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A Modular Questionnaire for Target-Group-Specific Evaluation of Event Formats: Developed in the Context of Virtual Worlds Knowledge Transfer

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Abstract

This paper presents a modular evaluation questionnaire designed to assess Knowledge and Technology Transfer (KT) events in Higher Education Institutions (HEIs). KT is central to the HEI's third mission, contributing to societal and economic progress. This mandate is critically highlighted by the need to disseminate digitalization competencies in rapidly evolving fields, notably immersive technologies—including Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR)—which are foundational for virtual worlds. Traditionally, transfer success relies on overall outcome indicators (patents, collaborations), which fail to capture the immediate impact of individual transfer events. Our questionnaire addresses this gap by evaluating event-level success and its alignment with the target groups: companies, citizens, and students. Developed via expert workshops in the context of virtual worlds, the tool's modular design supports flexible adaptation and broad applicability across different event types. It captures participant reactions, knowledge acquisition, and behavioral intentions, along with process items. This provides immediate, actionable insights into event success, enabling HEIs to optimize resource allocation and make informed adjustments tailored to audience needs. Future studies should validate the questionnaire's psychometric properties and assess long-term effects. Ultimately, this tool strengthens the capacity of HEIs to optimize transfer activities and cultivate stronger partnerships.

Keywords: knowledge transfer; technology transfer; evaluation tool; event evaluation; third mission; impact assessment

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1. Introduction

The significance of transfer activities in higher education institutions (HEIs) has been steadily increasing, encompassing both technology transfer, which has been integral to HEI operations for decades, and knowledge transfer (KT), which has gained substantial attention more recently. Almost every HEI engages in some form of transfer to industry and society and has established structures to support these activities [1].

Transfer activities are widely recognized as crucial to HEIs' third mission. The concept of the third mission at HEIs is multifaceted and has been approached in various ways in the academic literature. Although there is no widely accepted definition of the third mission [2], there have been various attempts to establish one. According to a traditional approach for a definition, the third mission at HEIs includes three main areas: continuing education, technology transfer and KT, and social engagement [3]. These activities are often referred to as the "third mission" of HEIs, in addition to their traditional core missions of teaching/learning (first mission) and research/development (second mission) [4]. Transfer as part of the third mission is increasingly understood not as a separate, downstream process but as an integral part of research and teaching. A particular focus is on transfer in teaching, including activities beyond traditional teaching at HEIs. Moreover, HEIs increasingly engage in activities and assume roles that extend beyond their conventional academic responsibilities, such as contributing to regional development, promoting lifelong learning, and advancing environmental sustainability [4,5]. Transfer activities strengthen collaborations with industry, society, and policymakers, ultimately driving innovation and development. While the third mission encompasses a broad spectrum of activities, a key challenge remains: effectively evaluating the impact of transfer-oriented events.

Operationally, we define transfer-oriented events as structured, goal-directed interaction formats—such as workshops, demonstrations, or seminars—that serve as an interface between HEIs and non-academic stakeholders (e.g., industry partners, citizens, or students). Unlike traditional academic teaching, these formats are designed to move beyond theoretical knowledge, aiming to foster awareness, enhance competencies, or enable the practical application of research findings within a non-academic context. While these events frequently aim for a bidirectional exchange where ideas, knowledge, and innovations move between academia and external partners, their primary focus is to support a mutually reinforcing interaction between HEIs and various sectors. A detailed classification of the specific event formats and the operational distinction from other transfer channels is provided in Section 3.3.1.

Strengthening transfer from HEIs is crucial for several reasons. HEIs have long been involved in transfer activities, and technology transfer is now an inseparable part of the academic language. Also, KT has been a priority in HEIs for many years. Although knowledge transfer and technology transfer are conceptually distinct in the literature, they are closely intertwined in many transfer-oriented contexts, particularly in the context of digitalization and immersive technologies, as technology transfer typically involves not only technological know-how but also the knowledge required for its successful use and implementation [6]. Since the present study focuses on evaluating event-level transfer effects rather than on commercialization mechanisms or institutional output indicators, KT is used in this paper as an umbrella term encompassing both knowledge-related and technology-related transfer activities. This comprehensive scope is essential, as the modular questionnaire is designed for flexible application across the full range of event formats, including those focused purely on knowledge dissemination. Collaborations between academia and companies are seen as drivers of societal advancement, with widespread agreement that all stakeholders must work together to address societal challenges. Such collaborations not only enhance the competitiveness of companies but also benefit HEIs by increasing research's relevance and innovation capacity, which positively impacts teaching [7].

A prominent example of such a dynamic and challenging field is the KT related to immersive media, including Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR), and the rapidly evolving domain of virtual worlds. These technologies are fundamentally transforming core sectors and extending the reach of the university's third mission. The application range is exceptionally broad, spanning from highly realistic training simu-

lations in manufacturing and engineering to innovative forms of cultural outreach [8,9]. Moreover, this domain is strategically important for digital therapeutics and mental health care, as well as crucial areas of citizen engagement and public participation [10,11]. Effective transfer in this domain demands more than just the communication of hard technical skills (e.g., programming, hardware handling); it necessitates the transfer of creative, ethical, and application-specific digitalization competences [12]. Crucially, transfer activities must also focus on building trust in the technology, mitigating acceptance hurdles, and clearly illustrating its transformative possibilities to diverse user groups [13]. For instance, with students, the goal often shifts to fostering motivation and demonstrating future career paths, while for citizens, it involves ensuring an understanding of the technology's implications for public participation and societal well-being. Quantifying the outcome of such multifaceted VR/AR events is highly complex. Traditional evaluation metrics often struggle to capture aspects such as increased motivation among students, enhanced trust in data security for virtual civic participation, or the extent to which companies are inspired to adopt VR/AR solutions and identify suitable areas of application. Given the high investment in these technologies by HEIs and the critical role of these new competences in driving digitalization, the ability to accurately measure the success of transfer events focused on immersive media and virtual worlds is indispensable. Therefore, while the instrument was deliberately designed at an abstract level to support broad applicability, its systematic, target group-specific, and modular nature is exceptionally well-suited to meet the complex and nuanced evaluation demands posed by the KT in this high-priority sector [14].

Despite the recognized importance of transfer alongside teaching and research, there is a lack of comprehensive knowledge regarding the transfer structures in German HEIs [1]. Additionally, the research-based transfer as a step in the innovation process is not adequately captured by existing indicators, neither qualitatively nor quantitatively. Current approaches aim to develop indicators that link research performance, research-based transfer activities, and the actual implementation of research-based innovations in the market. There is a need for indicators that more accurately reflect the societal impact of research and innovation, considering factors such as social awareness and technology acceptance [14].

HEIs and their researchers generally have extensive experience engaging with companies, institutions, and the public. They recognize the necessity of proactive engagement rather than waiting for external parties to initiate contact and collaborations. Establishing partnerships requires a continuous and tailored dialogue to build mutually beneficial relationships and networks. This engagement should be maintained through regular and varied interactions, aiming for meetings that promise reciprocal benefits. Moreover, building strong networks with external partners by strengthening transfer also involves continuously adapting to practice partners' diverse and evolving interests [14].

Due to its economic impact, monitoring and evaluating HEIs' KT performance has gained importance for policymakers. Policymakers have thus developed tools to systematically measure and evaluate KT activities, requiring HEIs to provide quantitative data on their KT efforts. However, measuring KT activities is complex and differs significantly from assessing research excellence through publication quality or teaching excellence through student-faculty ratio. Standard metrics, like patents, licenses, and spin-outs, are commonly used but insufficient to capture the full scope, and there is a need for indicators which enrich the evaluation and address the target audience and their needs. Research shows that only a small percentage of HEIs currently monitor and evaluate transfer activities focusing on KT, with a significant portion of these activities being transfer-oriented events [15].

Transfer-oriented events serve as a crucial bridge between HEIs and external partners. Events like workshops, networking events, hackathons, makerthons, transfer fairs, and open days are platforms for technology and KT and enhance stakeholder visibility and

collaboration opportunities [1]. To ensure that transfer-oriented events meet the involved parties' needs, HEIs must evaluate the outcomes and adjust future events accordingly. Understanding the unique needs and expectations of different target groups—e.g., citizens, students, and companies—is essential for creating tailored experiences that effectively resonate with them. As highlighted by [1], citizens value a reciprocal dialogue between academics and society that goes beyond simply providing information and instead offers concrete solutions to challenges. Students, particularly those considering higher education, represent a crucial demographic for institutional outreach. This group needs to communicate available opportunities and benefits. Evaluations that capture student perspectives can inform how well these messages are conveyed, ultimately influencing their educational decisions. For companies, the expectations from technology and KT activities are primarily centred on gaining access to innovative research, technology solutions, and skilled graduates who can meet companies' needs [16]. They seek practical outcomes to improve competitiveness, product development, and operational efficiency. Collaboration with HEIs allows companies to tap into cutting-edge research and expertise. Still, they also expect clear pathways for applying this knowledge, including intellectual property rights, co-creation of solutions, and training programs tailored to their specific needs [17]. Therefore, effective transfer-oriented events should foster collaborative environments where academic insights can seamlessly integrate into company practice. Additionally, companies value networking opportunities to connect with other businesses and institutions to form long-term partnerships [18].

As the literature described above shows, existing methods for measuring transfer are still insufficient to provide a comprehensive view of the success of individual transfer events. Current tools primarily assess transfer as a whole or focus on long-term outcomes such as patents, licensing agreements, or spin-offs, without adequately capturing the impact of individual events. There is a lack of instruments to identify which events were particularly successful and to measure and compare their effectiveness in achieving target group-specific goals.

To address this gap, this study developed a modular evaluation questionnaire designed to assess event-level transfer success across diverse target groups, including companies, students, and citizens—an aspect that is not captured by established transfer indicators and is only partially addressed by training-focused evaluation instruments. Its modular structure allows flexible adaptation to the objectives of each event, ensuring the evaluation remains relevant to the specific needs of the target groups while enabling scalable assessment across multiple events, including in digitally intensive contexts such as virtual worlds, where the initial design was rooted.

Against this background, the objective of this study was to develop a target-group-specific questionnaire for the systematic evaluation of transfer-oriented events at higher education institutions. Specifically, the study aimed to (a) identify core dimensions relevant for evaluating event-level transfer success across different target groups, (b) design a modular questionnaire structure that allows flexible adaptation to event objectives and formats while enabling systematic comparison within target groups, and (c) develop a practical evaluation instrument that complements existing transfer indicators by capturing participant reactions, perceived knowledge acquisition, and intended behavioral effects.

2. Theoretical Background

2.1. Measuring Transfer

2.1.1. Importance of KT and Transfer Indicators

KT has gained increasing strategic importance within HEIs over recent years. As Ref. [19] emphasize, HEIs recognise the need to establish robust transfer processes and

structures to enhance their impact on innovation and society. Despite this recognition, only a small proportion of HEIs systematically evaluate their transfer activities, limiting their ability to refine processes and improve outcomes [19].

