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# Immersive Virtual Reality Training for Soft Skills in Higher Education: An Investigation of Early-Adopter Instructors' Perceptions in an Ecologically Valid Context Using Bodyswaps

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**Abstract**

Various industry organisations point to a pressing need for future employees to master a variety of soft skills. These include skills such as communication, empathy, active listening, flexibility, and so on. As higher education institutions have noted this industry need, they are dedicating more attention to integrating the development of these skills throughout their curricula. However, they are faced with several organisational challenges in doing so. Immersive virtual reality has been identified as a promising avenue to address both industry need and higher education challenges. In this study, we investigate the perceptions of higher education instructors of IVR technology for soft skills training, using Bodyswaps software. A total of 103 instructors from 45 higher education institutions across five countries participated in our study, via self-selection within a vendor-coupled, grant-driven deployment. An extended UTAUT2 research model was adopted to investigate their perceptions. Next, we asked them to rate commonly cited educational affordances of IVR technology, further detailing the concept of performance expectancy. The results indicate that our research model could account for 57% of the explained variance and show that performance expectancy, facilitating conditions, and personal innovativeness significantly affect the behavioural intention to use. No significant moderating effects of age, gender, or prior IVR experience could be retrieved. Despite the limitations of self-selection recruitment bias in this grant-driven study, our findings provide both theoretical and practical contributions, following the ecological validity of this study. Several directions for future research are formulated.

**Keywords:** immersive virtual reality; acceptance; perceptions; higher education; soft skills

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## 1. Introduction

According to The Future of Jobs Report 2020 by World Economic Forum [1], the top 10 skills of 2025 include four types of skills: problem-solving, self-management, working with people, and technology use and development. Similar skills were identified by McKinsey in 2021 [2], who ran a large-scale survey with 18,000 participants in 15 countries, to investigate which skills are needed to future-proof citizens' ability to work. They clustered 56 foundational skills into four categories: cognitive skills (e.g., critical thinking, communication, mental flexibility, planning and ways of working), interpersonal skills (e.g., mobilising systems, developing relationships, teamwork effectiveness), self-leadership

(self-awareness and self-management, entrepreneurship, goals achievement), and digital skills (digital fluency and citizenship, software use and development, understanding digital systems). This is echoed by the OECD in their position paper The Future of Education and Skills [3]. They point to the need for a broad set of skills, including cognitive and meta-cognitive skills (e.g., critical thinking, creative thinking, self-regulation), social and emotional skills (e.g., empathy, collaboration), and practical and physical skills (e.g., using new information and communication technology devices). The close relation between these skillsets and employability has been the topic of interest of several studies too [4–8]. To prepare students for this new labour market demand, even increased by the rapid advancements in technology [9], educational institutions worldwide are challenged with addressing this need to train their students' proficiency in these needed skills.

### *1.1. Definitions*

#### 1.1.1. Soft Skills

Skills such as communication, collaboration, critical thinking, adaptability, and digital fluency have been labelled in various ways. Some studies refer to soft skills [8,10–12], while others adopt the label of 21st century skills [7,13], employability [4,14], horizontal skills [15], or transversal competencies [16]. For a more in-depth discussion on this multitude of labels, we refer to the bibliometric review by Zahn et al. [8]. Following their work and in view of the focus of our study, we adopt the term 'soft skills' in this paper, which can be defined as 'an individual's capacity to be flexible and responsive to diverse economic, social and personal circumstances' [8] (p. 3). Soft skills are to be set apart from the so-called hard skills or technical skills, with the latter focussing on subject matter-related skills needed for a specific profession [11].

Soft skills have been identified as being closely related to employability, i.e., the likelihood of being employed for the targeted vacancy [12]. The extent to which students master these soft skills will significantly impact their chances on the labour market [12]. Consequently, higher educational institutions have given more attention to addressing these soft skills in their curricula [10,12,16,17]. Despite this recognised need and sense of urgency, higher educational institutions face several challenges in training their students' soft skills [18,19]. In their 2022 report on Catalysing Education 4.0. Investing in the Future of Learning for a Human-Centric Recovery, the World Economic Forum explicitly refers to virtual and augmented reality as promising strategies to address labour market challenges, and thus soft skills, as these technologies 'can uniquely provide experiential learning experiences that are not easily reproduced in a classroom setting' [9] (p. 19).

#### 1.1.2. Immersive Virtual Reality

Virtual and augmented reality, together with mixed reality, are collectively called extended reality [20]. Immersive virtual reality (IVR) refers to a user being immersed into a virtual environment via a VR headset. The user is cut off of from the surrounding real world via this headset, often called a head-mounted display (HMD), creating immersion and a sense of presence. Immersion refers to the technological affordances of virtual reality technologies, including representational fidelity, 3D visualisation, and a sense of agency and embodiment [21]. Presence is defined as the psychological state of the user feeling present in this virtual environment [22]. Both 360° photos and videos and 3D game engines (e.g., Unity and Unreal) can be used to generate the virtual environment [23]. Due to the major investment of big tech companies such as Meta, HTC, and Pico, VR headsets have become increasingly affordable and user-friendly [24,25]. Consequently, they have triggered attention from the educational worldwide to address several learning goals [26].

### *1.2. Literature Review on Immersive Virtual Reality in Education*

The potential of immersive virtual reality for education has been the topic of several studies lately. IVR is being used in a wide area of domains, such as healthcare, engineering, language learning, informatics, biology, chemistry, and veterinary science [17]. Generally speaking, IVR is most commonly used to practice students' hard or technical skills [17]. This conclusion stems from the educational affordances of IVR: immersive virtual reality creates a safe space in which students can practice their skills without limits on time, space, or resources; students are supported by the 3D visualisation in their understanding of abstract concepts such as chemistry; students can work together in shared virtual spaces, enhancing their collaboration skills; and so on [27–30]. Because of these unique affordances, Kaplan et al. [31] (p. 9) refer to XR technologies as 'a superior option' over other learning methods. However, the effectiveness of XR, and of IVR in particular, is still a matter of debate in academia. Several meta-analyses have pointed to equal or better learning results obtained by adopting IVR over other methods [31–36], while identifying the value of IVR as embedded into a larger learning module, adding generative learning strategies such as enactment or discussion [37].

