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Learning At and From a Virtual Conference: A Comparison of Conference Formats and Value Contributing Factors

Nina Seidenberg[1], Ioana Jivet[2], Maren Scheffel[3], Vitomir Kovanović[4], Grace Lynch[5] and Hendrik Drachsler[6]

Abstract

A relevant learning space for academics, especially junior researchers, is the academic conference. While conference participation has long been associated with personal attendance at the conference venue, virtual participation is becoming increasingly important. This study investigates the perceived value of a purely virtual academic conference for its participants by analyzing the evaluation feedback (N = 759) from three virtual and two face-to-face LAK conferences. For the purposes of this study, we derive a definition of conference value and identify factors contributing to the overall value rating of virtual academic conferences based on the existing literature. Results indicate a perceived value of virtual conferences comparable with that of face-to-face events, satisfaction with social interaction and topics of interest being the most important predictors. Our insights show that virtual conferences are valuable events for academic professional development and conference organizers can utilize these results to design a valuable event for their participants.

Notes for Practice

- The value of a conference for a participant derives from personal perceptions based on previous knowledge, experience, and expectations.
- Virtual conferences can be just as valuable as face-to-face conferences for academics.
- The perceived value of virtual conferences is independent of participants' gender, age, organizational status, and conference experience.
- To provide a valuable event for participants, organizers should focus on topics of interest and social interaction when designing a virtual conference and ensure the quality of the presented content by checking the contributions in advance using (double) blind review procedures.

Keywords: Virtual conference, academic conference, conference value, event format comparison, event analysis

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Corresponding author [1]Email: seidenberg@em.uni-frankfurt.de Address 1: Goethe University Frankfurt – studiumdigitale, Eschersheimer Landstr. 155–157, 60323 Frankfurt, Germany. Address 2: Social Learning Department, Educational Sciences, Open University (OU) of the Netherlands, Valkenburgerweg 177 (6419 AT), Heerlen, Netherlands. ORCID iD: https://orcid.org/0000-0003-3290-6774

[2]Email: ioana.jivet@fernuni-hagen.de Address: CATALPA, FernUniversität in Hagen, Universitätsstr. 27, 58097 Hagen, Germany. ORCID iD: https://orcid.org/0000-0002-8715-2642

[3]Email: maren.scheffel@rub.de Address: Ruhr University Bochum – Faculty for Educational Data Science, Universitätsstr. 150, 44801 Bochum, Germany. ORCID iD: https://orcid.org/0000-0003-4395-4819

[4]Email vitomir.kovanovic@unisa.edu.au Address: Centre for Change and Complexity in Learning, University of South Australia, Barbara Hanrahan Building, 14–18 Fenn Place, Adelaide 5000, Australia. ORCID iD: https://orcid.org/0000-0001-9694-6033

[5]Email: gracelynch14@gmail.com Address: UNE Business School, University of New England, Elm Avenue, Armidale NSW 2351, Australia.

[6]Email: h.drachsler@dipf.de Address 1: Department for Educational Technologies, DIPF – Leibniz Institute for Research and Information in Education, Rostockerstr. 6, 60323 Frankfurt, Germany. Address 2: Goethe University Frankfurt - studiumdigitale, Eschersheimer Landstr. 155–157, 60323 Frankfurt, Germany. Address 3: Social Learning Department, Educational Sciences, Open University of the Netherlands, Valkenburgerweg 177 (6419 AT), Heerlen, Netherlands. ORCID iD: https://orcid.org/0000-0001-8407-5314

1. Introduction

Since 2020, higher education institutions have experienced an increasing shift towards digital education, adopting new technologies on an unprecedented scale to support their teaching activities (Keystone Academic Solutions, 2020). Technology-enhanced education, which increasingly gained importance even before the COVID-19 pandemic (Drachsler et al., 2021; Haleem et al., 2022), received a dramatic boost and provided researchers with many new opportunities. For the Learning Analytics and Knowledge (LAK) community, with its focus on "research into the challenges of collecting, analyzing and reporting data with the specific intent to improve learning … including informal learning on the internet … and workplace learning" (Society for Learning Analytics Research, 2022), the door for broader and more encompassing research in the field of learning and education opened.

