



Erasmus+



## REPORT IO4: EXPERIMENTAL USE CASES, PILOTING, AND MEASUREMENT

### HOTEL ACADEMY

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under the agreement n° 2019-1-FR01-KA202-063097*

#### **Deliverable [IO4] – Version [01]**

| <b>Type of Activity</b> |                                       |          |
|-------------------------|---------------------------------------|----------|
| <b>IO</b>               | Intellectual Output                   | <b>x</b> |
| <b>A</b>                | Project Management and Implementation |          |
| <b>M</b>                | Transnational Project Meeting         |          |
| <b>E</b>                | Multiplier Event                      |          |

| <b>Nature of the deliverable</b> |  |          |
|----------------------------------|--|----------|
|                                  | Feedback from participants                                     | <b>x</b> |
|                                  | Direct effect on participants and project partners             | <b>x</b> |
|                                  | Practical & reusable resources for the practitioners           |          |
|                                  | Research material bringing forward the reflexion in the sector | <b>x</b> |
|                                  | Community building tools                                       |          |
|                                  | Partnerships and Cooperation                                   |          |
|                                  | Dissemination material   | <b>x</b> |
|                                  | Organizational and working documents                           |          |

| <b>Dissemination Level</b> |  |          |
|----------------------------|--|----------|
| <b>PU</b>                  | Public   | <b>x</b> |
| <b>CO</b>                  | Confidential, only for members of the consortium (including the Commission Services) |          |

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The project runs from September 1<sup>st</sup>, 2019 to October 31<sup>st</sup>, 2021 (26 months), it involves 4 partners (MANZAVISION, France; MBA ESG, France; European University Cyprus, Cyprus; Fachhochschule Dresden, Germany) and is coordinated by Manzavision.

The report was created by the teams from FHD (Prof Dr Maik Arnold, Stefan Jung, B.A.) and the ESG (Prof Dr Pierre-Charles Chevallier).

### List of participants

| Participant No* | Participant organisation name | Acronym | Country |
|-----------------|-------------------------------|---------|---------|
| 1 (coord)       | Manzavision                   | MZV     | France  |
| 2               | MBA ESG                       | ESG     | France  |
| 3               | European University Cyprus    | EUC     | Cyprus  |
| 4               | Fachhochschule Dresden        | FHD     | Germany |

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### Abbreviations

|     |                       |
|-----|-----------------------|
| HMD | Head-mounted displays |
| VR  | Virtual Reality       |

## 1 INTRODUCTION: IMMERSIVE ROLE PLAY FOR COLLABORATIVE LEARNING

The ability to work in decentralized, location-independent, and international settings, in which collaborative information and communication technology (ICT) is applied, has not only since the pandemic become an integral part of the professional capability of so-called knowledge workers all over the world (Walberg, et al., 2000). Both the European Union and the OECD highlight collaborative skills, virtual communication, problem-solving competences, and purposeful use of network-based online tools, as well as the development of social skills and abilities to create digital content as key competencies for the 21st century (Carretero et al., 2017; Fadel, 2008). These skills are also essential for the tourism sector. In addition, internationality and cross-cultural competence are fundamental requirements for professionals in this field. Furthermore, in the context of technological change and digital transformation, there is a constant demand for future tourism managers who have acquired fundamental communication and digital literacy skills (Aktas et al., 2017).

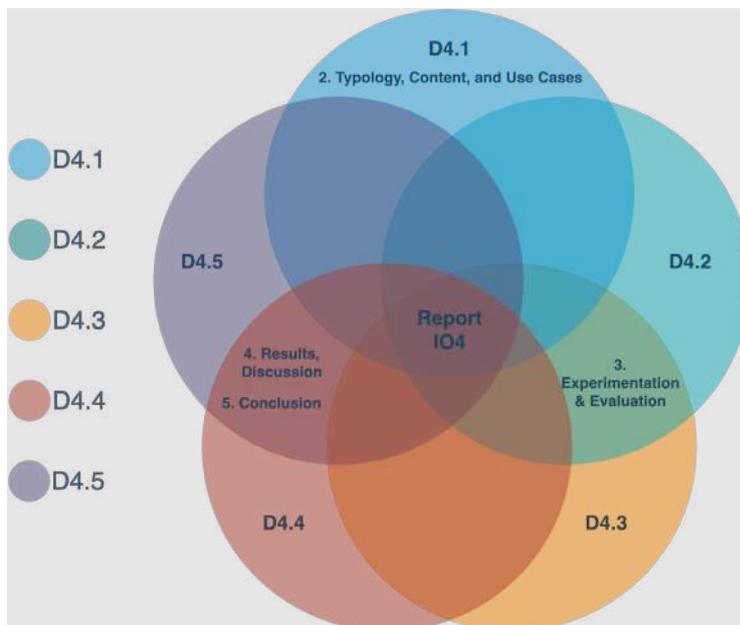
Against this backdrop, the Hotel Academy project aims at the development of a joint curriculum that enables virtual interdisciplinary, international, and intercultural collaboration and exchange between three European universities in the field of hospitality management. In the implementation of the curriculum, immersive technologies are applied to role plays as the primary didactic method (Fischer et al., 2021). *Role play*, as a learning method, offers to learners' realistic professional challenges on complex, credible life situations, and is strongly related to empathy skill development. Through role plays students learn to analyze problematic situations and to develop innovative solutions in complex social systems by taking over a range of authentic roles. Starting from there, students acquire strategic competences that strengthens both their professional and personal development (Baciu, 2016).

The use of immersive technologies such as *virtual reality (VR)* in role plays has high potential for the development of the mentioned 21<sup>st</sup> century skills. VR is understood as the “use of computer technology to create the effect of an interactive three-dimensional world in which the objects have a sense of spatial presence” (Bryson, 2013). With the help of information technology and behavioral interfaces, the behavior of 3D entities, which interact in real time with each other and with one or more users in a pseudo-natural immersive environment via sensor-motoric channels, can be simulated in a virtual world (Fuchs, Arnaldi & Tisseau, 2006). As such, VR is based on the two main concepts: *immersion* and *interaction* (technological dimension) and contributes to the creation of *physical presence*, *self-presence* and *social presence* or *co-presence* (Lee, 2004; Slater, 2009). By immersing themselves in a virtual world and the associated experience of presence, learners merge with the learning environment, immersive role plays are, therefore, felt to be natural and realistic. In such environments, learners then have the opportunity to change their perspective, to cooperate with one another and to solve authentic problems. In immersive role plays, the potentials of game-based learning and VR learning can be combined, which allows for a study-centered access to education, and which also enables the development of learners' social and communicative skills.

This report summarizes the experimental piloting of the immersive role play developed in the Hotel Academy Project and evaluates participants' user experiences when learning in a desktop/VR collaborative learning environment and, therefore, combines the following deliverables:

- D4.1: Typology, content, and schedule of experimental use cases (ESG)
- D4.2: Itemized lists of data, perception, and questionnaires (FHD)
- D4.3: Report of Usage Statistics (FHD)
- D4.4: Report regarding learning success (FHD)
- D4.5: Evaluation Report (FHD)

The reporting of the different deliverables has been merged to single report which is shown in Figure 1.



**Figure 1** Structure of the Report Based on the Deliverables

## 2 TYPOLOGY, CONTENT AND SCHEDULE OF EXPERIMENTAL USE CASES

What factors influence the user experience when learning in a virtual collaborative learning environment? This question has been focused during the preparation of the piloting. The single experimentations at the different universities at ESG, EUC, and FHD as well as the cross-institutional experimentation in October 2021 highlight the need for a specific preparation. This is important also to provide students the best possible environment for participation and learning. For the initiation of the various tests **five main phases** had to be anticipated:

1. Defining learning objectives
2. Scenario creation
3. Choice of one or more scenarios
4. Choice of technological supports
5. Which kind of scenario testing is needed for validation?

Additionally, the participation of users in the experimental setting has been classified into four specific **user types** (see Table I), as the immersive experience in the virtual environment depends on the different states of participation and interaction of users. This typology is a result of the the observation and analysis of the various experiments conducted.

- A. Those who explain the virtual role play, run the role play and analyze the content of the experience;
- B. Those who attend the experience without really being able to interact;
- C. Those who fully participate in the immersive virtual experience;
- D. Those who partially participate in the immersive virtual experience.

**Table I** Typology of Users

|                      | Immersion | No Immersion |
|----------------------|-----------|--------------|
| Active participation | A         | B            |
| No participation     | C         | D            |

**Category A: Immersion and active participation.** Students in this category were able to actively participate and fully benefit from the immersive virtual experience in the role play.

**Category B: No immersion and active participation.** Teaching staff had been chosen to monitor the test. They explained ahead to the student the situation they must face and the objectives to be achieved. They were also responsible for monitoring the students during the role play and initiated the group discussion at the end of the role play. The experience is determined by different factors, for example:

- Digital teaching approach: Face-to-face or remote;
- Group composition: Homogeneous or heterogeneous group of students;
- Availability of technical assistance;
- Interference of the instructor during the role play.