Despite the main focus on hard skills, immersive virtual reality is also increasingly being used to foster soft skills. IVR is considered as a scalable instructional means to create life-like learning environments, in which students can practice their communication skills in an authentic way [17,18,38]. Callahan et al. [18] propose a low-cost IVR training experience to foster clinicians' communication proficiency, built on four learning principles: intrinsic motivation, deliberate practice, spaced learning, and social learning. To train nurses' communication skills, Chae and colleagues [38] developed an IVR simulation environment using the ADDIE model. The results showed high levels of presence, usability, and satisfaction for the users, indicating its potential for future use. In another study [39], IVR was able to significantly increase students' empathy level, and high scores for enjoyment and perceived usefulness were noted. Similar conclusions were drawn by Huang and Macgilchrist [40] who investigated the potential of IVR to facilitate physical empathy in 10th grade students. Kickmeier-Rust et al. [41] found that an IVR training method provides better results for intrinsic motivation and perceived effectiveness over a face-to-face training method in the field of bank counselling. Van der Meer and colleagues [42] showed in their review study that IVR learning is beneficial to foster students' collaboration skills.

While the potential benefits of IVR are recognised, several challenges remain when trying to implement IVR technology in real classroom settings. Despite IVR headsets become more affordable [24,25], cost is still considered as an important barrier for adoption in education [17,24]. A lack of technical knowledge of the IVR technology is another inhibiting factor [24].

### *1.3. Problem Statement, Research Questions, and Hypotheses*

Bringing together the high demand for soft skills in the labour market, the challenges of educational institutions to address this need, and the potential of IVR to provide authentic learning environments to train these skills, this study aims to investigate the perceptions of early-adopter instructors in higher education of Bodyswaps (London, UK) IVR software to train students' soft skills. This resulted in two research questions:

RQ1: which factors thrive or inhibit higher education instructors' acceptance of IVR technology for soft skills training?

and as an elaboration of RQ1:

RQ2: what are the perceptions of commonly cited affordance of IVR technology for education, when applied to IVR soft skills training, and can they be linked to performance expectancy?

#### 1.3.1. RQ1: Research on Acceptance and Adoption of New Technologies

Research on acceptance and adoption of new technologies is considered one of the most mature research streams [43]. As indicated by Alfalah [44], it is of vital importance to investigate factors which thrive or inhibit the acceptance of IVR technology, to provide guidelines on how to implement it effectively [45], and to ensure actual use [44,46].

Several models on acceptance of information technologies have been developed from TAM [47] based on the Innovation Diffusion Theory [48] and the Unified Theory of Acceptance and Use of Technology [49], up to the Multi-Level Framework [50]. For an in-depth overview, refer to Venkatesh et al. [50]. Nihalsi and Abumalloh [51] developed a model for immersive technology acceptance (i-TAM), including elements such as social presence and perceived emotional impact.

#### 1.3.2. RQ1: Research on Acceptance and Use of IVR Technology in Education

Several studies have investigated teachers' and students' perceptions of IVR technology use in their courses. Doz et al. [52] investigated the perceptions of 324 educators from Europe and Eurasia and found that professional development of teachers, especially during long initiatives, was the most influential factor, followed by testing opportunities. Older and male participants showed a higher level of acceptance. Years of teaching experience and prior IVR experience had only limited impact. Boel et al. [53] investigated perceptions from 379 secondary education teachers, using an extended UTAUT2 model, and found that social influence, personal innovativeness, facilitating conditions, hedonic motivation, and performance expectancy were significantly affecting teachers' acceptance of IVR technology. No moderating effects of age, gender, or experience were retrieved. Puiu and Udristioiu [54] adopted the TAM model and found that system quality affected task–technology fit and perceived usefulness. In a large-scale survey on language teachers' perceptions on IVR technology, Kaplan-Rakowski et al. [55] found that practical knowledge and prior IVR experience were the main precursors for acceptance. Du et al. [56] identified task–technology fit to promote teachers' adoption and found that it was affected by the quality of the IVR experience. System quality was also found to be a determining factor in the study by Castiblanco et al. [57], next to computer self-efficacy, individual innovativeness, computer anxiety, perceived enjoyment, social norms, experience, and facilitating conditions.

#### 1.3.3. RQ1: Research Model and Hypotheses

Building on the previous findings and our previous work [53], we adopted an extended UTAUT2 research model to investigate higher education instructors' perceptions of Bodyswaps IVR software for soft skills training. Instead of aiming to construct a new theoretical model, we favoured the ecologically valid investigation of early-adopter higher education teachers' perceptions of a real-world deployment of Bodyswaps IVR software in authentic teaching settings. Consequently, we adopted an existing research model. The UTAUT2 model was chosen over the original UTAUT framework, as at this moment IVR technology is still considered to be an individual instructor's choice, not implemented on an educational organisational level. Moreover, UTAUT2 has been validated in previous studies [50], being able to account for up to 70% of the variance, in contrast with 'only' 40% prediction in the older TAM model [58,59]. Sagnier et al. [60], for instance, indicated that the hedonic value of a technology is an important factor in explaining a user's intention to use a technology. Finally, UTAUT2 was chosen over other models [55,57], as we were interested in instructors' general perceptions of IVR for soft skills training, focusing on the organisational level instead of investigating the quality of a single IVR learning experience. For an in-depth discussion of the UTAUT2 model, refer to Venkatesh et al. [43,50]. We extend the UTAUT2 model with the factor of personal innovation, as this has shown to be affecting

teachers' acceptance of IVR technology to a large extent [53,60–63]. Personal innovation in the domain of information technology can be defined as an individual's willingness to experiment and intrinsic interest in experimenting with new technologies [64]. Moreover, adding this variable accounts for the predicted sample bias overrepresenting early adopters through the self-selection recruitment procedure under the grant. Two original UTAUT2 variables were deleted, namely price value and habits. Price value was considered as irrelevant within the context of this study, as both hardware and software were provided by the vendor under this grant. As such, cost could no longer be considered as a potential factor of significance in this context. Habit refers to the extent to which a user feels the new technology fits within current user's practices. As the use of immersive virtual reality for soft skills training is still in its early stages in higher education, which was confirmed later on, we believed that participants were not able to assess habit appropriately at this point. Leaving out those two factors is in line with previous IVR acceptance studies [53,65], and as these studies showed good predictive power, we adopted the extended UTAUT2 model. This resulted in the following hypotheses:

**H1.** *Performance expectancy is significantly positively affecting behavioural intention to use.*

**H2.** *Effort expectancy is not significantly affecting behavioural intention to use.*

**H3.** *Social influence is significantly positively affecting behavioural intention to use.*

**H4.** *Facilitating conditions are significantly positively affecting behavioural intention to use.*

**H5.** *Hedonic motivation is significantly positively affecting behavioural intention to use.*

**H6.** *Personal innovation is significantly positively affecting behavioural intention to use.*

We also checked for the potential moderating effect of prior IVR experience, age, and gender, which were found in the UTAUT2 model and in other studies [53,55,57]. Following our prior research [53], we hypothesise, however, that these variables have no significant effects.

**H7a.** *Gender, age, and prior IVR experience will not significantly moderate the effect between facilitating conditions and behavioural intention to use.*

**H7b.** *Gender, age, and prior IVR experience will not significantly moderate the effect between hedonic motivation and behavioural intention to use.*

**H7c.** *Gender, age, and prior IVR experience will not significantly moderate the effect between personal innovativeness and behavioural intention to use.*

Figure 1 provides a visual representation of the research model.

#### 1.3.4. RQ2: Commonly Cited Educational Affordances of IVR Technology

Previous studies all indicated performance expectancy as being the prime driver for IVR acceptance by teachers [53,66,67]. However, apart from some qualitative studies [68,69], little is known about what constitutes this concept: which perceived affordances may contribute to teachers' perception of IVR as beneficial to their students' learning or their own teaching practices? As an elaboration of RQ1, focusing on performance expectancy only, in RQ2 we aim to provide more detailed insights regarding this construct. By investigating early-adopter instructors' views on the benefits, and correlating them to the factor of

performance expectancy, we obtain a more detailed view of which perceived benefits in fact contribute to teachers' positive performance expectations. Circling back to the literature review on IVR in education, we can identify some commonly cited educational affordances [70]. These affordances point to the potential benefits of IVR for educational goals. We were particularly interested in which perceived advantages in fact constitute the hypothesised significance of performance expectancy. We have focused in this overview on affordances which could be linked to soft skills training and/or the Bodyswaps IVR learning application. Virtual learning environments allow for experiential learning experiences due to the high levels of interaction and engagement [25,27,34,51,69,71–73]. Learners can also engage with the IVR learning content regardless of time and space constraints, leading to significant economic benefits for the training organisation [25,27,51,69,72,73]. Learners can perform actions in the IVR learning environment which would be not possible or would be too dangerous in real life [72,74–77]. IVR learning environments are able to represent life-like, authentic situations or conditions, enhancing transfer of knowledge and skills [27,71,77–80].

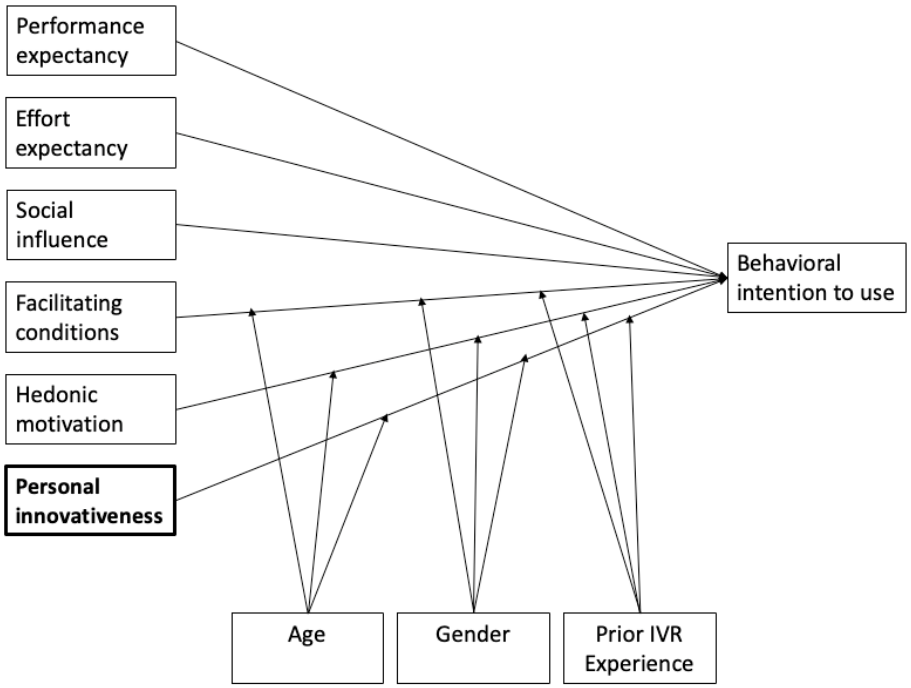



**Figure 1.** Research model (bold font indicates extension of original UTAUT2 model), adapted from [53].

Apart from these cognitive learning affordances, several affective affordances can be identified too [81]. IVR has the potential to increase learners' enjoyment [72,80,82–85] and motivation [72,74,80,82,83], to foster deeper learning [72,80,83–85], to generate higher levels of interest [74,80,82], to increase levels of knowledge [21,74,80,82–84], and to increase learners' self-efficacy [82].

Although these effects have been identified in several review studies and meta-analyses, research has also shown that they are highly related to the level of education and the learning topic under investigation. Coban et al. [21] found a medium to large effect size (g = 0.61) for IVR in K–12 education but only a small effect size (g = 0.31) for higher education. The most promising effects were found for the domains of architecture and chemistry, in contrast to language learning, medicine, and others. A similar large effect size (g = 0.75) for IVR in high school was found by Cao and Hsu [32], in contrast with a lower effect size (g = 0.37) for higher education. Large effect sizes could be retrieved for

humanities and social sciences (g = 1.18), in contrast with natural sciences (g = 0.29) and engineering and technology (g = 0.12). It is thus of interest to see how higher education instructors perceive these commonly cited affordances, providing more insight into the rationale behind the predicted significance of performance expectancy and its effect on behavioural intention. This study only reports teachers' perceptions of these reported affordances, and thus does not validate them. RQ2 adds to the understanding of the results of RQ1, contributing to our overall goal of identifying which elements facilitate or hinder acceptance of Bodyswaps IVR software for soft skills training by early-adopter higher education instructors.