A relevant learning space for academics, especially junior researchers, that is often under researched is the academic conference. The analysis of conferences can contribute to knowledge in the field of learning in multiple ways: First, to deepen our understanding of the learner perspective, which is *how* and *what* participants learn *at* conferences. Second, once we deepen our understanding of the learner perspective, we can derive a conference designer perspective, which is the organizer perspective, and recommend conference concepts and designs that enable participants to learn at a conference. Thus, organizers can learn *from* conferences to refine the event concept and improve the informal learning experience for participants. As a research community at the forefront of learning, education, and technology, the LAK community broadens its focus from the student–teacher perspective and their needs towards the perspective of conference stakeholders—participants and organizers—and extends its research to conferences as informal learning spaces for academics. Within this informal learning space, participants can be understood as learners, while organizers take the role of learning space designers.

With this focus on learning and technology aspects of education, the LAK community was one of the first to take up the challenge in March 2020 and shift from an in-person to a fully virtual event within only a few days to provide a fully virtual conference as an informal learning space for its members. The community embraced the challenge not only in 2020 but also in the following years.

While the need for sophisticated conference design exists for both in-person and virtual events, we see a need to focus on virtual events. Facing the challenge and uncertain nature of a rapidly changing world—for example, in terms of the climate crisis and its related concerns regarding conference travel (Jäckle, 2022) as well as the increasing importance of technology in events (Celuch, 2021; Van Winkle & Bueddefeld, 2020)—it is likely that the traditional model of face-to-face conference organization will have to adapt to a new reality (Roos et al., 2020). The LAK community has already adapted to this new reality: Since 2020, the community has offered virtual participation for its international conferences, either as part of a fully virtual or hybrid conference. As a result, it is crucial to examine how the community values the conference (online vs. virtual), not only for the LAK community but for all conference stakeholders attending virtual events or offering virtual participation.

This study seeks to shed light on the intricate web of factors that contribute to the perceived value of virtual conferences, focusing on those that encapsulate the core elements of effective learning experiences within conferences and their collective influence on the perceived overall value of virtual conferences. More specifically, the aims of this paper are 1) to show whether and how virtual conferences can be valuable informal learning events for academics and 2) to derive practical implications for the design of conferences. We investigate the perceptions of conference participants around what makes a valuable conference and how the format of the conference, virtual or in-person, changes these perceptions. For this purpose, we derive a definition for conference value from the existing literature and use participant evaluations from the 2018 to 2022 editions of the LAK conference, held in-person in 2018 and 2019 and in a purely virtual format from 2020 to 2022.

1.1. Background

Participation in academic conferences is seen as a major activity in academic life (Hauss, 2021; Oester et al., 2017; Sousa & Clark, 2017), representing an external, temporary workspace for academics. But what drives academics to attend a conference? What creates value for participants?

Previous research identified networking—the gathering and interaction of people sharing the same (research) interest—as a major motive to attend a conference (Mair et al., 2018). Barton (2005) stated, "The value of an academic conference lies in its ability to engage attendees in ongoing scholarly conversations" (p. 24). Rogers (2013) defined a conference as an event to "meet and exchange views, convey a message, open a debate or give publicity to some area of opinion on a specific issue" and as a "participatory meeting designed for discussion, fact-finding, problem solving and consultation" (p. 22). Both statements undoubtedly refer to the networking aspect. However, the statements also refer to learning and—in a broader sense—to professional development (Harrison, 2010). In a previous study, Fakunle et al. (2019) also identified conferences as learning sites. For academics, attending conferences is not just about networking and learning about new research findings. Attending conferences is also about learning to be and function as an academic, which is accompanied and driven by networking and participant interaction.

1.1.1. Conferences as Informal Learning Spaces

While conferences typically adhere to a predetermined schedule and participants anticipate acquiring knowledge from these gatherings, the learning process within such events takes on an informal, somewhat serendipitous nature. The definition of informal learning, as used in research publications, also suggests that conferences are informal learning spaces. Manuti et al. (2015) describe informal learning as occurring in unconventional settings that are not primarily intended for education. It emerges organically as it is sparked by specific problems or situations rather than structured intent, and the mode of knowledge acquisition often involves collaborative interactions, engaging with others and seeking guidance from other individuals with expertise. Based on this understanding of informal learning and the typical manner in which a conference takes place, we consider conferences as spaces where informal learning occurs and where learning is facilitated by the conference design.