**Category C: Immersion and no participation.** Represents the group of spectators. For the cross-institutional experiment, students from three different campuses (ESG, EUC, FHD) participated or observed the role play ‘from outside’. The students met in an auditorium to validate their experiences. Most of the participants had been briefed in advance, but their degree of technical skills and investment varied. Some students had already participated in previous simulations.

**Category D: No immersion and no participation.** Students in this category had registered for the role play and would have liked to participate but had not met the requirements for the experimentation (i.e., computer equipment and software requirements). However, downloading the application on laptops computers brought technical issues. It was necessary to switch on a proper configuration lately, moving to PC.

The phases of the virtual experience in the role play can be divided into the following three stages, which are described and illustrated in detail in chapter 3.2 (see Figure 3):

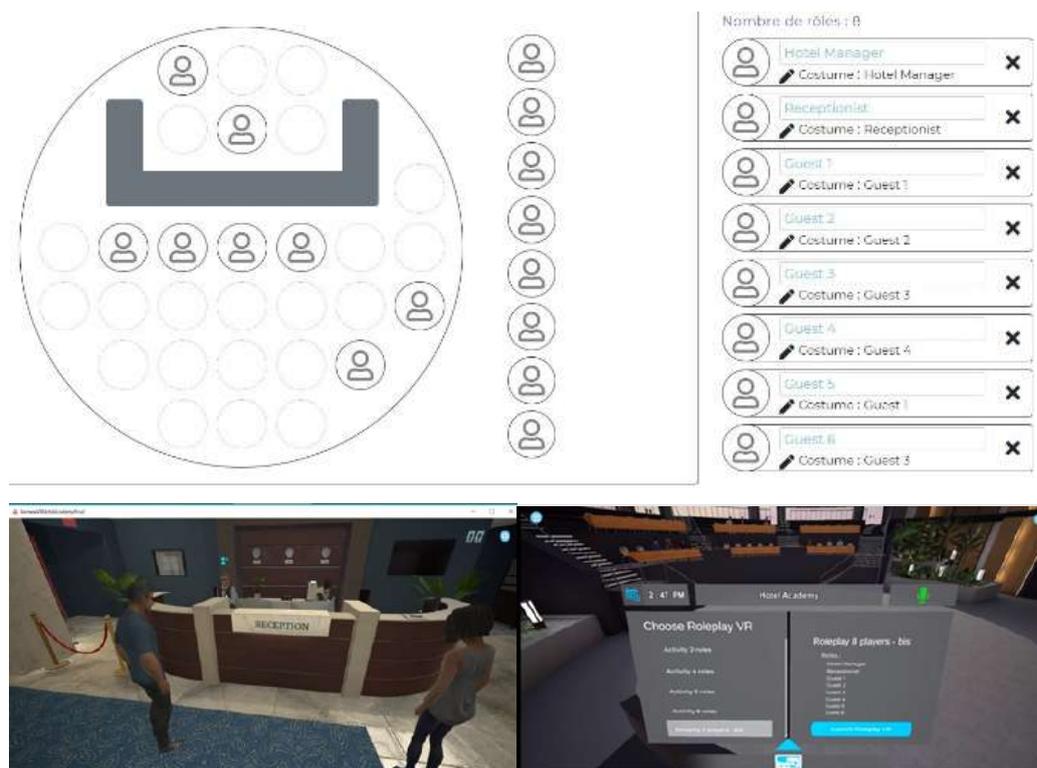
- **Phase 1** corresponds with all the information communicated before the virtual role play starts. This phase is itself divided into several sequences: The instructor presents the session to the spectators and participants and introduces the main objectives and course expectations.
- **Phase 2** corresponds with the role play with multiple participants. A scenario chosen by the instructor and the partner consortium was played twice in different ways.
- **Phase 3** corresponds with the debriefing with various approaches that range from spontaneous individual reactions to focus group discussions and questionnaire sent just after the role play, questionnaire distributed several weeks after the experience. All these data were necessary to better understand the user experience feedback.

### 3 EXPERIMENTATION AND EVALUATION

#### 3.1 DESCRIPTION OF THE TECHNICAL TOOL: THE DESKTOP/VR ROLE PLAY

The Hotel Academy TEEMEW application is designed to be played with VR headsets (Oculus Quest 2 HMD) to ensure optimal immersion. However, due to COVID-19 sanitary restrictions and the impossibility of meeting physically with students to offer them the experience in VR, we have started the first experimentations in a remote mode, via a modified desktop/VR version. Several iterations have been conducted so far. Additionally, other tools were used such as MS Teams™ (for chat purposes), Kahoot™, and MS Forms™ (for questionnaire purposes).

The desktop/VR version requires both users and instructor to install an executable file on a Windows™ operation system. For the instructor, a back office enables him/her to invite the students, plan their position within the amphitheater, upload files to be displayed (pictures, videos, presentations, and other documents), and finally to plan the roles that will be played (max. of eight actors and their roles e.g., hotel staff or guests).



**Figure 2** Role-play design: actors’ point of view in hotel lobby, and amphitheatre

Once the application is launched, each student creates his/her avatar and then enters the amphitheater and is placed on a seat. The instructor stands in the center of the amphitheater. Students and instructors each have their own individual screen and interface. Instructors can display media on these screens as well as launch role plays scenarios, which take place in a 3D hotel lobby. Actors are teleported to the hotel lobby while the other students remain in the amphitheater as spectators (see Figure 2).

Before launching, the instructor presents to the students the detailed situation of each scenario to be played and then decides with the group who will play each role (e.g., reception frontline staff, manager, or guests). In the scenarios, actors can speak and hear each other; spectators and instructors can intervene if their microphone is enabled. A good headset is required for optimal audio sound and to avoid echo or Larsen effects (Hodgson, 2010, p. 118).

The learning journey in Hotel Academy leads students through *three separate learning phases*:

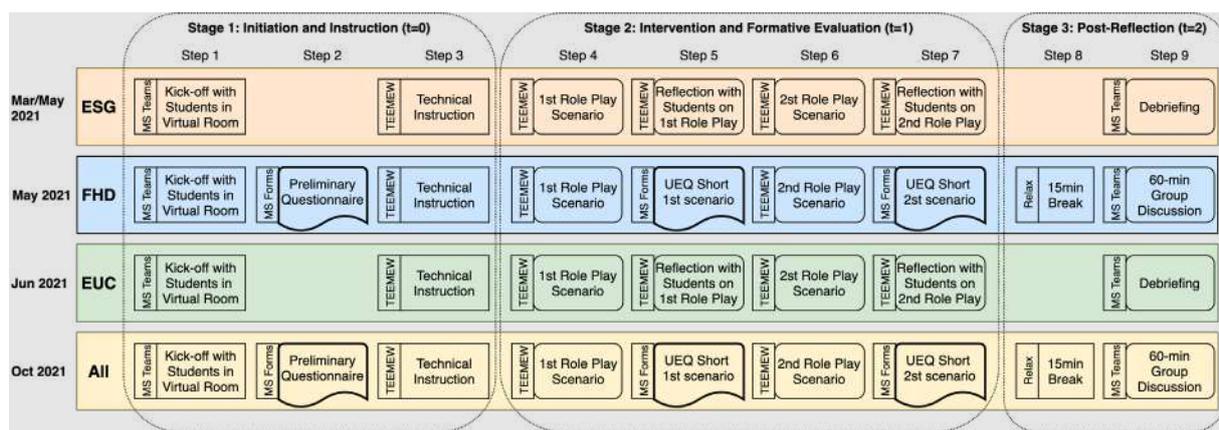
- (1) A *preparation phase*, in which learners define their roles, not only within an immersive VR scenario but also in spectator mode outside VR.
- (2) Within the *scenario phase*, learners participate in a role play as hotel management, hotel staff, or visitors, and test their skills in a variety of challenging situations.
- (3) In the final *feedback and discussion phase*, learners discuss and evaluate their learning experiences together in a collaborative, cross-institutional virtual classroom. This three-phase activity is part of two bachelor's and one master's degree programs of the participating university partners from Cyprus, Germany and France, since it already delivers complex interactivity that prepares students for further professional qualifications.

## 3.2 THE EXPERIMENTATION AND EVALUATION DESIGN

### 3.2.1 Methods

The experimentation and evaluation design follows a mixed methods approach and helps to triangulate multiple types of data and sources (written and oral, observations and user experiences) which allows for various procedural and formative evaluation objectives: a comprehensive impression of user experiences as well as the monitoring of the learning process, the exploration of the learning arrangement, and a reflection of the design of the role play itself (Arnold, 2010, p. 537). As evaluation instruments, we combined questionnaires, participatory observation, and reflective group discussions with learners and instructors at each stage of the process spanning from the *initiation and instruction phase* via the *formative evaluation* of the intervention itself to *post-reflections* of learners (see Figure 2). Moreover, we conducted guided online group discussions in a virtual learning environment (TEEMEW and MS Teams™; Gokhale & Machina, 2018).