## 2. Methodology

### *2.1. Context of This Study*

Meta (Menlo Park, CA, USA), formerly known as Facebook, is investing billions of dollars in the development of XR devices [86]. To promote XR technology in education and enterprise learning, Meta launched an Immersive Learning program in 2022, granting over 150 million dollars to several companies, including Unity, Inspirit, and Bodyswaps, to investigate the potential of XR for educational purposes. Bodyswaps is a London-based XR development agency focusing on soft skills training, both for education and enterprise. In 2022, Bodyswaps has been provided with 200 Meta Quest2 headsets in a Soft Skills Education Grant by Meta. In this grant, Bodyswaps aims to investigate the potential uptake of immersive learning supporting soft skills training in higher education institutions (HEIs). This study reports the design and results of the research.

### *2.2. Participants*

Participants were recruited via an open call, launched by Bodyswaps, during October–December, 2022. Interested HEIs could apply to engage in the Soft Skills grant via an online form. They were asked about their geographical location, their educational institution and their position therein, how they would organise the accelerator program during the grant period, and which profile of students would take part in the program. In total, 231 HEIs applied for the grant, of which 106 were selected. Selection of HEIs was based on the criteria of feasibility of organisation (will the accelerator program probably succeed during the grant period?) and representation across academic levels (university, higher education), countries, and academic programs (e.g., engineering, language studies, psychology). Part of the grant was to take part in academic research, but on a voluntary basis; no charges or penalties were induced when HEIs would not take part in the study. The self-selection procedure for the recruitment entails important boundary conditions for the study, as a high level of innovation-mindedness and potential inflated performance expectations were to be expected. However, investigating early adopters' perceptions is an important precursor for the further deployment in later adoption phases [48].

Of the 106 selected HEIs, 45 made up the sample for the current study. The voluntary nature of the study will probably have contributed to this major drop-out. Across the 45 HEIs in our sample, 103 participants completed the online survey. The university and college level were equally represented: 49 and 54 participants, respectively. In total, 61 participants defined themselves as male, 42 as female, and 0 as another gender. Our sample reflects a whole range of study domains, ranging from engineering to psychology, language studies, social care, business management, and so on.

### *2.3. Procedure and Instruments*

Prior to the study, the participating instructors were provided with an information letter, including an informed consent form. The participants were required to give active

informed consent via the online survey; otherwise, the survey was immediately ended. This study was conducted in accordance with the ethical guidelines defined in the Declaration of Helsinki. The study was given approval by the Social and Societal Ethics Committee of KU Leuven (number G-2023 05 2148).

The HEIs were provided with two Meta Quest2 IVR headsets by Bodyswaps, with the Bodyswaps software pre-installed, accompanied by some technical information on how to set up and use the IVR headset properly and safely. The HEIs were also invited to join a webinar, hosted by Bodyswaps, to provide the participating instructors and management staff with technical information. As such, we tried to ensure frictionless usage of the Meta Quest2 IVR headsets during the experiment.

Participants put on the Meta Quest2 IVR headset and took the IVR soft skills training from the Bodyswaps library, which offers several modules to train soft skills. The topics address several skills and situations (e.g., public speaking, inclusive leadership, job interview, active listening), but all have the same design. Each module lasts about 20 min, depending on the training module selected and the pace of the participant. The trainee is set in a virtual environment with one or more virtual conversation partners. Based on a scenario, the trainee is asked to engage with the virtual conversation partner, e.g., in a job interview. The trainee talks and listens to the virtual conversation partner, as if it were a real job interview. The virtual conversation partner is life-like, both in design and in behaviour. The trainee is supported by help features in terms of prompts. After the training, the trainee gets feedback on their performance, according to metrics such as fluency, eye contact, and appropriateness. Finally, the trainee 'swaps bodies', taking the perspective of the conversation partner and watching how they performed earlier. In the Bodyswaps modules, the trainee is taken back to the training and 'relives' the training, and metacognition and reflection are fostered through this 'body swapping'.

Participants were always observed by an instructor or staff member of the respective HEI, in order to ensure the mental and physical safety and comfort of the participant, but also to maintain the research procedure as described in the protocol. Immediately after the IVR experience, the participants filled in an online survey using a computer or mobile device in the same room of the experiment, provided by the HEI itself. Participants were asked about their wellbeing and, if recommended, were asked to stay in an adjacent room until they felt well.

Collection of data was limited to the period of 15 May to 4 June 2023.

### *2.4. Measures*

All participants were asked to answer an online survey via QuestionPro (Austin, TX, USA). The link to the survey was distributed via the Bodyswaps team to the HEI representatives. First, we asked for some demographic elements, such as gender, the name, level, and geographic location of their HEI institution, and the academic domain they work in. Next, we measured their prior IVR experience on a seven-point Likert scale, ranging from 1 (no experience) to over 4 (moderate experience) to 7 (much experience).

To tap into their perceptions (RQ1), the instructors were presented with an extended version of the UTAUT2 questionnaire. To prevent drop-out from the experiment as much as possible, due to the voluntary nature of the study and the remote format of the study, we opted for a reduced version of the survey, bringing the original 37 items to 22 items for the instructors. Similarly, we investigated self-efficacy (adapted from [87]) via four items and interest via another two items (adapted from [88]).

To investigate the hypothesised significant relationship between performance expectancy and behavioural intention, another 14 items measured whether the commonly cited affordances of IVR for education also apply to the Bodyswaps IVR software for soft

skills training by early-adopter HEI instructors. All items tested individual affordances, such as a psychologically safe place for learning, a high-focus learning environment, a realistic learning experience, an accessible learning instrument, and so on. Thirteen instructors' items were targeted towards their perceptions of performance at the student level, e.g., 'Virtual reality increases students' engagement' and 'Virtual reality makes students more focused'. The remaining seven items addressed the role of the organizer as an instructor, e.g., 'Virtual reality makes it less complicated to train students' communication skills' and 'Virtual reality would serve as a selling point to attract students to our institution over others'.