Furthermore, there is a growing emphasis on developing tools to measure KT, including technology transfer, as part of HEIs' broader performance assessments. Ref. [20] stress the need for specific metrics to evaluate these activities, reflecting the increasing focus on knowledge dissemination and its role in supporting technological innovation and collaboration.

Additionally, given the significant financial investments that HEIs allocate to transfer-oriented activities, including events, it is essential to provide empirical evidence of their impact and to quantify effect sizes to substantiate these expenditures.

Indicators play a crucial role in measuring the progress and impact of KT activities. As Ref. [21] note, indicators not only assess outputs but also provide valuable insights that can influence policy and institutional practices. These metrics inform key stakeholders—including HEIs, KT offices (KTOs), and policymakers—while also serving the public by demonstrating the societal value of academic research [21].

2.1.2. Transfer Indicators in the Literature

The measurement of KT has been explored through various lenses, ranging from academic research to government reports and guidelines from transfer agencies. Over the years, this literature has highlighted a growing diversity in the indicators used to assess KT activities. Early approaches, such as those proposed by [22], emphasized commercially oriented outputs, including developing new products through technology transfer. However, the scope of measurement has expanded considerably, now covering a more comprehensive array of channels, as Ref. [21] point out. While traditional indicators like patenting, licensing, spin-offs, and revenue generation remain central to evaluating KT, new metrics have gained prominence internationally. These newer indicators emphasize commercial success, research collaborations with industry, and engagement with non-academic stakeholders. Ref. [21] note that, despite the broadening scope, commercially driven metrics—such as invention disclosures, patent applications, and intellectual property revenues—continue to dominate, particularly in terms of activity volume and revenue generation.

Building upon this foundation, additional indicators have been developed to capture universities' more diverse roles in KT. For example, a pioneering study in Italy led to the creation of a handbook for evaluating the third mission, which includes both research-enhancing activities—such as patents, spin-offs, and third-party contracts—and activities that contribute to social welfare. These social-oriented activities include public engagement, cultural assets, continuous education, and clinical experiments [23]. This broadens the scope of KT indicators by incorporating societal impact alongside traditional commercialization metrics.

Other studies show that public engagement also plays a critical role in KT. While some sources view public engagement and community engagement as interchangeable, Ref. [24] treats community engagement as a distinct element of the third mission of universities. The HEI-Community Partnership Performance Index, developed by [25], is a relevant tool for assessing the effectiveness of university-community partnerships. This index evaluates inputs (e.g., financial and human resources, transparency), processes (e.g., shared decision-making, communication, trust), and outcomes (e.g., objective and subjective results, learning outcomes), further extending the indicators of transfer to include social partnerships.

Additionally, the collaboration between HEIs and industry remains a crucial aspect of KT activities. As Ref. [26] emphasize, universities play a central role in providing firms

with the necessary academic knowledge and skills. Ref. [27] categorize these collaborations into educational, research, and integrated interactions, capturing the broad spectrum of university-industry engagement, which ranges from joint publications and consulting to shared research facilities and employment.

Crucially, Ref. [28] expand the framework of KT by incorporating socially oriented activities, including Citizen Science, community-based research, and campus-community partnerships. These participatory formats depart from the commercially focused indicators often emphasized in the literature. Citizen Science enables the direct involvement of the public in scientific projects. Similarly, community-based research integrates civil society into the research process, from designing research questions to interpreting results. Ref. [28] identify campus-community partnerships as another key dimension, as they strengthen relationships between universities and local communities. Altogether, these indicators from Ref. [28] offer a comprehensive framework for evaluating the full range of HEI KT activities. By explicitly incorporating Citizen Science, community-based research, and campus-community partnerships, they broaden the scope of KT to encompass both intellectual outputs and meaningful societal engagement. This aligns with the growing consensus in the literature that effective KT measurement requires a multi-dimensional approach, integrating both traditional and non-traditional indicators to fully reflect the diverse roles HEIs play in knowledge dissemination and social impact.

2.1.3. Challenges with Current Transfer Indicators and Recommendations

While several traditional indicators of KT remain effective in measuring certain aspects of transfer [28], these traditional metrics often fail to address the broader societal impacts and the more informal knowledge exchanges crucial for fostering innovation.

Both Refs. [14,21] call for adopting multi-dimensional indicators that integrate quantitative and qualitative dimensions. While quantitative indicators remain essential, they must be complemented by qualitative measures that capture broader impacts. For example, as suggested by [21], evidence-based case studies can provide insights into the long-term social and regional benefits of transfer activities.

This need for multi-level and multi-dimensional evaluation is particularly pressing in the context of technology transfer involving complex, rapidly evolving fields such as immersive media [29]. The successful dissemination of digitalization competence in areas like VR and AR is highly context-dependent and requires instruments that are adaptable to both the technology's rapid pace of change and the varying needs of the diverse target groups (e.g., industry, education, general public) [30].

Although there is no valid classification of KT indicators as purely qualitative or quantitative measures, it can be helpful to categorize them this way to capture different dimensions of KT. Indicators, such as the number of patents, licenses, and spin-offs [21] as well as intellectual property management [28], or the revenue they generate, could be viewed as concrete, quantifiable measures that reflect direct economic or organizational outcomes. These indicators provide more objective data that can be systematically tracked and analyzed. Similarly, the number of industry collaborations, encompassing the transfer of knowledge and skills from HEIs to companies [27], can be considered another quantifiable measure.

However, such collaborations also embody relational and contextual dimensions that add depth to KT assessment. Indicators that consider societal impact, social and public engagement [23], as well as the perceived quality of partnerships [25] and university-community collaborations [24], emphasize the broader social contributions of KT. These can be considered as more qualitative and subjective measures, capturing impacts that

are less straightforward to quantify but are valuable in assessing the societal reach and relational aspects of KT.

Thus, while quantitative indicators remain central for their measurable data, they do not fully encompass KT's social and contextual impacts. Therefore, this study's questionnaire aims to supplement these objective measures with meaningful subjective insights, creating a more comprehensive picture of KT outcomes.

2.2. Evaluation of Transfer-Oriented Events

As the reviewed literature above demonstrates, measuring transfer activities is complex and requires a comprehensive approach. Qualitative and quantitative methods, encompassing subjective and objective measures, should be employed to obtain a complete picture of the effectiveness of transfer projects. A thorough evaluation should ideally be conducted at various points in time to capture both immediate and long-term impacts of the transfer [31].

So far, evaluations have often focused on transfer projects or activities as a whole. However, individual transfer-oriented events, such as workshops or lab visits, are rarely assessed in detail. Transfer-oriented events can target different audiences—from students to companies, the general public, or policymakers—and can vary in format and objectives. Most of the time, the focus is on knowledge dissemination, whether through presenting specific topics or promoting projects and institutions.

It is crucial to tailor each event to the specific needs of its target audience to maximize its appeal and achieve the intended goals. Therefore, evaluations of transfer-oriented events should be specific, as general assessments of entire transfer projects do not provide insights into the performance of individual events. Only by thoroughly examining individual events one can assess how well they were received by participants and what outcomes were achieved.

The evaluation of events involves systematically assessing their effectiveness and efficiency to measure success and identify areas for improvement. This process includes examining various aspects such as participant satisfaction, the achievement of set goals, and the long-term impact on the target audience, which may be estimated initially and measured in detail at a later stage [32]. A thorough event evaluation enables the identification of strengths and weaknesses, allowing for targeted adjustments to enhance the effectiveness of future events. Participant feedback provides valuable insights into their experiences and expectations, which is crucial for improving the quality and relevance of future events and ensuring long-term success [33].

2.2.1. The Four-Level Model of Kirkpatrick

For a structured and effective evaluation, many organizations rely on established models. One of the most well-known and widely used models is the Kirkpatrick Model [32,34]. Although initially developed for evaluating training programs, the Kirkpatrick Model is also relevant for assessing other transfer-oriented events. Since these events often aim to impart knowledge with practical relevance, and sometimes include training or workshops, the model's four levels provide a suitable structure for a detailed analysis of effectiveness.

Level 1 (Reaction) captures participants' immediate satisfaction with the event. While this feedback is valuable for designing future events, it is limited in assessing actual learning and transfer success [35]. Level 2 (Learning) examines the acquisition of new competencies [32], which is crucial for ensuring that learning objectives have been achieved. Level 3 (Behavior) assesses whether participants apply the new knowledge and skills in their workplace. Measuring the integration of the learned material into daily work is a key indicator of a transfer-oriented event's success and must therefore be investigated [36,37].

Level 4 (Results) evaluates the long-term impact on the organization, including financial and performance-related aspects [32]. The challenge is to measure and interpret the direct impact of the event on operational metrics, given the multitude of factors influencing outcomes simultaneously [38].

2.2.2. Critique of the Kirkpatrick Model, Alternative Models, and Challenges in the Context of Immersive Technologies and Virtual Worlds

An ideal evaluation of a training program should assess each of the four levels of the Kirkpatrick Model through independent measures, with the effort and complexity increasing at each level [32]. However, empirical studies suggest that relationships between these levels can vary. For instance, affective reactions may be less predictive of learning outcomes or training transfer than the perceived utility of the training [39]. Critics argue that the model is simplistic and that the causal relationships between the levels are unclear [40].

Due to these concerns, Ref. [41] modified Kirkpatrick's hierarchical model. In their model, the reaction level is independent of the other three levels. Learning is causally linked to behavior and organizational results, with behavior and results mutually influencing each other. This means that behavior leads to specific outcomes, and individuals continue performing tasks that result in visible outcomes (see Figure 1).

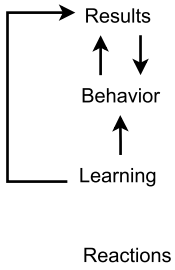

Figure 1. Alternative causal model by (p. 335, [41]) among Kirkpatrick's four levels of training criteria [32,34].

Moreover, several established models offer additional perspectives. The Return on Investment (ROI) Model by [38,42], for example, quantifies the financial benefits of a training program relative to its costs, adding an economic dimension to the evaluation. The Social Return on Investment (SROI) approach [43] assesses the social and environmental value of investments, expanding the Kirkpatrick Model's perspective to include broader societal dimensions. Another example is the CIPP Model (Context, Input, Process, Product) by [44], which provides a more comprehensive evaluation by considering the context and inputs of a program, offering an expanded view of a training's effectiveness.