Learning at conferences can be investigated from multiple stakeholder perspectives and with a focus on different aspects of learning. From the vantage point of conference participants, two of these aspects are the 1) acquisition of certain skills and knowledge, which is *what* participants can learn at conferences and 2) information processing, which is *how* participants learn at a conference.

In terms of the first aspect—the acquisition of certain skills and knowledge—conferences offer a variety of learning opportunities, primarily focused on professional growth and development. First, conferences provide the opportunity of learning to create an academic identity and making oneself known to other academics. When attending conferences, participants learn to introduce themselves to the research community and to people who share the same interests. Researchers also receive formal and informal recognition from others (Gross & Fleming, 2011; Mantai, 2017). Many researchers already receive recognition on social media platforms by posting new findings or publications (Darling et al., 2013). However, attending an academic conference provides the opportunity to learn to personally link oneself to a certain research field, show certain interests, show expertise in a specific research topic, and have the chance to be recognized as a person (Konzett, 2012), not just as a picture, avatar, or username. As the need for self-promotion—and, to some degree, the pressure to demonstrate "impact"—gained increasing importance in recent years (Bartram, 2020; Huber et al., 2019), conferences serve as a platform for self-promotion and self-presentation and provide the opportunity to learn self-promotion skills in a real-life setting.

Another opportunity to learn at a conference refers to new or non-daily experiences. Unlike publishing in research journals, at conferences, academics face the challenge of presenting their findings and ideas (Edelheim et al., 2018) mostly verbally and in a limited time span. Moreover, they should be able to participate in spontaneous discussions and react ad hoc to feedback. Thus, especially for—but not limited to—young researchers and inexperienced conference participants, conference participation can bring new and valuable learning experiences regarding presentation and discussion skills and insights about how research communities work (Egri, 1992). Academic conferences offer the opportunity to share and disseminate knowledge with others, create knowledge, and form new relationships and networks (Hixson, 2012). They support "the production and exchange of knowledge, *and* the creation and maintenance of the ties" (Erickson et al., 2011, p. 503). The creation and maintenance of ties can even be considered a fundamental element of conferences.

And finally, the most obvious of all learning aspects: An event where new research findings are presented is a site for learning about the latest developments in the field, including findings, methods and promising future research directions. Conferences offer the opportunity to deepen participant understanding and insights into certain topics and to broaden their knowledge horizon.

To sum up, *what* an academic can learn at a conference includes learning to create an academic identity, including self-promotion in a real-life setting, presentation and discussion skills, as well as the creation and maintenance of ties and learning about new findings and gaining knowledge.

In terms of the second aspect—information processing, meaning *how* knowledge acquisition takes place—a large body of literature from different research fields, i.e., neurocognitive science (Çeliköz et al., 2019; Shing & Brod, 2016), is available. Hofstädter-Thalmann et al. (2022) derive five principles from the problem-based learning literature and introduce a formal framework for how participants gain knowledge at conferences. The framework describes that learning happens best when (a) prior knowledge is activated and can be linked to new information, (b) new information is embedded into and presented with context, (c) the learners manage to make their own meaning out of the new information, (d) new information can be stored in memory, and (e) the situation, e.g., realizing a knowledge gap, creates interest as a learning stimulus.

Hofstädter-Thalmann et al. (2022) describe these principles as applicable for virtual and in-person conferences. However, the different conference formats come with features and characteristics that are controversially discussed in the literature. The role of virtual conferences as learning events for academics remains unclear, as some characteristic drawbacks of virtual events—for example, the lack of serendipitous encounters during breaks—might hinder participants from experiencing a valuable event.

1.1.2. Benefits and Drawbacks of Virtual Conferences

Expert opinions about the pros and cons of virtual conferences and their values are divergent. While some of them seem to emphasize the limitations of interaction and personal contact, other authors highlight the new and broader opportunities for conference participation in the virtual space.