## 3. Results

### *3.1. Descriptive Analysis*

Analysis of the data was performed using SPSS28 (IBM, Amonk, NY, USA). First, the unidimensionality of the instrument was tested using factor analyses (maximum likelihood, promax with Kaiser normalisation). All factors were found to be unidimensional, except for social influence. In this, we found two subconstructs: social influence on a personal level (e.g., 'people who are important to me think I should use virtual reality to learn soft skills') and on an organisational level (e.g., 'the senior leadership of my institution is facilitating the use of virtual reality'). As factor analyses indicated that dispersed factor loadings and subsequent reliability analyses were very good, we decided to keep these two factors. This is in line with the MLF framework [50], which distinguishes between individual-level user attributes and higher-level organisation attributes, and corroborates our previous findings [53] All other reliability analyses (see Table 1) turned out to be very good, which allowed us to proceed with subsequent analyses.

**Table 1.** Results of reliability analysis and descriptives (n = 103).

| Construct | Cronbach's Alpha | Means | SD | Min Score | Max Score |
|---|---|---|---|---|---|
| Performance expectancy | 0.893 | 5.388 | 1.053 | 2.00 | 7.00 |
| Effort expectancy | 0.694 | 5.680 | 0.871 | 3.50 | 7.00 |
| Social influence (personal) | 0.894 | 4.398 | 1.322 | 1.00 | 7.00 |
| Social influence (organisational) | 0.804 | 5.131 | 1.122 | 2.50 | 7.00 |
| Facilitating conditions | 0.675 | 4.676 | 1.211 | 1.67 | 7.00 |
| Hedonic motivation | 0.867 | 6.003 | 0.892 | 3.00 | 7.00 |
| Personal innovativeness | 0.800 | 5.845 | 0.970 | 2.50 | 7.00 |
| Behavioural intention to use | 0.942 | 4.443 | 1.544 | 1.00 | 7.00 |

As we were interested in individuals' characteristics potentially moderating the associations between the predicting factors and behavioural intention to use, we also measured prior IVR experience (see Table 2). As we had expected, only a few participants had prior IVR experience, validating our dropping of use behaviour, habit, and price value. We also asked them for their gender and age, as previous studies had indicated these were significant moderating variables. For age, we noted a variance from 27 to 59 years.

Next, we explored the data, calculating several ANOVA analyses (Bonferroni post hoc tests) in search of significant between-group results (Table 3). To investigate the effect of country, we first clustered the five countries (United States of America, Canada, United Kingdom, Ireland, and Belgium) into four categories: United States of America (USA), United Kingdom (UK), European Union (EU), and Other. There were no significant differences among the four categories, although the differences were close to significance for facilitating conditions ($p = 0.077$) and personal innovativeness ($p = 0.079$). As our sample was heavily skewed towards UK participants, however, the multi-country scope of our

findings should therefore be treated carefully and not extrapolated to a global scale without considering relevant national and institutional context boundaries. Significant differences for level of institution were found for social influence at the organisational level ($p = 0.022$) and close to significance for facilitating conditions ($p = 0.061$), both in favour of colleges over universities. All differences, however, had very low effect sizes. Consequently, we did not include these demographic variables in our subsequent analyses to investigate their potentially moderating effects.

**Table 2.** Demographic overview of participants (n = 103).

| Variable | Value | Frequency | % |
|---|---|---|---|
| Gender | Male | 61 | 59.2 |
| | Female | 42 | 40.8 |
| | Undefined, other, or prefer not to say | 0 | 0 |
| Prior IVR experience | 1 | 25 | 24.3 |
| | 2 | 27 | 26.2 |
| | 3 | 21 | 20.4 |
| | 4 | 12 | 11.7 |
| | 5 | 8 | 7.8 |
| | 6 | 6 | 5.8 |
| | 7 | 4 | 3.9 |
| Country | United States | 4 | 3.9 |
| | Belgium | 6 | 5.8 |
| | Ireland | 8 | 7.8 |
| | Canada | 13 | 12.6 |
| | United Kingdom | 72 | 69.9 |
| Level of institution | University | 49 | 47.6 |
| | University of Applied Sciences or College | 54 | 52.4 |

**Table 3.** Overview of ANOVA tests in search of relevant between-group scores.

| Construct | Significance Results for Country (Clustered) | Significance Results for Level of Institution |
|---|---|---|
| Performance expectancy | 0.502 | 0.800 |
| Effort expectancy | 0.388 | 0.344 |
| Social influence (personal level) | 0.335 | 0.785 |
| Social influence (organisational level) | 0.135 | 0.022 (0.143 omega-squared random-effect size) |
| Facilitating conditions | 0.077 (0.054 omega-squared random-effect size) | 0.061 (0.117 omega-squared random-effect size) |
| Hedonic motivation | 0.683 | 0.532 |
| Personal innovativeness | 0.079 (0.054 omega-squared random-effect size) | 0.216 |
| Behavioural intention to use | 0.111 | 0.216 |

### *3.2. Hypothesis Testing*

Next, we applied general linear modelling to analyse the associations. To account for potential differences between the groups, we adopted standard robust errors (HC3 method). First, we built our model with main effects only (see Table 4). Main effects analysis resulted in three factors of significance: performance expectancy ($p < 0.001$), facilitating conditions ($p = 0.023$), and personal innovation ($p = 0.023$). Next, we added gender, age, and prior IVR experience to our model to test for moderating effects. An overview of hypothesis-testing results is provided in Table 5.

