)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| R-PLAY-1                                            | Basic controls. The basic controls of the player will be: <ul style="list-style-type: none"> <li>● Select media source: which is likely to be a list of available content, located in public servers.</li> <li>● Play: Starts to process the selected source.</li> </ul>                                                                                                                                                                                                                                                                                                |

|           |                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | <ul style="list-style-type: none"> <li>• Stop: Stops the current reproduction and allows you to select a content once again.</li> <li>• Select tablet or HMD mode: switch from tablet to HMD behaviour and rendering.</li> </ul>                                                                                                                                                                                    |
| R-PLAY-2  | The player will process metadata to describe and define the scene: The information regarding how the scene is composed must be distributed to the player. It must include information like which videos are visible and where are they placed or how are they composed. This data may be transmitted muxed or signaled within the stream itself, or it might be transmitted using a parallel communication channel. |
| R-PLAY-3  | The scene is device dependent. Each type of device will have to render a different scene, as the interaction with the user will be different. This implies there is a scene description for each device.                                                                                                                                                                                                            |
| R-PLAY-4  | Render multimedia content over textures and 3D objects. One or several videos will be displayed in different positions over the 3D scene (over a spherical surface, as a regular 360° video, or over plain surface in a mirror or portal like effect).                                                                                                                                                              |
| R-PLAY-5  | Apply video masks in videos. A mask is needed to overlay more than on video over the same texture forming an overlay of an arbitrary shape (i.e. to render a portal as a circle over the 360° sphere).                                                                                                                                                                                                              |
| R-PLAY-6  | Interaction management. There needs to be a systematic way to define interaction mechanisms in the end-user devices, and the methods implementing such interaction mechanisms need to be made available to the content creator.                                                                                                                                                                                     |
| R-PLAY-7  | Achieve a frame level precision: This is relevant as devices can display different omnidirectional and directional contents that were shot together, so any sort of desynchronization is going to be noticeable by the user.                                                                                                                                                                                        |
| R-PLAY-8  | The devices may need to synchronize to any base media time at start up: A device can be turned on when there is already the reproduction going on in another device, so the one joining the group must get synchronized without affecting the other ongoing reproductions.                                                                                                                                          |
| R-PLAY-9  | Basic audio control in the end-user devices                                                                                                                                                                                                                                                                                                                                                                         |
| R-PLAY-10 | Real time communication channel between devices: It will be needed to send messages from one device to another                                                                                                                                                                                                                                                                                                      |
| R-PLAY-11 | Second screen scene definition: The definition of the second screen view (mosaic layout) in the tablet must be defined within the content production process.                                                                                                                                                                                                                                                       |
| R-PLAY-12 | The end-user can capture screen casts and share them with other devices                                                                                                                                                                                                                                                                                                                                             |
| R-PLAY-13 | The end-user can capture screen casts and share them through social media                                                                                                                                                                                                                                                                                                                                           |

Table 6: Professional and software requirements for pilot 1

## Participants

A total of **12 professional users** will test the software and provide feedback in this first phase of the pilot. 6 professional users will test the software at VRT and 6 professional users will test the software at Lightbox. For VRT, 2 friendly test users with direct links to the ImmersiaTV project will evaluate the software as of June 29. Starting mid-July, four additional editors with no direct relationship to the project will participate in the testing and provide feedback. This multi-stage approach allows us to do the testing in two phases, one with a still very immature version of the software tested by friendly users, extended to other users in a second phase, when the software is in a more mature phase.

For Lightbox, 3 friendly test users will start testing from the first software release and as of mid-July, additional editors will be added to the test and provide their feedback.

All selected users will test the software releases individually and provide their individual feedback.

## Timing

The different software releases were initially scheduled every two weeks, starting June 15<sup>th</sup> 2016. However, after v0.3 it revealed necessary to delay a release due to the amount of improvements that are needed, a specific release might be delayed. After each release, feedback will be gathered and implemented in the next software release. Participants will test and evaluate each new released version of the software. The specific timing for the different releases has been scheduled as follows:

- SWR v.02: June 15
- SWR v0.3: June 29
- SWR v0.4: July 21
- SWR v0.5: August 4

After August 4, the aim will be to maintain releases every 2 weeks mainly for bug correction. Once a stable version is available, the version issued will be 1.0.

## Detailed test procedure

### Online survey

To gather the feedback of the professional users, an **online survey** will be used. A survey allows us to gather specific feedback from users in different locations. They can complete the survey immediately after testing the software, leading to more accurate feedback on their experience. The survey will be in English such that it can be used for both VRT employees as well as Lightbox employees. It will be created using Qualtrics software. An online link to the survey will be distributed with each new software release. The survey will take maximum 10-15 minutes to complete and results will immediately be available for analysis, which is a huge advantage as this allow us to integrate the feedback in each new software iteration.

The survey will consist of three parts:

- 1) User evaluation using the USE questionnaire

For the generic user evaluation, we will make use of the USE (Usefulness, Satisfaction and Ease of Use) questionnaire as developed by Lund (2001). This survey is a standardised survey specifically designed to evaluate software, hardware, services and user support materials. This survey will be used for each new iteration so we can measure the improvement in the different scales for each new software release.

## 2) Functional evaluation and validation of requirements

For the functional evaluation of the requirements, all specific features of the effect controls and of the export panel are evaluated. Respondents can score each feature and give specific feedback for improvement of each feature.

## 3) Integration in workflow and general comments

The final part of the survey focuses on the integration of the developed tools with the respondents' regular production workflow. Respondents can also provide the most positive and negative feature(s) of the ImmersiaTV Pro Extension and will be able to give additional comments if required.

The full survey can be found in Annex I.

### **Think-aloud evaluative method**

A second way of evaluating the software is an observation while editors use the software. For this observation, we will use the think aloud method as developed by Nielsen (1993). He defines thinking aloud as follows: *"In a thinking aloud test, you ask test participants to use the system while continuously thinking out loud — that is, simply verbalizing their thoughts as they move through the user interface."*

For this assessment, we will use a more mature version of the software after at least 3 iterations. Advantages of this thinking aloud method is that it is easy to conduct and facilitate and flexible. As it allows discovering more in-depth emotions and attitudes, it is complementary to the survey, which has a more quantitative nature. The disadvantages of the think aloud method are that it might appear quite unnatural for the user since he or she is not used to it and that users provide filtered statements instead of what pops up first in their mind, while this immediate unfiltered feedback is what we are looking for.

The think aloud method will be applied with two users at Lightbox and two users at VRT. They will be asked to test the software by creating and exporting a specific content fragment, while in the meantime express their thoughts and ideas. It is important that these respondents did not use the specific software plugin (nor a previous version of the software plugin), such that they can express their first thoughts and ideas while experimenting with the software. The think aloud sessions will be captured on audio for detailed analysis afterwards. The researcher will ask additional questions when required, but will avoid influencing the respondents.

### **Expected outcome**

The expected outcome of the software evaluation activities is a validated toolset that integrates well within editors' workflow, has a high-perceived usefulness and is intuitive and user friendly.

### 3.2.2 P.1.2. IBC evaluation activities

#### Setting

ImmersiaTV will make use of the EBU booth space to demonstrate the first pilot activities. More specifically there will be demos of:

- The pilot 1 documentary (if available by September)
- The software plugin for the content creation toolkit

The specific setting of the IBC demo is described in annex V.

#### Participants

Participants will be the visitors of the IBC exhibition. This will include professionals in the broad field of electronic media and entertainment and the broadcasting industry, journalists, researchers and students. Since we will not know beforehand who will attend the booth, it is not possible to apply specific selection criteria. Therefore, all booth participants will be asked to provide short feedback on their experience with the demonstrator.

#### Timing

IBC exhibition takes place between September 8 and September 12, 2016.

#### Detailed test procedure

The aim is to gather some **ad-hoc feedback** on the visitors' experience with the ImmersiaTV demonstrators. We will not be able to set up a formal evaluation procedure, but we will gather some feedback:

- 1) ImmersiaTV representatives at the booth will have an evaluation form they can informally discuss with the visitors. If required, the form can also be used digitally on a tablet. This form will include the following feedback questions:
  - Background of the visitor (function/ sector)
  - Feedback on the documentary (open feedback question)
  - Feedback on the software plug-in (open feedback question)
  - Contact details if they want to receive updates about the ImmersiaTV project
- 2) Video testimonials: Some visitors will be invited to record a brief video testimonial sharing their opinion about the ImmersiaTV project. These statements will be posted on the project website. Participants will be asked to give their consent for publication of the videos on the website.

#### Expected outcome

The expected outcome of the IBC activity is to generate interest for the ImmersiaTV project in the broader community of professionals and researchers, identification of possible synergies with other projects and services and gather some specific feedback on the project in general and on the first pilot.

### 3.2.3 P.1.3. - P1.4. Pre-test and controlled lab test

In a first phase of the end-user evaluation of the developed documentary, we will conduct a controlled lab test in Brussels (IMEC-VUB lab). The advantage of the controlled lab setting is that all participants will evaluate the documentary in the same setting with identical lighting conditions and making use of the exact same devices, which makes it easier to control the setting for the researcher and to compare the results.

The main questions that will be addressed in this controlled lab test are:

- How do users experience a multi-device synchronous immersive documentary?
- How does this type of experience fit within a social viewing context? More specifically we will focus on the difference in experience between solo- and group viewing of the documentary.

As a research methodology, we opted for a qualitative research approach (observation and a qualitative interview) combined with objective measures of the respondents' behaviour while watching the documentary. The advantage of qualitative research methods in this first phase of the pilot is that they allow the researcher to evaluate the user feedback more in-depth, exploring different motivations for the respondents' behaviour while watching the documentary. The results of this qualitative research phase will be further implemented in the semi-open test (phase 2) in which we will apply a more quantitative approach (survey). The research findings of this first phase will enable us to design a more detailed survey with more accurate answering categories. This way we can ensure an iterative research approach.

Before the actual lab test, a pre-test of the lab set-up, observation protocol and interview topic list will take place with 5 users. After this pre-test, the set-up and topic list will be further refined and the actual controlled lab test will take place.

#### Setting

The visual quality lab at IMEC-VUB in Brussels will be used as a setting for the controlled lab test.



Figure 3: Lab setting IMEC-VUB, Brussels

The specific equipment we will use for the test is:

- TV-set Panasonic TX-65AX800E 4K TV screen (65 inch) 2 HMD devices (Samsung Gear VR)
- 2 tablets (android)
- Camera for video and audio recording while respondents watch the documentary and for the interview afterwards.

## Participants

### *Recruitment*

For the pilot activities in Belgium, we will make use of two user panels: VRT's *De Proeftuin (living lab)* panel and the IMEC living lab panel. Besides these two panels, we can also make use of the student population of the Vrije Universiteit Brussel, as the IMEC Brussels offices are located on campus.

#### 1) VRT De Proeftuin panel

VRT's De Proeftuin panel consists of 980 Flemish participants who registered for previous VRT research activities. There is an almost equal spread male/female. There is also a good representation of the different age categories. About 70% owns a smartphone, about half of them are Apple iOS users the other half owns an Android phone. This panel can be accessed by dedicated communication via e-mail, VRT websites/social networks and telephone.

#### 2) IMEC living lab panel

The IMEC living lab panel is a panel of over 5000 Flemish participants that agreed to be contacted for research purposes. This panel can be accessed based on specific user criteria (for example socio-demographical factors, smartphone ownership, tablet ownership, viewing behavior etc.). A dedicated call for participation can be done via e-mail and social networks.

### *Number and sampling of participants*

A total number of **30 test-users** will be invited to watch the documentary in a lab setting that is organized as a living room setting, including couches and a TV-set. We foresee a mix of individual versus group viewing in order to gather feedback on both scenarios.

- 10 users will watch the documentary individually.
- 20 test users will watch the documentary in groups of 2 (10 x 2 users). It is important that these individuals know each other when they participate in the test, as we want to mimic a real social experience in which people watch video content together.

Selection criteria include:

- gender balance (mix male/female)
- mix in age categories
- smartphone and/or tablet ownership and usage
- Good knowledge of English (or Portuguese)

## Timing

The test set-up will be prepared in week 3-7/10, immediately followed by the pre-test in the same week. The controlled lab-tests will take place in week 10-14/10 and 17-21/10.

The test procedure will consist of a combination of observations while people are watching the documentary, objective measures and a qualitative interview immediately after the experience. The questionnaire for the interview will include questions about the overall experience as well as more detailed questions to check the end-user requirements as defined in D2.1. Each lab test will take approximately 1 hour:

- Briefing + informed consent: +- 7 minutes
- Drop-off questionnaire: +- 8 minutes
- Documentary + observation: +-15 minutes
- Qualitative interview: +- 30 minutes

We foresee a total of **20 sessions**: 10 individual sessions, 10 sessions in pairs.

## Detailed test procedure

### 1) Briefing + Informed consent

Participants will receive a short briefing about the study and will sign an informed consent explaining the aim of the study, ethical procedure (right to withdraw from study, use of audio and video recordings, privacy/anonymity of data) and the incentive.

### 2) Drop-off questionnaire

Participants will complete a drop-off questionnaire. This drop-off questionnaire includes information on:

- Socio-demographics:
  - o name (will be made anonymous)
  - o gender
  - o year of birth
  - o education
  - o profession
  - o household composition
- Viewing behaviour:
  - o average hour of TV-viewing on a day in the week/day in the weekend
  - o most common way to watch television (alone, with family members, with others)
  - o number of TV-sets
  - o possession of: GSM, smartphone, tablet, DVD-player, DVD-recorder, Blu-ray player, game console, mediacenter, home theatre PC
  - o interactive digital TV subscription
  - o Previous experience with VR? If yes, which one?

### 3) Multi-device viewing of documentary

#### *Scenario - Respondents watch the documentary*

Based on the outcome of the pre-test, we will select one of the following scenarios for the test:

- Scenario A: **free usage**: Respondents **watch** the documentary and they can **freely** decide which devices they would like to use during viewing. The advantage of letting people choose how they consume the documentary is that we will be able to observe the natural flow of the usage and can see what triggers the users to switch devices or to explore certain aspects of the content more in-depth. The disadvantage is that it is possible that users will not make use of all the devices to watch the documentary and/or will miss certain cues (for example portals) on which we aim to get feedback during the trial.
- Scenario B: **directed usage**: Respondents are asked to watch the documentary, while making use of the different available devices (television, tablet and HMD). They are asked to use each device at least once during the documentary.
- Scenario C: **directed group usage**: in group viewing (2 respondents), we could have a scenario in which we give a main device to each person on which they watch the majority of the documentary. For example, one respondent starts watching on the tablet, the other respondent on the HMD.

#### *Observation while watching the documentary*

The researcher **observes** how the individual respondents or teams of respondents watch the documentary, following the observation protocol (see annex II). The observation will focus on:

- Usage of different devices (when do users switch to another device?)
- Body and head movement (do they sit down/stand up? Head movement or not?)
- Feedback (do they say anything when watching the content)
- Social interaction (do they talk with others while watching the documentary? What do they say? What different devices do they use?)

#### *Objective measures*

Objective measures are tracked during the lab test, as mentioned in 7.4.1. and include:

- switching viewing angle on different devices
- use of different devices
- use of portals

Part of these objective measures will be immediately available for analysis and further discussion during the qualitative interview.

### 4) End-user evaluation via qualitative interview

A **Qualitative interview** will take place immediately after the viewing experience. For the respondents that watched in pairs, the interview will be a duo-interview.