When comparing traditional and virtual conferences—see Sá et al. (2019) for a review and Anderson and Anderson (2010) for a comparative list—several authors agree that purely virtual formats will not fully replace face-to-face events. The limitations on social interaction, communication, and networking that undoubtedly exist in the virtual space are not only caused by physical distance and missing personal contact but also by participation from different time zones and distractions that limit synchronous communication and attention (Carr & Ludvigsen, 2017; Oester et al., 2017). Thus, the learning experience and overall learning opportunities of virtual conference formats are different—and, to some degree, limited. Based on these limitations, some authors doubt the value of the virtual conference format and expect less value from them. At first glance, these doubts seem valid.

In contrast, some authors see virtual conferences as a potential new norm for academic conferences (Foramitti et al., 2021), doubt that face-to-face events are viable options for the future (Mair et al., 2018), or see enhanced networking opportunities in the virtual conference space (Estien et al., 2021). Anderson and Anderson (2010) see greater formal interaction options at virtual conferences as a wider audience can be reached, and more people can enrich the knowledge-sharing process and the scientific discourse among experts. In fact, virtual participation can open the door for people who would not be able to attend in person for varied reasons. For example, virtual attendance comes with a considerable reduction in participation and travel costs (Falk & Hagsten, 2022), no travelling time, and therefore also a significantly smaller carbon footprint (Fraser et al., 2017; Holden et al., 2017; van Ewijk & Hoekman, 2021). Virtual participation also helps to address other issues like those related to visas, travel restrictions, and potential health issues (De Picker, 2020; Nicolson, 2018).

In summary, virtual conferences offer a compelling model for reducing costs and enhancing diversity, equity, and inclusion, as well as expanding global outreach (Black et al., 2020; Skiles et al., 2022). They also align with sustainable practices, particularly relevant in the context of the climate crisis. However, their value for individual academic development is nuanced and variable. While they maintain key academic elements like research presentations, they lack the spontaneous interactions found in traditional face-to-face events. The personal value derived from such conferences is influenced by multiple individual factors, leading to varied perceptions among attendees. Therefore, while virtual conferences offer significant advantages, they are not a one-size-fits-all solution and differ fundamentally from their in-person counterparts.

1.1.3. Pivoting the LAK Conference to the Virtual Space

To deepen our understanding of the value of virtual conferences, we used the LAK conference series as a case study. The LAK conference is an interdisciplinary research forum in the field of analytics on teaching, training, learning, and development. LAK is held annually and provides an exchange platform for researchers, educators, instructional designers, data scientists, software developers, institutional leaders, and governmental policy makers. The conference series was held all over the globe 12 times by 2022.

For three days, 500–600 participants gather to present around 160–190 research papers and practitioner reports and 60–80 posters and demos. The conference schedule contains three keynotes, several 90-minute parallel sessions, each with three or four paper presentations, several coffee breaks in between, a separate 90-minute poster and demo session, and additional formal and informal social events. As for many conferences before 2020, LAK participation was associated with personal attendance at the venue. Formal and informal events took place in physical spaces, only the keynote presentations were recorded.

In spring 2020, the COVID-19 restrictions triggered a phase of social distancing and became a game changer in how LAK conferences were held: the event moved to Zoom. While the session length was kept at 90 minutes, the session structure was adjusted to fit the presenters' time zones of residence and provide a convenient presentation time slot for all speakers. With presenter permission, presentations, including the question-and-answer sessions, were recorded and made available in an online video gallery just a few minutes after the live presentation was finished. Questions and feedback on presentations could be given either via chat or verbally, synchronously during the live presentation or later in online discussion forums. The organizing team invested even more effort to provide a stage for participants to self-promote, to connect people, and to provide the best conference experience possible. Back-channel technologies like microblogging—already proven to support communication among conference participants (Ross et al., 2011) and reported to have been utilized by many conferences even before 2020 (Ebner & Reinhardt, 2009; Reshef et al., 2020)—were deployed to a greater extent.

Thus, LAK participants—like most conference participants all over the world—had to deal with a revised conference concept, including limitations and new opportunities, as discussed above. As "the true value of a conference lies in its effects on participants" (Serrat, 2017, p. 961), it is crucial to investigate the perceived value of virtual events. The evaluation of virtual events should be fundamental to finding out whether this format should be part of future conference designs.