Since these models are primarily theoretical frameworks, it is necessary to develop specific measurement tools for practical evaluation [45]. The Questionnaire for Professional Training Evaluation (Q4TE) by [46] (see Figure 2) is an example of such a tool, using the four levels of Kirkpatrick as a framework. The Q4TE refines the first level, Reaction, by subdividing it into overall satisfaction and perceived usefulness, providing a more nuanced picture of participant reactions. At the learning level, the Q4TE focuses on perceived knowledge acquisition. The behavior level emphasizes the practical application of what was learned, while the results level distinguishes between individual and organizational outcomes, particularly considering the qualitative and temporal impacts of the training. These adjustments make the Q4TE a more practice-oriented method for assessing training effects, focusing more on participants' subjective experiences.

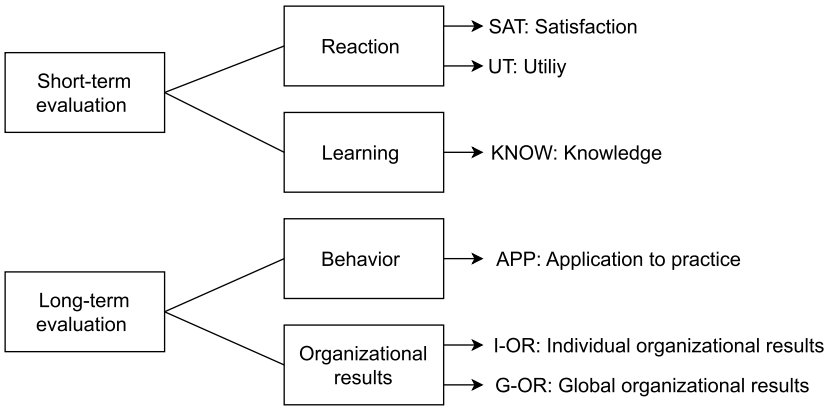

Figure 2. Scales of the Q4TE by [46] (framework following Refs. [32,47]).

While established evaluation models and instruments provide a valuable general structure for assessing learning and transfer outcomes, they remain closely tied to classical training settings. Their application to transfer-oriented events in the context of immersive technologies, therefore, poses specific challenges. Knowledge transfer related to VR/AR and virtual worlds goes beyond the acquisition of abstract digital competencies and is strongly shaped by experiential, contextual, and psychological factors [48]. These include the ability to envision concrete application scenarios, the development of trust in novel technologies, perceived usability and relevance, as well as acceptance barriers related to unfamiliar interaction paradigms or physical strain [49,50]. Consequently, the evaluation of VR/AR-related transfer events requires instruments that are sensitive to heterogeneous target-group expectations and that can capture not only perceived learning outcomes but also motivational, attitudinal, and intention-related effects. This makes immersive technology transfer a particularly demanding use case for established assessment models and highlights the need for flexible, modular evaluation approaches that can be adapted to context-specific transfer objectives while remaining theoretically grounded.

Despite criticism and possible limitations, the Kirkpatrick Model remains a widely recognized and accepted model for evaluating training in practice [51]. For measuring the success of transfer-oriented events, it highlights that this is a complex task requiring a differentiated approach and consideration of various transfer levels. Combining different measurement methods and timing enables a more accurate assessment of transfer success and a more comprehensive evaluation of the effectiveness of transfer-oriented events.

2.2.3. Process-Oriented Evaluation

In addition to outcome evaluation, process-oriented evaluation is a crucial aspect that should be considered. While the Kirkpatrick Model and some derivative models or tools primarily focus on outcomes, they often neglect process variables. Although these results-oriented models provide information on whether an event was successful, they do not illuminate the causes of success or failure. Therefore, process-oriented evaluation is essential to identify both the causes of inadequate results and the factors contributing to success.

The framework for the transfer process by [36] emphasizes that several variables can influence the success of an event, including participant characteristics (e.g., motivation and skills), training aspects (e.g., alignment of training tasks with job requirements), and the work environment (e.g., opportunities for application and support). These and other process-related dimensions are critical for identifying barriers that can arise before, during, and after the event [31]. It is equally important to understand the factors that contributed to successful transfer so that they can be leveraged for future initiatives.

Process-oriented evaluations, as described by [52], explore the implementation, receipt, and setting of interventions and help interpret the event's outcomes. They can investigate participants' perspectives on the event, analyze its implementation, distinguish between different components, and examine contextual factors influencing the event. Data from process-oriented evaluations can be quantitative and qualitative, helping distinguish between a flawed concept and poor execution of the event [53,54].

In conclusion, both outcome evaluation and process-oriented evaluation are essential for a comprehensive assessment of events. While outcome models provide valuable insights into results, it is necessary to consider also processes and contextual factors to gain a complete picture of effectiveness and the factors influencing transfer. This includes identifying the causes of inadequate results as well as the conditions and factors contributing to the event's success. Despite its complexity, evaluating transfer-oriented events is a necessary endeavor to ensure that the resources invested deliver the desired outcomes.

3. Methods

3.1. Format and Objective

The evaluation questionnaire was developed within the framework of "Digitalise_SWF," a third-party funded KT project. This initiative, jointly conducted by the Hamm-Lippstadt University of Applied Sciences and the South Westphalia University of Applied Sciences, focuses on transferring digitalization competencies to the South Westphalia region in Germany. The project utilizes various transfer formats for different target groups, with a particular focus on companies, citizens, and students. The "Digitalise_SWF" project is structured around seven Virtual Institutes, which are cross-location networks of experts dedicated to various digitalization topics. The work presented here was developed specifically in the context of the Virtual Institute for Virtual and Augmented Reality (VR/AR), which functions as a consortium of experts with specialized expertise in immersive media. This institute serves to consolidate knowledge before systematically transferring it to the regional stakeholders. The project initiated two expert workshops on the evaluation of transfer-oriented events. The primary objective of the first workshop was to develop a flexible, modular evaluation questionnaire for assessing transfer-oriented events across various formats and target groups. Given the context of the specific VR/AR transfer focus within the "Digitalise_SWF" project, the development involved experts possessing relevant practical experience and contextual knowledge. The modules were thus designed to be directly aligned with the project's real-world application (particularly in immersive media transfer), while simultaneously maintaining a deliberate level of generality to support their applicability to other knowledge transfer initiatives and formats beyond VR/AR. In this sense, the questionnaire was conceptualized as an institutional evaluation tool intended to support HEIs and their transfer units in assessing and optimizing event formats across contexts, while companies, citizens, and students constitute the respondent groups. The second workshop focused on the review and refinement process of the developed questionnaire. Following these workshops, the questionnaire was reviewed by two additional academic professionals and an external consultant from an institute for social science. The resulting questionnaire is presented in Tables A1–A3 of Appendix A, with the order of presentation reflecting the sequence in which we recommend the components of the questionnaire should be assembled.

3.2. Participants

The two workshops were attended by a total of eight participants, including researchers from both universities, the majority of whom were members of the Virtual Institute for VR/AR, along with a representative from a local digitalization platform that

serves as a central hub for citizens interested in digitalization topics. This representative contributed expertise in digital transformation and experience with transfer-oriented events. The university participants brought diverse knowledge in areas including immersive media, media pedagogy and didactics, psychology, and item and test construction, as well as both quantitative and qualitative research methods. They work and conduct research in these fields, establishing themselves as experts at the university. Given the qualitative and exploratory nature of the workshops, the group size enabled focused, in-depth discussions, ensuring relevant expert contributions, enriched by their multidisciplinary backgrounds, to the development of the questionnaire.

In the review process following the workshops, two additional researchers and an external consultant from an institute for social science were involved. One of the researchers and the external consultant are experts in questionnaire design, including scale development and evaluation, while the other specializes in human-machine interaction and user experience. Their feedback contributed to the further refinement of the questionnaire developed from the workshops.

3.3. Steps and Methodological Considerations in Developing the Evaluation Questionnaire

The questionnaire was developed using a qualitative, expert-based instrument development approach with iterative refinement. This approach was chosen to integrate theoretical evaluation frameworks with practical experience from transfer activities, which are characterized by heterogeneous formats and target groups. During the development process, we oriented our approach towards established guidelines for ensuring the reliability and validity of questionnaires, such as those outlined by [55] in relation to question and response formats, as well as item generation. The specific considerations and steps taken are outlined below. While psychometric evaluation is yet to be conducted, it will be discussed in Section 4.3.

3.3.1. Defining Transfer-Oriented Events

In the initial step of the workshops (for an overview of the steps, see Figure 3), we defined the formats that fall under the term "transfer-oriented events." Consistently with the conceptual framework introduced in Section 1, these are operationalized as synchronous, time-bound formats designed to transfer research-based knowledge or technologies from HEIs to the identified target groups. This definition encompasses a broad spectrum of formats identified during the expert workshops, ranging from informative settings, such as presentations, specialized lectures, and seminars, to demonstrative formats like lab tours, trade fairs, and exhibitions. Furthermore, collaborative and interactive formats, including workshops, hackathons, and makeathons, are included.

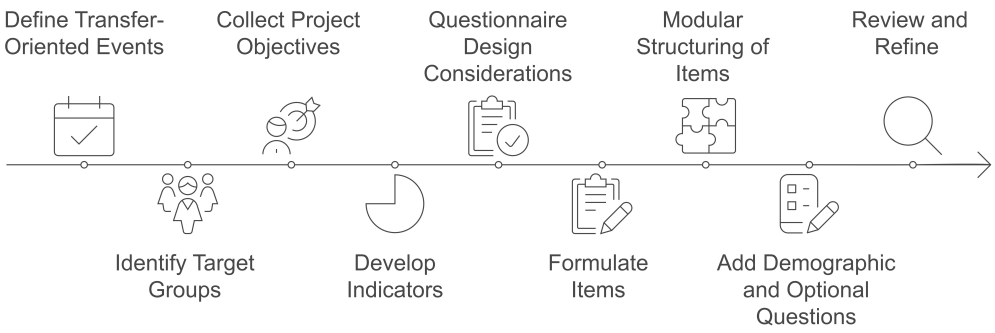

Figure 3. Steps and Methodological Considerations in Developing the Evaluation Questionnaire (Note: This figure was created using *Napkin AI* (Public Beta Version; developed by Second Layer, Los Altos, CA, USA; https://napkin.ai; accessed on 1 September 2024)).

A fundamental requirement for this classification is the "event character," which is defined by temporal synchronicity, meaning the transfer occurs at a specific, designated time. While asynchronous channels, such as purely informative websites or scientific publications, undoubtedly represent valid transfer formats, they lack this specific event character. Consequently, they are explicitly excluded from the scope of this evaluation tool, which is specifically designed to measure the immediate impact of synchronous interaction.