The interview will be a **semi-structured qualitative interview**. This means that in this topic list, we provide a guideline with a list of topics to be discussed in the interviews along with possible interview questions. In qualitative research the aim is to gather more in-depth information about respondent's thoughts and feelings. Follow-up questions on the different answers are extremely important. This topic list is therefore a starting point for the interview, but does not contain the full list of interview questions that will eventually be discussed in each interview.

In the **topic list**, we will refer to the different end-user requirements as listed in D.2.1. End-user requirements. We will refer to the number of the specific requirement (for example R1.1.) as can be found in the overview in D2.1. pg. 30-32. The detailed topic list can be found in annex II.

The following topics are included:

- Topic 1. Overall user experience
- Topic 2. Multi-device usage
- Topic 3. Usability
- Topic 4. Interaction + level of control
- Topic 5. Content
- Topic 6. Social viewing
- Topic 7. Future expectations

The topic list will be further refined after the pre-testing phase.

### **Expected outcome**

The expected outcome of this closed lab-test is detailed insights in user experience and user attitude towards the setting of the documentary. By the combination of logging, observation and qualitative interviews, an in-depth analysis of the user practices, user expectations and social aspects can be acquired. The results will be used as input for the next iteration with the content as described in pilot activity P.1.5. Closed pilot test Porto.

### **3.2.4 P.1.5. Closed Pilot test (Porto)**

A second closed pilot test will be organised in Porto, in close cooperation with the University of Porto and Lightbox. This closed pilot test activity will involve Portuguese professional users and end-users. Specific research questions that will be addressed in this closed pilot are:

- How do non-experienced professional users (students) are able to understand and use the developed software toolkit?
- How do native Portuguese end-users experience and evaluate the multi-device synchronous immersive documentary?

### **Setting**

The focus of this closed pilot test activity is twofold:

### 1) Evaluation of the software with students of the University of Porto

The developed software toolkit will be evaluated with students of the arts and design department. They will participate in a workshop organised at the University of Porto in which they learn how to use the software and will be able to experiment with the software and provide their feedback afterwards.

### 2) Evaluation of the documentary with selected end-users

The evaluation of the documentary with selected end-users offers an enormous advantage, since the documentary will be shot in Portuguese and these end-users will be able to watch the documentary in their native language.

The specific evaluation activities will take place at the University of Porto. For the evaluation of the software, a classroom/computer room will be used. For the end-user evaluation we will make use of a living room setting.

A similar set-up as for the lab-test in Brussels will be used, including:

- TV-set
- 2 HMD devices (Samsung Gear VR)
- 2 tablets (android)
- Camera for video and audio recording while respondents watch the documentary and for the interview afterwards.

## Timing

The workshop and evaluation activities will take place end of October, the dates are still to be decided.

## Participants

Participants will be recruited via the university (students and staff) as well as via Lightbox. The software evaluation is open for all students of the arts and design department. They will be able to register via an online form. For the professional workshop, we aim to include at least 10 participants.

For the end-user evaluation of the documentary, users will be recruited via the university communication channels and via Lightbox. An online call for participation with a link to a registration form will be created for distribution. We aim for at least 20 participants for this test.

## Detailed test procedure

### 1) Software evaluation

For the software evaluation, students will participate in a tutorial workshop. At the end of the workshop, feedback will be gathered via a group discussion in which all participants can share their opinion. After the workshop students will have the option to test the software in a specific project themselves. For the students that will engage in this activity, a separate feedback interview applying the think aloud method as described above will be conducted.

## 2) End-user evaluation

For the end-user evaluation, we will apply a similar test procedure as in the Brussels closed test (see P1.4., pg. 22-24). The specific outcome of the first test in the Brussels lab setting will be integrated in this iteration of the evaluation. This means that both the documentary and the evaluation material can be refined based on the results of the previous trial phase.

### Expected outcome

The expected outcome of this specific test in Porto is twofold: insight in how non-professional users evaluate the developed software and insight in how native Portuguese users evaluate the immersive multi- device documentary.

### 3.2.5 P.1.6. Semi-open test (Brussels/Portugal/Barcelona)

In a second phase of the end-user evaluation of pilot 1, a semi-open test will be planned in which selected viewers can watch the documentary in their own home setting.

This test will have two main aims:

- 1) Technical test to test the performance of the system when multiple users access the content.
- 2) User feedback: this test will allow us to gather feedback of respondents that consume the content in their natural setting, making use of their own devices.

The specific research questions for the semi-open test can be formulated as follows:

- How robust is the system when multiple users download the application at the same time?
- How do end-users evaluate an immersive multi-device experience in their home?
- How does the immersive experience fit within the regular viewing activities of users?

In this phase we will monitor the system and make use of an online survey in which selected users can provide their feedback. An online survey will be created, making use of the input of the qualitative research results in phase 1.

### Setting

Selected users will be invited to download an app via which they can watch the documentary at home. The online set-up will be installed by i2cat. A dedicated website will be developed with explanation of the test set-up and download procedures in three different languages. Invited users will receive a unique download link so we can track the number of downloads in each country. An online survey will be developed by IMEC in Dutch and English and translated in the different languages. The survey will automatically open at the end of the documentary.

A limiting factor is that it might be difficult to recruit users who already have a HMD, limiting the multi-device usage to television in combination with a tablet.

### Participants

A selected number of users will be invited to participate in the test and receive a link to the content and to the online survey. For Belgium, respondents will be recruited via the VRT De Proeftuin panel (980 members) and the IMEC panel (5000 members). For Portugal, respondents

will be recruited via Lightbox contact lists (>100). For Barcelona, a panel of testers will be recruited through a set of dedicated contact pipelines (>100).

Our aim is to have a total of at least 50 respondents downloading the app and completing the online feedback survey.

### **Timing**

The semi-open test will take place in December, after a successful completion of the lab test.

### **Detailed test procedure**

- 1) The user installs the ImmersiaTV app on his devices
- 2) The user fills in a pre-experimental questionnaire on a website and obtains a token.
- 3) With the token he can access the content
- 4) Multi-device viewing of documentary

Respondents will be able to watch the documentary on their own devices. They will receive a brief instruction on the documentary explaining the aim and scope and give their consent to use their feedback for the project (digital consent that they agree with the terms of the research).

- 5) Online survey

Immediately after they have watched the documentary, an online survey will open in the app, displaying a limited number of questions. The online survey will take maximum 10 minutes of the respondents' time.

The survey questions will include a short socio-demographic profile and feedback on the usability, the content, multi-device experience, social viewing and future expectations. We will make use of Likert scales and closed answers for the survey, to ensure a fluent evaluation procedure.

A first draft of the survey can be found in annex IV. It will be further elaborated after the closed lab test, as the research results of these first phases can be used as input for the survey, as part of the mixed method research approach (see supra).

### **Expected outcome**

The expected outcome of this semi-open test is a technical evaluation of the robustness of the system and insights in how different user profiles evaluate this documentary in their own natural environment (living room), the multi-device usage and the integration of the immersive TV experience in the current viewing practices of users.

## **3.2.6 P.1.7. Open pilot test**

A final activity within the first pilot is the actual open pilot test. This is also referred to as the proof-of-concept test. In this phase of the research, the documentary is placed online and publicly available for downloading and viewing. All project partners will promote this via the different available communication channels (website, social media, press releases etc.).

The aim of this open pilot test is to show the developed documentary to the wider audience and gather feedback on the user experience.

## **Setting**

The open pilot test will have the same set-up as the semi-open pilot test. The number of downloads will be logged and a brief online survey will be made available for users to fill in after finishing the documentary.

## **Participants**

The trial will be open for all interested users. Everyone with the necessary equipment can download and view the documentary. Hence, there will be no specific recruitment criteria, but a short socio-demographic profile will be part of the evaluation survey, so we can create a profile of the involved users. Our aim is to reach at least 200 users.

Participants will be recruited in the different countries where the project partners are active, including Belgium, Portugal, Spain, Switzerland, France and Poland. All project partners will promote the open pilot via their different available communication channels (website, social media, newsletters, ...). The open pilot will also be promoted in other dissemination events (for example the ACM TVX conference in 2017).

## **Detailed test procedure**

The detailed test-procedure will be similar to the semi-open test procedure, including the installation of the application, the multi-device viewing of the documentary on viewer's own devices and the evaluation via an online survey.

## **Expected outcome**

The expected outcome of the open pilot is a large distribution of the developed content and an open feedback module in which users can provide their feedback.

## 4 PILOT 2: LIVE CONTENT

### 4.1 Pilot aim

While the focus of the first pilot was on the offline production scenario (the FC Porto Football documentary), the focus of the second pilot is on a live production scenario (live sports event). More specifically, a Belgian cyclo-cross event was selected as a case study for this second pilot phase.

Cyclo-cross uses a looped track, which allows for fixed omnidirectional camera positions at the most spectacular points on the track. Further, cyclo-cross was selected because of the proximity of the athletes to the spectators, and 360 video gives the opportunity for viewers at home to feel like they are one of the spectators. This pilot is coordinated by VRT, with many years of experience in the directing and broadcasting of cyclo-cross events.



Figure 4: Mock-up interface for live HMD experience cyclo-cross



Figure 5: Portal showing head of the race (tv) content

The pilot involves the following specific actions:

- Testing of live director's tool for omnidirectional audio and video with professional users: this will give first insights in what works and what doesn't with regards to user experience, basic interaction and storytelling is concerned
- Testing of how the real-time production workflow integrates within the existing traditional workflows of professional users.
- End-user evaluation of the live broadcast scenario: how do users experience the multi-device omnidirectional set-up for a live broadcast? How do they evaluate the interaction and storytelling? What is their quality of experience?

The focus of pilot 2 is on the director's view only. End-user interaction (e.g. choosing viewpoints) is only foreseen for pilot 3.

These actions are translated in different pilot evaluation activities as discussed in the next section.

## 4.2 Pilot activities

The following four pilot evaluation activities are foreseen for this pilot:

| N°    | Activity                                  | Timing                     | Target group                     | Location      |
|-------|-------------------------------------------|----------------------------|----------------------------------|---------------|
| P2.1. | Evaluation of the live director's toolkit | March-July 2017            | Professional users               | VRT, Brussels |
| P2.2  | Closed pilot test                         | Oct-Nov 2017               | End-users/<br>professional users | Belgium       |
| P2.3  | Semi-open pilot test                      | Dec 2017 –<br>January 2018 | End-users                        | Belgium       |
| P2.4  | Open pilot test                           | February 2018              | End-users                        | Belgium       |

Table 7: Overview of pilot 2 activities

### 4.2.1 P2.1 Evaluation of the director's toolkit

The aim of this pilot activity is to further iterate upon the developed software toolkit and to make sure that the software is in line with the professional user requirements. Whereas the focus of the professional evaluation of the software development toolkit in pilot 1 was on post-production and the evaluation of the ImmersiaTV plug-in for Adobe, the focus in pilot 2 is on the live-production features.

The live toolkit is developed by Cinegy. The developed toolkit will have the following features:

- Several omnidirectional sources
- Several directional sources
- Directors choice view only (changes are controlled by the Live Production operator)
- Scene with at least one portal (for example, traditional TV output)
- Additional viewpoints markers (camera icons or previews) highlighting the active camera

- The operator should be able to change the main scene video (background sphere) to the new source, the corresponding camera icon should be also changed (highlighted)
- The operator should be able to change portals source, visibility and positions

Focus will be placed upon the following research questions:

- Is the developed software in line with the formulated software and professional requirements as part of WP2 research activities?
- How do professional users evaluate the live production tools in terms of usability, usefulness and satisfaction?
- How do professional users evaluate the added value and complementarity of live 360° editing when compared to traditional live editing?

## Setting

For the development and testing of the director's toolkit, three phase of testing with professional users are foreseen. First the software will be iteratively developed and tested by professional users with a direct link to the ImmersiaTV project. In a second phase, once a stable version of the software is released, professional editors with no direct link to the ImmersiaTV project will test the software in an offline simulation of a live scenario by having live streams recorded and prepared for re-broadcast. In the third phase, professional editors will test the software in a real live scenario.

For the software development by Cinegy, an iterative approach is applied. 4 to 6 software drops are foreseen. For each software drop, 2 weeks are planned for intermediate testing and feedback. Each iteration will incorporate specific feedback given by professional users on the different functionalities.

On March 16, **drop#1** was made available on FTP (/releases/Cinegy). The following features are included:

- Initial Live Production Tools graphical user interface for evaluation and feedback;
- Real-time preview for file based sources (simulation for live sources);
- Configurable portals (parameters, visibility);
- Preview of the main scene video source;
- Ability to change main scene video source with defined transition;
- Ability to toggle portals visibility;
- Recording of the Director's actions into ImmersiaTV scene description file.

**Drop#2** should be available at the end of March and introduce the following functionality:

- Live RTP streams preview (simulation for live RTMP sources);
- Ability to show/hide portals with defined start/end transitions;
- Prepared offline content package for live simulation.

**Drop#3** should be available mid-April and introduce the local preview of the changes made in Live Production Tools GUI in local ImmersiaTV player based on RTSP streaming.

**Drop #4** should be available at the end of April and include RTMP streams support with explicit sources sync.

The development cycle will use 2 week periods to provide new version of the software for tests and feedback. The majority of requirements defined in D2.2 and D2.3 should be covered within Drop#4 and Drop#5. Next software releases are targeted for optimizations and stabilization based on the received feedback.

At Cinegy tests are done with Vahana VR generated sources for tests of RTMP streams handling. VRT will test the live production tools with real Oras 4i cameras starting with drop#3. The software will be used to create 360° content on their own infrastructure.

For the functional evaluation, we will make use of the specific requirements that were defined before the start of the creation of the toolkit and documented in D2.2. and D2.3.

An overview of the different related requirements from D2.2. and D2.3. is listed below, and it will be completed as soon as a stable release is issued. It will be indicated in deliverable 4.4 which of the requirements are implemented in the main software release. Once a stable version is available, the version issued will be 2.0.