**Table 4.** Results of cluster–robust regression models with behavioural intention to use as the dependent variable.

| Variable | Direct Effects Only | Direct Effects and Interactions |
|---|---|---|
| | **Parameter Estimates (Standard Robust Errors)** | **Parameter Estimates (Standard Robust Errors)** |
| Performance expectancy | 0.573 ** | 0.604 ** |
| Effort expectancy | −0.156 | −0.185 |
| Social influence (personal level) | 0.217 | 0.219 |
| Social influence (organizational level) | 0.122 | 0.133 |
| Facilitating conditions | 0.319 * | 0.435 |
| Hedonic motivation | −0.201 | −0.248 |
| Personal innovativeness | 0.288 * | 0.169 |
| **$R^2$** | **0.569** | |
| FC × gender | | Male: −0.182; female: 0 [a] |
| HM × gender | | Male: 0.161; female: 0 [a] |
| PI × gender | | Male: −0.021; female: 0 [a] |
| FC × prior IVR experience | | −0.036 |
| HM × prior IVR experience | | −0.046 |
| PI × prior IVR experience | | 0.090 |
| FC × age | | −0.001 |
| HM × age | | −0.011 |
| PI × age | | 0.013 |
| **$R^2$** | | **0.592** |

* $p < 0.05$; ** $p < 0.001$. [a] To test interaction with gender, female is used as a comparison base, with a value of 0.

**Table 5.** Overview of hypothesis-testing results.

| #H | Hypothesis | Result |
|---|---|---|
| H1 | Performance expectancy is significantly affecting behavioural intention to use | Accepted |
| H2 | Effort expectancy is not significantly affecting behavioural intention to use | Accepted |
| H3 | Social influence is significantly positively affecting behavioural intention to use | Rejected |
| H4 | Facilitating conditions are significantly positively affecting behavioural intention to use | Accepted |
| H5 | Hedonic motivation is significantly positively affecting behavioural intention to use | Rejected |
| H6 | Personal innovation is significantly positively affecting behavioural intention to use | Accepted |
| H7a | Gender, age, and prior IVR experience will not significantly moderate the effect between facilitating conditions and behavioural intention to use | Accepted |
| H7b | Gender, age, and prior IVR experience will not significantly moderate the effect between hedonic motivation and behavioural intention to use | Accepted |
| H7c | Gender, age, and prior IVR experience will not significantly moderate the effect between personal innovation and behavioural intention to use | Accepted |

No significantly moderating effects could be retrieved. Our results accounted for 0.57% ($R^2$ = 0.569) of the variance of the results, which is good.

### *3.3. IVR Educational Affordances*

Our second research question was how early-adopter HEI instructors perceived the affordances of IVR for education when using Bodyswaps IVR software for soft skills training. Results showed positive perspectives of all previously identified affordances. A somewhat lower result was noted for the item 'Would involve fewer trainers for the same number of students' (M = 4.71, SD 1.570).

We were, however, especially interested in investigating which commonly cited IVR affordances and were contributing to early-adopter HEI instructors' positive perception of performance expectancy and to what extent. As our sample was rather small, we adopted

an exploratory Perason correlation test instead of structural equation modelling, which is appropriate for model testing and with larger samples. The results of the correlation testing can be found in Table 6. It is clear that almost all items were strongly correlated with the factor of performance expectancy, apart from four statements: 'IVR provides a more psychologically safe place to learning communications skills'; 'IVR helps students to better remember what they have learned'; 'IVR provides students with more detailed personal feedback on their communication skills'; 'IVR would involve fewer trainers for the same amount of students'. The results of these correlation tests provide more insights into which affordances relate to performance expectancy to a greater or lesser extent, and thus which to stress and support when designing implementation strategies. The results will be discussed in more detail in the discussion section.

**Table 6.** Overview of correlation tests of commonly cited affordances and performance expectancy.

| Commonly Cited IVR Affordances for Learning | Correlation Coefficient with PE |
|---|---|
| Helps students to be more confident interacting with other people | 0.610 ** |
| Helps students to become more skilled with other people | 0.573 ** |
| Increases students' engagement during practicing communication skills | 0.562 ** |
| Increases students' interest in communication skills training | 0.568 ** |
| Helps students to become more aware of their current skills | 0.623 ** |
| Provides a more psychologically safe place to learn communication skills | 0.424 ** |
| Provides students with more opportunities to train communication skills | 0.608 ** |
| Makes students more focused while practicing their communication skills | 0.635 ** |
| Helps students to better remember what they have learned | 0.461 ** |
| Helps students to practice communication skills on a more personal level | 0.531 ** |
| Helps students to empathise more with others | 0.535 ** |
| Provides a more realistic learning experience while practicing communication skills | 0.509 ** |
| Provides students with more detailed personal feedback on their communication skills | 0.433 ** |
| Will make communication skills training accessible to more students | 0.637 ** |
| Provides easier opportunities for asynchronous learning | 0.532 ** |
| Makes it less complicated to practice my communication skills | 0.553 ** |
| Would serve as a selling point to attract students to our institution over others | 0.521 ** |
| Would provide me with more detailed information regarding individual students' performance | 0.506 ** |
| Would involve fewer trainers for the same number of students | 0.463 ** |

** $p < 0.001$.

## 4. Discussion

As indicated by many organisations, there is a pressing need for soft skills for future students' employability and to meet industry needs. Although higher education systems are aware of this sense of urgency and have dedicated more focus to these soft skills in their curricula, they still face several organisational challenges. Immersive virtual reality might address these challenges, as research has pointed to several educational affordances of IVR. However, before actually implementing IVR technology in education, it is of importance to investigate whether key stakeholders, especially instructors, are accepting of this new technology. In this study we aimed to investigate the perceptions of early-adopter higher

education instructors on immersive virtual reality for soft skills training, using Bodyswaps IVR software in an ecologically valid implementation setting.

An adapted version of the UTAUT2 model, extended with the factor of personal innovation in the domain of information technology, was adopted as a research model. We will now discuss the findings for RQ1 in more detail. Comparison of the model with main effects only and with added moderating variables indicated that including interaction terms (e.g., gender × facilitating conditions) did not significantly improve the explained variance. This suggests that demographic variables and prior IVR experience do not systematically moderate the effects of our key predictors on behavioural intention, underscoring the robustness of these main effects.