3.3.2. Identifying Target Groups and Objectives

Subsequently, we defined the target groups for our evaluation questionnaire, focusing on companies, citizens, and students, as these groups are central to our project and other projects. In the next step, we gathered each target group's project and event objectives. For the identification of objectives, workshop participants were divided into three small groups corresponding to the predefined target groups, with two to three participants per group. Each group first worked independently to collect and formulate objectives of transfer-oriented events for their respective target group, which were documented on flipcharts. This initial phase was conducted as a quiet working period to avoid early convergence and to encourage a broad range of perspectives. The collected objectives were subsequently presented in plenary and discussed with all participants. During this discussion, objectives were clarified, refined, and complemented by additional aspects suggested by the other groups, enabling cross-target-group reflection on shared and divergent goals. Then, to support their relevance independent of specific event content or the HEI involved, we generalized these objectives. All collected objectives were qualitatively clustered according to their underlying intended effects, emphasizing functional similarity rather than thematic content. Through this process, concrete formulations were abstracted into higher-level goal categories. This functional rather than thematic abstraction was chosen to ensure that the resulting goal categories remain applicable to heterogeneous event formats and allow for comparisons within target groups across different types of transfer activities. For example, instead of stating an objective like "increasing interest in a technology" for a digitalization event, we generalized it to "increasing interest in the event topic". This approach was intended to broaden the construct of transfer success to ensure that the questionnaire captures relevant aspects across different event types and thereby enhance construct validity. The overall process was guided by the Kirkpatrick Model, aiming to cover multiple evaluation levels. The gathered objectives were categorized into general goals applicable to all three target groups (e.g., acquiring new knowledge from the event or increased interest in the event topic) and target group-specific goals (e.g., increased interest in studying at the HEI for students or the applicability of content in the workplace for businesses).

3.3.3. Developing Indicators and Questionnaire Items

Based on the generalized objectives, indicators were derived using the same group–plenary structure. Within the target-group-specific groups, participants discussed how the achievement of each objective could become observable or reportable from a participant perspective and formulated corresponding indicators. These preliminary indicators were then discussed and refined in plenary, and additional indicators were added where relevant. Deriving indicators directly from the defined objectives was intended to maintain conceptual coherence across development stages and to avoid introducing constructs that were not grounded in the agreed-upon goals of the transfer formats. For example, indicators for the goal of "acquiring companies as cooperation partners" might include the development of joint research proposals or projects, or the placement of HEI students in internships, theses, or part-time positions within companies. On the basis of

the finalized indicators, a preliminary pool of questionnaire items was generated by the authors of this paper as a proposal for further discussion and refinement in the second workshop (see Section 3.3.7). It was decided to use rating scales in the form of Likert scale items to capture participant opinions in a more nuanced manner, with the goal of enhancing reliability by ensuring consistent and structured responses. This approach also aims to enhance participant engagement through a straightforward and quick response method. It also facilitates efficient data analysis and comparison of results.

3.3.4. Questionnaire Design Considerations

A 7-point Likert response scale was chosen for the evaluation form, with each scale point fully labeled to ensure precise and differentiated measurement of participants' opinions. The response category labels range from "Strongly Disagree" (German: *"Stimme überhaupt nicht zu"*) at 1, "Disagree" (*"Stimme nicht zu"*) at 2, "Somewhat Disagree" (*"Stimme eher nicht zu"*) at 3, "Neutral" (*"Neutral"*) at 4, "Somewhat Agree" (*"Stimme eher zu"*) at 5, "Agree" (*"Stimme zu"*) at 6, to "Strongly Agree" (*"Stimme voll und ganz zu"*) at 7. The decision to use a 7-point scale is grounded in research showing that a scale width of five to seven points provides an optimal balance between reliability, validity, and differentiation [56,57]. Although more recent studies suggest that a larger number of categories tends to improve measurement quality (e.g., [58]), the practical rule of thumb of five to seven points has proven particularly effective, especially because such scales can be more easily verbalized. Based on this, we chose a 7-point scale instead of a 5-point one to achieve a better balance between differentiation and respondent comprehension. Fully labeled scales encourage more consistent responses and improve the clarity of categories, which is particularly beneficial for individuals with lower education levels and helps avoid biases introduced by numerical labels [56,59]. Despite the possibility that some respondents might choose the middle category out of convenience or social desirability, we selected a scale with a clear midpoint to allow for an accurate representation of neutral positions, to prevent distortions caused by forced extreme responses and thereby enhance both the validity and reliability of the results [59].

The items were deliberately formulated to be as neutral as possible, avoiding the use of intensifiers to minimize suggestive effects. For instance, "I enjoyed the event" was used instead of "I enjoyed the event very much." This neutral phrasing is intended to ensure that responses remain unbiased and are not distorted by wording. Although negatively framed items were considered to counteract potential positive bias (e.g., "I did not learn new things from the event." versus "I learned new things from the event."), ultimately, they were mainly excluded to avoid confusion from double negatives and to prevent inadvertently highlighting potential issues to participants.

The present study deliberately focuses on the conceptual development of the questionnaire as a first step toward a standardized evaluation framework. Potential sources of bias inherent to self-report instruments were acknowledged during the design process and addressed through the aforementioned procedural mitigations, such as item neutrality, anonymity, and optimized scaling. However, structural mitigation strategies such as multimethod approaches, longitudinal follow-ups, or behavioral measures were intentionally not implemented within the scope of this study, as they would have exceeded the primary objective of developing a flexible and broadly applicable evaluation instrument for heterogeneous transfer formats. These limitations and corresponding methodological extensions are therefore addressed explicitly in Sections 4.2 and 4.3.

3.3.5. Modular Structure of the Questionnaire

The generated items were thematically grouped into nine overarching dimensions, each containing four to six items. These dimensions together form a modular questionnaire (see Table A2) that can be tailored based on the target group and event objectives. Some dimensions and items are relevant to all target groups and thus form the core of the questionnaire, while others are target group-specific and are added as needed. In the following, the dimensions and the modular structure of the evaluation questionnaire will be described in more detail, highlighting their relevance and application for each target group.

The first three dimensions of the questionnaire are applicable to all three target groups. The first dimension addresses the *Event Experience* and includes six items (e.g., "I enjoyed the event."). This dimension reflects the idea that a positive event experience can facilitate KT by increasing participants' motivation to further engage with the topic and integrate it into their own context. The second dimension is *Organization and Delivery of Content*, which contains five items (e.g., "I was satisfied with the organization of the event (e.g., registration process, punctuality, event location)."). This dimension is based on the consideration that effective KT depends on both a well-organized event and clear, structured delivery. It therefore assesses organizational aspects as well as how effectively the content was conveyed, including the quality of materials, engagement, clarity, and opportunities for interaction. Meanwhile, the third dimension is *Knowledge Gain* and comprises four items, such as "I learned new things from the event." This dimension reflects the assumption that acquiring new knowledge or deepening existing knowledge is a key outcome of transfer-oriented events, assessing whether the event provided new insights, diverse perspectives, and a better understanding of how to apply the topic in practice.

The fourth, fifth, and sixth dimensions are specific to the companies target group. The fourth dimension, titled *Relevance and Use of Event Topic in the Company*, contains five items, including "The event showed me that the topic has an impact on my field." This dimension reflects the premise that transfer is more effective when companies perceive the topic as relevant and applicable to their industry or specific challenges. The fifth dimension focuses on *Networking of Stakeholders* and includes four items, such as "The event facilitated constructive exchanges with other stakeholders." This dimension reflects our consideration that networking is vital for successful transfer, as stakeholder interactions can foster collaborations and enhance knowledge exchange. Lastly, the sixth dimension assesses the *Interest in Cooperations with the University* with another four items, including "The event increased my interest in collaborating with the university (e.g., through joint projects, research proposals, or commissioned research)." This dimension reflects the idea that fostering university collaborations is crucial for effective KT, strengthening partnerships that enhance research application and impact.

In contrast, the seventh dimension is directed only at citizens and centers on *Trust in Science and Societal Engagement*. This dimension includes five items related to this topic, such as "The event has increased my trust in science." The idea behind this dimension is that successful KT fosters trust in science and societal engagement, as trust supports the application of research findings and engagement encourages active participation in societal challenges.

The eighth dimension, *Increase in University Awareness and Preference*, consists of six items. The first five items are applicable to all target groups (e.g., "I learned more about this university at the event."), while the final item is specifically for the student group: "The event showed me that this university is a good place to study." The reasoning behind this dimension is that increasing awareness of the HEI and its activities through events

strengthens its reputation, fosters engagement, and can stimulate future collaborations or student recruitment.

The ninth dimension, which focuses on the *Impact of the Event on Academic Interest and Career Goals*, contains four items (e.g., "The event increased my interest in scientific research") and is directed solely at students. This dimension follows the consideration that transfer-oriented events may influence students' academic interests and career aspirations, potentially fostering future engagement in research and innovation.

In terms of module application, specific guidelines are as follows: To compile the questionnaire for companies, dimensions one through six and dimension eight should be included, excluding the last item of dimension eight. For the citizens group, dimensions one through three, along with dimensions seven and eight (excluding the last item of dimension eight), are required. For the students group, the questionnaire will comprise dimensions one through three, as well as dimensions eight and nine.

3.3.6. Integration of Demographic and Optional Questions

In the second workshop, target group-specific demographic questions were added to the questionnaire, which were considered particularly relevant for evaluation purposes and form the first part of the questionnaire (see Table A1). These questions were intended to facilitate the analysis of responses in relation to relevant target group characteristics, potentially improving the interpretability of the results. Additionally, four optional questions directed at all target groups were integrated at the end of the questionnaire, along with a field for additional comments (see Table A3). One of these questions is closed-ended and captures how participants learned about the event, with a selection of response options. The other three are open-ended questions, allowing respondents to elaborate on what they particularly liked about the event, what they disliked, and their wishes for future events. These open-ended questions aim to provide valuable qualitative insights beyond the structured responses of the closed-ended questions, helping to make targeted improvements for future events.

3.3.7. Review and Refinement Process

In the next step, the proposed questionnaire was reviewed and revised by the workshop participants in target-group-specific small groups and subsequent plenary discussion. The review was guided by the following questions:

- Are the items and dimensions clearly derived from the target-specific project goals?
- Does the questionnaire cover all relevant aspects?
- Are the items clearly and understandably formulated?
- Is the length of the questionnaire appropriate?
- Is the categorization of items into sections well-structured?

The results of the group discussions were consolidated in plenary, where overlapping suggestions were merged and divergent assessments were discussed. Based on this joint discussion, items were rephrased, restructured, added, or removed. This participatory review was chosen to ensure that item formulations are not only theoretically aligned with the defined objectives but also practically meaningful and understandable for individuals with direct experience in designing and implementing transfer events. Particular attention was given to ensuring that the items are comprehensible for students, employees, and citizens, regardless of age (for students from grade 5 onward) and educational background. For example, the item "Through the event, I expanded my knowledge about this university" (German: *"Durch die Veranstaltung habe ich mein Wissen über diese Hochschule erweitert"*) was rephrased as "I learned more about this university at the event" (*"Ich habe bei der*

Veranstaltung mehr über diese Hochschule gelernt") to enhance clarity and accessibility for a broader audience.