The specific software requirements not specified in the previous table are not within the scope of pilot 2.

| N°                                                              | Requirement                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Professional user requirements (From deliverable 2.2)</b>    |                                                                                                                                                                                                                                                                                                                                                                                                                       |
| R.2.2.2                                                         | Synchronisation is key.<br>When streaming content on multiple devices, the issue of latency has to be taken into account.                                                                                                                                                                                                                                                                                             |
| R.2.2.7                                                         | The director can preconfigure scene compositions for the HMD experiences, (ideally) starting from existing templates.                                                                                                                                                                                                                                                                                                 |
| R.2.2.9                                                         | The director must have a clear view of all incoming sources.                                                                                                                                                                                                                                                                                                                                                          |
| R.2.2.10                                                        | The director must have the ability to measure the different camera delays and synchronize between the different 360 video cameras.                                                                                                                                                                                                                                                                                    |
| R.2.2.11                                                        | The director can perform a live preview of the interactive HMD experience.                                                                                                                                                                                                                                                                                                                                            |
| R.2.2.12                                                        | The director can select, initiate and change scene compositions for the HMD interface: removing icons, change camera source, ...                                                                                                                                                                                                                                                                                      |
| R.2.2.13                                                        | The director can make cuts or transitions between different sources, both directive and omnidirectional streams.                                                                                                                                                                                                                                                                                                      |
| R.2.2.14                                                        | The director can see a live preview of 360 scenes before putting an updated version on air.                                                                                                                                                                                                                                                                                                                           |
| <b>Live production tool requirements (From deliverable 2.3)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                       |
| R-PROD-1                                                        | Ingest: the possible sources include streams from omnidirectional cameras, streams from directive cameras, and optionally video files. <ul style="list-style-type: none"> <li>• HD SDI signals to be converted to RTMP</li> <li>• Compatibility with VahanaVR and Oras4i RTMP streams</li> <li>• RESTful API to control the Studio.One camera</li> <li>• Configurable number of sources (RTP, RTMP, files)</li> </ul> |

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | <ul style="list-style-type: none"> <li>RTMP to RTP (Cinegy Live format) and RTSP (live preview) rewrapping support</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| R-PROD-2 | Synchronisation of streams (Cinegy Transport): configurable service that lists the RTMP streams to be processed and specifies the required delay.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| R-PROD-3 | <p>Live content edition (Cinegy Live): the live production operator workstation will have Cinegy Live VR application running that is Windows OS-based and provides the following functionality:</p> <ul style="list-style-type: none"> <li>Sources: display of all incoming streams</li> <li>Preset 360 scene composition: One or more preconfigured 360 scene compositions. The operator can at least: <ul style="list-style-type: none"> <li>define a set of graphical icons and portals in the scene</li> <li>select portions of omnidirectional and directive video for use in portals</li> <li>assign position, size, shape and user/world reference of the insert</li> <li>assign input streams to graphical icons representing cameras</li> <li>define user interaction patterns e.g. switch from one scene composition to another one, triggered by user input</li> <li>Scene changes: the director can define required scene changes which activates an automatic scene update action</li> <li>Transitions: the director can activate a transition between omnidirectional and/or directive streams. A set of quick access scene transitions is available.</li> <li>Live Preview: the director can locally preview scene modifications in real-time (or sufficiently low latency).</li> <li>Content for second screen (tablet): the director can preconfigure and change the second screen experience</li> <li>Mixing TV audio and omnidirectional audio into a stereo stream (pilot 3).</li> </ul> </li> </ul> |
| R-PROD-5 | <p>Distribution: collection and packaging of all streams and metadata to send towards MPEG-DASH streaming server that</p> <ul style="list-style-type: none"> <li>accepts RTMP streams as live sources</li> <li>supports MPEG-DASH events mechanism</li> <li>allows scene profile modifications and scene updates</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

Table 8: : Professional and software requirements for pilot 2

## Timing

Different software releases are scheduled. After each release, feedback will be gathered and implemented in the next software release. The goal is to have first feature full stable version in April 2017.

During the course of May-June-July, the second and third test phases will be organized in which the software will be tested in offline simulation of a live scenario and in a real live scenario. It is

not yet possible to give an exact timing of the second and third test phase, as we are dependent here on the agenda of the professional users at VRT (for phase 2) and on the possibility of testing the software at a live event (most likely a summer festival) and the date of that event (for phase 3).

## Participants

The software will be tested by professional users (directors) at VRT and Cinegy.

The first software releases will be tested by researchers with professional director skills at VRT and Cinegy with a direct link to the ImmersiaTV project.

Once a stable version of the software with a wide variety of features is released, professional directors and/or technical directors at VRT with no direct link to the ImmersiaTV project will be asked to test the software.

All selected users will test the software releases individually and provide their individual feedback.

## Detailed test procedure

Three phases are foreseen during which the software will be tested.

- **Phase 1:** The first phase is the software development phase, where an iterative approach is applied. Professional users with a direct link to the ImmersiaTV will test and evaluate the software after each software drop. They will do a technical evaluation of the software and ensure that the requirements are implemented as requested.
- **Phase 2:** Once a stable version of the software is released, professional directors and/or technical directors with no direct link to the ImmersiaTV project will test the software in an offline simulation of a live scenario by having live streams recorded and prepared for re-broadcast. Such a test procedure enables to replicate and repeat at any moment not depending on actual cameras availability. Live packages from available sources (e.g. Gouden K from VRT, MULTICAM\_PROJECT from Lightbox) will be prepared for this purpose.
- **Phase 3:** In the last phase, professional directors at VRT with no direct link to ImmersiaTV will test the software in a real live scenario. VRT will search for a live event where testing can take place. This will most likely be a summer festival in Belgium.

For phase 1, professional users will be asked to send feedback via a short online **survey** in which they will be asked to give specific feedback on the different functionalities. A first draft of the survey can be found in Annex VI. A survey allows us to gather specific feedback from users in different locations. They can complete the survey immediately after testing the software, leading to more accurate feedback on their experience. The survey will be in English such that it can be used for both VRT employees as well as Cinegy employees. It will be created using Qualtrics software. An online link to the survey will be distributed with each new software release. For the generic user evaluation of the software we will make use of the USE (Usefulness, Satisfaction and Ease of Use) questionnaire as developed by Lund (2001). This survey is a standardised survey specifically designed to evaluate software, hardware, services and user support materials. This survey will be used for each new iteration so we can measure the improvement in the different scales for each new software release. Respondents will be able to give additional comments and feedback in the survey as well if required.

For phase 2 and 3, the feedback of the professional users will be gathered by means of observation and an interview.

- **Observation:** The professional users will test the software in the presence of an IMEC researcher, so they can immediately explain and evaluate their interaction with the software. The participants will be asked to continuously 'think out loud' or say their thoughts while using the software and its basic functionalities (= Think-aloud evaluative method, see P1.1). The researcher will ask additional questions about the actions of the professional users when required.
- **Interview:** After the using the software, additional questions will be asked to the professional users to get a clear view on their positive and negative experiences with the software.

The think aloud sessions and interview will be captured on audio for detailed analysis afterwards. A first draft of the observation protocol and the topic list of the qualitative interview can be found in Annex VII and Annex VIII.

### Expected outcome

The expected outcome of the software evaluation activities is a validated toolset that integrates well within directors' workflow, has a high-perceived usefulness and is intuitive and user friendly.

## 4.2.2 P2.2 Closed pilot test

A closed pilot test will be organized at a cyclo-cross event in Belgium, in close cooperation with VRT. In this closed pilot, Belgian end-users and professional users will be involved for the testing. The goal of this closed pilot is to explore the following:

- How do end-users experience and evaluate live viewing of a cyclo-cross event in a multi-device immersive setting?
- How does the (technical) director experience the production toolkit in a live scenario? How different is the workflow from a traditional workflow where the user has no immersive viewing experience?
- What is the performance of the live production tools in the field? Are there any deployment and setup difficulties? What about the live operation stability and delivery of the content?

### Setting

For technical reasons, the evaluation activities will take place at the location where the cyclo-cross event takes place. For the end-user tests, a room will be set up in close proximity to the cyclo-cross race. A living-room setting will be created in the room, including at least:

- 1 or 2 TV-sets
- 2 HMD devices (Samsung Gear VR)
- 2 tablets (android)
- Camera for video and audio recording while respondents watch the documentary

There will not be one HMD device and the tablets for each test participant. The participants will be asked to regularly pass these devices to another participant.

### Timing

The cyclo-cross seasons is at its first peak in Belgium in October and November. The evaluation activities will therefore be organized in October or November 2017. The specific cyclo-cross event for the testing still has to be selected, so the date has not been decided yet.

## Participants

People with an interest in cyclo-cross will be selected to participate in the study as an end-user. They will be recruited via personal networks, via the VRT De Proeftuin panel (980 members) and the IMEC Living Labs panel (5000 members). They will be able to register via an online form. We will recruit 20 participants. We aim to have a mix in socio-demographics characteristics among the study participants (gender, age, profession).

## Detailed test procedure

### *End-user evaluation:*

As a cyclo-cross event usually lasts around 60 minutes, we only have 60 minutes to organize the tests. To not have 20 participants simultaneously in the room for testing, they will be divided into three groups. Each group will be given a timeslot in advance, and will be able to watch the event for 15 minutes in a multi-device set-up. In between the testing period of each group, 5 minutes are open to give the new participants the time to install themselves in the room. Right before the start of the cycling event, all three groups will be asked to attend a short briefing in the test room. They will be explained the aim and scope of the study and instructions will be given on how they can watch the event using the different devices in the room. During this briefing, the participants will also be asked to sign an informed consent in which they agree with the terms of the research. Table 9 gives an overview of the test process:

| Times             | Test group          |
|-------------------|---------------------|
| Before start race | Briefing experiment |
| Min. 1-15         | Test group 1        |
| Min. 16-20        | Arrival new group   |
| Min. 21-35        | Test group 2        |
| Min. 36-40        | Arrival new group   |
| Min. 41-55        | Test group 3        |
| Min. 56 – 70      | /                   |

Table 9: Overview end-user evaluation closed pilot

During the tests, an IMEC researcher will be present and observe how the respondents watch the live video and how they interact. The researcher will follow an **observation protocol** and write down:

- Usage of different devices (What devices do they use? When do users switch to another device?)
- Feedback (Do they say anything when watching the content?)
- Social interaction (Do they talk with others while watching the content? What do they say? What different devices do they use?)

A first draft of the observation protocol can be found in Annex IX.

Right after the testing, each participant will fill in a short **survey** in which they will be asked to evaluate the viewing experience on the different devices. The survey will also ask for

demographic information, previous experience with VR and interest in cyclo-cross. A first draft of the survey can be found in Annex X.

*Professional user evaluation:*

After the cyclo-cross event, an interview will take place with the director. He/she will be asked about his/her experience with the toolkit: has he/she taken different decisions knowing that end-users can watch the event in 360°? How different is the workflow compared to a traditional workflow? How does he/she evaluate the toolkit in terms of usefulness and usability?

A first draft of the topic list for the interview can be found in Annex XI.

### **Expected outcome**

This test will give us a detailed insight into how sports fans experience the immersive multi-device viewing of a sports event in a live setting, and on how this changes the live production workflow of a professional user.

## **4.2.3 P2.3 Semi-open pilot test**

Following the closed tests which will take place in real-time during the cyclo-cross event, a semi-open test will be planned in which selected viewers in Belgium can watch part of the same cyclo-cross event in their own home setting. Contrary to the closed pilot test, this test will not take place live during the cyclo-cross event. A live test setting will be simulated. An offline simulation of the live scenario tests will be created by having live streams recorded and prepared for re-broadcast. A 'live package' will be prepared from the cyclo-cross content sources by Cinegy. To make the simulation close to the real event, content recorded from several cameras simultaneously from both 360° and traditional camera is necessary.

The goal of this open pilot test is to explore the following:

- How do end-users experience and evaluate the viewing of a cyclo-cross event in a multi-device immersive setting, in their home environment and making use of their own devices?
- What is the performance of the system for live content distribution to the client in the real long-range environment – i.e. via Internet? Assessment of scalability potential of the delivery module.

### **Setting**

Since in the semi-open pilot test users will see an offline simulation of a live scenario, possible human errors during the live production that may affect the viewing experience will be removed. The respondents will see a 'flawless' live package, which allows to fully focus on the multi-device immersive end-user experience.

Selected users will be invited to download an app via which they can watch the content at home. The online test set-up will be similar to the one in semi-open test in pilot 1. A clear explanation of the test set-up will be provided and the download procedures will be provided in at least one language (Dutch). Invited users will receive a unique download link so we can track the number of downloads. The test users will be able to give their feedback in an online survey they will be asked to fill in after the testing.

## Participants

A selected number of users in Belgium will be invited to participate in the test and receive a link to the content and to the online survey. The participants will be recruited via personal networks, via the VRT De Proeftuin panel (980 members) and the IMEC panel (5000 members). They will be able to register via an online form. We aim to recruit 40 participants and have a mix in socio-demographics characteristics among the study participants (gender, age).

During the recruitment, we will also address people with an already existing interest in cyclo-cross or sports in general. We aim to recruit some respondents who sometimes go and view a cyclo-cross event at location, because they already know the live experience and we want to compare this with the cyclo-cross VR experience.

A requirement for participation is that the users have a HMD or cardboard Virtual Reality goggles, a computer and a TV at home. If necessary, a limited amount of test users loan a HMD from IMEC or VRT for testing.

## Timing

The semi-open test will take place in December 2017 – January 2018, after a successful completion of the closed test.

## Detailed test procedure

The participants will be asked to view the content in their home environment and with their own devices. A fragment of about 15 minutes of the cyclo-cross event will be selected for the test. The next steps have to be followed by the participants:

- 1) Signing of digital consent that they agree with the terms of the research
- 2) The user installs the ImmersiaTV app on his devices
- 3) The user fills in a pre-experimental questionnaire on a website and obtains a token.
- 4) With the token he can access the content
- 5) Multi-device viewing of content
- 6) Online survey

An online survey will be created in Dutch by IMEC. The participants will be asked to fill in the survey right after watching the content. The survey questions will include a short socio-demographic profile and feedback on the viewing setting, usability, the content, the multi-device experience, social viewing and future expectations. We will make use of Likert scales and closed answers for the survey, to ensure a fluent evaluation procedure. We make use of the System Usability Scale (SUS) (Brooke, 2016), the users engagement scale (O'brian and Toms, 2010) and the differential emotions scale (Izard, 1991). Filling in the survey will take maximum 10 minutes of the respondents' time.

A first draft of the survey can be found in annex XII. It will be further elaborated after the closed pilot test, as the research results can be used as input for the survey.

## Expected outcome

This test will give us a detailed insight into how sports fans experience the immersive multi-device viewing of a sports event in a simulated live setting in their home-environment.

#### **4.2.4 P2.4 Open pilot test**

The final activity within the second pilot is the open pilot test, or the ‘proof-of-concept’ test. Similar to the open test in pilot 1, the video content is placed online and publicly available for downloading and viewing. Viewers can watch the offline simulation the ‘live package’ of the cyclo-cross event at home with their own devices. Open testing will be promoted via the different available communication channels (website, social media, press releases etc.).

The aim of this open pilot test is to show the developed content to the wider audience and gather feedback on the user experience.

##### **Setting**

The open pilot test will have the same set-up as the semi-open pilot test. The number of downloads will be logged and a brief online survey will be made available for users to fill in after finishing the documentary.

##### **Timing**

The open test will take place in February 2018, after a successful completion of the closed test.

##### **Participants**

The trial will be open for all interested users. Everyone with the necessary equipment can download and view the documentary. Hence, there will be no specific recruitment criteria, but a short socio-demographic profile will be part of the evaluation survey, so we can create a profile of the involved users. The aim is to reach at least 200 users. The participants will be recruited via VRT channels (website, newsletter, social media), via the VRT De Proeftuin panel (980 members) and the IMEC panel (5000 members).

##### **Detailed test procedure**

The detailed test-procedure will be similar to the semi-open test procedure, including the installation of the application, the multi-device viewing of the documentary on viewer’s own devices and the evaluation via an online survey.

##### **Expected outcome**

The expected outcome of the open pilot is a large distribution of the developed content and an open feedback module in which users can provide their feedback.