Additionally, the short version of the user experience questionnaire (UEQ-S, German translation) was used for a quick and immediate assessment of the feelings, impressions, and attitudes that arise when experiencing the TEEMEW desktop/VR (see section 4), whose scales (pragmatic and hedonic quality) and various translations have been successfully validated elsewhere (e.g., measured by Cronbach's Alpha; Schrepp, 2017).



**Figure 3** Evaluation Design for Piloting of Hotel Academy

### 3.2.2 Sample and Data

Experimentation with single pilots at the different campuses spans from March to June 2021 and was completed with cross-institutional piloting in September 2021 (for an overview see Table 2). In March and May 2021, the sample at ESG consisted of three (out of four) students and one lecturer from a postgraduate degree program “Management de l’Hôtellerie (MBA)”. In May 2021, at FHD five students, one lecturer, and two instructors from the undergraduate degree program “Tourism and Event Management (B.A.) participated in the piloting. In June 2021, at EUC five students and two lecturers from the undergraduate degree program “Hospitality and Tourism Management (B.A.) were included in the role play scenario. In September 2021, the experimentation was completed with a cross-institutional virtual collaboration between ESG, FHD, and EUC. In this last scenario, seven students, four lectures and two instructors participated in the piloting. Additionally, in all piloting scenarios,

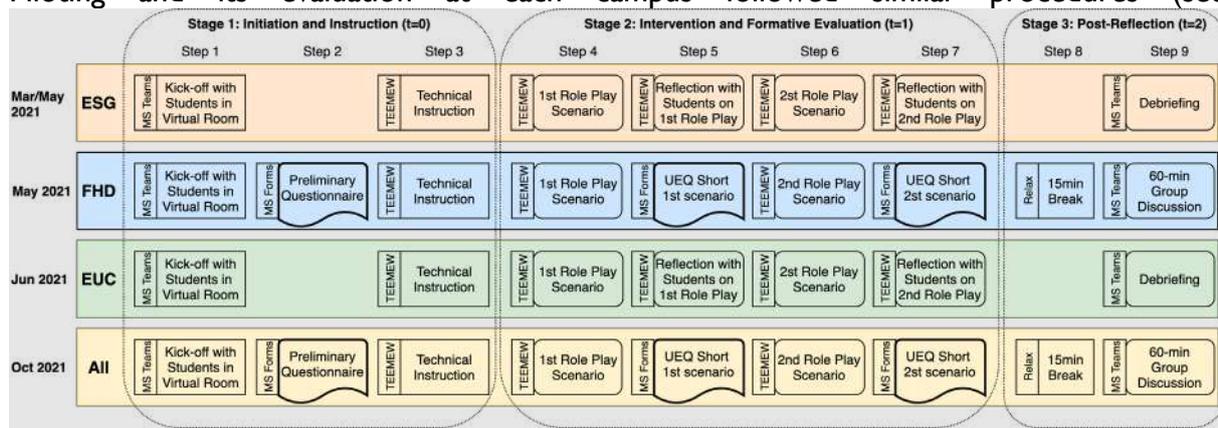
one instructor from Manzalab assisted with the technical administration of the role play scenarios; another person from Manzalab was responsible for the documentation of the evaluation.

**Table 2** Sample and Data

| Dates    | Partner | Students, active | Students, spectators | Lecturers | Instructors | Admins |
|----------|---------|------------------|----------------------|-----------|-------------|--------|
| 03/22/21 | ESG     | 4                | 1                    | 1         | 1           | 2      |
| 05/07/21 | FHD     | 4                | 1                    | 1         | 2           | 2      |
| 05/10/21 | ESG     | 3                | 1                    | 1         | 1           | 2      |
| 06/16/21 | EUC     | 4                | 1                    | 2         | 2           | 2      |
| 10/12/21 | ALL     | 7                | 7                    | 4         | 3           | 3      |
| Sum      |         | 22               | 11                   | 9         | 9           | 11     |

### 3.2.3 Procedure and Data Analysis

Piloting and its evaluation at each campus followed similar procedures (see



**Figure 3).** The *first stage* ( $t=0$ ) comprises the initiation of the experimentation through a kick-off meeting with students in a virtual room (MS Teams™). In the single experimentation at FHD and EUC and in the cross-institutional experimentation with all partners, students were asked before technical instruction to fill in a preliminary questionnaire to assess their pre-knowledge and previous experiences in communication trainings of this sort.

The *second stage* ( $t=1$ ) included the actual intervention and a formative evaluation approach: After students had played two separate role play scenarios, a reflection process followed. Two scenarios were selected for all the pilots:

- **Scenario I:** Role play takes place in a 5-star hotel in a Coastal city. There is a clear hierarchy in the hotel's structure and all roles are well-defined. The hotel has 220 rooms of various types, two conference rooms, rated as the most well-equipped in the area. The hotel has two restaurants: one of them of international cuisine and one thematic (fish restaurant). The thematic restaurant is closed during Sundays. Both

restaurants are very popular and recognised in the area and attract tourists as well as locals. As a policy and for maintaining and retaining the high level of experience that the hotel provides, customer service is number one priority for management. In this respect, the guests of the hotel are considered as the most significant market for the management.

- **Scenario II:** Role play takes place in a 3-star hotel in a city centre, an urban destination that is highly industrialised and with offices of many companies. This area has many hotels, restaurants, and conference centres of various types and the transportation system of the city is excellent. The hotel has a capacity of 50 rooms of various types and the occupation rate is during this period high (85%) due to the intense business activity of the city. Due to a discontinuation in water facilities, two of the rooms are under maintenance. The hotel management aims at increasing its star-rating in the next years, and for this reason a top priority of the management is customer satisfaction. Every customer counts. Thus, to meet this criterion, management allows staff for flexibility in the pricing policy (e.g., special rates, upgrading to a higher type of room at a discounted price, sales promotions, etc.).

In the single experimentation at ESG, students were involved in an open discussion with staff from Manzalab and with their lecturer. In the single experimentation at FHD and EUC and in the cross-institutional experimentation, directly after each scenario students completed the UEQ-S (validated German and English translation), as the “goal of the UEQ is to catch the immediate impression of a user towards a product. Thus, try to get the answers to the UEQ before you discuss with the participants” (Schrepp, Hinderks & Thomaschewski, 2017).

The evaluation procedure was concluded in the *third stage (t=2)* with a debriefing discussion with a guided 60-minute group discussion in each of the different experimentations.

The analysis of the students’ user experiences in the UEQ-S questionnaires followed the procedure provided by the most up-to-date version of the Microsoft Excel tool that is available on [www.ueq-online.org](http://www.ueq-online.org). The results from the various open and guided group discussions were derived from a systematic application of the steps of qualitative content analysis that included (re-)reading all transcribed data, comparing the data with a view to establishing similarities, differences, and contradictions, creating codes using thematic coding and in-vivo-coding, and summarizing headings into main categories until thematic saturation of the data collected was achieved (Guest, Namey & Chen, 2020).

## 4 RESULTS AND DISCUSSION

### 4.1 PRE-KNOWLEDGE QUESTIONNAIRE

#### 4.1.1 Preliminary Questionnaire on previous experiences

In the first two experimentations at the FHD and EUC, we have asked participants to complete a short questionnaire before the meeting and the experimentation to better understand the pre-knowledge and experiences of role plays and/or virtual environments. Participants were asked to fill out a short MS Form questionnaire before the technical instruction and intervention. The findings from this pre-knowledge questionnaire will be presented in this chapter, starting with the experimentation at FHD in May 2021 and EUC in June 2021 and the cross-institutional experimentation in October 2021. In March and May 2021, at the ESG experimentation this questionnaire was not used.

#### 4.1.2 Results of FHD Experimentation

The results show that of the eight participants only one had previous experience with similar communication trainings. The question of whether the respondents make regular or more frequent use of virtual environments (for differing purposes) shows that about 75% do not use it at all and only two respondents (13%) use it on a more frequent basis. So far, no respondent has participated in a virtual or online role play specifically for educational purposes. Six of the respondents (75%) feel prepared for communication in professional contexts, especially in contact with customers or colleagues if conflicts arise, while the rest feel less, rather than more, prepared. The reasons and motives why participants enrolled freely in this piloting course include curiosity and the acquisition of new knowledge for professional reasons. Respondents expected from the TEEMEW role play scenarios to discover new opportunities for interactions, to learn innovative approaches, and to receive new impulses for conflict mediation, but also to have fun.

#### 4.1.3 Results of EUC Experimentation

None of the respondents has ever participated in a communication training. The results also show that 4 of the five students were enrolled in the Hospitality and Tourism study program and only one student in Business. Concerning the question, whether participants have ever been in a VR environment (with goggles or in the desktop variation), only one of the five respondents had previous experiences (20%). Asked whether respondents have dealt with virtual reality environments on a more regular or frequent basis before the experimentation, only one in five had regular experiences with PlayStation™ VR and VR videos in general. Regarding the question, if participants have ever participated in a virtual or online educational role-playing game, none of the respondents had previous experiences. Four of the five (80%) participants felt perfectly prepared when conflicts arise in communication in the working world, e.g. with customers and colleagues and only one felt rather less prepared. The motivation for signing up for the planned experimentation, participants found this invitation “an excellent way to learn and understand what it takes to work with people of different mindset”, an “innovative learning [...] that may be more productive”, and they could learn “to deal with difficult situations and customers”. Also, the expectations for the upcoming experimentation were positive and future-oriented and included feedback such as: “To learn and understand more of the mindset of people, how they work and how they communicate, but as well as practice myself all those things”; “a new way to experience

potential scenarios that we can relate to and get appropriate feedback“; “to learn more things about tourism and hospitality industry”.