Three predicting factors were found to be significantly affecting behavioural intention to use. The most dominant one (b = 0.573; $p < 0.001$) is performance expectancy. Innovative higher education instructors are clearly primarily focused on the added value of the IVR technology for their teaching and for the students' learning process. When deciding whether or not to engage with Bodyswaps IVR software, they want to make sure that it is beneficial for delivering effective learning programmes about soft skills to their students. This is in line with several other studies pointing to the significant impact of performance expectancy on the extent to which instructors are inclined to adopt IVR technology for learning [51,53–56,60,89–94]. The second most impactful factor is facilitating conditions (b = 0.319; $p = 0.023$). This might be closely related to the high impact of performance expectancy: when instructors perceive of the IVR software as a learning technology that is beneficial to their teaching practice, they are inclined to think of the organisational conditions which are needed to actually engage with IVR. When these are supportive, they will be inclined more to adopt IVR technology. This underscored the need of an ecologically valid study. As the participants were recruited via self-selection, a high level of innovation-mindedness could be expected. Subsequently, these innovative instructors know that implementing new technologies in education can bring some challenges. All participants were also provided with some training by the Bodyswaps team. Still, despite these two assets, these indicators still indicated a sound need for institutional support. Although higher education instructors hold a high level of pedagogical autonomy in their teaching practice (which can be linked to the non-signifcance of social influence; see below), these instructors depend on and are bound by institutional facilities, including network access, account management, maintenance, didactic support for IVR implementation, and so on. This finding is supported by several other studies [56,89,90]. The final factor significantly predicting the acceptance of IVR technology by higher education instructors is personal innovativeness in the domain of information technology (b = 0.288; $p = 0.023$). Again, this does not come as a surprise, as IVR technology adoption in education is still in its infancy and is mainly the initiative of early adopters. This reconfirmed our sampling of innovative educators. As such, instructors who are eager to experiment with new technologies will be more inclined to engage with the Bodyswaps IVR software programme for soft skills training than others. Again, this corroborates earlier findings [60,61,95–98].

No other factors were found to be significantly affecting behavioural intention to use. These findings are in line with other studies for effort expectancy [51,54–56,90,99] but contradict other research regarding social influence [66,68,91,94] and hedonic motivation [51,54,56]. Earlier studies have pointed to the significant effect of social influence (both on a personal and organisational level) on the behavioural intention to use of IVR technology [66,68,91,94]. Our own findings are divergent and might be attributed to the high level of autonomy higher education instructors experience in contrast with other educational levels [53]. The negative impact of hedonic motivation might be explained by instructors perceiving IVR technology as a gamified experience, focusing on enjoyment more than

on learning, potentially negatively impacting the learning process. The participants were focused primarily on the positive contribution of IVR for teaching soft skills. When they believe that IVR is too much of a game, they might be concerned about its negative effect on the learning process of their students. As hypothesised, no moderating effects of age, gender, or prior IVR experience could be retrieved. This is in line with previous research [51,53,90] but contradicts other studies [52,97]. Following MLF [50], age, gender, and prior IVR experience are synthesised into individual user attributes and mediated via individual beliefs, i.e., performance expectancy and effort expectancy. As such, they are not individually significantly moderating the main effects on behavioural intention to use.

We had hypothesised performance expectancy to be the main factor significantly affecting acceptance of Bodyswaps IVR software. As an elaboration of the first RQ1, we were, however, also interested what constituted this perception (RQ2). To address this, we investigated how our sample instructors perceived of commonly cited IVR affordances, including if and to what extent they correlate to the factor of performance expectancy. In line with the results for RQ1, all affordances were rated highly, apart from the last statement: 'IVR would involve fewer trainers for the same amount of students'. The slightly lower rating could be linked to the idea that teachers believe they will be replaced [100,101]. Another explanation might be the negative results of effort expectancy. Instructors might believe that it is rather cumbersome in terms of organisation to engage with IVR technology for soft skills training. This might be aggravated by their lack of prior IVR experience: for many of the instructors who were involved, this was (one of) the first experience(s) with IVR technology in their training. The initial setup of hardware and software and integrating it into their training offerings might have been overwhelming, potentially negatively impacting their effort expectancy and perceived instructors' presence. This then links back to teachers' stress on facilitating conditions.

When looking at the correlation coefficients (see Table 6), we noted that all affordances significantly related to the concept of performance expectancy. As such, it in fact provides us with better insight into what constitutes the perceived benefits of Bodyswaps IVR software for soft skills training by early-adopter higher education instructors. Most items were strongly correlated to the factor of performance expectancy. At a cognitive level, participants valued the extra learning opportunities, the personalised learning pathway, and the accessibility. At an affective level, our sample teachers expected higher interest and engagement. Four items were less correlated with performance expectancy. The first one ('IVR would involve fewer trainers for the same number of students') has been discussed in the previous paragraph. As for the second statement, our sample teachers do not think that 'IVR provides a more psychologically safe place to learning communications skills' in comparison to the current, non-immersive approach. Potentially teachers already put a lot of effort in creating psychologically safe learning environments for their communication courses and do not believe that IVR will make a big advancement. Our sample teachers also indicated that they did not perceive Bodyswaps IVR software as 'helping students to better remember what they have learned'. Probably the phrasing of this statement, focusing on remembering instead of practicing, might have caused this lower score. This relates to other studies indicating that IVR is better suited for skills training instead of (remembering) factual knowledge [37]. Finally, the participants also did not agree fully with 'IVR provides students with more detailed personal feedback on their communication skills'. This statement might have been conceived as a critique on their own teaching proficiency, suggesting that they are not providing effective feedback to their students [102], or could represent hesitant views on AI-driven feedback [103]. Despite the slightly lower correlation scores for these four statements, all affordances were significantly related to the

factor of performance expectancy, providing better insight into how this concept should be interpreted and subsequently addressed while drafting implementation strategies.

### *4.1. Contributions*

The findings of our study indicate that the early-adopter higher education instructors in our sample hold generally positive perceptions of Bodyswaps IVR technology for soft skills training. This is evidenced by the high results for performance expectancy, indicating they think it significantly contributes to their teaching and to students' learning. Next, facilitating conditions and personal innovation were identified as significantly predicting instructors' acceptance. All other factors were of less importance. These findings are relevant for both research and practice. First, they corroborate earlier findings of extending the UTAUT2 model with personal innovation [53,60,61,95,96,98]. Second, they indicate that the commonly cited educational affordances of IVR technology significantly correlate with and provide more detail about the concept of performance expectancy.