In the final step, the revised version of the questionnaire was reviewed by two additional researchers and an expert from an external research institute for social sciences. The feedback received was thoroughly discussed and, where feasible, incorporated into the final version of the questionnaire.

The refinement process aimed to improve the clarity of the items, ensure that all relevant aspects were covered, and refine the overall structure to enhance the questionnaire's content and construct validity. Furthermore, this step was included to provide an independent methodological perspective beyond the workshop participants and to strengthen the applicability of the instrument across institutional settings.

3.3.8. Translation

The questionnaire was translated into English using the Large Language Model (LLM) ChatGPT (GPT-4; developed by OpenAI, San Francisco, CA, USA; https://chat.openai.com; accessed on 1 September 2024) to reach a broader audience, particularly beyond German-speaking countries. As native German speakers proficient in English as a second language, we critically reviewed each item of ChatGPT's translation for clarity and semantic equivalence, making any necessary adjustments to enhance the quality of the translation. Subsequently, the questionnaire was evaluated by two native English speakers, who also speak German as a second language. They assessed the items for comprehensibility, naturalness, and semantic equivalence with the original German items. Some phrasing was then discussed and revised.

4. Discussion

4.1. Strengths and Additional Features of the Evaluation Questionnaire

This study contributes a modular, target-group-specific evaluation instrument for transfer-oriented events that complements established transfer indicators and differs from training-focused evaluation tools by explicitly addressing event-level transfer outcomes and audience-specific objectives. In doing so, it fills a methodological gap between institution-level transfer metrics and context-specific, single-event evaluations. The following sections outline the main strengths and additional features of the questionnaire. This summative evaluation questionnaire provides HEIs with valuable insights to better understand the success of their transfer activities. While transfer success is often measured by general indicators such as patents and collaborations (see Section 2.1.2), these metrics rarely account for the impact of individual events in the overall success of KT. The questionnaire addresses this gap by providing a more precise supplementary analysis, identifying which specific event formats contribute to more or less successful transfer activities. This insight helps determine which formats are particularly well received by a target audience and why, enabling targeted adjustments and optimization. Furthermore, the questionnaire can be a foundation for developing and testing new transfer formats. Participant feedback enables HEIs to offer more effective and targeted transfer formats that are better aligned with the needs and expectations of their target groups.

To the best of our knowledge, it is the first instrument specifically developed for evaluating a wide variety of transfer-oriented events organized by HEIs, extending beyond traditional training sessions. In comparison to specific evaluation forms tailored to the characteristics of a particular event, this questionnaire offers the ability to compare transfer-orientated events largely independently of their format and structure within a target group. By enabling systematic and comparable evaluations of KT activities, the questionnaire addresses the lack of standardized assessments in HEIs. Moreover, its structured

approach to data collection across diverse transfer activities makes it a scalable and efficient tool, allowing for the evaluation of a large number of events more easily than qualitative approaches. While case studies and semi-structured interviews provide in-depth insights into individual events, they often lack standardization and comparability across multiple events. Rather than replacing these methods, the questionnaire aims to complement them by generating structured data that enable comparisons and support broader evaluations. The wide applicability across different event types is supported by the modular design of the questionnaire, which allows for flexible adaptation to different target groups. The questionnaire is aligned with the specific transfer goals, enabling a targeted application. These goals include, among others, outcomes of KT that traditional indicators often overlook, such as societal engagement and the practical application of research in non-commercial contexts. Despite its focus on outcome-oriented aspects, some process-oriented elements are taken into account, contributing to a more balanced evaluation.

The modular structure is particularly relevant for the dissemination of digitalization competencies in rapidly evolving and highly complex fields such as immersive media [29], as the fast technological change and the rapid development of hardware and software result in a constant heterogeneity of learning environments. The ability to select target group- and context-specific items ensures that the evaluation captures the unique adoption hurdles and the varying transfer goals (e.g., technical implementation in industry vs. competency acquisition among students or sensitization of the general public) associated with VR/AR transfer. Research on VR adoption demonstrates that its success is determined by a varied set of complex, subjective user and context factors across different user groups [30]. The questionnaire's modular design provides a structurally necessary mechanism for HEIs to tailor the evaluation to the most relevant objectives for a specific audience, making it a highly targeted tool for those engaged in the field of virtual worlds.

In addition to the short-term assessment through immediate reactions, the questionnaire also allows for evaluating longer-term results by measuring behavioral intentions and motivations. This broader scope of measurement goes beyond the traditional focus on economic and intellectual outputs by incorporating subjective insights into motivations and engagement, leading to a more comprehensive analysis of the event's impact. High time efficiency is ensured through predominantly closed Likert-scale response items, enabling quick administration and analysis. Additionally, a few optional open-ended questions provide participants with the opportunity to flexibly share further opinions, suggest topics for future events, and provide additional comments.

The questionnaire covers various levels of the Kirkpatrick Model and the Q4TE by [46]. The reaction level is measured using different items, capturing both overall satisfaction with the event (e.g., "I enjoyed the event.") and the perceived utility of the event (e.g., "The event content is applicable to current challenges in my company."). The latter is advantageous as utility ratings, at least for training sessions, show stronger correlations with transfer success measures than pure satisfaction ratings [60]. At the learning level, the questionnaire, like the Q4TE, focuses on perceived knowledge acquisition, measured through self-report items. Both practical knowledge (e.g., "The event helped me understand how to apply the topic in practice.") and theoretical knowledge (e.g., "The event gave me new perspectives on the topic.") are taken into account. The behavior level is captured through behavioral intentions or motivations (e.g., "The event motivated me to participate in more events from this university."). The questionnaire does not cover the results level, as it is difficult to accurately assess the long-term effects of a single event. While an event may initiate immediate actions or first steps, achieving sustainable, long-term changes often requires additional measures or more comprehensive engagement with the topic. Therefore, the results of such an assessment could be too speculative. We recommend

investigating the results level through a follow-up survey, such as additional questionnaires or measuring key figures, to better capture the long-term effects.

4.2. Limitations and Practical Implications

The present questionnaire has several limitations. Our evaluation questionnaire is based—like the Q4TE—exclusively on self-reports, and similar limitations should therefore be considered as described by [46]. On one hand, this can lead to Common Method Bias (CMB). CMB occurs when both predictor and criterion variables are measured using the same method, which can distort the relationships between the variables. Participants may tend to provide consistent or socially desirable responses, which can undermine the validity of the results. To minimize CMB, additional data collection methods could be considered, such as collecting data at different time points or using various information sources to enhance the accuracy and comprehensive evaluation of the results [61]. Despite these potential risks, self-reports are a proven method for capturing psychological constructs such as attitudes, as participants are considered reliable data sources [62]. Studies also show that self-report instruments accurately represent specific learning outcomes [63]. We focus on how the event resonates with participants and to what extent it influences their future engagement with the topic and the institution. In this context, self-reports are particularly valuable, as they capture the personal reactions and intentions of participants, thus enabling a deeper evaluation.

However, when measuring behavioral intentions, it should also be noted that intentions do not always align with actual behavior. Therefore, the questionnaire primarily serves to compare reactions to different events and the associated intentions, without guaranteeing that these intentions will translate into actual behavior. However, we assume that higher behavioral intentions tend to increase the likelihood that the desired behavior will be exhibited later. For example, students who indicate motivation to study at the respective HEI after a transfer-oriented event may not all actually enrol there—yet we assume that the proportion of students who later do study at the HEI will be higher than at events where interest in studying at the HEI is lower. To ensure that behavioral intentions are actually acted upon, it may be helpful to conduct a follow-up survey. This could be done through a re-survey or by other methods (e.g., behavioral observation) to later verify the intentions.

While the questionnaire is well-suited for comparing the resonance of events within a target group, its modular structure complicates standardized evaluations between different target groups, as the items vary. Therefore, a fully standardized comparison of event outcomes across different target groups is not possible. This limitation, however, is not a structural deficiency, but rather an unavoidable necessity given the subject matter. In the transfer of highly complex and diverse competencies, such as those related to VR/AR, the intended outcomes fundamentally differ between target groups (e.g., specific application potential for companies vs. basic literacy for citizens). Since VR adoption depends on varied success factors across different user contexts [30], a fully standardized instrument would yield irrelevant data. Modularity thus serves a vital purpose: It forces the alignment of the evaluation with the actual, context-dependent VR/AR transfer criteria.

Additionally, some items in the questionnaire could be criticized for being thematically broad, which may lead to lower context-specific predictive power. An example is the item "The event facilitated constructive exchanges with other stakeholders." Here, the agreement does not clarify which specific group of stakeholders the constructive exchange occurred with. One possible solution would be to break these items into more specific statements by further differentiating the term "stakeholder". However, we chose not to do this for two reasons: first, we wanted to avoid making the questionnaire too lengthy, as this could lead to it being completed less thoroughly. Second, while the project's goal is to assist companies

in better networking, it is less relevant to us which specific stakeholders this exchange takes place with. What is more important is that the exchange occurs in general and is perceived as constructive. Similar trade-offs between thematic breadth and context-specific predictive power had to be made with comparable items.

Since the questionnaire is intended to be applicable for different types of events, process-oriented aspects can only be limitedly addressed. Participants do, however, have the opportunity to provide their feedback on these aspects through open-ended questions. If the questionnaire does not fully clarify the reasons for insufficient results or successes, we recommend using supplementary process-oriented instruments, such as interviews or feedback sessions. These methods complement the results-oriented assessment of the questionnaire by helping to investigate underlying causes and, if necessary, target process shortcomings. They are particularly useful for the targeted optimization of events.

Finally, a key limitation concerns the generalizability of the instrument. While it was deliberately developed at an abstract level to support broad applicability across various knowledge transfer settings, its design, expert review, and target category definition primarily involved experts engaged in immersive and digital transfer activities (VR/AR). This focused development was essential for ensuring high content validity and the instrument's initial robustness within the digital transfer domain. Consequently, the empirically demonstrated utility of the questionnaire is currently mainly limited to this specific context. The transferability and predictive power of the instrument to other, non-digital transfer domains (e.g., medical or humanities) must be comprehensively validated in future studies, as mentioned in Section 4.3.

4.3. Future Research

The evaluation questionnaire presented here already offers promising approaches for assessing the effectiveness of transfer-oriented events. However, further investigations are advisable to validate the instrument's psychometric properties and fully exploit its potential, especially in the context of high-tech and digitalization transfer. Below, several particularly interesting aspects of the questionnaire for future investigations are explained in more detail.