#### 4.1.4 Results of Cross-Institutional Experimentation

In the survey before the cross-institutional experimentation only three of the participants completed in the pre-knowledge questionnaire, due to technical issues. Nevertheless, we present the results of this rather small sample and will only highlight the most pertinent feedback. All students were enrolled in a Hospitality and Tourism study program. Two of the three students already had already participated in previous communication trainings. And one of the respondents also reflected on the previous role play in which the student participated:

“It consisted of different role play games with an actress in presential mode. 2 different games: 1) There was a problem with my guest (actress) and I had to deal with her (actress) as a receptionist. 2) There was a problem with a person in my team (actress) and I had to deal with her as a manager.“

The answers to the question if they feel prepared when conflicts arise in communication in the working world, e.g. with customers or colleagues, the answer vary widely from “yes, perfectly” via “rather less” to “no”. Their motivation to participate in the planned experimentation was a bit cautious, including: “I don't know it yet, but it seems to be an excellent technological device. I'm used to presential mode, and it will be very interesting to interact with students from other schools;“ “to have an idea of what I'm may facing to in the future working environment.” Also, the expectations for the upcoming experimentation were positive: “To be given some skills for a better communication when problems come up. And to be assessed after my performance;“ „a realistic hotel scene simulation experience;“ “to communicate all around the world easily.”

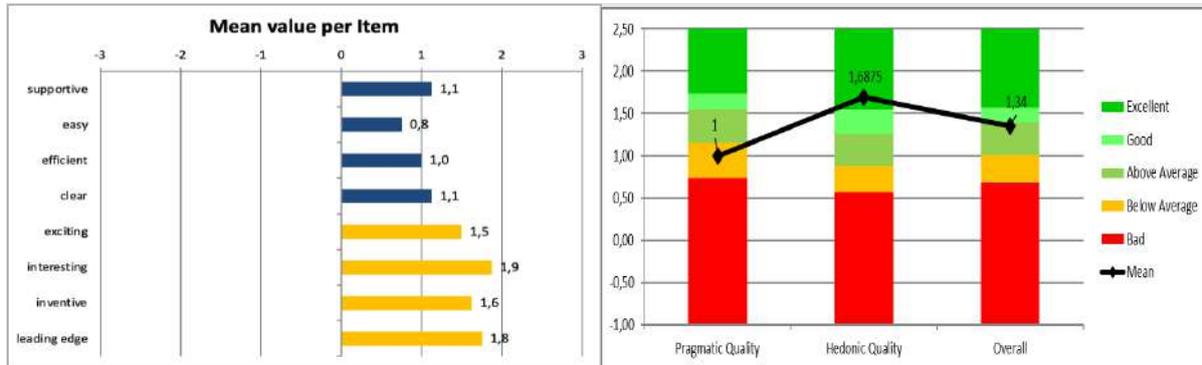
## 4.2 USER EXPERIENCES IN THE USER EXPERIENCE QUESTIONNAIRE

### 4.2.1 Results of FHD Experimentation

The evaluation of piloting the TEEMEW Second Version at FHD took place on 5th May 2021. The following findings will be presented based on the user experience questionnaire (UEQ-S) after the first ( $t_1$ ) and second ( $t_2$ ) scenario. Respondents were asked to fill in an MS Form with the short version of the UEQ (German translation) immediately after the first ( $t_1=1$ ) and second scenarios ( $t_2=1$ ). The results are presented in Figure 4 and Figure 5. The pragmatic quality consists of efficiency (item: efficient), perspicuity (items: easy, clear) and dependability (item: supportive), while the hedonic quality consists of stimulation (items: exciting, interesting) and novelty (items: inventive, leading edge) (Schrepp, Hinderks & Thomaschewski, 2017, p.3).

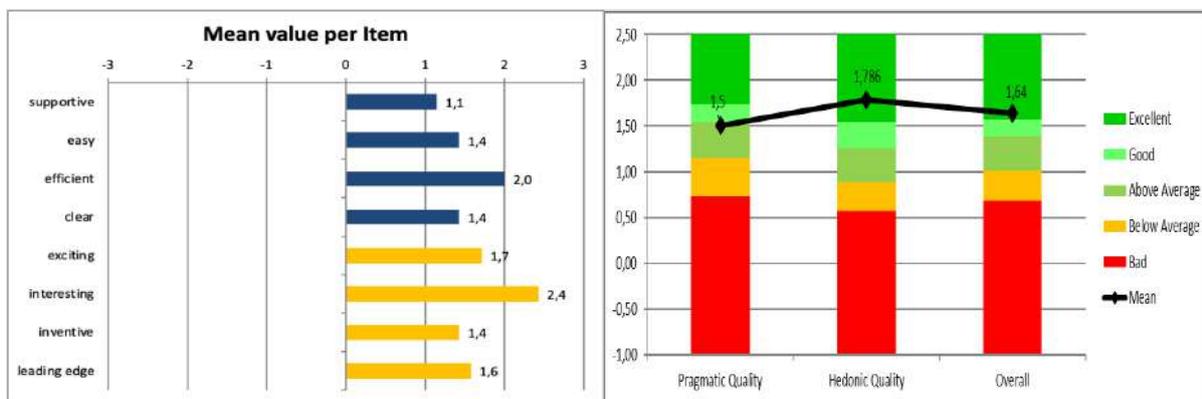
**Scenario 1.** All pragmatic values (supportive, easy, efficient, clear; mean scale value of 1.0) and hedonic values (exciting, interesting, inventive, leading edge; mean scale value of 1.688) qualities of the product were assessed as positive within the range of 0.8 to 1.8, except for the quality “easiness” as being at the “positive” end of a neutral evaluation (see Figure 4). Nevertheless, the pragmatic quality was perceived as “below average” (50% of results better, 25% results worse) and the hedonic quality as “good” (10% of results better, 75% of results worse). Overall, the quality of the TEEMEW product was assess “above average” (mean scale value of 1.34; 25% of results better, 75% of results worse). These scales measure how easy it

is to become familiar with the TEEMEW app. As it was the aim of the first scenario to ensure that participants would learn how to use the application, this result shows that participants need some time to become familiar with it. As shown, the pragmatic quality scale (goal-oriented aspects) was lower than the hedonic quality scale (non-goal-oriented aspects).



**Figure 4** Scales pragmatic quality (blue) and hedonic quality (yellow) FHD Scenario 1 at  $t_1$ .

**Scenario 2.** All pragmatic (supportive, easy, efficient, clear; mean scale value 1.5) and hedonic (exciting, interesting, inventive, leading edge; mean scale value 1.786) qualities of the product were assessed without any exception as positive within the range of 1.1 to 2.4 (see Figure 5). Similarly, the pragmatic quality scale (goal-oriented aspects) was lower than the hedonic quality scale (non-goal-oriented aspects). Compared to scenario 1, both scale values and the overall value (from 1.34 to 1.64) were not only higher but the difference between the scales also decreased from 0.688 to 0.286. This means that after the second scenario, participants assessed TEEMEW to be almost equally pragmatic (useful and helpful in achieving their goals) and hedonic (interesting, attractive, and encouraging enough to catch their interest).



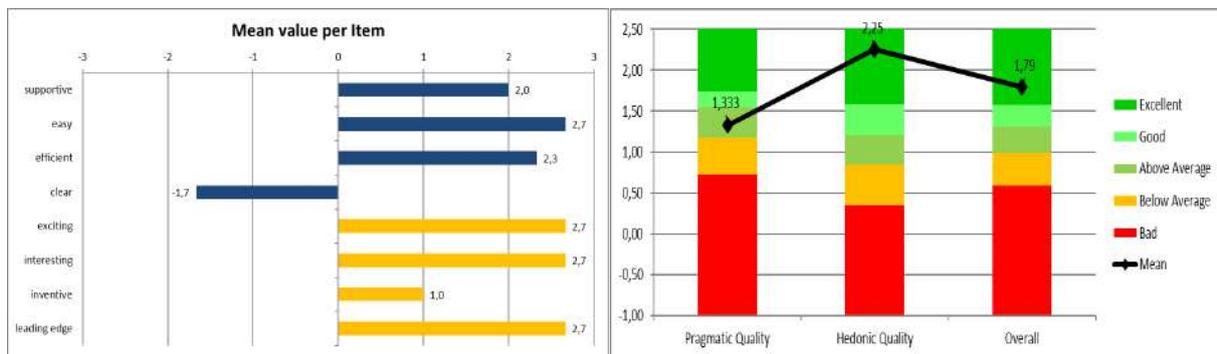
**Figure 5** Scales pragmatic quality (blue) and hedonic quality (yellow) FHD Scenario 2 at  $t_2$ .