## 5 PILOT 3: OFFLINE CONTENT

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### 5.1 Pilot aim

In the first pilot, offline content for television, HMD and second screens was created for the specific offline scenario of a documentary on a football school in Porto. In this third pilot with focus on the offline scenario, we will build further on this gathered knowledge about the production of offline immersive content. In this new offline scenario, the aim is to create a more enriching and interactive experience within the storyline. This is completely in line with lessons learned on user expectations and experiences during this project as well as with regard to the technical challenges on creating an optimal immersive experience. The main feature in this scenario, will be the introduction of the “exploration mode”, in which the user can freely explore the content on the different devices (TV, HMD, tablet). The narrative for this new content scenario is an interactive mystery narrative (a ‘whodunnit’). The viewer will be challenged to look for clues in the immersive content, to solve the mystery that is unfolding on the tv-screen:

*Mr. Ample is found dead in his study by his housemaid in the morning. Scotland Yard’s dynamic duo - Inspector Eugene Legrand and Dr. Richard Walnut are called to the scene in order to unravel this mystery. Murder or accident?*

In contrast with the broadcast mode that was applied in pilot 1 (in which the content on the HMD and tablet was displayed synchronously), in exploration mode the TV scenes are decoupled from the HMD/tablet scenes in time, i.e. they do not overlap. The exploration mode is activated by breaking out from the main TV storyline to the second screen devices. Each device (TV, HMD, tablet) has its own dedicated function in the overall experience. The TV displays the main thread of the movie and leads users across the interactive story, the HMD enables viewers to look around in an (interactive) 360° scene and select objects and finally the tablet allows viewers to examine objects selected in the scenes watched in HMD. While the exploration mode is on, 3 different options of TV experience can be considered: a looped video clip or cropped video of the omnidirectional scene, a static image giving a wide angle view on the scene or the VR view (what the HMD user is seeing). By default, it is assumed that the minimal number of people using exploration mode is 2, however, 3 roles can be defined for the viewer:

- **Explorer:** he or she is exploring a 360° scene in HMD and can pick objects that are highlighted when focusing on them by clicking an HMD button. The view from the person’s HMD may be streamed on television so other people are able to see what he or she sees in HMD.
- **Assistant:** a person using a tablet to examine objects picked up by the Explorer. The assistant analyses collected objects and confers with the HMD users. He/she can also switch the TV view between static and VR modes.
- **Observer:** person not being directly engaged into Exploration Mode. He or she can observe the “game” on TV and give advice to the explorer and observer.



Figure 6: Wireframe of HMD experience (pilot 3). The magnifying glass represents the user's point of view

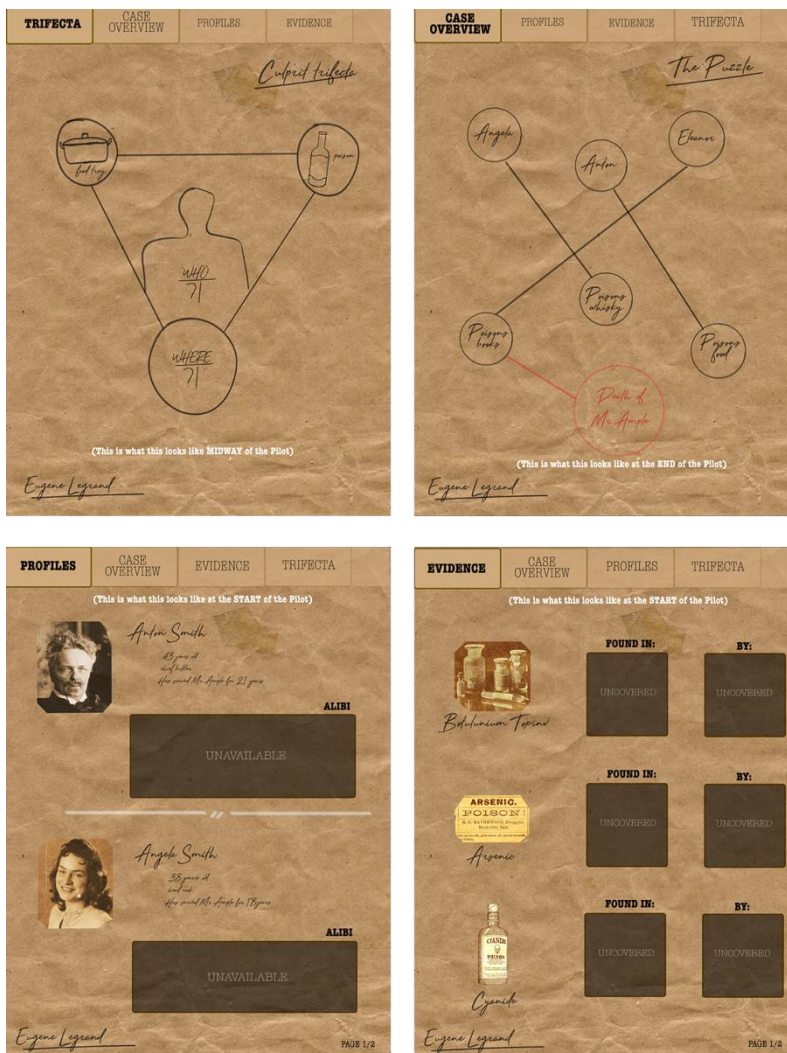


Figure 7: Wireframe of tablet experience (pilot 3): Tripecta (top left), Case Overview (top right), Profiles (bottom left), Evidence (bottom right)

The complete scenario and the envisioned interaction between the different devices is described in Deliverable 2.4.

The pilot involves the following specific actions:

- **Iterative development and testing of a content creation toolkit (software).**
- **Creation and testing of offline content and exploration mode with end-users**

These actions are translated in different pilot evaluation activities as discussed in the next section.

## 5.2 Pilot activities

The following four pilot evaluation activities are foreseen for this pilot:

| N°      | Activity                                                     | Timing           | Target group       | Location                             |
|---------|--------------------------------------------------------------|------------------|--------------------|--------------------------------------|
| P3.1.1. | Evaluation of content creation toolkit (software evaluation) | April – May 2018 | Professional users | Lightbox (Porto), i2cat (barcelona), |
| P3.1.2. | Closed pilot test                                            | May-June 2018    | End-users          | Belgium                              |
| P3.1.3. | Open pilot test (open online test)                           | June 2018        | End-users          | Europe                               |

Table 10: Overview of pilot 3 (offline content) activities

### 5.2.1 P3.1.1 Evaluation of content creation toolkit with professional users

The aim of this pilot activity is to further iterate upon the developed software toolkit as developed in pilot 1 and to make sure that the software is in line with the professional user requirements. Different iterations of the software will be made until a stable version is developed.

At general level, the following new features will be added to the toolkit developed in pilot 1:

- The synchronization paradigm used in pilot 1 and 2 is not mandatory anymore, so synchronization across devices can be broken and the exploration mode is introduced (HMD can be used to explore the scene and select objects).
- HMD masters the experience and acts as trigger of events that have an effect, on TV or on tablet).
- The tablet (second screen) acts as a notebook and html elements appear triggered by actions on the HMD.

The evaluation of the content creation toolkit will focus on the following specific questions:

- Is the developed software in line with the formulated software requirements as part of WP2 research activities?

- How can we maximize the usability, the perceived usefulness and satisfaction with the developed software?

## Setting

First the software will be iteratively developed and tested by professional users at Lightbox and i2cat with a direct link to the ImmersiaTV project. They will provide specific feedback on the different functionalities in order to adapt the software. Once a stable version of the toolkit is released, at least 3 professional users in Porto (Lightbox) and Barcelcon (i2cat) will learn how to use the software and edit some new content with the toolkit.

For this user evaluation, editors will be observed while using the software and their experience with the software will be questioned in-depth in an interview. For the functional evaluation, we will make use of the specific requirements that were defined before the start of the creation of the toolkit and documented in D2.2. and D2.3. This list of requirements will be checked and it will be indicated which of the requirements are already incorporated in the main software release (v1.0). Deliverable 4.4 will report on which requirements are finally implemented in the software.

## Participants

During the development of the software, friendly test users at Lightbox and i2cat who are directly involved in the ImmersiaTV project will test the still very immature versions of the software and provide feedback on the different functionalities. Feedback will be gathered until a stable version of the software is released. The stable version will be at least 3 editors:

- 1 editor at Lightbox
- 2 editors at i2cat

Both professional users who already tested the first version of the software for pilot 1 and new professional users will be contacted. All selected users will test the software releases individually and provide their individual feedback.

## Timing

Different software releases are scheduled. After each release, feedback will be gathered and implemented in the next software release. The goal is to have first feature full stable version at the end of March 2018.

In April and May, the software will be tested by the editors:

- Editor(s) at Lightbox: Mid April
- Editors at i2cat: Beginning of May

## Detailed test procedure

The software will be evaluated by means of observation, the think-aloud evaluative method and an interview.

A tutorial will be created that teaches an editor in approximately two hours how to use the ImmersiaTV Premiere Pro plugin to edit video-based content for multi-device consumption. At the end of the tutorial, the editor will know how to create video content that can be consumed synchronously across head mounted displays, tablets and the traditional TV. After reading the tutorial, the editor will be asked to edit some new content with the toolkit and will be given some specific assignments.

While the editor is using the software, a researcher will be present to **observe** how the editors use the software. The editors will be asked to express their first thoughts and ideas while experimenting with the software (**thinking aloud**). It is important that these respondents did not use the specific software plugin (nor a previous version of the software plugin), such that they can express their first thoughts and ideas while experimenting with the software. The think aloud sessions will be captured on audio for detailed analysis afterwards. The researcher will ask additional questions when required, but will avoid influencing the respondents. After the software has been tested, the editor will be interviewed to get an in-depth view on their experiences while using the software.

Annex VII and Annex VIII show the observation protocol and the topic list of the qualitative interview for pilot 2. For pilot 3, we will make use of the same observation protocol and a very similar topic list.

### Expected outcome

The expected outcome of the software evaluation activities is a validated toolset that integrates well within editors' workflow, has a high-perceived usefulness and is intuitive and user-friendly.

### 5.2.2 P3.1.2 Closed pilot test

For the end-user evaluation of the developed offline content format, we will first conduct a controlled lab test in Brussels and in Barcelona. This controlled test serves as a pre-test for the open pilot and provides us with first detailed user feedback on the asynchronous immersive viewing experience. A living room set-up will be created in which end-users will be invited to watch the content using all the devices available. The advantage of a closed living room set-up is that all participants will evaluate the "whodunnit" content in the same setting with identical lighting conditions and making use of the exact same devices, which makes it easier to control the setting for the researcher and to compare the results.

The end-users will be invited to watch a content scenario that follows an interactive mystery narrative (a 'whodunnit') and introduces the exploration mode.

The main questions that will be addressed in this controlled lab test are:

- How do users experience multi-device immersive content in the specific case of an asynchronous scenario?
- How do users experience the exploration mode on the mobile devices? How do they interact with the portal? How do they experience the interplay between HMD (Explorer) and tablet (Assistant)?
- How does this type of experience fit within a social viewing context in which viewers can take different roles?
- How do users experience the explorer, assistant and observer role? And how do they experience switching between the roles?

As a research methodology, we opt for a qualitative research approach (observation and a qualitative interview) combined with objective measures of the respondents' behaviour while watching the "whodunnit" content.

### Setting

The visual quality lab at IMEC in Brussels or Ghent and the lab at i2CAT in Barcelona will be used as a setting for the controlled lab test. This is an ideal test setting for the closed lab test, since they are organised as a living room, including couches and a TV-set, mimicking a real living room experience.

The specific equipment we will use for the test is:

- TV-set
- 1 Android smartphone (Samsung Galaxy S6 Edge or newer model) and 1 HMD device (Samsung Gear VR)
- 1 Android tablet (1 Samsung galaxy tab S2 or newer model)

## **Participants**

In the whodunit scenario, social interaction between viewers beyond jointly watching TV content is particularly encouraged by the HMD-tablet interplay. By default, it is assumed that the minimal number of people using exploration mode is 2, however roles can be defined for 3 people (the explorer, the assistant and the observer). Therefore, no individual user tests will be organized. A total of 15-18 end-users will be invited to come and watch the whodunit in teams of 2 or 3. About half of the tests will be organized in Brussels and half of the tests will be organized in Barcelona. It is important that these individuals know each other already when they participate in the test together, as we want to mimic a real social experience in which people watch video content together.

Selection criteria include:

- Gender balance (mix male/female)
- Mix in age categories
- Smartphone and/or tablet ownership and usage

In Brussels, the tests will be organized in Dutch or English. In Barcelona, the tests will be organized in Spanish.

## **Timing**

The end-user evaluation activities of the offline pilot 3 will take place in May and/or June 2018.

## **Detailed test procedure**

The test procedure will consist of a combination of observations while people are watching the “whodunit”, objective measures and a qualitative interview immediately after the experience. The questionnaire for the interview will include questions about the overall experience as well as more detailed questions to check the end-user requirements as defined in D2.1. Each lab test will take approximately 1 hour:

- Briefing + informed consent: +- 7 minutes
- Questionnaire (part I – Drop-off): +- 4 minutes
- Whodunnit + observation: +-15 minutes
- Questionnaire (Part II – evaluation of the content experience): +- 4 minutes
- Qualitative interview: +- 30 minutes

### **1) Briefing + Informed consent**

Participants will receive a short briefing about the study and will sign an informed consent explaining the aim of the study, ethical procedure (right to withdraw from study, use of audio and video recordings, privacy/anonymity of data) and the incentive.

### **2) Questionnaire (Part I)**

Participants will complete a drop-off questionnaire. This drop-off questionnaire includes information on socio-demographics, TV viewing behaviour, ICT ownership and previous experience with VR.

### 3) Multi-device viewing of whodunnit

Respondents are asked to watch the whodunnit, while making use of the different available devices (television, tablet and HMD). If they participate in teams of 2, one person will be assigned to take the role of the explorer (HMD) and the other person will take the role of the assistant (tablet). If they participate in teams of 3, the extra person will take the role of the observer. Halfway through the “whodunnit”, they will be asked to switch roles, so they can experience each role at least once.

They are asked to use each device at least once during the whodunnit.

During the tests, an IMEC researcher will be present and **observe** how the respondents watch the content and how they interact. The researcher will follow an observation protocol and write down:

- Body and head movement (do they sit down/stand up? Head movement or not? How does this relate on the role/device taken?)
- Feedback (Do they say anything while watching about the content? And about the devices?)
- Social interaction (Do they talk with others while watching the content? What do they say?)
- What happens if they switch roles while watching?

The sessions will also be recorded on video, so detailed information about the body and head movement and device switches can be coded afterwards. Ideally we also have a logging of the gaze in the HMD.

### 4) Questionnaire (Part II)

Right after the testing, each participant will fill in the second part of the questionnaire in which they will be asked to evaluate the viewing experience on the different devices, the added value of the different views and the interplay between the HMD and tablet.

### 5) End-user evaluation via qualitative interview

**A Qualitative interview** will take place immediately after the viewing experience, with the 2 or 3 respondents together.

The interview will be a **semi-structured qualitative interview**. This means that in this topic list, we provide a guideline with a list of topics to be discussed in the interviews along with possible interview questions. In qualitative research the aim is to gather more in-depth information about respondent's thoughts and feelings. Follow-up questions on the different answers are extremely important. This topic list is therefore a starting point for the interview, but does not contain the full list of interview questions that will eventually be discussed in each interview.

The following topics are included:

- Overall viewing experience
- The exploration mode on the HMD and tablet
- The social viewing and interplay between the viewing roles (explorer, assistant and observer)
- Usability

## **Expected outcome**

This test will give us a detailed insight into how end-users experience the multi-device viewing of an interactive offline content scenario that implements Exploration Mode. By the combination of observation and qualitative interviews, an in-depth analysis of the user practices, user expectations and social aspects can be acquired. This research phase will also serve as a pre-test for the open pilot test.

### **5.2.3 P3.1.3 Open pilot test**

The final pilot activity for the pilot 3 offline content scenario is the open pilot test.

The developed content is placed online and publicly available. All project partners will promote this via the different available communication channels (website, social media, press releases etc.).

The aim of this open pilot test is to show the developed 'whodunnit' to the wider audience and gather feedback on the user experience.

## **Setting**

The open pilot test will have the same set-up as the open pilot phase for pilot 1 and 2 (see 3.2.5 for explanation set-up). The number of downloads will be logged and a brief online survey will be made available for users to fill in after finishing the "whodunnit".

## **Participants**

The trial will be open for all interested users. Everyone with the necessary equipment (a windows computer, an Android smartphone (model not later than 2016, Android 6.0 or superior, Processor Snapdragon 820 or equivalent), an HMD) can download and view the documentary.