First, cognitive pretesting, such as think-aloud interviews, would be beneficial to ensure that the questions are understood by the participants as intended. This process allows for the early identification and correction of potential causes of misunderstandings (c.f. [64]). The next step would involve conducting a factor analysis. An exploratory factor analysis (EFA) could provide initial insights into the underlying dimensions of the questionnaire, while a confirmatory factor analysis (CFA) would confirm the fit of the theoretical structure (c.f. e.g., [65]). This would help refine the internal structure of the questionnaire and ensure that the measured constructs are accurately captured. To further strengthen the instrument's validity, convergent and discriminant validity should be assessed by correlating the questionnaire scores with related and dissimilar measures, particularly those that have already been validated [66]. Moreover, piloting the questionnaire with systematic item analysis would be valuable for identifying unclear or redundant items and assessing the internal consistency of the scales. Poor internal consistency (e.g., low Cronbach's alpha or item-total correlations) or high non-response rates could indicate the need for revision [55].

Additionally, criterion validity should be investigated. For example, it could be examined whether participants from companies that express a strong interest in cooperation with the HEI actually initiate more collaborations. Reported learning progress could also be validated through knowledge tests to assess whether the stated learning gains are objectively verifiable (c.f. e.g., [67]). Of particular relevance is investigating the criterion

validity of the instrument in virtual world settings, specifically examining if self-reported intentions from immersive events correlate with objective technology transfer metrics, such as the actual initiation of VR/AR pilot projects or follow-up participation in specialized VR/AR workshops.

A follow-up survey could provide additional insights into the long-term consistency of results and the implementation of intentions to act, offering conclusions about the sustainable impact of the event. It would also examine whether self-reported outcomes align with observable behavioral changes, such as tracking engagement in follow-up activities, the application of acquired knowledge, measurable increases in collaborations, or enrollment in further academic programs at the HEI. This would offer a clearer picture of the questionnaire's predictive validity. Additionally, longitudinal studies assessing test-retest reliability would help strengthen the questionnaire's reliability over time [55].

To increase the generalizability of the questionnaire, these investigations should be conducted in both the German version and the English translation. A cultural comparison could yield valuable insights into potential differences in the interpretation of the questions and help identify cultural influences on the instrument's validity. Such an approach would also help detect possible biases in the formulation of items, ensuring cross-cultural applicability.

Guidelines for analyzing the completed questionnaire should then be provided based on the results obtained from a thorough validation process, ensuring they are empirically grounded.

Moreover, the questionnaire's coverage of core KT mechanisms makes it highly suitable for evaluating VR/AR event formats, providing a strong initial assessment. However, the modular design provides a clear path for future research to maximize the instrument's relevance in specific technological fields. Given that the success of immersive media transfer is often jeopardized by unique technical and psychological challenges, future efforts should focus on developing a dedicated immersive media module. This module would include items specifically addressing VR/AR-related issues, such as motion sickness, ergonomics, and the feeling of presence [68], thus ensuring the instrument can capture these highly specific outcomes essential for high-tech dissemination. Beyond this effort to maximize domain-specific relevance, the second essential line of research focuses on the instrument's generalizability. Validation of the questionnaire in diverse non-digital knowledge transfer domains (e.g., medical or humanities) is still pending and represents an important next step. These studies are necessary to comprehensively examine the broad applicability of the instrument beyond the initial VR/AR and digitalization context.

Although the questionnaire is already helpful in its current form for evaluating transfer-oriented events, these additional analyses could further strengthen its validity and reliability while also enhancing its scope and applicability across various contexts and target groups.

5. Conclusions

The evaluation questionnaire presented in this paper represents an advancement in understanding the effectiveness of transfer activities. Focusing on event formats offers valuable insights into which formats are more or less successful with specific target groups, enabling HEIs to make informed adjustments and optimizations tailored to their needs.

Its modular design allows flexible adaptation to various target groups, while its general structure supports broad applicability across different event types. This approach facilitates effective comparison of transfer activities within a target group, regardless of the specific event format, and allows for a targeted application aligned with audience-specific transfer goals.

The questionnaire is designed to be time-efficient, capturing immediate participant reactions and assessing longer-term outcomes by measuring intentions and motivations. This efficiency makes it a practical tool for HEIs seeking to understand which events have a substantial impact on their target groups.

While the questionnaire covers multiple evaluation levels, it relies solely on self-reports and is limited to a single time point. Therefore, we recommend complementing it with additional methods and follow-up surveys to provide a more comprehensive understanding of intention implementation and long-term effects. Future research should focus on validating the questionnaire's psychometric properties and exploring multimodal and longitudinal assessment approaches to further enhance its effectiveness. The questionnaire's modularity provides a clear pathway for its future evolution. Its unique potential lies in the development of dedicated modules for high-tech dissemination, such as VR/AR technologies. By allowing researchers to integrate specialized items (e.g., assessing motion sickness or presence), the instrument can be finely tuned to capture the highly specific determinants of success in technologically advanced fields.

In summary, the evaluation questionnaire provides a valuable foundation for assessing the effectiveness of HEIs transfer activities with a focus on virtual worlds. Its promising potential lies in tailoring activities to specific target groups and identifying what works best and resonates most effectively with participants, thereby strategically advancing the HEIs' involvement in the evolving landscape of digital technology transfer.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of Ethics Commission Lippstadt (protocol code EL202512041 and date of 4 December 2025).

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Abbreviations

The following abbreviations are used in this manuscript:

AR	Augmented Reality
CFA	Confirmatory Factor Analysis
CIPP	Context, Input, Process, Product
CMB	Common Method Bias
EFA	Exploratory Factor Analysis
HEI	Higher Education Institution
KT	Knowledge and Technology Transfer
KTO	Knowledge Transfer Office
MR	Mixed Reality
Q4TE	Questionnaire for Professional Training Evaluation
ROI	Return on Investment
SROI	Social Return on Investment
VR	Virtual Reality

Appendix A. Components of the Evaluation Questionnaire

Table A1. Demographic Questions.

Target Group	Item	Response	Response Type
All	Gender *Geschlecht*	Female *Weiblich* Male *Männlich* Non-binary *Divers* Prefer not to say *Keine Angabe*	Choice option
	Age *Alter*		Free text
Companies	Industry of your company *Branche Ihres Unternehmens*		Free text
	Your position in the company *Ihre Position im Unternehmen*		Free text
	Number of employees in your company *Anzahl der Mitarbeiter in Ihrem Unternehmen*		Free text
Citizens	Profession *Beruf*		Free text
	Do you have a university degree? *Haben Sie einen Hochschulabschluss?*	Yes *Ja* No *Nein* Prefer not to say *Keine Angabe*	Choice option
Students	Type of school * *Schultyp*	*Grundschule* *Hauptschule* *Realschule* *Sekundarschule* *Gesamtschule* *Gymnasium* *Berufsschule* Other (please specify: _____) *Andere (bitte nennen: _____)*	Choice option

Table A1. *Cont.*

Target Group	Item	Response	Response Type
Students	Desired school leaving certificate * *Angestrebter Schulabschluss*	*Hauptschulabschluss* *Realschulabschluss* *Fachhochschulreife (Fachabitur)* *Allgemeine Hochschulreife (Abitur)* Not yet decided *Noch nicht entschieden* Other (please specify: _____) *Andere (bitte nennen: _____)*	Choice option

* For the English versions of the "type of school" and "desired school leaving certificate" selections, please note that the names of school types and school leaving certificates should be manually added, as there are no standardized translations due to variations in education systems across target countries.

Table A2. Modular Evaluation Questionnaire.

Target Group	Dimension	Item
All	1. Event Experience 1. *Veranstaltungserlebnis*	I enjoyed the event. *Die Veranstaltung hat mir gefallen.* The atmosphere of the event was pleasant. *Die Atmosphäre der Veranstaltung war angenehm.* The event increased my interest in the event topic. *Die Veranstaltung hat mein Interesse am Veranstaltungsthema verstärkt.* I found the content of the event to be relevant. *Die Inhalte der Veranstaltung fand ich relevant.* The event was too challenging for me. *Die Veranstaltung hat mich überfordert.* The event was not challenging enough for me. *Die Veranstaltung hat mich unterfordert.*
All	2. Organization and Delivery of Content 2. *Organisation und Vermittlung von Inhalten*	I was satisfied with the organization of the event (e.g., registration process, punctuality, event location). *Ich war mit der Organisation der Veranstaltung zufrieden (z.B. Anmeldeprozess, Pünktlichkeit, Veranstaltungsort).* The materials and media used were effective. *Die eingesetzten Materialien bzw. Medien waren gut.* The content was delivered in an engaging way. *Die Inhalte der Veranstaltung wurden auf eine ansprechende Weise vermittelt.* The event was easy to understand. *Die Veranstaltung war verständlich.* I had the opportunity to ask questions during the event. *Ich hatte die Möglichkeit, bei der Veranstaltung Fragen zu stellen.*
All	3. Knowledge Gain 3. *Wissenszuwachs*	I learned new things from the event. *Durch die Veranstaltung habe ich Neues gelernt.* The event showed me how diverse the topic is. *Die Veranstaltung hat mir gezeigt, wie vielfältig das Thema ist.* The event gave me new perspectives on the topic. *Die Veranstaltung hat mir neue Sichtweisen auf das Thema gegeben.* The event helped me understand how to apply the topic in practice. *Ich habe durch die Veranstaltung besser verstanden, wie man das Thema praktisch anwenden kann.*

Table A2. *Cont.*

Target Group	Dimension	Item
Companies	4. Relevance and Use of Event Topic in the Company 4. *Relevanz und Nutzung vom Veranstaltungsthema im Unternehmen*	The event showed me that the topic has an impact on my field. *Die Veranstaltung hat mir gezeigt, dass das Veranstaltungsthema einen Einfluss auf meine Branche hat.* The event gave me ideas for implementation within my company. *Durch die Veranstaltung habe ich Ideen für Einsatzmöglichkeiten in meinem Unternehmen entwickelt.* The event increased my interest in applying the content within my company. *Die Veranstaltung hat mein Interesse an der Anwendung der Veranstaltungsinhalte in meinem Unternehmen gesteigert.* The event showed me how relevant the content is for my company. *Die Veranstaltung hat mir gezeigt, wie relevant die Inhalte für mein Unternehmen sind.* The event content is applicable to current challenges in my company. *Die Inhalte der Veranstaltung sind auf aktuelle Herausforderungen in meinem Unternehmen anwendbar.*
Companies	5. Networking of Stakeholders 5. *Vernetzung von Stakeholdern*	The event facilitated constructive exchanges with other stakeholders. *Die Veranstaltung hat mir einen konstruktiven Austausch mit anderen Stakeholdern ermöglicht.* The event provided opportunities to network with other stakeholders. *Die Veranstaltung hat mir die Möglichkeit geboten, mich mit anderen Stakeholdern zu vernetzen.* The event allowed me to explore potential areas for cooperation with other stakeholders. *Durch die Veranstaltung konnte ich mit anderen Stakeholdern potenzielle Kooperationsbereiche erkunden.* The event strengthened my interest in collaborating with other stakeholders. *Die Veranstaltung hat mein Interesse an der Zusammenarbeit mit anderen Stakeholdern gestärkt.*
Companies	6. Interest in Cooperations with the University 6. *Interesse an Kooperationen mit der Hochschule*	The event increased my interest in collaborating with the university (e.g., through joint projects, research proposals, or commissioned research). *Die Veranstaltung hat mein Interesse an einer Kooperation mit der Hochschule gesteigert (z.B. im Rahmen von gemeinsamen Projekten, Forschungsanträgen oder Auftragsforschung).* The event motivated me to employ university students in my company through internships, theses, or part-time jobs. *Die Veranstaltung hat mich dazu motiviert, Studierende der Hochschule im Rahmen eines Praktikums, einer Abschlussarbeit oder eines Nebenjobs in meinem Unternehmen zu beschäftigen.*