Although our results to a large extent confirm earlier findings, what our study adds is that teachers' perceptions were now tested in an ecologically valid setting involving early-adopter higher education instructors wanting to implement IVR software in their courses. Previous UTAUT2-based studies have been executed in lab-like settings strictly controlled by the researcher(s). In our study, the instructors were unsupported and dependent on themselves. Although provided with IVR hardware and software, they were challenged to deploy it themselves. This provided a more authentic view on how higher education teachers perceive of the implementation of IVR software for soft skills training. They were faced with some struggles (e.g., connecting to WiFi, setting up devices, troubleshooting while teaching, and so on), which were in previous acceptance studies neglected due to the lab-controlled setting. Likewise, the effect of hedonic motivation, typically present in UTAUT2 (lab-set) studies, has been shown to be adverse. This would potentially not have been unveiled in controlled settings. The ecological validity of our study, contributing to the strand of immersive learning studies in authentic and dynamic contexts [22], is a first important contribution.

A second contribution derives from our sample consisting of early-adopter instructions, who were all open to innovation and to exploring new ways of implementing instructional technologies in their teaching. Despite this innovative mindset, our findings show that the main driver is the perceived benefits for their students' learning or their own teaching practice, more importantly than openness to innovation. It seems that the importance of personal innovation identified in previous studies [53,60–63] should be revised in favour of the main drive of performance expectancy.

Thirdly, our deeper exploration of this construct of performance expectancy (RQ2), based on correlating research-driven affordances, provides valuable insight into what exactly constitute the perceived benefits of Bodyswaps IVR software for soft skills training. Apart from some qualitative studies [68,69], this remained largely unknown. Although exploratory in nature, our findings may be an incentive for further exploration and deepening of the construct of performance expectancy in IVR studies.

From a practical point of view, higher education managers can use these findings to design implementation strategies for IVR technology, similar to Bodyswaps software for soft skills training. This study provides a sound ground for implementing IVR for soft skills training in higher education: instructors are positive about this new technology and think it will significantly contribute to their teaching and students' learning process. When starting to implement it into curricula, it is advised to start with the early adopters, our cohort—instructors who are open minded to innovation and new technologies—and to

support them as best as possible (infrastructure, IT support), which might serve as good practice to diffuse the innovation further.

### *4.2. Limitations*

Although our extended UTAUT2 research model proved successful, accounting for 57% of the explained variance, and several commonly cited educational affordances were correlated to the concept of performance expectancy, our study is also limited in a number of ways.

First, due to the voluntary nature of the study, our sample of instructors will have been biased, in terms of being innovation-minded. It is likely that participating instructors were already interested in IVR technology when applying for this study. As such, our results for the effects of performance expectancy and of personal innovation might be overrated, although they confirm earlier findings [53]. Future studies might try to overcome this self-selection bias by integrating larger samples including instructors who are not necessarily already interested in IVR technology. Related to the previous limitation is the major drop-out of participants, due to the voluntary nature of the study. This also led to skewedness of our results in terms of country representation. This resulted in a smaller sample than predicted. This might limit the generalisability of our findings. Thirdly, as this study was grant-driven via Bodyswaps, participants only tested Bodyswaps IVR software. Although the software suite provides a wide array of soft skills scenarios, the instructors' perceptions and our related conclusions should not be extended beyond this context. Or, at best, they could be extended to IVR software which holds the same technical and pedagogical affordances. Linking to the previous limitations, future studies are invited to validate our findings in other educational faculties, other institutions, and other countries, with other/similar IVR soft skills training software, and under other (less funding-dependent) recruitment conditions. Moreover, as we only used quantitative measures, we were only able to explain the participants' perceptions to a limited extent, which provides opportunities for qualitative studies in the future. Another methodological constraint was the general linear modelling approach. Although it was not our intention to construct a new model, partial least squares modelling could have been applied and might be advised in future studies when aiming to describe the identified relationships into more detail. As this study was set remotely, the researchers had little control over the experiment. Although an extensive research protocol was drafted, and participating institutions could reach out for help both in terms of technology support and research assistance, we were not able to monitor the study into detail. This might have had an impact on the findings.

## 5. Conclusions

Many studies have referred to immersive virtual reality as a promising tool to foster both teachers' and students' proficiency. Addressing industry's need for employees mastering a variety of soft skills, several VR development agencies have started to build IVR learning experiences to train students' soft skills. However, before implementing these applications into existing curricula, it is of importance to investigate higher education instructors' perceptions of the potential of IVR for soft skills training. In our study we collected the views of early-adopter higher education instructors on the potential of Bodyswaps IVR software. Despite the self-selection bias and the small sample size, we were able to collect valuable insights, focusing on the ecological validity of our findings. Our study has indicated that our sample educators are in general positive about the educational affordances of Bodyswaps IVR software, specifically stressing performance expectancy and facilitating conditions. Participants mainly refer to their expectations of the instructional value of Bodyswaps IVR software. Via correlation analyses, we were able to find both

cognitive (e.g., more learning opportunities, more personalised learning) and affective (e.g., higher interest and engagement) benefits, which are linked to the concept of performance expectancy. Due to the ecologically valid testing conditions, we were also able to validate the significance of supporting even early-adopter instructors in the innovation. Despite their autonomy, higher education educators also depend on and are bound to institutional infrastructures and policies. Our findings help to design implementation strategies for adopting Bodyswaps-like IVR software for soft skills training in higher education. Following typical adoption cycles, supporting early adopters with these findings in mind might be a vital strategy to progress towards broader adoption. The combination of the good explanatory power of 57% of the variance and the ecological validity underscores the strength of our findings. They are of value to both theory and practice, guiding future researchers and higher education managers.

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**Informed Consent Statement:** All participants engaged in this study on voluntary basis. All participants were presented with an information letter and were asked for active informed consent prior to the study.

**Data Availability Statement:** The datasets generated and/or analysed during the current study are available in the Open Science Framework repository via https://doi.org/10.17605/OSF.IO/3XZDB. A data management plan (DMP) had been developed to guarantee data protection.

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