#### 4.2.2 Results of EUC Experimentation

The evaluation of piloting the TEEMEW Second Version at EUC took place on 16th June 2021. The following findings are based on the user experience questionnaire (UEQ-S) after piloting the mentioned role play scenarios ( $t_1=1$ ).

As shown in Figure 6, the user experiences of the role play scenario on the pragmatic scale was perceived by the participants highly positive for the sub-categories supportive, easy and efficient design (ranging from 2.0 to 2.7) except for the sub-category of clarity (-1.7) (mean scale value of 1.333 in total). On the hedonic scale, all sub-criteria were recognized as highly

positive ranging from 1.0 to 2.7 (mean scale valued of 2.250 in total) except for the quality “inventive” as being at the “positive” end of a neutral evaluation. The sub-category “inventive” received the weakest positive appreciation (above average). Based on these results, the pragmatic qualities (goal-orientated aspects) of TEEMEW were assessed as positive in total, but only as “above average” (25% of results are better, 50% of results worse). Nevertheless, it needs to be mentioned that the sub-category “clarity” was assessed negatively, meaning that the role play procedure or instructions have been confusing for some of the participants. On the hedonic scale (non-goal-oriented aspect), the quality of the role play was understood as “excellent” (in the range of the 10% best results). Overall, the user experiences can be benchmarked still at the “excellent” level (in the range of the 10% best results) which shows that participants become familiar with TEEMEW at EUC, but the clarity of the product and its inventive nature need to be developed for future iterations.

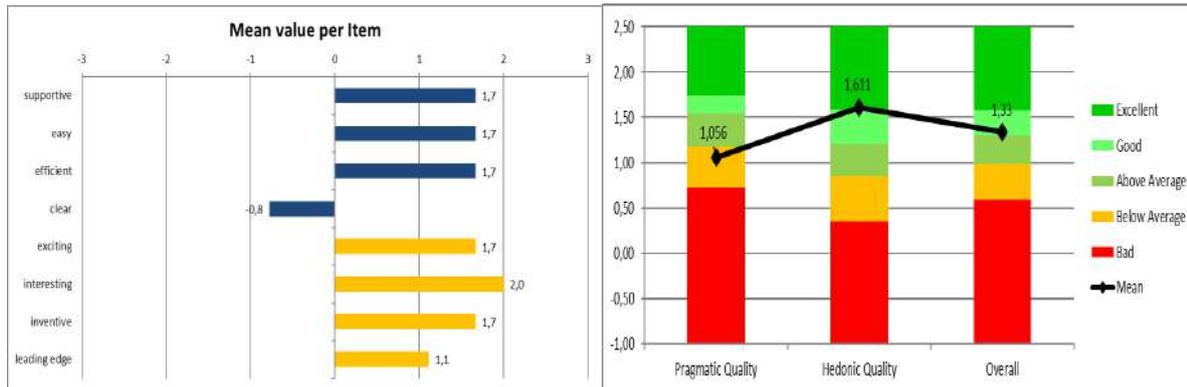


**Figure 6** Scales pragmatic quality (blue) and hedonic quality (yellow) EUC Scenario at  $t_1$ .

#### 4.2.3 Results of Cross-Institutional Experimentation

The evaluation of piloting the TEEMEW Second Version at all three universities (EUC, ESG, FHD) took place on 12th October 2021. The following findings are based on the user experience questionnaire (UEQ-S) after piloting the mentioned role play scenarios ( $t_1=1$ ).

As shown in Figure 7, the user experiences of the role play scenario on the pragmatic scale (supportive, easy, efficient, clear; mean scale value 1.056) was perceived by the participants highly positive for the sub-categories supportive, easy and efficient design (value of 1.7) except for the sub-category “clarity” which was assessed negatively (-0.8). On the hedonic scale, all sub-criteria were understood as positive ranging from 1.1 to 2.0 (mean scale valued of 1.611 in total). The sub-category “leading edge” received the weakest positive appreciation (above average). Based on these results, the pragmatic qualities (goal-orientated aspects) of TEEMEW were assessed positive in total, but only as “below average” (50% of results are better, 25% of results worse). On the hedonic scale (non-goal-oriented aspect), the quality of the role play was understood as “excellent” (in the range of the 10% best results). Overall, the user experiences can be benchmarked still as “good” (10% of results better, 75% of results worse). Based on these results, students appreciated the learning experience in TEEMEW as positive, but were curious about the clarity of the product as already mentioned in the experimentation at EUC (see Figure 6). These and other findings will be further reflected in the analysis of the qualitative data collected from the group discussion and participatory observation.



**Figure 7** Scales pragmatic quality (blue) and hedonic quality (yellow) EUC-FHD-ESG at  $t_1$ .

In the second part after the UEQ, all nine participants were asked VR-related questions. These questions included five statements to which the respondents needed to react on a 5-point Likert scale (ranging from strongly agree to strongly disagree). To question, if students felt that the people in the virtual environment were aware of my presence, 78% said “yes, perfectly” compared to 22% “no, not that much”. Asked whether they correctly identified or localized sounds produced by the virtual environment, 67% of the participants relied “yes, perfectly” while 22% said “Was okay, but there is a way for improvement” and 11% said “No, I felt disturbed most of the time”. To the statement “My thoughts/activities ran fluidly and smoothly. At each step I knew what to do,” 78% of the students “agreed” or “strongly agreed”, while 11% “disagreed” or another 11% were “neutral”. Ask if they felt just the right amount of challenge, 89% of the respondents “strongly agreed” or just “agreed” and only 11% were “neutral”. To the statement “Learning to operate in the virtual environment would be easy for me,” 89% of the students “strongly agreed” or “agreed” while only 11% were “neutral”. We also asked openly the respondents if they wanted to add or comment on something. The following suggestions were made:

- “Once it works properly, the device can be used in whichever social context, not only reception”;
- “Moving around the amphitheater, doing, moving hands”;
- “Since we did not used VR glasses it did not felt extremely useful/immersive - more like a call - the visuals did not seem to be that important since we did not move our head around. But it was good to have a visual indicator to see which role is talking. When using VR glasses the immersion/usefulness could be perfect for me”;
- More critical assessments: “improve audio quality”, “fix audio issues”, or “product needs development”;
- “pretty nice experiment and environment”;
- “The device is easy to use. The more the roles are prepared in advance, the better the exercise will be. We can prepare what to say in other to make it difficult to our receptionist (I was a customer) to deal with me”;
- “I find it an innovative way to prepare to with the right tools to prevent certain unwanted situations”.

Overall, this means that this app was evaluated positive at both instances as users could solve their tasks without unnecessary effort, felt in control of their actions, were excited and motivated to use the product and found the app innovative and creative. Compared to evaluations of other products, we can benchmark our data with data sets of the full UEQ (280 studies; 14,056 respondents), which allows for conclusions about the relative quality of the

evaluated product compared to other products (e.g., Schrepp, Hinderks & Thomaschewski, 2017). Our data show that pragmatic qualities have evaluated positively above average and hedonic qualities as well as the overall impression of TEEMEW have been rated as of excellent value.

### 4.3 GROUP DISCUSSIONS AND PARTICIPATORY OBSERVATION

At the end of each experimentation, all participants were involved in various group discussions that help to highlight the different experiences, activities, expectations, and recommendations of the students, lecturers, and instructors in the role play.

#### 4.3.1 Common findings on ALL experimentations

In the following, and before the reports of the detailed findings from each individual experimentation, the main categories of the findings will be briefly presented and will show the proportions of their outcomes of the project.

**Table 3** Main Categories in the Group Discussions

| Main categories   | Description  |
|---|--|
| (1) Presence in the virtual environment (VE)                      | How the presence of the VE is received by the players as well as how the players feel their individual presence acting out in the VE: Approx. 75% of the participants referred to this aspect in a positive way, whilst the others formulated critical responses.  |
| (2) Reflection on role play design                                | Thoughts about how good and adequate the role play is designed, so that it indicates a clear expedient quality during the whole use and play: Almost everyone, approx. 90% described the role play design as truly functional; its effectiveness and consistent simplicity was praised throughout.   |
| (3) Reflection on one's own action and immersion during role play | Deeper thoughts about one's own actions within the VE, and how these actions lead to a truly immersive development during the play: These reflections imply aesthetic and narrative impulses. Here, the experiences varied widely, while positive and critical aspects kept the balance. Not everybody saw her/his personal intentions/actions well portrayed and received. 50-50 in terms of scale. |
| (4) Reflection on learning and teaching                           | Participants reported also about how the play can (even better) be of use for consistent and feasible implementation while teaching (and learning). Although most of the participants had few to add to this matter, a few good ideas were collected here, which shows, that the playful VE evokes thoughts and inspiration throughout its presence.   |
| (5) General impressions   | More generally, respondents also discussed about fundamental aspects realized by the players during the scenario, not specifically displayed in one of the other categories.   |

Results at the different national pilots provided different insights into the experimentation and from various perspectives. This results section included the reflections of all national experimentations and the cross-institutional experimentation and are described chronologically in the following.