Table A2. *Cont.*

Target Group	Dimension	Item
Companies	6. Interest in Cooperations with the University 6. *Interesse an Kooperationen mit der Hochschule*	The event motivated me to employ university students in my company through internships, theses, or part-time jobs. *Die Veranstaltung hat mich dazu motiviert, Studierende der Hochschule im Rahmen eines Praktikums, einer Abschlussarbeit oder eines Nebenjobs in meinem Unternehmen zu beschäftigen.* The event sparked my interest in participating in future university events (e.g., workshops and networking events) with my company or organizing them together. *Die Veranstaltung hat mein Interesse geweckt, zukünftig mit meinem Unternehmen an Hochschulveranstaltungen (z.B. Workshops und Netzwerkveranstaltungen) teilzunehmen oder diese gemeinsam zu gestalten.* The event encouraged me to involve university experts for consulting or training in my company. *Die Veranstaltung hat mich dazu angeregt, Experten der Hochschule für Beratungen oder Schulungen in meinem Unternehmen einzusetzen.*
Citizens	7. Trust in Science and Social Engagement 7. *Vertrauen in die Wissenschaft und gesellschaftliches Engagement*	The event has increased my trust in science. *Die Veranstaltung hat mein Vertrauen in die Wissenschaft gestärkt.* I gained new insights from the event that I can apply in everyday life. *Ich habe durch die Veranstaltung neue Erkenntnisse gewonnen, die ich im Alltag nutzen kann.* The event has shown me why this topic is important for society. *Die Veranstaltung hat mir gezeigt, warum das Thema wichtig für unsere Gesellschaft ist.* I now have a better understanding of how research can help address societal challenges. *Ich verstehe nun besser, wie Forschung zur Lösung gesellschaftlicher Herausforderungen beitragen kann.* I am motivated to actively apply what I learned from the event in my environment. *Ich bin motiviert, das Gelernte aus der Veranstaltung aktiv in meinem Umfeld umzusetzen.*
All	8. Increase in University Awareness and Preference 8. *Steigerung der Hochschulbekanntheit und -präferenz*	I learned more about this university at the event. *Ich habe bei der Veranstaltung mehr über diese Hochschule gelernt.* The event showed me what research is being conducted at this university. *Die Veranstaltung hat mir gezeigt, woran an dieser Hochschule geforscht wird.* The event encouraged me to recommend this university. *Die Veranstaltung hat mich dazu angeregt, diese Hochschule weiterzuempfehlen.* The event motivated me to participate in more events from this university. *Die Veranstaltung hat mich dazu motiviert, an weiteren Veranstaltungen dieser Hochschule teilzunehmen.* The event facilitated mutual exchange with the university. *Die Veranstaltung hat mir einen wechselseitigen Austausch mit der Hochschule ermöglicht.*

Table A2. *Cont.*

Target Group	Dimension	Item
Students	8. Increase in University Awareness and Preference 8. *Steigerung der Hochschulbekanntheit und -präferenz*	The event showed me that this university is a good place to study. *Die Veranstaltung hat mir gezeigt, dass diese Hochschule ein guter Ort zum Studieren ist*
Students	9. Impact of the Event on Academic Interest and Career Goals 9. *Einfluss der Veranstaltung auf das akademische Interesse und die beruflichen Ziele*	The event increased my interest in scientific research. *Die Veranstaltung hat mein Interesse an wissenschaftlicher Forschung erhöht.* I wish the event topic were incorporated more frequently in class. *Ich wünsche mir, dass das Thema der Veranstaltung öfter in den Unterricht einbezogen wird.* *After the event, I am more motivated to take courses related to the event topic at my school.* *Nach der Veranstaltung bin ich motivierter, Fächer aus dem Themengebiet der Veranstaltung an meiner Schule zu belegen.* After the event, I am more motivated to pursue a degree or training in the field related to the event's topic. *Nach der Veranstaltung bin ich motivierter, ein Studium oder eine Ausbildung im Themenbereich der Veranstaltung zu machen.*

Note: In this table, the term "University" is used instead of "HEI" to enhance clarity for respondents. However, the questionnaire is intended for use across all types of HEIs. If the term "University" does not fit your institution, we recommend replacing it with the appropriate term.

Table A3. Optional Questions.

Target Group	Item	Response	Response Type
All	How did you hear about the event? *Wie haben Sie/hast du von der Veranstaltung erfahren?*	Advertisements in newspapers or magazines *Anzeigen in Zeitungen oder Magazinen* Through my school/my employer *Über meine Schule/meinen Arbeitgeber* Personal recommendation (friends, family, colleagues) *Persönliche Empfehlung (Freunde, Familie, Kollegen)* Social media *Soziale Medien* Newsletter or email announcement *Newsletter oder E-Mail-Ankündigung* Flyers or posters *Flyer oder Plakate* Industry events or fairs *Branchenveranstaltungen oder Messen* Online search engines *Online-Suchmaschinen* Other (please specify: _____) *Sonstiges (bitte nennen: _____)*	Choice option

Table A3. *Cont.*

Target Group	Item	Response	Response Type
All	What did you like about the event? *Was hat Ihnen/dir an der Veranstaltung gefallen?*		Free text
	What did you not like about the event? *Was hat Ihnen/dir an der Veranstaltung nicht gefallen?*		Free text
	What topics do you wish for in future events? *Welche Themen wünschen Sie sich/du dir für zukünftige Veranstaltungen?*		Free text
	What else would you like to add? *Was möchten Sie/möchtest du sonst noch sagen?*		Free text

References

1. Roessler, I. *CHECK—Transfereinrichtungen an Deutschen Hochschulen*; CHE Centrum für Hochschulentwicklung: Gütersloh, Germany, 2020. Available online: https://www.che.de/download/check_transfer/?wpdmdl=14761&refresh=681b677a39f7f1746626426 (accessed on 1 September 2024).
2. Haj Taieb, S. Measuring the third mission of European Universities: A systematic literature review. *Soc. Econ.* **2024**, *46*, 147–167. [CrossRef]
3. Spraul, K.; Hufnagel, J. Hochschulen und Nachhaltigkeit: Fallstudie der Technischen Universität Kaiserslautern. In *CSR in Rheinland-Pfalz*; Schmitz, M., Schmidpeter, R., Eds.; Management-Reihe Corporate Social Responsibility; Springer: Berlin/Heidelberg, Germany, 2020; pp. 63–77. [CrossRef]
4. Henke, J.; Pasternack, P.; Schmid, S. Third Mission von Hochschulen. Eine Definition. *Hochschulwesen* **2016**, *64*, 16–22.
5. Compagnucci, L.; Spigarelli, F. The Third Mission of the university: A systematic literature review on potentials and constraints. *Technol. Forecast. Soc. Chang.* **2020**, *161*, 120284. [CrossRef]
6. Cunningham, J.A.; Menter, M.; Starke, F. The evolution of university technology transfer research: A text mining approach. *J. Technol. Transf.* **2025**, *50*, 1231–1268. [CrossRef]
7. Roessler, I.; Federkeil, G. *Transferstrukturen: Die Rolle von Nationalen Agenturen Beim Transfer aus Hochschulen*; DUZ Spotlight—Gute Praxis International; CHE Centrum für Hochschulentwicklung: Gütersloh, Germany, 2023; pp. 39–57. Available online: https://www.che.de/download/spotlight-transferagenturen/ (accessed on 1 September 2024).
8. Alhakamy, A. Extended Reality (XR) Toward Building Immersive Solutions: The Key to Unlocking Industry 4.0. *ACM Comput. Surv.* **2024**, *56*, 237. [CrossRef]
9. Doukianou, S.; Lalioti, V. Ethical Extended Reality: Bridging Technology and Cultural Heritage. In Proceedings of the 2024 IEEE International Conference on Metrology for eXtended Reality, Artificial Intelligence and Neural Engineering (MetroXRAINE), St. Albans, UK, 21–23 October 2024; pp. 301–306. [CrossRef]
10. Morgan, J.W.; Patel, R.A.; Campbell, S. Practical considerations of clinical XR (AR/VR) deployments. *Front. Virtual Real.* **2025**, *6*, 1517402. [CrossRef]
11. Simonofski, A.; Johannessen, M.R.; Stendal, K. Extended reality for citizen participation: A conceptual framework, systematic review and research agenda. *Sustain. Cities Soc.* **2024**, *113*, 105692. [CrossRef]
12. Vuorikari, R.; Kluzer, S.; Punie, Y. *DigComp 2.2: The Digital Competence Framework for Citizens—With New Examples of Knowledge, Skills, and Attitudes*; European Union, Publications Office of the European Union: Luxembourg, 2022. [CrossRef]
13. Swift, P.E.; Hwang, A. The impact of affective and cognitive trust on knowledge sharing and organizational learning. *Learn. Organ. Int. J.* **2013**, *20*, 20–37. [CrossRef]
14. Fuhrland, M.; Brucksch, M.; Wink, R.; Günther, S. Indikatorik zum forschungsbasierten Transfer von Know-how und Technologie. *Wissenschaftsmanagement* **2017**, *2*, 24–26.
15. Rubens, A.; Spigarelli, F.; Cavicchi, A.; Rinaldi, C. Universities' third mission and the entrepreneurial university and the challenges they bring to higher education institutions. *J. Enterp. Communities People Places Glob. Econ.* **2017**, *11*, 354–372. [CrossRef]
16. Perkmann, M.; Tartari, V.; McKelvey, M.; Autio, E.; Broström, A.; D'Este, P.; Fini, R.; Geuna, A.; Grimaldi, R.; Hughes, A.; et al. Academic engagement and commercialisation: A review of the literature on university–industry relations. *Res. Policy* **2013**, *42*, 423–442. [CrossRef]