Hence, there will be no specific recruitment criteria, but a short socio-demographic profile will be part of the evaluation survey, so we can create a profile of the involved users. Our aim is to reach at least 250 people who watch the content in different European countries, of which at least 100 users complete the questionnaire.

Specific recruitment activities will be organized in the different countries where the project partners are active, including Belgium, Portugal, Spain, Switzerland, France and Poland. All project partners will promote the open pilot via their different available communication channels (website, social media, newsletters, ...). The open pilot will also be promoted in other dissemination events such as conferences.

## **Timing**

The open test will take place in June 2018, right after a successful completion of the closed pilot test.

## **Detailed test procedure**

- 1) The user installs the ImmersiaTV app on the devices
- 2) The user fills in a pre-experimental questionnaire on a website and obtains a token.
- 3) With the token he can access the content

- 4) Multi-device viewing of content: the respondents watch the whodunnit using their own devices.
- 5) Online survey: Immediately after they have watched the whodunnit, an online survey will open in the app, displaying a limited number of questions. The online survey will take maximum 10 minutes of the respondents' time. The survey questions will include a short socio-demographic profile and feedback on the usability, the content, multi-device experience, social viewing and future expectations. We will make use of Likert scales and closed answers for the survey, to ensure a fluent evaluation procedure. The survey will be similar to the one used in pilot 2. A draft of the survey can be found in Annex XI.

### **Expected outcome**

The expected outcome of the open pilot is an open distribution of the developed content and an open feedback module in which users can provide their feedback.

## 6 PILOT 3: LIVE CONTENT

### 6.1 Pilot aim

The focus of the second pilot was on a live production scenario. The pilot 3 live content scenario is an iteration of the live pilot 2 scenario that puts a bigger focus on free user exploration as opposed to offering a director's choice-based experience, with more advanced 360° scene configurations, refined interactions with the portals and additional functionality such as replays. A sports event (cyclo-cross) was selected as a case study for the second pilot phase. For the live pilot 3, we will not focus on a live sports event, but on a live entertainment event (e.g. awards show, music show ...). The live broadcast of an entertainment event has some fundamentally different dynamics compared to sports broadcast, which will be explored in the live pilot 3. VRT will search for a live event where testing can take place.



Figure 8: Mock up interface of configurable portal set-up per omnidirectional scene

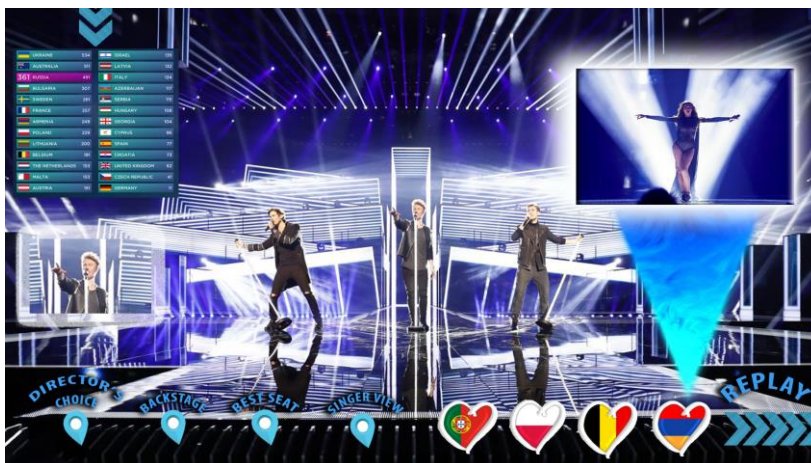


Figure 9: Mock up interface of Concept of replays in live ImmersiaTV experience.

The pilot involves the following specific actions:

- **Iterative development and testing of live director's tool** for omnidirectional audio and video with professional users: this will give first insights in what works and what doesn't work with regards to user experience, basic interaction and storytelling, and this will give insights into how the real-time production workflow integrates within the existing

traditional workflows of professional users and how new 360°-based and traditional workflows can complement each other in terms of storytelling.

- **End-user evaluation** of the live broadcast scenario: how do users experience the advanced multi- device omnidirectional set-up for a live broadcast? How do they evaluate the interaction with portals and storytelling? How do they perceive the additional functionality of replays in the overall concept? What is their quality of experience?

These actions are translated in different pilot evaluation activities as discussed in the next section.

## 6.2 Pilot activities

The following three pilot evaluation activities are foreseen for this pilot:

| N°      | Activity                                                   | Timing                | Target group       | Location       |
|---------|------------------------------------------------------------|-----------------------|--------------------|----------------|
| P3.2.1. | Evaluation of the director's toolkit (software evaluation) | April – May 2018      | Professional users | VRT (Brussels) |
| P3.2.2. | Closed pilot test                                          | April and/or May 2018 | End-users          | Belgium        |
| P3.2.3. | Open pilot test (open online test)                         | June 2018             | End-users          | Europe         |

Table 11: Overview of pilot 3 (live content) activities

### 6.2.1 P3.2.1 Evaluation of the director's toolkit with professional users

The aim of this pilot activity is to further iterate upon the software toolkit as developed in pilot 2 and to make sure that the software is in line with the professional user requirements as defined in D2.2. Different iterations of the software will be made until a stable version is developed.

The following new features will be added to the toolkit developed in pilot 2:

- Individual scene configuration: placement of portals individually for each omnidirectional camera.
- Recording and publishing of replays, use of pre-recorded content
- Generation of ambisonic sound
- Synchronization across devices based on audio from traditionally broadcasted TV

The evaluation of the director's toolkit will focus on the following specific questions:

- Is the developed software in line with the formulated software requirements as part of WP2 research activities?

- How can we maximize the usability, the perceived usefulness and satisfaction with the developed software? For example, does the tool enable an efficient mixing live, replay and pre-corded content during a live show?
- How do professional users evaluate the added value and complementarity of live 360° editing when compared to traditional live editing? Does the per scene configuration adds more complexity to the directing process?

## Setting

First the software will be iteratively developed and tested by professional users with a direct link to the ImmersiaTV project. Once a stable version of the toolkit is released, three phases of testing with professional users with no link to the ImmersiaTV project are foreseen.

In a first phase, a professional director or researcher with directing skills will test the software in an offline simulation of a live scenario by having live streams recorded and prepared for re-broadcast. The recorded pilot 2 cyclocross footage can be used for this purpose. In the second phase, a professional editor will test the software in a real live scenario during the live broadcast of the entertainment event selected for the live pilot 3. Finally, in the weeks after the event, a professional editor will test the software again in an offline simulation by having the live streams of the entertainment event recorded and prepared for re-broadcast.

## Participants

The software will be tested by professional users (directors) at VRT. The first software releases will be tested by researchers with professional director skills at VRT with a direct link to the ImmersiaTV project.

Once a stable version of the software with all new features is released, professional directors and/or technical directors at VRT with no direct link to the ImmersiaTV project will be asked to test the software.

All selected users will test the software releases individually and provide their individual feedback.

## Timing

Different software releases are scheduled. After each release, feedback will be gathered and implemented in the next software release. The goal is to have first feature full stable version in April 2018.

In April and May, the software will be tested by editors with no direct relationship to the project:

- Phase I (offline simulation of a live scenario): April 2018
- Phase II (real live scenario): May 2018
- Phase II (offline simulation of a live scenario): May 2018

## Detailed test procedure

Three phases are foreseen during which the software will be tested.

- **Phase I:** Once a stable version of the software is released, a professional director and/or technical director at VRT will test the software in an offline simulation of a live scenario by having live streams recorded and prepared for re-broadcast. Such a test procedure enables to replicate and repeat at any moment not depending on actual cameras availability. Live packages from pilot 2 cyclocross event will be prepared for this purpose.

- **Phase II:** A professional director and/or technical director at VRT with no direct link to ImmersiaTV will test the software in a real live scenario. An entertainment event that is broadcasted live will be selected.
- **Phase III:** Right after the event, a professional director will test the software again in an offline simulation by having the live streams of the entertainment event recorded and prepared for re-broadcast.

The feedback of the professional users will be gathered by means of observation and an interview.

- **Observation:** The professional users will test the software in the presence of an IMEC researcher, so they can immediately explain and evaluate their interaction with the software. The participants will be asked to continuously 'think out loud' or say their thoughts while using the software and its functionalities (= Think-aloud evaluative method, see P1.1). The researcher will ask additional questions about the actions of the professional users when required.
- **Interview:** After using the software, additional questions will be asked to the professional users to get a clear view on their positive and negative experiences with the software.

The think aloud sessions and interview will be captured on audio for detailed analysis afterwards. Annex VII and Annex VIII show the observation protocol and the topic list of the qualitative interview for pilot 2. For pilot 3, we will make use of the same observation protocol and a very similar topic list with focus on the newly added pilot 3 features.

## Expected outcome

The expected outcome of the software evaluation activities is a validated toolset that integrates well within the directors' workflow, has a high-perceived usefulness and is intuitive and user friendly.

### 6.2.2 P3.2.2. Closed pilot test

For the end-user evaluation of the developed live content format, we will conduct a controlled lab test in Brussels at the VRT premises. A living room set-up will be created in which 8 to 10 end-users will be invited as a group, to watch together the broadcast of the entertainment event as selected by VRT for the live pilot 3. The test will be organized 2 times, with each time a group of 4 to 5 viewers. We opt for this group viewing of this third pilot scenario, to mimic the experience of watching a live event in a group setting (e.g. with a group of friends). This evaluation activity will not take place in real-time at the moment the event takes place, but at a later moment (maximum 2 weeks after the date of the event). An offline simulation of a live scenario enables us to prepare an ideal viewing experience.

The main questions that will be addressed in this closed pilot test are:

- How do end-users experience and evaluate live viewing of an entertainment event in a multi-device immersive setting?
- How do they experience the mix of live and off-line content?
- How do they evaluate the option to pause/resume live content?
- How do they appreciate the possibility to publish 360° content on social media based on their tracked path of user head movements?
- How do they evaluate the added value of ambisonics audio in the overall experience?

- How does this type of experience fit within a social viewing context?

As a research methodology, we opted for a qualitative research approach (observation and a focus group interview).

### **Setting**

For the end-user tests, a room will be set up and organized as a living room including couches and at least:

- 1 TV-set
- 2 Android smartphones (Samsung Galaxy S6 Edge or newer model version) and 2 HMD devices (Samsung Gear VR)
- 2 tablets (Samsung galaxy tab s2)

There will not be one HMD device and tablet for each test participant. The participants will be asked to regularly pass these devices to another participant.

### **Participants**

8 to 10 respondents will be selected to participate in the study as an end-user. They will be recruited via personal networks, via the VRT De Proeftuin panel (980 members) and the IMEC Living Labs panel (5000 members). They will be able to register via an online form. We aim to have a mix in socio-demographics characteristics among the study participants (gender, age, profession).

### **Timing**

The closed pilot test for the live pilot 3 will take place in April and/or May 2018. The exact date will depend on the date of the selected entertainment event. The closed pilot test will take place maximum 2 weeks after the date of the live broadcast.

### **Detailed test procedure**

An offline simulation of the live scenario will be made by having live streams recorded during pilot 3 execution and prepared for re-broadcast. Such a test procedure enables to replicate and repeat at any moment not depending on actual cameras availability. Live packages from available sources will be prepared for this purpose.

The test procedure will consist of a combination of observations while people are watching the live entertainment experience and a focus group with all respondents immediately after the experience.

- Briefing + informed consent: +- 7 minutes
- Questionnaire (part I – Drop-off): +- 4 minutes
- Viewing live content + observation: +-20 minutes
- Questionnaire (Part II – evaluation content): +- 4 minutes
- Focus group: +- 60 minutes

#### **1) Briefing + Informed consent**

Participants will receive a short briefing about the study and will sign an informed consent explaining the aim of the study, ethical procedure (right to withdraw from study, use of audio and video recordings, privacy/anonymity of data) and the incentive.

## 2) Questionnaire (Part I)

Participants will complete a drop-off questionnaire. This drop-off questionnaire includes information on socio-demographics, TV viewing behaviour, ICT ownership and previous experience with VR.

## 3) Multi-device viewing of the content

Respondents are asked to watch the content, while making use of the different available devices (television, tablet and HMD). They are asked to use each device at least once while watching the live entertainment content.

During the tests, an IMEC researcher will be present and **observe** how the respondents watch the live video and how they interact. The researcher will follow an observation protocol and write down:

- Usage of different devices (What devices do they use? When do users switch to another device? How much time do they spend on each device, which is the cross-device usage pattern?)
- How often and when do they make use of the option to pause and resume the live content? How do they interact with replay or pre-recorded content offered during the live experience?
- How often do they switch between different omnidirectional scene viewpoints in the HMD?
- Body and head movement (do they sit down/stand up? Head movement or not?)
- Feedback (Do they say anything when watching the content?)
- Social interaction (Do they talk with others while watching the content? What do they say? What different devices do they use?)

The sessions will also be recorded so additional objective data (e.g. switches between omnidirectional viewpoints) can be coded in detail after the sessions.

## 4) Questionnaire (Part II)

Right after the testing, each participant will fill in the second part of the questionnaire in which they will be asked to evaluate the viewing experience on the different devices and their feeling of immersion with the content.

A first draft of the survey can be found in Annex XIII.

## 5) End-user evaluation via focus group

**A focus group with all respondents** will take place immediately after the viewing experience. The aim of this focus group is to get an in-depth insight in their viewing experience.

The following topics are included:

- Overall viewing experience in a group setting
- Multi-device usage, Complementarity of TV and mobile (HMD/tablet) experience: do they strengthen each other?
- Usability
- Interaction + level of control, balance director's control vs. viewer's control
- Mixing live and off-line content in the HMD experience
- Added value of ambisonics sound
- Social viewing

### **Expected outcome**

This test will give us a detailed insight into how end-users experience the multi-device viewing of an interactive live content scenario in a group setting. By the combination of observation and a qualitative focus group interview, an in-depth analysis of the user practices, user expectations and social aspects can be acquired.

### **6.2.3 P3.2.3. Open pilot test**

The final pilot activity for the pilot 3 live content scenario is the open pilot test.

The developed content is placed online and publicly available for downloading and viewing. All project partners will promote this via the different available communication channels (website, social media, press releases etc.).

The aim of this open pilot test is to show the multi-device live entertainment experience to a wider audience and gather feedback on the user experience.

### **Setting**

The open pilot test will have the same set-up as the open pilot phase for pilot 1 and 2. The number of downloads will be logged and a brief online survey will be made available for users to fill in after finishing the documentary.

### **Participants**

The trial will be open for all interested users. Everyone with the necessary equipment can download and view the documentary. Hence, there will be no specific recruitment criteria, but a short socio-demographic profile will be part of the evaluation survey, so we can create a profile of the involved users. Our aim is to reach at least 100 users.

Specific recruitment activities will be organized in the different countries where the project partners are active, including Belgium, Portugal, Spain, Switzerland, France and Poland. All project partners will promote the open pilot via their different available communication channels (website, social media, newsletters, ...). The open pilot will also be promoted in other dissemination events.

### **Timing**

The semi-open test will take place in June, right after a successful completion of the closed pilot test.

### **Detailed test procedure**

- 1) The user installs the ImmersiaTV app on the devices
- 2) The user fills in a pre-experimental questionnaire on a website and obtains a token.
- 3) With the token he/she can access the content
- 4) Multi-device viewing of content: the respondents watch the content using their own devices.
- 5) Online survey: Immediately after they have watched the documentary, an online survey will open in the app, displaying a limited number of questions. The online survey will take maximum 10 minutes of the respondents' time. The survey questions will include a short socio-demographic profile and feedback on the usability, the content, multi-

device experience, social viewing and future expectations. We will make use of Likert scales and closed answers for the survey, to ensure a fluent evaluation procedure. The survey will be similar to the one used in pilot 2. A draft of the survey can be found in Annex XI.