#### 4.3.2 Specific results of ESG Experimentation

The experimentation with students from ESG was set in two sequences and with a range of role play scenarios on separate dates (March 22nd and May 10th 2021), which involved data collection from TEEMEW beta tests, and from students' feedback about the technical organization of the role play, as well as its benefits and obstacles during the scenarios. This was complemented by user recommendations (student and instructor) in open discussion rounds after testing each of the scenarios.

The following conclusion and recommendation were drawn from the first experimentation at ESG and the Manzalab team: A technical manual should be sent to the students ahead of the scheduled experimentation and a pre-test should be conducted. Headsets should be mandatory to avoid echoes, as well as being a fundamental requirement for efficient communication. Participants should also be able to participate in spectator mode during the role play. The role play is technically limited to eight actors/testers for one session, and multiple sessions can be planned.

The objective of the second test was to replicate the piloting from March 2021 with the lecturer, two instructors, and three students (same testers as for the previous test). All testers and instructors used TEEMEW Second Version; the downloading was successful and the TEEMEW passage fluid. Two new detailed role plays were offered to students. While the first scenario was short and required a second attempt with more instructions, the second scenario was successful at the first attempt. The following feedback was collected in the open discussions: There is a need to provide the “players” with a more detailed presentation of the role play scenarios. Additional features were suggested such as videos in the background of the reception desk area. Conducting the role play in their native language would increase the students' learning experiences except for the case of joint virtual collaborative meetings with EUC and FHD partners. Furthermore, future piloting should consider evaluating the learning experiences and effects of the role plays on the participants during the intervention itself and continue to involve them to discuss potential improvement.

After both test sequences, the following general indications were stated: a possible voting (to vote/rate certain actors in their roles) should be done while the roleplay scenario is still open, so immediately after its run and before it is getting closed; general depictions of poor sound quality were stated, the importance of good and stable sound quality (with no interferences) is highlighted; in addition to the more detailed instructions in the second sequence, a general enrichment of the scenario is highlighted by the teachers, this should take place at the beginning of the game; on the other hand the students liked the scenario's qualities for the possibility of improvisation and for the “magic of the moment”; pre-course training could be done ahead of the course with the instructors through a tutorial.

#### 4.3.3 Results of FHD Experimentation

The main findings were derived from a systematic application of the thematic qualitative analysis steps of the guided online group discussion with the participants, which include the following main and sub-categories (see Table 4):

*Presence in the VE.* Interaction and bodily presence in VR-based interventions was mediated during the role play through the TEEMEW app which did not allow for body movements but only for audio-visual responses of the players. Users felt that the response time is very quick. Avatars that had been selected before the role play and the surrounding environment during the role play was deemed realistic, so it was easy for all participants to (i) *quickly adapt their own actions to the VE*. Nevertheless, the way participants perceived their involvement in the VE and opportunities and barriers to actively contribute to the role play were also discussed. The current scenarios were evaluated as sufficient; participants felt drawn into each scenario and it allowed for more focused contributions to the actual situation in the simulation: (ii) “I think that the *current ‘Immobility’ is sufficient for this kind of game*, otherwise the game would go in a different direction.” (Quote). In general, the VE was perceived as suitable; everybody could focus on the hotel lobby, and nobody felt distracted from the surroundings.

**Table 4** Main and sub-categories in the guided online group discussion

| Main Categories  | Partner   |
|--|---|
| <i>Presence in the virtual environment (VE)</i>                      | i. Quick adaptation of one’s own actions to the virtual environment   |
|  | ii. Despite a feeling of immobility, involvement of players is experienced as realistic and focused, no distraction from surroundings                   |
| <i>Reflection on role play design</i>                                | iii. Inefficiency to switch on/off control panel  |
|  | iv. Annoying echoes of players with no appropriate headsets   |
|  | v. Suggestions for the synchronous representation of body movements or responses to events in the game  |
| <i>Reflection on one’s own action and immersion during role play</i> | vi. Successful interaction highly depended on the behavior, ideas, and creativity of the players themselves   |
|  | vii. More realism at a visual level would increase experiences of immersion   |
|  | viii. Lack of non-verbal communication in the virtual space allows for development of (verbal) communicative and negotiation skills in hotel management |
|  | ix. Degree of immersive experience depends on pre-knowledge of and prior experiences with VE  |
| <i>Reflection on learning and teaching</i>                           | x. VE role plays can be more effective than normal in-class teaching  |
|  | xi. Suggestions for development of future scenarios   |

*Reflection on role play design.* While the group generally supported the idea that the role play scenario is “a cool concept, very new and nicely developed” and “this was very good training during Corona time” (Quote), they also reflected critically on the role play design: Firstly, icons for the player’s control panel should be better implemented into the screen. It was felt (iii) *inefficient to constantly switch on/off the control menu within the app*. Secondly, (iv) *constant echoes in the headset (because some players did use the built-in mic instead of a headset) were annoying at the beginning of and during the intervention*. Participants suggested integrating a push-and-talk function such as that on the Discord™ platform. They also discussed how the (v) *synchronously representation of body movements or responses to events in the game would intensify the feeling of immersion, e.g., by giving avatars something to hold, or by further developing the highlight function (overhead) which visualizes who is speaking*. Additionally, participants suggested the possibility that each character should receive a separate on-screen display, through which a list of tasks and special player instructions (stage directions) could be communicated.

*Reflections on one’s own actions and immersion during the role play.* Impressions differed for each scenario. In the first scenario, the majority of participants felt overburdened, and they were hesitant at the beginning, compared to the very lively interaction during the second scenario, which only ended when the instructor announced the game’s end. Many participants mentioned that a (vi) *successful interaction in the various scenarios highly depended on the behavior, ideas, and creativity of the players themselves*. For example, in the first scenario, the manager had to constantly focus on the receptionist, but had doubts about when, specifically, to intervene. For the receptionist, it was difficult to anticipate the intervention of the manager to mediate in the conflictual interaction with the customers. In the second scenario, a lively discussion developed between the characters, which participants compared with conversations in ‘reality’, where several people could interact at the same time. The lecturer (who played the manager) noted that the second scenario was diffuse in a way, meaning it was more difficult to keep track of things. He found the role play situation and its concept to be very good, and suggested that, to be completely drawn into the play and to merge with one’s own avatar, (vii) *more realism at a visual level should be brought into the play in future, e.g., accuracy of avatar’s shape and haircut*. Moreover, a real VR scenario (compared to the desktop VR used in our study) would be expected to be more immersive. Participants experienced a (viii) *lack of non-verbal communication in the virtual space, e.g., facial expressions and gestures were missing*. With facial expressions, various facets could be displayed which would be even more realistic. Additionally, few players found it difficult for to identify who was speaking and that some voices had become quieter during the conversation. Currently, the role play scenarios can be understood solely as verbal interactions. This means that the participants experienced the scenarios as a communication training in the field of tourism and hotel management which involved, to a great extent, the development of verbal communicative and negotiation skills. The discussion also showed that (ix) *the degree of immersive experience in the role play also depends on participant’s pre-knowledge and prior experiences in VE*.

*Reflections on learning and teaching.* In general, participants mentioned on several occasions that the role play would be useful as an integral part of any tourism and event management courses which (x) *can be more effective than normal in-class teaching*. Furthermore, participants also discussed and (xi) *suggested the development of future scenarios that support, for example, the development of negotiation and mediation skills for tour operators, stationary travel agencies, tourist information, airport ticket counter, conference meetings, strategy development, outdoor activities like city tours and also staff in other industries such as care workers*. The TEEMEW app could also be used as a research tool e.g., for market research. Last, but not

least, the role play has certain potential to be applied to other contexts such as conflict management, preparation for exams and training for de-escalation strategies.

#### 4.3.4 Results of EUC Experimentation

*Participatory observation of scenario 1.* The experimentation included two scenarios of which the first was played twice. The first trial of the first scenario lasted approximately 6-8 minutes. Guests (students 2 and 4) played the 'easy' customers and when the receptionist (Student 1), provided them with a discount at the other (open) restaurant, they accepted, and everyone was satisfied, and the scenario finished. After the completion of the first trial, instructors explained to students that they had to be more 'demanding' customers, that they should also incorporate the manager in the game, and that in the scenario they leave the next day. After the first trial, the student team decided to play again the first scenario and this time with different people in different roles. As mentioned earlier, roles were allocated by the admins. In this second trial of the first scenario, Student 2 was the receptionist, Student 3 the manager, Student 1 the first guest and Student 3 the second guest. The trial lasted approximately for 10-12 minutes and this time the scenario was more realistic because students were more enthusiastic and played their role with more excitement. Guests were very angry because they could not dine during their stay to the restaurant of the hotel they stayed and demanded by the manager and reception a solution. Finally, after debates the solution was to offer a space to the other open restaurant in the VIP lounge and with a discount for their dinner. Eventually, the scenario was finished, and everyone was happy. After the completion of both trials of the first scenario, instructors thanked students and informed them that the second trial was more realistic. Students asked for feedback of how to perform as the manager or receptionist in a situation like this. They said that in this case, guests have an easier role to play, but from all the 'worst scenarios' the suggested solution was the 'least unsatisfactory' and hence students performed very well.