17. Bruneel, J.; D'Este, P.; Salter, A. Investigating the factors that diminish the barriers to university–industry collaboration. *Res. Policy* **2010**, *39*, 858–868. [CrossRef]
18. Plewa, C.; Korff, N.; Baaken, T.; Macpherson, G. University–industry linkage evolution: An empirical investigation of relational success factors. *R&D Manag.* **2013**, *43*, 365–380. [CrossRef]
19. Burk, M.; Grindel, C.; Hetze, P. *Transferkompass*; Stifterverband für Deutsche Wirtschaft e.V.: Essen, Germany, 2021.
20. Rossi, F.; Rosli, A. Indicators of University-Industry Knowledge Transfer Performance and Their Implications for Universities: Evidence from the United Kingdom. *Stud. High. Educ.* **2015**, *40*, 1970–1991. [CrossRef]
21. Campbell, A.; Cavalade, C.; Haunold, C.; Karanikic, P.; Piccaluga, A. *Knowledge Transfer Metrics: Towards a European-Wide Set of Harmonised Indicators*; European Commission: Brussels, Belgium, 2020. [CrossRef]
22. Souder, W.E.; Nashar, A.S.; Padmanabhan, V. A Guide to the Best Technology-Transfer Practices. *J. Technol. Transf.* **1990**, *15*, 5–16. [CrossRef]
23. Frondizi, R.; Fantauzzi, C.; Colasanti, N.; Fiorani, G. The Evaluation of Universities' Third Mission and Intellectual Capital: Theoretical Analysis and Application to Italy. *Sustainability* **2019**, *11*, 3455. [CrossRef]
24. Vargiu, A. Indicators for the Evaluation of Public Engagement of Higher Education Institutions. *J. Knowl. Econ.* **2014**, *5*, 562–584. [CrossRef]
25. Plummer, R.; Witkowski, S.; Smits, A.; Dale, G. The Issue of Performance in Higher Education Institution-Community Partnerships: A Canadian Perspective. *J. High. Educ. Policy Manag.* **2021**, *43*, 537–556. [CrossRef]
26. Rybnicek, R.; Königsgruber, R. What Makes Industry-University Collaboration Succeed? A Systematic Review of the Literature. *J. Bus. Econ.* **2019**, *89*, 221–250. [CrossRef]
27. Kotiranta, A.; Tahvanainen, A.; Kovalainen, A.; Poutanen, S. Forms and Varieties of Research and Industry Collaboration across Disciplines. *Heliyon* **2020**, *6*, e03404. [CrossRef]
28. Frank, A.; Heinlein, M.; Lehmann-Brauns, C.; Lohr, F.; Schröder, C.; Schröder-Krahlemann, A.K. *Erfolgsmessung von Transfer und Kooperation an Hochschulen*; Stifterverband für die Deutsche Wissenschaft e.V.: Essen, Germany, 2019.
29. Wu, X. A review of virtual reality technology. *Appl. Comput. Eng.* **2024**, *38*, 1–6. [CrossRef]
30. Fares, O.H.; Aversa, J.; Lee, S.H.; Jacobson, J. Virtual reality: A review and a new framework for integrated adoption. *Int. J. Consum. Stud.* **2024**, *48*, e13040. [CrossRef]
31. Kauffeld, S. *Nachhaltige Personalentwicklung und Weiterbildung*; Springer: Berlin/Heidelberg, Germany, 2016. [CrossRef]
32. Kirkpatrick, D.L.; Kirkpatrick, J.D. *Evaluating Training Programs: The Four Levels*, 3rd ed.; Berrett-Koehler: San Francisco, CA, USA, 2006.
33. Ambu-Saidi, B.; Fung, C.Y.; Turner, K.; Lim, A. A Critical Review on Training Evaluation Models: A Search for Future Agenda. *J. Cogn. Sci. Hum. Dev.* **2024**, *10*, 142–170. [CrossRef]
34. Kirkpatrick, D.L. Evaluation of Training. In *Training and Development Handbook*; Craig, R.L., Bittel, L.R., Eds.; McGraw-Hill: New York, NY, USA, 1967; pp. 87–112.
35. Noe, R.A.; Schmitt, N. The influences of trainee attitudes on training effectiveness: Test of a model. *Pers. Psychol.* **1986**, *39*, 497–523. [CrossRef]
36. Baldwin, T.T.; Ford, J.K. Transfer of training: A review and directions for future research. *Pers. Psychol.* **1988**, *41*, 63–105. [CrossRef]
37. Ford, J.K.; Weissbein, D.A. Transfer of Training: An Updated Review and Analysis. *Perform. Improv. Q.* **1997**, *10*, 22–41. [CrossRef]
38. Phillips, J.J. *Return on Investment in Training and Performance Improvement Programs*, 2nd ed.; Improving Human Performance Series; Butterworth-Heinemann: Burlington, MA, USA, 2003.
39. Alliger, G.M.; Tannenbaum, S.I.; Bennett, W.; Traver, H.; Shotland, A. A meta–analysis of the relations among training criteria. *Pers. Psychol.* **1997**, *50*, 341–358. [CrossRef]
40. Bates, R. A critical analysis of evaluation practice: The Kirkpatrick model and the principle of beneficence. *Eval. Program Plan.* **2004**, *27*, 341–347. [CrossRef]
41. Alliger, G.M.; Janak, E.A. Kirkpatrick's levels of training criteria: Thirty years later. *Pers. Psychol.* **1989**, *42*, 331–342. [CrossRef]
42. Phillips, J.J. *HRD Trends Worldwide: Shared Solutions to Compete in a Global Economy*; Gulf Publishing: Houston, TX, USA, 1999.
43. Emerson, J. *Social Return on Investment: Exploring Aspects of Value Creation, Redf Box Set*, 2nd ed.; Roberts Enterprise Development Foundation: San Francisco, CA, USA, 1999.
44. Stufflebeam, D.L. The CIPP model for evaluation. In *International Handbook of Educational Evaluation*; Kellaghan, T., Stufflebeam, D.L., Wingate, L.A., Eds.; Springer: Berlin/Heidelberg, Germany, 2003; pp. 31–62.
45. Nickols, F.W. Why a stakeholder approach to evaluating training. *Adv. Dev. Hum. Resour.* **2005**, *7*, 121–134. [CrossRef]
46. Grohmann, A.; Kauffeld, S. Evaluating training programs: Development and correlates of the Questionnaire for Professional Training Evaluation. *Int. J. Train. Dev.* **2013**, *17*, 135–155. [CrossRef]
47. Wang, G.G.; Wilcox, D. Training Evaluation: Knowing More Than Is Practiced. *Adv. Dev. Hum. Resour.* **2006**, *8*, 528–539. [CrossRef]

48. Lee, H. A unified conceptual model of immersive experience in extended reality. *Comput. Hum. Behav. Rep.* **2025**, *18*, 100663. [CrossRef]
49. Quamara, M.; Schmuck, V.; Iani, C.; Primavesi, A.; Plaum, A.; Viganò, L. Evaluating Social Acceptance of eXtended Reality (XR) Agent Technology: A User Study. In *Proceedings of the 16th Biannual Conference of the Italian SIGCHI Chapter, Salerno, Italy, 6–10 October 2025*; Association for Computing Machinery: New York, NY, USA, 2025; pp. 1–10.
50. Davis, F.D. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Q.* **1989**, *13*, 319–340. [CrossRef]
51. Alvarez, K.; Salas, E.; Garofano, C.M. An integrated model of training evaluation and effectiveness. *Hum. Resour. Dev. Rev.* **2004**, *3*, 385–416. [CrossRef]
52. Wight, D.; Obasi, A. Unpacking the black box: The importance of process data to explain outcomes. In *Effective Sexual Health Interventions*; Stephenson, J.M., Imrie, J., Bonell, C., Eds.; Oxford University Press: Oxford, UK, 2003; pp. 151–166.
53. Oakley, A.; Strange, V.; Bonell, C.; Allen, E.; Stephenson, J. Process evaluation in randomised controlled trials of complex interventions. *BMJ (Clin. Res. Ed.)* **2006**, *332*, 413–416. [CrossRef]
54. Rychetnik, L.; Frommer, M.; Hawe, P.; Shiell, A. Criteria for evaluating evidence on public health interventions. *J. Epidemiol. Community Health* **2002**, *56*, 119–127. [CrossRef]
55. Rattray, J.; Jones, M.C. Essential elements of questionnaire design and development. *J. Clin. Nurs.* **2007**, *16*, 234–243. [CrossRef]
56. Krosnick, J.A.; Fabrigar, L.R. Designing rating scales for effective measurement in surveys. In *Survey Measurement and Process Quality*; Lyberg, L., Biemer, P., Collins, M., de Leeuw, E., Dippo, C., Schwarz, N., Trewin, D., Eds.; John Wiley & Sons, Inc.: New York, NY, USA, 1997; pp. 141–164.
57. Krosnick, J.A.; Presser, S. Question and Questionnaire Design. In *Handbook of Survey Research*; Marsden, P.V., Wright, J.D., Eds.; Emerald: Bingley, UK, 2010; pp. 264–313.
58. Saris, W.E.; Gallhofer, I.N. *Design, Evaluation, and Analysis of Questionnaires for Survey Research*; John Wiley & Sons, Inc.: New York, NY, USA, 2007.
59. Menold, N.; Bogner, K. *Gestaltung von Ratingskalen in Fragebögen (GESIS Survey Guidelines)*; GESIS—Leibniz Institute for the Social Sciences: Mannheim, Germany, 2015. [CrossRef]
60. Warr, P.; Allan, C.; Birdi, K. Predicting three levels of training outcome. *J. Occup. Organ. Psychol.* **1999**, *72*, 351–375. [CrossRef]
61. Podsakoff, P.M.; MacKenzie, S.B.; Lee, J.Y.; Podsakoff, N.P. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *J. Appl. Psychol.* **2003**, *88*, 879–903. [CrossRef] [PubMed]
62. Spector, P.E. Method Variance in Organizational Research. *Organ. Res. Methods* **2006**, *9*, 221–232. [CrossRef]
63. Kraiger, K.; Ford, J.K.; Salas, E. Application of cognitive, skill-based, and affective theories of learning outcomes to new methods of training evaluation. *J. Appl. Psychol.* **1993**, *78*, 311–328. [CrossRef]
64. Willis, G.B. *Cognitive Interviewing: A Tool for Improving Questionnaire Design*, 1st ed.; Sage: Thousand Oaks, CA, USA, 2005.
65. Bandalos, D.L.; Finney, S.J. Factor analysis: Exploratory and confirmatory. In *The Reviewer's Guide to Quantitative Methods in the Social Sciences*; Hancock, G.R., Stapleton, L.M., Mueller, R.O., Eds.; Routledge: New York, NY, USA; London, UK, 2018; pp. 98–122.
66. Bowling, A. *Research Methods in Health*; Open University Press: Buckingham, UK, 1997.
67. American Educational Research Association; American Psychological Association; National Council on Measurement in Education. *Standards for Educational and Psychological Testing*; American Educational Research Association: Washington, DC, USA, 2014.
68. Chen, Y.; Wang, X.; Xu, H. Human factors/ergonomics evaluation for virtual reality headsets: A review. *CCF Trans. Pervasive Comput. Interact.* **2021**, *3*, 99–111. [CrossRef]