### **Expected outcome**

The expected outcome of the open pilot is a large distribution of the developed content and an open feedback module in which users can provide their feedback.

## 7 NEXT STEPS

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This is the final version of this deliverable. The results of the different planned activities will be discussed in D4.4.

## 8 REFERENCES

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## 9 ANNEXES

### Pilot 1: Offline content

#### Annex I: Software evaluation survey

ImmersiaTV software evaluation as programmed in qualtrics



#### Q56 Browser Meta Info

- Browser (1)
- Version (2)
- Operating System (3)
- Screen Resolution (4)
- Flash Version (5)
- Java Support (6)
- User Agent (7)

#### Q1 Name

#### Evaluation of the tool in general

#### Q2 How do you evaluate the ImmersiaTV Premiere Pro Extension in general? - USEFULNESS

|                                      | strongly disagree (1) | Disagree (2)          | Somewhat disagree (3) | Neither agree nor disagree (4) | Somewhat agree (5)    | Agree (6)             | Strongly agree (7)    | Not applicable (8)    |
|--------------------------------------|-----------------------|-----------------------|-----------------------|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| It helps me to be more effective (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

|                                                                 |                       |                       |                       |                       |                       |                       |                       |                       |
|-----------------------------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| It helps me to be more productive (2)                           | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It is useful (3)                                                | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It gives me more control over the activities in my life (4)     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It makes the things I want to accomplish easier to get done (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It saves me time when I use it (6)                              | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It meets my needs (7)                                           | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It does everything I would expect it to do (8)                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q3 How do you evaluate the ImmersiaTV Premiere Pro Extension in general? - EASE OF USE

|                       | strongly disagree (1) | Disagree (2)          | Somewhat disagree (3) | Neither agree nor disagree (4) | Somewhat agree (5)    | Agree (6)             | Strongly agree (7)    | Not applicable (8)    |
|-----------------------|-----------------------|-----------------------|-----------------------|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| It is easy to use (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

|                                                                                   |                       |                       |                       |                       |                       |                       |                       |                       |
|-----------------------------------------------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| It is simple to use (2)                                                           | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It is user friendly (3)                                                           | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It requires the fewest steps possible to accomplish what I want to do with it (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It is flexible (5)                                                                | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Using it is effortless (6)                                                        | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I can use it without written instructions (7)                                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I don't notice any inconsistencies as I use it (8)                                | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Both occasional and regular users would like it (9)                               | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I can recover from mistakes quickly and easily (10)                               | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I can use it successfully every time (11)                                         | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q4 How do you evaluate the ImmersiaTV Premiere Pro Extension in general? -EASE OF LEARNING

|                                       | strongly disagree (1) | Disagree (2)          | Somewhat disagree (3) | Neither agree nor disagree (4) | Somewhat agree (5)    | Agree (6)             | Strongly agree (7)    | Not applicable (8)    |
|---------------------------------------|-----------------------|-----------------------|-----------------------|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| I learned to use it quickly (1)       | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I easily remember how to use it (2)   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It is easy to learn how to use it (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I quickly became skillful with it (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q5 How do you evaluate the ImmersiaTV Premiere Pro Extension in general? -SATISFACTION

|                                         | strongly disagree (1) | Disagree (2)          | Somewhat disagree (3) | Neither agree nor disagree (4) | Somewhat agree (5)    | Agree (6)             | Strongly agree (7)    | Not applicable (8)    |
|-----------------------------------------|-----------------------|-----------------------|-----------------------|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| I am satisfied with it (1)              | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I would recommend it to a colleague (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It is fun to use (3)                    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It works the way I                      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

|                              |                       |                       |                       |                       |                       |                       |                       |                       |
|------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| want it to work (4)          |                       |                       |                       |                       |                       |                       |                       |                       |
| It is wonderful (5)          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I feel I need to have it (6) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It is pleasant to use (7)    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

## Evaluation of the Effect Controls

Q6 How do you evaluate the Media Type Snippet?

- \_\_\_\_\_ Usefulness (1)
- \_\_\_\_\_ Ease of Use (2)
- \_\_\_\_\_ Ease of Learning (3)
- \_\_\_\_\_ Satisfaction (4)

Q7 How can we improve the Media type Snippet?

Q8 How important is it for you that these suggested improvements are implemented?

- ☐ Not at all important (1)
- ☐ Slightly important (2)
- ☐ Moderately important (3)
- ☐ Very important (4)
- ☐ Extremely important (5)

Q9 How do you evaluate the Reference Snippet?

- \_\_\_\_\_ Usefulness (1)
- \_\_\_\_\_ Ease of Use (2)
- \_\_\_\_\_ Ease of Learning (3)
- \_\_\_\_\_ Satisfaction (4)

Q10 How can we improve the Reference Snippet?

Q11 How important is it for you that these suggested improvements are implemented?

- ☐ Not at all important (1)
- ☐ Slightly important (2)
- ☐ Moderately important (3)
- ☐ Very important (4)
- ☐ Extremely important (5)

Q12 How do you evaluate the Longitude and Latitude Snippet?

- \_\_\_\_\_ Usefulness (1)
- \_\_\_\_\_ Ease of Use (2)
- \_\_\_\_\_ Ease of Learning (3)
- \_\_\_\_\_ Satisfaction (4)

Q13 How can we improve the Longitude and Latitude Snippet?

Q14 How important is it for you that these suggested improvements are implemented?

- ☐ Not at all important (1)
- ☐ Slightly important (2)
- ☐ Moderately important (3)
- ☐ Very important (4)
- Extremely important (5)

○

Q15 How do you evaluate the Size Snippet?

- \_\_\_\_\_ Usefulness (1)
- \_\_\_\_\_ Ease of Use (2)
- \_\_\_\_\_ Ease of Learning (3)
- \_\_\_\_\_ Satisfaction (4)

Q16 How can we improve the Size Snippet?

Q17 How important is it for you that these suggested improvements are implemented?

- ☐ Not at all important (1)
- ☐ Slightly important (2)
- ☐ Moderately important (3)
- ☐ Very important (4)
- ☐ Extremely important (5)

Q18 How do you evaluate the Luma Matte Snippet?

- \_\_\_\_\_ Usefulness (1)
- \_\_\_\_\_ Ease of Use (2)
- \_\_\_\_\_ Ease of Learning (3)
- \_\_\_\_\_ Satisfaction (4)

Q19 How can we improve the Luma Matte Snippet?

Q20 How important is it for you that these suggested improvements are implemented?

- ☐ Not at all important (1)
- ☐ Slightly important (2)
- ☐ Moderately important (3)
- ☐ Very important (4)
- ☐ Extremely important (5)

Q21 How do you evaluate the Render Mode?

- \_\_\_\_\_ Usefulness (1)
- \_\_\_\_\_ Ease of Use (2)
- \_\_\_\_\_ Ease of Learning (3)
- \_\_\_\_\_ Satisfaction (4)

Q22 How can we improve the Render Mode?

Q23 How important is it for you that these suggested improvements are implemented?

- ☐ Not at all important (1)
- ☐ Slightly important (2)
- ☐ Moderately important (3)
- ☐ Very important (4)
- ☐ Extremely important (5)

## Evaluation of the ImmersiaTV export panel

Q24 How do you evaluate the ImmersiaTV export panel?

- \_\_\_\_\_ Usefulness (1)
- \_\_\_\_\_ Ease of Use (2)
- \_\_\_\_\_ Ease of Learning (3)
- \_\_\_\_\_ Satisfaction (4)

Q25 How can we improve the ImmersiaTV export panel?

Q26 How important is it for you that these suggested improvements are implemented?

- ☐ Not at all important (1)
- ☐ Slightly important (2)
- ☐ Moderately important (3)
- ☐ Very important (4)
- ☐ Extremely important (5)

## Evaluation of overall production workflow

Q27 How well do the tools integrate in your production workflow?

- ☐ 1 (1)
- ☐ 2 (2)
- ☐ 3 (3)
- ☐ 4 (4)
- ☐ 5 (5)

Q28 Explain your answer. What would you like to see changed about the integration?

Q29 What is the main difference with the tools you regularly use for your productions?

Q30 What is the most positive feature of the ImmersiaTV Pro Extension?

Q31 What is the most negative feature of the ImmersiaTV Pro Extension?

Q32 Do you have any other comments?

## Annex II: Observation protocol

(Preliminary observation protocol, to be fine-tuned during pre-test)

| <b>Observation protocol closed pilot test</b>                                                                                                                             |              |              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|
| <p><i>Date:</i></p> <p><i>Time:</i></p> <p><i>Session n°:</i></p> <p><i>Number of participating users: ½</i></p> <p><i>Observer Name:</i></p>                             |              |              |
| <p><b>Questions or comments during explanation of test?</b></p> <p><i>(describe possible questions/comments)</i></p>                                                      |              |              |
| <p><b>Use of devices during viewing:</b> (TV, tablet (t), Head-mounted-display (h))</p> <p><i>Indicate which device is used and when it is switched (which scene)</i></p> |              |              |
|                                                                                                                                                                           | Respondent 1 | Respondent 2 |
| Start of documentary                                                                                                                                                      | TV – t – h   | TV – t – h   |
| Switch (describe scene):                                                                                                                                                  | TV – t – h   | TV – t – h   |
| <p><i>Trigger to switch? (was there a specific trigger to switch to another device?)</i></p>                                                                              |              |              |
| Switch (describe scene):                                                                                                                                                  | TV – t – h   | TV – t – h   |
| <p><i>Trigger to switch? (was there a specific trigger to switch to another device?)</i></p>                                                                              |              |              |

|                                                                                                                                                      |            |            |
|------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|
|                                                                                                                                                      |            |            |
| Switch (describe scene):                                                                                                                             | TV – t – h | TV – t – h |
| <i>Trigger to switch? (was there a specific trigger to switch to another device?)</i>                                                                |            |            |
| Switch (describe scene):                                                                                                                             | TV – t – h | TV – t – h |
| <i>Trigger to switch? (was there a specific trigger to switch to another device?)</i>                                                                |            |            |
| Switch (describe scene):                                                                                                                             | TV – t – h | TV – t – h |
| <i>Trigger to switch? (was there a specific trigger to switch to another device?)</i>                                                                |            |            |
| <p><b>Social interaction during viewing</b></p> <p>Do respondents say something out loud during the session?</p> <p>Yes/No</p> <p>If yes, about:</p> |            |            |

- ☐ content of documentary
- ☐ devices
- ☐ other

If yes, when they are watching one:

- ☐ TV
- ☐ Tablet
- ☐ HMD

Briefly explain what they say?

(only for sessions of 2 people) Do respondents interact with each other?

Yes/No

If yes, about:

- ☐ content of documentary
- ☐ devices
- ☐ other

If yes, when they are watching one:

- ☐ TV
- ☐ Tablet
- ☐ HMD

Briefly explain what they say?

## Annex III: Topic list for closed lab test

### Topic 1. Overall user experience

*(open question, aim is to see whether people refer to the experience in general, the multi-device aspect, the 360°, the content and whether they felt like they were more engaged with the content...).*

*Based on their answer, additional follow-up questions will be asked, going more into detail on their experience.*

- How do you evaluate the overall experience of the documentary?
- What was the main difference with watching a regular documentary on television?
- How would you describe your feelings while watching the documentary? (aim is to find out whether they feel they were fully into the story, did they feel more involved, or maybe they felt interrupted by the different scenes, fear of missing out,..)
- How do you evaluate the image quality of the documentary? (R1.3)
- Did you experience any physical discomfort while watching the documentary? (R1.1)

### Topic 2. Multi-device usage

*(aim is to see how they experienced the use of different devices to watch the documentary)*

- How did you experience the use of different devices to watch the documentary?
- + additional questions based on the answers:
- did you consider this a natural experience? Why/why not?
- how do you feel about switching between the different devices? Was there a difference in your experience when switching from one type of device to another? (R1.6)
- what do you think about the content that was displayed on each device? Was this in line with what you expected? How did this influence the storytelling? (R1.7)

### Topic 3. Usability

*(aim is to focus on usability of the multi-device documentary)*

- How do you evaluate the user friendliness of the interaction with the content?

- Was it clear how you could switch between devices?
- What kind of cues did you notice that made you switch from one device to another? What did you think about these cues?
- How do you evaluate the use of the Head-Mounted Display?
  - How did you experience the navigation on the HMD?
  - How did you experience the 360° viewing? (*this can also be linked to the observation, whether people turned their head or not*)
- How do you evaluate the use of the tablet?
- You've watched the documentary standing/seated, why? How do you evaluate the viewpoint in that position? (R1.10)
- Is there anything related to the user friendliness of the experience that you would like to see improved?

#### **Topic 4. Interaction + level of control**

- On the different devices, other ways of interacting with the content were possible. What type of interactions did you notice? (for example select camera viewpoint, portal with map, icon to access additional information, 180° viewpoint..) (R1.11-R1.12)
- What type of interactions did you like in the documentary?
- What type of interactions did you dislike in the documentary?
- Overview of different scenes and interactions + respondent provides feedback on each scene/interaction:
  - Scene 1: extra info about location on tablet; overall viewpoint <-> viewpoint of David
  - Scene 2: 360° view + more info on tablet
  - Scene 3 and 4: portal with map, additional information, different viewpoint
  - Scene 6: 360°, additional info on tablet, change point of view, additional footage of Messi, statistics
  - Scene 7: choose point of view, additional statistics on tablet
  - Scene 8: position in car
  - Scene 9: 180°, audio, choose position in conversation, option to go outside (but loose conversation)

- Scene 10: different viewpoints, additional info via portal on HMD, additional info on tablet
- End credits: video of making off on TV or via portal on HMD
- What do you think about the number of different interactions that was foreseen in the documentary? (R1.6)
- What do you think about the length of the different interactions with the content you've had? (for this the observation can be used to get more detailed feedback) (R1.6 & R1.8)
- How would you evaluate the level of control you had over the content while watching the documentary? Is there anything you would like to see different about this? (R1.13)

### Topic 5. Content

*(aim is to see whether they enjoyed the content and thought the scenario was interesting)*

- What did you think about the content of the documentary? (R1.17)
- How do you feel about the additional information that was provided (for example the location information, the map, statistics etc.)?
- The content was in Portuguese and translated, how did you feel about that?

### Topic 6. Social viewing

*(aim is to focus on the social aspects of the multi-device viewing experience)*

- You've watched the documentary with your friend/family member/... How did you experience this?
- Do you consider this a social viewing experience? Why/why not?
- (based on observation) You've talked a lot/not that much while viewing. Why? Is there a difference with how you regularly watch television?
- If you would watch this kind of multi-device content at home, would you watch it alone or with others? Why?

### Topic 7. Future expectations

- Could you imagine yourself watching a documentary like this in your own home setting? Why/why not?
- Would you consider buying a head-mounted display? Why/why not?
- For what other types of content do you think this multi-device set-up is useful?



## Annex IV: Draft survey for semi-open test

### *1. Socio-demographic questions*

Gender:

Date of birth:

Highest obtained educational degree:

Current occupation:

Family situation (+ number of kids):

Previous experience with VR? yes/no

Which of the following devices do you own?

- Tv-set
- smartphone
- tablet
- laptop
- media centre PC
- Head-mounted display (example: Oculus Rift)
- Google cardboard

### *2. Viewing setting*

Which of the following devices did you use while watching the documentary?