*Participatory observation of scenario 2.* In the second scenario, Student 2 had connection problems; therefore, her role as a guest was played by one of the admins. The trial lasted approximately 5-6 minutes and the main outcome was that it was too smooth. Instructors noticed that students gave too high prices for the rooms and mentioned that competition is tough because the area is too busy, with a very good transportation system and many other alternative options. They also explained what yield management is. The team decided to replay the scenario. In the second trial, Student 4 had also a microphone problem and thus, even though she stayed in the room, she could not participate. The trial lasted about 10 minutes. In this case, the guest was more demanding, and wanted better prices than those provided by the hotel. After debating both parties agreed that they could have three rooms in a satisfactory rate and also guests' transportation to the airport. The scenario was considered easier than the first one by the participants and actors performed well and eventually the solution was satisfying for everybody.

*Group discussion after the role play.* The discussion focused on the technical challenges as shown in the results of the other partners (see sections above) and included an overall assessment of the student's experiences. Students felt not confident with the installation of the VR platform. They reported few technical challenges such as connection problems, background noise, etc. The fact that both applications (MS Teams and TEEMEW) required students to constantly mute and unmute microphones. Students need an explanation of the scenarios. The fact that we used longer versions was beneficial but what has also been discussed was the need to provide clear guidance to the students during the exercise. The session was difficult because of the workload of the student. Another important aspect was the suggestion that

experimentations could have been done at regular academic lecture periods. Overall, the comments of the students and their experiences during the experiment were positive and the tool is a positive addition to the training environment and for sure provides added value.

#### 4.3.5 Results of Cross-Institutional Experimentation

To evaluate the many and various results of the common Cross-Institutional Experimentation with best possible precision, an immediate discussion (approx. 45 mins) via MS Teams was carried out, based on a prepared scripted Q&A with 10 questions. The Q&A was additionally provided to the participating students in text form after the group discussion on the day of the testing to gain more and deeper results. Starting with the first question recurring on general impressions, the student testers first focused on most intriguing experiences.

*1. What were important things that are currently of interest to you? - What impressions have been collected?*

Here the overall character of the game scenario was praised, which would come up with the unique idea and may help people from the hotel sector to improve their actions in specific situations; the context of the scenarios is well understood, and it is a very beneficial way to teach and to put in focus everyone involved the right way. The VR experience should rely on the real situation the best possible way. Overall, the sound issues were a big factor, for it was highlighted by most students that one should hear clearly all the time and without interruptions or interferences to principally gain a good impression of the scenario, that is based on verbal communication. In the end, the scenario was described by over the half of the students as “very interesting”, “useful”, “eye opening” and even “wonderful”. “Addressing a variety of topics regarding my field in the industry with a group of people, which are all opinionated, can assist to a more specific and assessed outcome and if there is a chance to use this in the near future to train personnel in the hospitality industry it can be a useful tool.” With the second and third question, the overall presence in the Virtual Environment (VE) was examined.

*2. Did you experience that the virtual environment adapted quickly and well to your actions you initiated (regarding speed of reaction of the environment)?*

Here most of the students felt comfortable, noticing that their characters moved adequately to their speech and to the slight changes in the personal field of view (movement of heads, focusing on certain different persons and things within the VE; overall, the program adapted well to their actions; here a local difference has to be stated, for ESG’s students were “not sure that the environment adapted that much”, or even that it “was hard to navigate through” and that it “wasn’t intuitive”, whereas FHD’s and EUC’s students, despite singular technical problems, found the scenario practicable and “accurate enough”.

*3. Did you feel well-involved in the virtual environment, for example, did you have at all times the feeling that you wanted to contribute with something actively, or did you feel yourself more distant, or have you been careful and just wanted to observe?*

Here, even when communication in general was described as good to handle within the scenario, the limitations of the technical nature of the scenario/program was indicated by most of the students; so, they felt that the natural quality of mimic reactions on a human’s face was missing as an important part of inter-connected communication. Given this, as well as the fact that some technical issues occurred (delays, interferences), the participants felt distant at times, not always well-involved in the VE; besides that, some felt “a (good) pressure of needing to participate actively since everybody could see each other’s characters (I had the feeling that no interaction could stand out a lot more compared to voice-only-scenarios)”; some cited the

communication quality as good, some as poor; overall, the involvement in the VE received mixed reviews, both in terms of active contribution and communication quality.

In the fourth question one's own actions and immersion during the role play was investigated, with a comparable quality recurring to the very first and the following moments of their experience in the scenario.

*4. How would you describe your impression in the first three minutes compared to your experience at the end? What has changed? Please describe.*

Most of the participants described their experience in the very beginning as of surprising quality, as kind of an adventure, where the next step is not pre-defined or programmed; they had to rely on their intuition to act further within the role play. Apart from that, experiences differed due to two different aspects: technology and narrative. With the first, technology, evolving alongside a more critical point of view among the participants, the lack of technical imperfection was at the centre of the arguments (although the simplicity of the design was a positive factor amongst all); the second aspect, narrative, was received controversial: one part of the students said their feelings, actions and immersion would instantly improve after a more or less confusing first start, the other half of the participants argued that, as time progressed, the nature of the later (more challenging) scenarios – e.g. more people addressing more problems –, as well as the performed duration within the VE did not help their own personal immersion.

The fifth question again referred to the general presence in the VE during the role play, especially in the beginning, to investigate the initial impression and nature of the scenario.

*5. What did you focus on in the first scenario? What did your senses focus on?*

Here, it was highlighted that the focus clearly lied on audio keys, “such as people around you are speaking and [verbally] reacting to you; their senses were focused on the things the other participants would say, on a conversation within the VE; additionally, the first thing, when one enters the scenario, would be a quick look to check where you are and how things look like. The participants also highlighted the importance of a true VR experience (with HMDs) to get better involved in the scenario, even if the PC version was well accepted. On a very basic level, the experience was described as a gathering point of moments of learning, where one is forced to speak clearly and verbally explain the situation, especially in the very first scenario.

The sixth question then clearly focused on the immersive qualities of the design of the scenario, a combination of the reflections on the role play design and one's own actions and immersion within the scenario

*6. Realistic design: Have you merged with your character/avatar? Please describe your experience of immersion.*

The participants overall praised the possibilities of the character design, and that, for a non-VR scenario, the immersion worked very well; options of personal avatar creation (clothes, look of the face/skin) were praised in general, most of the participants wished a better variety of details for the personal avatar. Given the fact, that it is obviously no “real” situation, the immersion and merging with the avatar would increase just after a short time inside the VE. Also, students in spectators' mode, who could not actively participate in the play, reported that the active participants seemed well integrated in their roles.

The seventh question offered space for general assessments, for pros and cons.

*7. How did you perceive the game? What was still missing? Pros and cons*

Aside from general praise, some issues were named, here transcribed in direct speech for better understanding: “Pre-made scenarios would be fine – email received but a more detailed description would be better only for me as a player (secretly); As mentioned before, at the start it feels strange being in this virtual environment, but with time you get used to it and technology allows infinite ways to catch the user. There should be way more variety, such as situations in a restaurant, outside at the pool, room service etc. to practice all kinds of scenarios, not only front desk”; “I liked the concept and the graphics; I think that the fast switch from plenum in the lecture hall to the hotel lobby (or any other scenario) is a huge pro; an audio volume slider for each individual player is still missing in my opinion; overall, the sound quality is a huge factor in the experience à for the future, an implemented noise reduction and push to talk feature could help to compensate users with bad microphones; maybe there should be an option to design your character for multiple scenarios (for example casual or business as a guest, and dressed up as a manager for example) – this could improve immersion even more and helps to understand the characters’ role”; “...the game was very interesting. I would add more flexibility of movements to the roles. There may also be the possibility of mute and unmute during the simulation so that there is no interference, and the conversations are heard more clearly. Maybe there could be 2-3 different versions of the hotel reception so that users can feel more familiar”; “I made that kind of exercise in a presential environment. It might be interesting if groups of guests or receptionists are made in advance, and they can prepare what to say. This would be the way to profit from the exercise. We couldn’t know who was going to take the same role than us for the same exercise, so in the end we had to improvise”; “Maybe we can add some expression systems to show the status of guests and employees, because our coping style will also change in the face of angry or tired guests in real work” – further aspects were:

- name of the person needs to be visible
- an icon on top of avatar would be good, in real scenarios we would have names
- Audio needs to be improved
- The possibility of having people in the spectator mode was praised
- Pros: Very innovative idea, pleasant experience / Cons: Needed prior communications between the groups of each scenario

In the eighth question, again one’s own actions and immersion during the role play was investigated.