- Tv-set
- tablet
- smartphone
- tablet
- head-mounted display
- Google cardboard

How often did you switch between the different devices? (to be refined after the observations in phase 1 of the evaluation)

- only once
- 2-3 times
- 4-5 times
- more than 5 times

-  
Did you watch the documentary?

- alone
- together with 1 other person
- together with multiple persons

### 3. Viewing experience

Could you indicate to which degree you liked the content of this specific video?

| Not at all<br>(0) | Slightly<br>(1) | Moderately<br>(2) | Fairly<br>(3) | Extremely<br>(4) |
|-------------------|-----------------|-------------------|---------------|------------------|
|                   |                 |                   |               |                  |

How did you experience the switching between devices?

- + answering categories based on phase 1 qualitative research results

How do you evaluate the level of interaction while watching the documentary?

- + answering categories based on phase 1 qualitative research results

Statements based on the outcome of the qualitative research

Possible additional questions we can use as part of the survey, to capture the enjoyment and feeling of involvement in the viewing experience:

**Could you please indicate to which extent you agree or disagree with the following statements related to your experience while watching the video? (we use a scale ranging from 1. completely disagree to 5. completely agree).**

|  |                          |     |     |     |                       |
|--|--------------------------|-----|-----|-----|-----------------------|
|  | Strongly disagree<br>(1) | (2) | (3) | (4) | Strongly agree<br>(5) |
|--|--------------------------|-----|-----|-----|-----------------------|

|                                                                       |  |  |  |  |  |
|-----------------------------------------------------------------------|--|--|--|--|--|
| I lost myself in the viewing experience                               |  |  |  |  |  |
| I was really drawn into the video watching                            |  |  |  |  |  |
| I was so involved in the viewing experience that I lost track of time |  |  |  |  |  |
| The viewing experience was fun                                        |  |  |  |  |  |
| When I was viewing, I lost track of the world around me               |  |  |  |  |  |
| I felt involved in the viewing experience                             |  |  |  |  |  |
| I was absorbed in the viewing experience                              |  |  |  |  |  |

**After seeing the video, to what extent do the words below describe how you feel now?**

| I feel.... | Not at all<br>(0) | Slightly<br>(1) | Moderately<br>(2) | Fairly<br>(3) | Extremely<br>(4) |
|------------|-------------------|-----------------|-------------------|---------------|------------------|
| Attentive  |                   |                 |                   |               |                  |

|               |  |  |  |  |  |
|---------------|--|--|--|--|--|
| Delighted     |  |  |  |  |  |
| Astonished    |  |  |  |  |  |
| Joyful        |  |  |  |  |  |
| Surprised     |  |  |  |  |  |
| Concentrating |  |  |  |  |  |
| Happy         |  |  |  |  |  |
| Alert         |  |  |  |  |  |
| Amazed        |  |  |  |  |  |

#### *Future expectations*

**For which types of video content do you think a multi-device omnidirectional video experience (as the documentary you have just seen) is most suitable?**

|                                                        | Not at all<br>(0) | Slightly<br>(1) | Moderately<br>(2) | Fairly<br>(3) | Extremely<br>(4) |
|--------------------------------------------------------|-------------------|-----------------|-------------------|---------------|------------------|
| Film                                                   |                   |                 |                   |               |                  |
| News programme<br>(e.g. Het Journaal,<br>Terzake, ...) |                   |                 |                   |               |                  |
| Documentary                                            |                   |                 |                   |               |                  |
| Sports game                                            |                   |                 |                   |               |                  |
| Drama serie (e.g.<br>House of Cards)                   |                   |                 |                   |               |                  |
| Soap (e.g. Familie)                                    |                   |                 |                   |               |                  |

|                                                    |  |  |  |  |  |
|----------------------------------------------------|--|--|--|--|--|
| Sitcom (e.g. How I met your mother)                |  |  |  |  |  |
| Talkshow (e.g. Café Corsari)                       |  |  |  |  |  |
| Reality show (e.g. Mijn pop- up restaurant)        |  |  |  |  |  |
| Human interest (e.g. Iedereen beroemd)             |  |  |  |  |  |
| Game show (e.g. De Pappenheimers)                  |  |  |  |  |  |
| Music show (e.g. The Voice)                        |  |  |  |  |  |
| Lifestyle programme (e.g. Vlaanderen Vakantieland) |  |  |  |  |  |
| Cooking programme (e.g. SOS Piet)                  |  |  |  |  |  |

Would you consider watching similar multi-device content in the future?

Yes

No

Maybe

## Annex V: Setup for the IBC booth



OPERATING EUROVISION AND EURORADIO



### Overview

ImmersiaTV is creating a novel form of broadcast omnidirectional video content production and delivery that offers end-users a coherent audiovisual experience across head mounted displays, second screens and the traditional TV set.

ImmersiaTV is also assembling an end-to-end toolset covering the entire audiovisual value chain: immersive production tools, support for omnidirectional cameras, adaptive content coding and delivery.

We take advantage of the large field of view available in head mounted displays to create experiences where the user can navigate through and interact with video inserts.

We also explore the possibilities of synchronized content delivery to use second screens for the display of complementary aspects of the broadcast, in an attempt to reconcile second screen consumer habits with a more integrated and coherent multi-platform experience around the TV.

This demo shows our early efforts to implement the tools and content examples covering offline production. Figure 10 shows how the editor can create synchronized multi-platform content and video-based interactive experiences. The red frame shows the portal effect, which allows defining inserts and transitions between omnidirectional videos, as well as interactive behaviour in reaction to the user's input. The blue frame shows the ImmersiaTV Export panel, which allows selecting the tracks that are relevant for each device. Figure 11 depicts how the ImmersiaTV services allow publishing this content easily. Through the immersiaTV services, the content creator

can convert his content to DASH and publish the content for synchronized playout during content consumption.

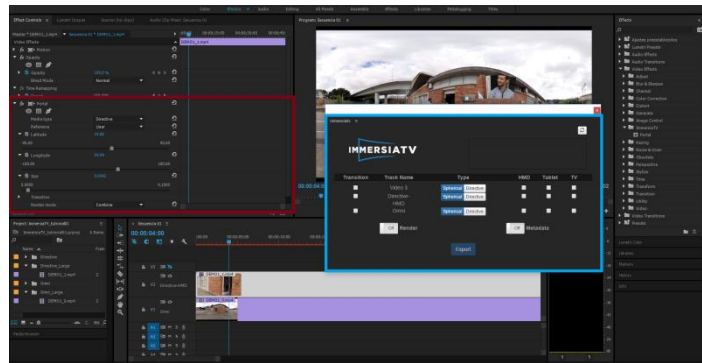


Figure 10: Example of the editor's dashboard

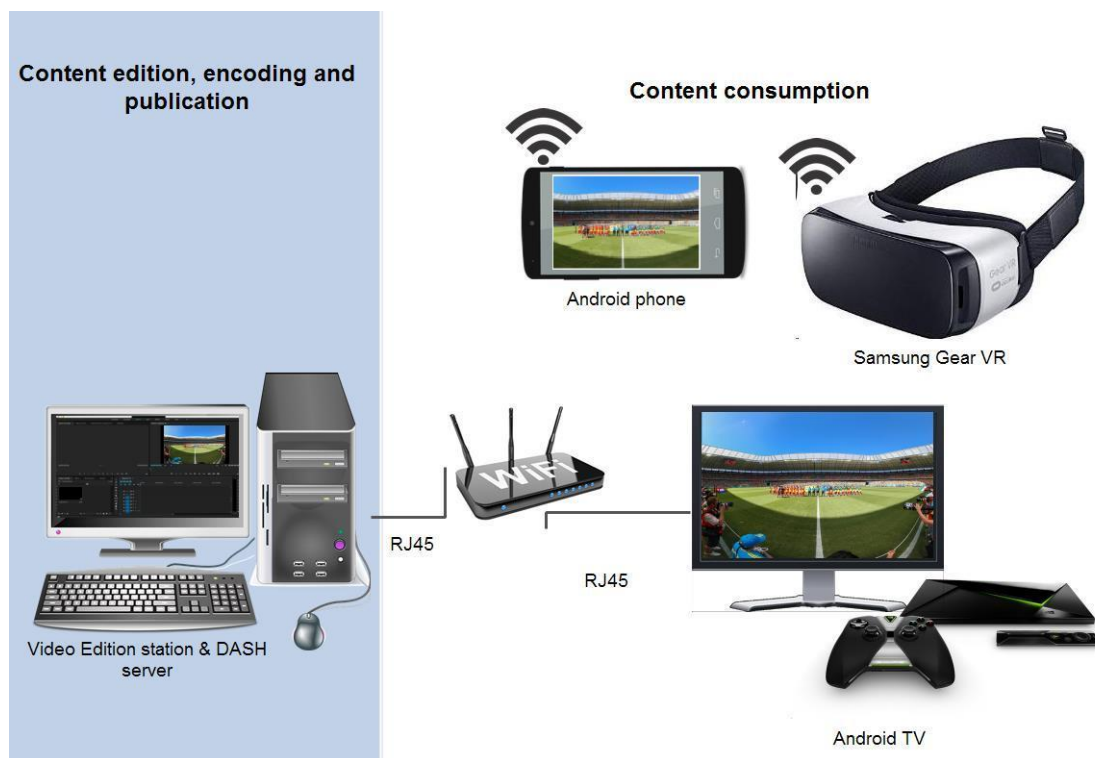


Figure 11: Illustration of how the ImmersiaTV services allow content consumption

ImmersiaTV has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°688619.



### Key messages

- Video-based content delivered synchronously on TV, second screens (tablets) and third screens (virtual reality goggles)
- Portals and video inserts allow defining interactive experiences based on omnidirectional video

- Integration in Premiere Pro for easy content creation

#### Related information

- [www.immersiatv.eu](http://www.immersiatv.eu)

#### Key contact at EBU

- Luk Overmiere (VRT)





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FILM & ADVERTISING

## Pilot 2: Live content

### Annex VI: Draft survey for the evaluation of the content creation toolkit

Q1 Name

Q2 How do you evaluate the toolkit in general? - USEFULNESS

|                                                                 | strongly disagree (1) | Disagree (2)          | Somewhat disagree (3) | Neither agree nor disagree (4) | Somewhat agree (5)    | Agree (6)             | Strongly agree (7)    | Not applicable (8)    |
|-----------------------------------------------------------------|-----------------------|-----------------------|-----------------------|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| It helps me to be more effective (1)                            | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It helps me to be more productive (2)                           | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It is useful (3)                                                | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It gives me more control over the activities in my life (4)     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It makes the things I want to accomplish easier to get done (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

|                                                |                       |                       |                       |                       |                       |                       |                       |                       |
|------------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| It saves me time when I use it (6)             | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It meets my needs (7)                          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It does everything I would expect it to do (8) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

### Q3 How do you evaluate the toolkit in general? - EASE OF USE

|                                                                                   | strongly disagree (1) | Disagree (2)          | Somewhat disagree (3) | Neither agree nor disagree (4) | Somewhat agree (5)    | Agree (6)             | Strongly agree (7)    | Not applicable (8)    |
|-----------------------------------------------------------------------------------|-----------------------|-----------------------|-----------------------|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| It is easy to use (1)                                                             | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It is simple to use (2)                                                           | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It is user friendly (3)                                                           | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It requires the fewest steps possible to accomplish what I want to do with it (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It is flexible (5)                                                                | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Using it is effortless (6)                                                        | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

|                                                     |                       |                       |                       |                       |                       |                       |                       |                       |
|-----------------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| I can use it without written instructions (7)       | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I don't notice any inconsistencies as I use it (8)  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Both occasional and regular users would like it (9) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I can recover from mistakes quickly and easily (10) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I can use it successfully every time (11)           | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**Q4 How do you evaluate the the toolkit in general? -EASE OF LEARNING**

|                                     | strongly disagree (1) | Disagree (2)          | Somewhat disagree (3) | Neither agree nor disagree (4) | Somewhat agree (5)    | Agree (6)             | Strongly agree (7)    | Not applicable (8)    |
|-------------------------------------|-----------------------|-----------------------|-----------------------|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| I learned to use it quickly (1)     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I easily remember how to use it (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

|                                       |                       |                       |                       |                       |                       |                       |                       |                       |
|---------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| It is easy to learn how to use it (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I quickly became skillful with it (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**Q5 How do you evaluate the the toolkit in general? -SATISFACTION**

|                                         | strongly disagree (1) | Disagree (2)          | Somewhat disagree (3) | Neither agree nor disagree (4) | Somewhat agree (5)    | Agree (6)             | Strongly agree (7)    | Not applicable (8)    |
|-----------------------------------------|-----------------------|-----------------------|-----------------------|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| I am satisfied with it (1)              | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I would recommend it to a colleague (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It is fun to use (3)                    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It works the way I want it to work (4)  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It is wonderful (5)                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I feel I need to have it (6)            | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

|                           |                       |                       |                       |                       |                       |                       |                       |                       |
|---------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| It is pleasant to use (7) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
|---------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|

**Q6 Did you experience any technical issues during the test with one of the devices?**

4. No
5. Yes: ...

**Q7: What is the most positive feature of the the toolkit?**

...

**Q8: What is the most negative feature of the the toolkit?**

...

**Q9: What would you change?**

...

**Q10: What is missing?**

...

**Q11 How well do the tools integrate in your production workflow?**

| Very bad<br>(0) | Bad<br>(1) | Moderately<br>(2) | Good<br>(3) | Excellent<br>(4) |
|-----------------|------------|-------------------|-------------|------------------|
|                 |            |                   |             |                  |

**Q12 Explain your answer. What would you like to see changed about the integration?**

...

**Q13 What is the main difference with the tools you regularly use for your productions?**

...

**Q14 Do you have any other comments?**

...

## Annex VII: Observation protocol for the evaluation of the content creation toolkit

(Preliminary observation protocol)

*Respondent nr.:*

*Date:*

*Observer Name:*

**Does the test user asks a questions or gives a comments during the explanation of test?**

*Yes/No*

If yes, describe possible questions/comments:

**What features of the toolkit do they use during the testing?**

**Questions or comments during the use of the toolkit:**

*Describe for each comment or question what triggered the remark (e.g. the use of which feature) and what the remark or question was.*

| Remark 1    |  |
|-------------|--|
| Trigger     |  |
| Description |  |

|                 |  |
|-----------------|--|
| <b>Remark 2</b> |  |
| Trigger         |  |
| Description     |  |

|                 |  |
|-----------------|--|
| <b>Remark 3</b> |  |
| Trigger         |  |
| Description     |  |

|                 |  |
|-----------------|--|
| <b>Remark 4</b> |  |
| Trigger         |  |
| Description     |  |

|                 |  |
|-----------------|--|
| <b>Remark 5</b> |  |
| Trigger         |  |
| Description     |  |

|                 |  |
|-----------------|--|
| <b>Remark 6</b> |  |
| Trigger         |  |
| Description     |  |

|                 |  |
|-----------------|--|
| <b>Remark 7</b> |  |
| Trigger         |  |
| Description     |  |

### Remark 8

Trigger

Description

### Remark 9

Trigger

Description

### Remark 10

Trigger

Description

## Annex VIII: Topic list for the evaluation of the content creation toolkit

(Preliminary topic list)

*Respondent nr.:*

*Date:*

*Observer Name:*

### Evaluation of the toolkit

- How do you evaluate the software editing toolkit in general?
- How useful was the toolkit for you? Did it help you in being more efficient?
  - First open question, then rating
  - Give score on a scale from 1 (Not at all) to 7 (Extremely): “It makes the things I want to accomplish easier to get done”
- Do you think the toolkit was easy to use?
  - First open question, then rating
  - Give score on a scale from 1 (Not at all) to 7 (Extremely): “It is easy to use”
- What 3 features of the toolkit did you like the most?
- What 3 features of the toolkit did you like the least?
- What would you change?
- What is missing?