#### 8. What is your “take away” from the communication in the lobby?

Impressions on details as well as reflection on one’s own actions and immersion differed quite a bit during the communication in the lobby, given the fact, that for some it was still the first experience. So, details on the design of the VE were in focus of some participants; the possibility of moving the head around helped pretty much all of the participants to get the necessary orientation; a few students remarked, that aside from verbal communication, the non-verbal and paraverbal (interactive, with natural overlaps) communication was a problem, including gestures and further movements of the body. As for a few, the physical qualities of the scenario (body movement, room characteristics) were of some interest, most of the students realized and felt, that communication is the key (“it made me understand that communication is the key when working at such position, because there could easily be misunderstandings”). Some students that already participated in first scenario wanted to improve their actions in the second scenario.

In the ninth question, possible further requirements of learning and teaching according to the scenario were investigated.

*9. Would there be any other information or training opportunities needed?*

Based on generally favourable reviews and remarks on the role play, some participants wished that more information was provided, so that the training could fully develop; also, more diverse scenarios, also in terms of other activities (outside a hotel), were named as options. The combination of real-world scenarios – in a real, physical group, and/or in a real hotel – together with VE scenarios was named as an option. Overall, “it felt good”, and the possibilities and option of further training were highlighted by most participants.

The last question offered space for final remarks and general impressions.

*10. Are there any aspects that we have not yet addressed, but would still be important feedback for us?*

Most of the students had nothing to add, they were happy with the result and experience. A few remarked, that the context in which the role play itself was put had to be improved (technical and didactic aspects). Overall, the scenarios offered a “new user-friendly interface” and a “great new experience”. The common result was that the experimentations were felt “interesting” and “useful”.

## 5 CONCLUSIONS AND RECOMMENDATIONS

The report addressed the question of what factors influence participants' user experiences when learning in a virtual collaborative learning environment. The following **empirical conclusions** can be drawn from the experimentation: Reflective discussion with students about the role-play scenarios especially brought to light the following interim results which will be briefly summarized and discussed. *Firstly*, the general feedback of the participants has been very positive (in the sense of the UEQ as well as in the discussion). It can be presumed that the main reason for this observation was the participant's high motivation and curiosity of the tests (see preliminary questionnaire). In fact, all of them saw a lot of potential and positive aspects in the scenarios, which were continuously improved regarding their technical and didactical quality from the first experimentation at ESG to TEEMEW's second version test at FHD. Another "point of criticism" was the lack of mobility of the avatars during the role play. In other words, the movement capacity in terms of a live action game was obviously missed. Nevertheless, the actual purpose of the virtual scenario became clear to everyone during the first test run: As it is the primary goal to promote strategic thinking as well as problem- and conflict-solving skills, each participant's attention is drawn directly to their rhetoric and communicative skills and capacity for teamwork, while reducing the cognitive load. As has been shown in recent studies, the role of cognitive load as a factor of students' engagement in desktop-based virtual reality is a desideratum in literature (Vesga, Xu & He, 2021). Our results imply that students were willing to pay full attention to the underlying learning task when working in the desktop VR environment. This seems to confirm research on the effects of cognitive load on students' engagement in virtual environments (Vesga, Xu & He, 2021).

*Secondly*, for the technical limitations and recommendations, the following factors come into account: A crucial factor is the size of the room and the number of headsets plus technical issues of the TEEMEW App and WIFI connectability; the use of the TEEMEW App for the two experiments do not work for Mac computers and require a large memory size. It would be a drawback for users and may spoil the users experiment and generate a loss of time. The three experiments managed showed the malfunction. On the hardware side, a preliminary validation of the kind of computers is mandatory (PC, Mac), their configuration and their ability to run with the various applications. This validation might be similar if the experience is performed with VR headsets. Regarding the material requirements, participants must be more or less isolated places, at least only a few in the same room, and with over-ear headphones. In order not to be disturbed by various factors such as ambient noise, sound feedback, and low Wi-Fi connection.

*Thirdly*, the basic acoustic configurations of the virtual learning environment were praised and other persons in the role play have been clearly identified as nearby or more distant. A spatial sound image turned out to be the most important feature of the acoustic framework. In this context, high quality headsets are a self-evident necessity. The use of high-quality headsets (over-ear, good microphone) seems increasingly relevant in this context, also in connection with the original technical concept of the Hotel Academy project. However, the current desktop variant is only a transitional solution due to the coronavirus pandemic, which should be replaced by real immersive VR in the future (with Oculus VR headsets, people in the lab, high-quality over-ear headsets).

*Fourthly*, we can also draw a few conclusions for the development of the didactical and pedagogical framework of the role play design. Based on the findings, precise role descriptions

and a standard scenario script will help to make comparable the procedure of the role play between the various campuses. It would also be beneficial for participants' learning experiences, their learning achievements and for transferring the project into a regular curriculum. In addition, it was also suggested that status information (linked to scenario scripts) should be appropriately visualized in a compact and goal-oriented form. For each scenario, two to three key facts that describe the basic situation in the scenario could be made visible in the user interface by means of an intuitively designed text or menu area that can be folded out and in. This would enable instructors to strategically influence the role play, e.g., with game events.

Last, but not least, the transitional solution of the desktop VR version turned out to have additional positive effects which helped to identify and optimize initial didactic and technical problems at an early stage of the project. Future research will need to focus on additional pilots with an updated version of the TEEMEW app which not only allows for the verification of the findings in this study but also helps to expand the VR framework developed in Hotel Academy to international virtual collaboration.

At the end of this report, we conclude with few **practical recommendations** which specifically focus on technical, material, communication, design, and pedagogical issues:

- **Technical recommendations:** A preliminary validation of the computers is mandatory (requirement: PC with current Windows™ operation system) as well as their configuration and their ability to run with the various applications (e.g., TEEMEW App). This validation might be of similar experience if performed with VR headsets. Other aspects related to the technology need also be organized beforehand: Are the VR Headsets available? Have all necessary applications been installed and loaded correctly? A pretest should be planned before the role-play with possible users.
- **Material recommendations:** In order not to be disturbed by various factors such as ambient noise, sound feedback, and low Wi-Fi connection, participants must participate in 'isolated' places. For hygienic conditions, students expected to test VR with specific Covid masks. "At the beginning, I was interested with the idea of virtual reality. I thought that we would have had mask, so I was disappointed" (Student) Under the intended conditions of Covid-19, the implementation of all hygienic and sanitation measures must be monitored by the instructors. A successful experience should be guaranteed if a high speed WIFI connection is available. This should be planned and tested ahead. A large audience over 50 headsets in parallel use requires a broadband connection.
- **Recommendations for communication:** Careful upstream preparation is mandatory for each VR session: Which scenario should be delivered to the students before the role play to encourage them to participate? Are materials provided by the instructor to the user before the session, during, and at the end of the role-play? What kind of assessment will suitable and how should it be managed? Depending on the target group, e.g., HE students or VET trainees, the debriefing need to be adjusted to become more efficient. Students need to be informed before the role play about how communication takes place between the participants and with whom to interact: "I made that kind of exercise in a presential environment. It may be interesting if groups of guests or receptionists are planned in advance, for helping them to prepare what their role play. This would be a benefit" (Student). Additionally, the tests revealed the level of understanding about the testers' role-play management based on different assumptions: without any preparation, with information disseminated via different

media such as video, written materials, and/or oral information. All experiments allowed for testing the interest of making the students interact without prior conciliation or with prior conciliation. Nonetheless, the length of the role play is directly linked to the role-play preparation, especially if the experiments are managed by three partners. Concerning the interaction students gave various recommendation: (1) “The virtual interaction needs to be performed under the same conditions as in a presential role play. Students need to think and interact as if they were in a presential context.” (2) Could a specific classroom be dedicated to and design for only VR test in schools and universities? A student expressed concern about conventional classrooms: “I am not sure that the environment adapted that much. I could speak when I wanted to, my colleagues heard me, in addition, interaction was fine because we could listen to each other without problems.” Thus, we suggest planning a room available to student actors and as space for spectators for every role play or a projection room fully equipped plus session recording would be a benefit for further analysis for an experience improvement and feedback.

- **Design recommendations:** It would be important to create a more immersive and sensory experience. The attraction of the immersive experience will be even more enhanced, the more senses are involved: e.g., touch, sight, smell. VR technology will be much more approachable, and avatars could also physically react as participants in onsite settings: touch furniture in front desk, shake hands, etc. Meanwhile, voice is the only way to practice in that kind of exercise. Furthermore, VR experiments uncover new perspectives: Know-how of instructors and teaching staff who have not designed or participated in the role play need to be integrated and/or experiments with other user groups would be advantageous: e.g., teachers in vocational education. There is also a need for companies in the Hospitality industry due to 7d/24h operations and multiple shifts. Furthermore, new use case could be considered as part of a recruitment process, new employee's on-boarding, introduction to international franchise hotel chain or a large independent hotel group.
- **Pedagogical recommendations:** Instructors should be convinced of using VR technology for designing learning experiences. In this regard, the following question emerge that are key to a successful implementation in education programs: How can skills and knowledge be transferred to future instructors? Should it be part of their academic development managed by the head of department. How can teaching staff be become a volunteer in role plays in the organization? Will there be more volunteers because the experiment has already been successful and marketed by the instructors? Last, but not least, the stress caused by the use of a new technology is the most important factor for the users and might prevent them from actively participating in the role play.

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