### Integration with normal workflow

- How well do the tools integrate in your normal production workflow? Would you like to see changed about the integration?
- What is the main difference with the tools you regularly use for your productions?

### Round-up:

- Do you have any other comments?

## Annex IX: Observation protocol for the closed pilot test

(Preliminary observation protocol)

*Test group nr.:*

*Date:*

*Number of participating users:*

*Observer Name:*

**Are there questions asked or comments given during the explanation of test?**

*Yes/No*

If yes, describe possible questions/comments:

**Devices used during viewing:**

*What devices do the respondents use during the viewing?*

Indicate which device is used at the start and indicate when the devices are switched: TV, tablet (t), Head-mounted-display (h)

(R1=respondent 1, R2=Respondent 2, ...)

|                  | R1           | R2 | R3 | R4 | R5 | R6 | R7 |
|------------------|--------------|----|----|----|----|----|----|
| Start of viewing | (TV – t – h) |    |    |    |    |    |    |
| Switch           |              |    |    |    |    |    |    |

|        |  |  |  |  |  |  |  |
|--------|--|--|--|--|--|--|--|
| Switch |  |  |  |  |  |  |  |
| Switch |  |  |  |  |  |  |  |
| Switch |  |  |  |  |  |  |  |
| Switch |  |  |  |  |  |  |  |

*During which scenes are the devices switched?*

*Are there specific triggers to switch to another device?*

**Interaction during viewing:**

*Do the respondents ask questions or give comments during the explanation of test?*

Yes/No

*If yes, about:*

- ☐ content of documentary
- ☐ devices

☐ other:

- ...
- ...
- ...
- ...
- ...

*If yes, when they are watching on:*

- ☐ TV
- ☐ Tablet
- ☐ HMD

*If yes, describe the questions:*

*If yes, describe the comments:*

*Do the respondents interact with each other?*

Yes/No

*If yes, about:*

- ☐ content of documentary
- ☐ devices
- ☐ other:

- ...
- ...
- ...
- ...
- 

*If yes, when they are watching on:*

- ☐ TV
- ☐ Tablet
- ☐ HMD

*Briefly describe what they say:*

## Annex X: Draft survey for the closed pilot test

### Socio-demographic information

*Gender:*

*Date of birth:*

*Highest obtained educational degree:*

*Current occupation:*

*Family situation (+ number of kids):*

*Which of the following devices do you own?*

- Tv-set
- Smartphone
- Tablet
- Laptop
- Media centre PC
- Head-mounted display (example: Oculus Rift, Samsung Gear VR)
- Google cardboard

*Did you have a previous experience with virtual reality?*

- Yes
- No

*If yes, what are your experience(s) with virtual reality?*

...

*Are you a cyclo-cross fan?*

| Not at all<br>(0) | Slightly<br>(1) | Moderately<br>(2) | Fairly<br>(3) | Extremely<br>(4) |
|-------------------|-----------------|-------------------|---------------|------------------|
|                   |                 |                   |               |                  |

*Have you ever attended a cyclo-cross event at location before?*

- Never

- Only once
- A few times
- Regularly

### Viewing setting

*Which of the following devices did you use while watching the video?*

- Tv-set
- tablet
- Head-mounted display (Samsung Gear VR)

*How often did you switch between the different devices?*

- only once
- 2-3 times
- 4-5 times
- more than 5 times
- I didn't switch between the devices

### Viewing experience

*Could you indicate to which degree you liked the content of this specific video?*

| Not at all<br>(0) | Slightly<br>(1) | Moderately<br>(2) | Fairly<br>(3) | Extremely<br>(4) |
|-------------------|-----------------|-------------------|---------------|------------------|
|                   |                 |                   |               |                  |

*How would you rate the visual quality of the live video on the different devices?*

|               | Very bad<br>(0) | Bad<br>(1) | Moderately<br>(2) | Good<br>(3) | Excellent<br>(4) |
|---------------|-----------------|------------|-------------------|-------------|------------------|
| In general    |                 |            |                   |             |                  |
| On the TV-set |                 |            |                   |             |                  |

|                             |  |  |  |  |  |
|-----------------------------|--|--|--|--|--|
| On the tablet               |  |  |  |  |  |
| On the head-mounted display |  |  |  |  |  |

How would you rate the audio quality of the live video on the different devices?

|                             | Very bad<br>(0) | Bad<br>(1) | Moderately<br>(2) | Good<br>(3) | Excellent<br>(4) |
|-----------------------------|-----------------|------------|-------------------|-------------|------------------|
| In general                  |                 |            |                   |             |                  |
| On the TV-set               |                 |            |                   |             |                  |
| On the tablet               |                 |            |                   |             |                  |
| On the head-mounted display |                 |            |                   |             |                  |

On which of the following devices did you prefer to watch the live video?

- A Combination of all devices
- TV + head-mounted display + tablet
- TV + head-mounted display
- TV + tablet
- I prefer to watch on 1 device only: ...

Would you consider watching a cyclo-cross event via a similar multi-device set-up at home, if you would have access to devices?

- Yes
- No
- Maybe

## **Annex XI: Topic list professional end-user evaluation closed pilot test**

(Preliminary topic list)

### **Evaluation of the toolkit:**

- How do you evaluate the software editing toolkit in general?
- Have you experienced any issues while using the toolkit?
- How useful was the toolkit for you? Did it help you in being more efficient?
- Do you think the toolkit was easy to use?
- What 3 features of the toolkit did you like the most?
- What 3 features of the toolkit did you like the least?
- What would you change?
- What is missing?

### **Integration with normal workflow:**

- How different was your workflow from a normal workflow where the viewer has no immersive viewing experience?
- Have you taken taken different decisions knowing that viewers can watch the event in 360°?
- What is the main difference with the tools you normally use? How well do the tools integrate in your normal production workflow?

### **Round-up:**

- Do you have any other comments?

## Annex XII: Draft survey for the semi-open test

### Socio-demographic information

*Gender:*

*Date of birth:*

*Highest obtained educational degree:*

*Current occupation:*

*Family situation (+ number of kids):*

*Which of the following devices do you own?*

- Tv-set
- Smartphone
- Tablet
- Laptop
- Media centre PC
- Head-mounted display (example: Oculus Rift, Samsung Gear VR)
- Google cardboard

*Did you have a previous experience with virtual reality?*

- Yes
- No

*If yes, what are your experience(s) with virtual reality?*

...

*Are you a cyclo-cross fan?*

| Not at all<br>(0) | Slightly<br>(1) | Moderately<br>(2) | Fairly<br>(3) | Extremely<br>(4) |
|-------------------|-----------------|-------------------|---------------|------------------|
|                   |                 |                   |               |                  |

*Have you ever attended a cyclo-cross event at location before?*

- Never

- Only once
- A few times
- Regularly
- Viewing setting

*Which of the following devices did you use while watching the video?*

- Tv-set
- Tablet
- Smartphone
- Head-mounted display (example: Oculus Rift, Samsung Gear VR)
- Cardboard Virtual Reality bril
- Computer/laptop

*How often did you switch between the different devices?*

- only once
- 2-3 times
- 4-5 times
- more than 5 times
- I didn't switch between the devices

*How did you watch the video?*

- Alone
- Together with 1 other person
- Together with multiple persons

### **Viewing experience**

*Did you experience any technical issues during the test with one of the devices?*

- No
- Yes: ...

*Could you indicate to which degree you liked the content of this specific video?*

| Not at all<br>(0) | Slightly<br>(1) | Moderately<br>(2) | Fairly<br>(3) | Extremely<br>(4) |
|-------------------|-----------------|-------------------|---------------|------------------|
|                   |                 |                   |               |                  |

*How would you rate the visual quality of the video on the different devices?*

|                                                | <i>I didn't<br/>use this<br/>device</i> | Very bad<br>(0) | Bad<br>(1) | Moderately<br>(2) | Good<br>(3) | Excellent<br>(4) |
|------------------------------------------------|-----------------------------------------|-----------------|------------|-------------------|-------------|------------------|
| In general                                     |                                         |                 |            |                   |             |                  |
| On the TV-<br>set                              |                                         |                 |            |                   |             |                  |
| On the<br>computer                             |                                         |                 |            |                   |             |                  |
| On the<br>tablet                               |                                         |                 |            |                   |             |                  |
| On the<br>smartphon<br>e                       |                                         |                 |            |                   |             |                  |
| On the<br>head-<br>mounted<br>display          |                                         |                 |            |                   |             |                  |
| On the<br>cardboard<br>virtual<br>reality bril |                                         |                 |            |                   |             |                  |

How would you rate the audio quality of the video on the different devices?

|  | <i>I didn't<br/>use this<br/>device</i> | Very bad<br>(0) | Bad<br>(1) | Moderately<br>(2) | Good<br>(3) | Excellent<br>(4) |
|--|-----------------------------------------|-----------------|------------|-------------------|-------------|------------------|
|  |                                         |                 |            |                   |             |                  |

|                                       |  |  |  |  |  |  |
|---------------------------------------|--|--|--|--|--|--|
| In general                            |  |  |  |  |  |  |
| On the TV-set                         |  |  |  |  |  |  |
| On the computer                       |  |  |  |  |  |  |
| On the tablet                         |  |  |  |  |  |  |
| On the smartphone                     |  |  |  |  |  |  |
| On the head-mounted display           |  |  |  |  |  |  |
| On the cardboard virtual reality bril |  |  |  |  |  |  |

*Could you please indicate to which extent you agree or disagree with the following statements related to your viewing experience while watching this video on multiple devices? (we use a scale ranging from 1. completely disagree to 5. completely agree).*

- I think that I would like to use this set-up frequently
- I found the set-up unnecessarily complex
- I thought the set-up was easy to use
- I think that I would need the support of a technical person to be able to use this set-up
- I found the various functions in this set-up were well integrated
- I thought there was too much inconsistency in this set-up
- I would imagine that most people would learn to use this set-up very quickly
- I found the set-up very cumbersome to use
- I felt very confident using the set-up
- I needed to learn a lot of things before I could get going with this set-up

*Could you please indicate to which extent you agree or disagree with the following statements related to your experience while watching the video? (we use a scale ranging from 1. completely disagree to 5. completely agree).*

- I lost myself in the viewing experience
- I was really drawn into the video watching
- I was so involved in the viewing experience that I lost track of time
- The viewing experience was fun
- When I was viewing, I lost track of the world around me
- I felt involved in the viewing experience
- I was absorbed in the viewing experience

*Could you please indicate to which extent you agree or disagree with the following statements related to your experience while watching the video with the HMD/Google cardboard? (we use a scale ranging from 1. completely disagree to 5. completely agree).*

- I felt dizzy when I tried the HMD/Google cardboard experience
- I felt desoriented when I tried the HMD/Google cardboard experience

*Could you please indicate to which extent you agree or disagree with the following statements related to the switching between devices? (we use a scale ranging from 1. completely disagree to 5. completely agree).*

- I liked the freedom to switch freely between devices
- The switching between the different devices was confusing
- I would rather watch the content on only 1 device
- I found the right balance while switching between the devices
- I like having access to different experiences of the same scenes and content

*On which of the following devices did you prefer to watch the live video?*

- A Combination of all devices
- TV + HMD/cardboard + tablet/smartphone
- TV + HMD/cardboard
- TV + tablet/smartphone
- I prefer to watch on 1 device only.

If 'I prefer to watch on 1 device only' is selected (automatic routing): *On what device do you prefer to watch the documentary?*

- Smartphone
- Tablet
- HMD/Cardboard
- TV-set

### **Future expectations**

*Would you consider watching a cyclo-cross event via a similar multi-device set-up at home, if you would have access to devices?*

- Yes
- No

- Maybe

*For which types of video content do you think a multi-device omnidirectional video experience (as the video you have just seen) is suitable?*

|                                                  | Not at all<br>(0) | Slightly<br>(1) | Moderately<br>(2) | Fairly<br>(3) | Extremely<br>(4) |
|--------------------------------------------------|-------------------|-----------------|-------------------|---------------|------------------|
| Film                                             |                   |                 |                   |               |                  |
| News programme (e.g. Het Journaal, Terzake, ...) |                   |                 |                   |               |                  |
| Documentary                                      |                   |                 |                   |               |                  |
| Sports game                                      |                   |                 |                   |               |                  |
| Drama serie (e.g. House of Cards)                |                   |                 |                   |               |                  |
| Soap/sitcom (e.g. How I met your mother)         |                   |                 |                   |               |                  |
| Talkshow                                         |                   |                 |                   |               |                  |
| Live TV show (e.g. The Voice)                    |                   |                 |                   |               |                  |
| Music concert                                    |                   |                 |                   |               |                  |
| Lifestyle programme                              |                   |                 |                   |               |                  |
| Cooking programme                                |                   |                 |                   |               |                  |
| Gaming                                           |                   |                 |                   |               |                  |
| Other: ...                                       |                   |                 |                   |               |                  |

## Pilot 2: Live content

### Annex VI: Draft survey for the closed pilot test

Name:

Gender:

Year of Birth:

Education:

Profession:

---

1. How many hours of video content (online + on TV) do you watch on an average on a day in the week?

...hour ... minutes

How many hours of video content (online + on TV) do you watch on an average on a day in the weekend?

...hour ... minutes

2. How do you watch TV most often?

- ☐ Alone
- ☐ Together with family
- ☐ Together with others (friends,...)

3. Which of the following devices do you own?

- ☐ Smartphone
- ☐ Tablet PC (vb. iPad,...)
- ☐ Laptop
- ☐ Desktop computer
- ☐ TV-set
- ☐ Digital television
- ☐ Game console

☐ Mediacenter

**4. Do you already have experience with VR?**

☐ Yes

☐ no

If yes, which experience?

( → TO BE FILLED IN AFTER WATCHING THE DOCUMENTARY)

**5. Could you indicate to which degree you liked the content of this specific video?**

| Dislike a great deal | Dislike somewhat | Neither like nor dislike | Like somewhat | Like a great deal |
|----------------------|------------------|--------------------------|---------------|-------------------|
|                      |                  |                          |               |                   |

**6. How would you rate the visual quality of the documentary?**

|                   | Extremely bad | Somewhat bad | Neither good nor bad | Somewhat good | Extremely good |
|-------------------|---------------|--------------|----------------------|---------------|----------------|
| On the TV         |               |              |                      |               |                |
| On the tablet     |               |              |                      |               |                |
| On the VR glasses |               |              |                      |               |                |

**7. Could you please indicate to which extent you agree or disagree with the following statements related to your viewing experience while watching this documentary on multiple devices?**

|                                            | Strongly disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Strongly agree |
|--------------------------------------------|-------------------|-------------------|----------------------------|----------------|----------------|
| I lost myself in the viewing experience    |                   |                   |                            |                |                |
| I was really drawn into the video watching |                   |                   |                            |                |                |
| I was so involved in the viewing           |                   |                   |                            |                |                |

|                                                         |  |  |  |  |  |
|---------------------------------------------------------|--|--|--|--|--|
| experience that I lost track of time                    |  |  |  |  |  |
| The viewing experience was fun                          |  |  |  |  |  |
| When I was viewing, I lost track of the world around me |  |  |  |  |  |
| I felt involved in the viewing experience               |  |  |  |  |  |
| I was absorbed in the viewing experience                |  |  |  |  |  |