1.2. Defining Conference Value

For the purpose of this study and to illustrate our understanding of conference value, we see a need for a definition of conference value. Based on our explanations above and in reference to Evensen and Graham (2022), who define values as "core commitments that fundamentally matter to them [people] and their identity …. [that] leads to an evaluative belief, and to an attitude" (p. 1), we suggest the following as a working definition for conference value:

> *The value of a conference is the essential meaning individuals place on participation in academic exchange that promote knowledge sharing, the creation and maintenance of the ties, self-promotion, professional growth and learning. Its evaluation is a personal perception based on previous knowledge, experience, and expectations.*

1.3. Research Questions

As explained above, conferences serve as informal learning events where learning is facilitated through social engagement. For virtual conferences, the widely criticized limited options for social interaction are assumed to have a negative impact on the conference value for participants. Consequently, one can assume that participant perceptions of conference elements that foster interaction and learning play a crucial role in shaping the perceived overall value of a conference. However, it was essential to get data-driven insight about how the conference series was perceived by its participants. Though much effort was invested into value-creating—in-person and online—LAK events from an organizer perspective, the perceived conference value to participants remains the crucial factor in evaluating an event's success. Furthermore, we can gain insights into whether value perceptions evolve in response to changes in the conference format, which conference-related factors contribute to participant value perceptions, and how to optimize conferences as informal learning spaces. As this study focuses on virtual events, we first investigated whether the conference format affects the perceived overall value of the attended conference. We guided our research with the following research question:

RQ1: Does the value of virtual and traditional face-to-face conferences as perceived by participants differ depending on the format?

We then expand our investigation and examine event-related factors that contribute to the perceived overall value of virtual conferences (detailed in section 2.1):

RQ2: To what extent do perceived interaction, interest, and quality contribute to the overall value rating of purely virtual conferences?

2. Method

2.1. Operationalization of Conference Value

As defined above, conference value is an individual perception of conference aspects, while these aspects and their weight might differ among participants. For the purpose of this study, and based on the existing literature, we examine three factors that we assume contribute to the perceived conference value: satisfaction with social interaction (*Interaction),* the degree to which the conference sessions met participant interest (*Interest*), and the degree to which the conference presentations met participant quality expectations (*Quality*).

We see *Interaction* as contributing to the overall value of a conference from two perspectives: First, we draw on the argument that conferences are places of informal learning, defined as occurring during collaborative interactions and when engaging with others, devoid of predefined structures (Manuti et al., 2015). We see social interaction as one of the pivotal variables when investigating conferences due to its capacity to foster engagement, collaboration, a sense of collective inquiry and the creation of a dynamic learning community (Liu & Xu, 2024; McInnerney & Roberts, 2004). Second, *Interaction* assesses the extent to which participants feel engaged and connected with their peers, fostering knowledge sharing and the creation and maintenance of ties, two essential aspects that enhance the value of a conference as defined in section 1.2. Conferences, as learning spaces, should stimulate active participation and the exchange of diverse perspectives. In this context, measuring satisfaction with social interaction provides valuable insights into how effectively a conference nurtures an environment conducive to engaged learning and extending one's professional network (Kordts-Freudinger et al., 2017).

Moreover, we see *Interest* as a value-contributing factor. We derive our inference from the learning principle (e) situational interest (see section 1.1.1), which in turn refers to the learning aspect of our value definition in section 1.2. Interest resonates with the essence of self-directed and meaningful learning and fosters social engagement (Lai et al., 2024; Rotgans & Schmidt, 2017). Interest is a strong driver for motivation and the learning process, which determines academic and career trajectories and is an essential element of academic success (Harackiewicz et al., 2016). Furthermore, the pursuit of knowledge and its exchange driven by intrinsic motivation reflects the self-guided nature of learning, often associated with long-lasting comprehension and retention (Oudeyer et al., 2016), and therefore seems to be a valid contributor to the overall value of conferences.

And finally, we see *Quality* as an essential component of the overall perceived value of conferences. Based on our understanding of learning as an active construction of meaning (see learning principle (c) in section 1.1.1), high-quality

presentations encourage attendees to actively construct meaningful understanding by processing information deeply (Jordan et al., 2020) and encourage the audience to participate in knowledge exchange and critical thinking. We understand these aspects as measures for professional growth in the context of the definition of conference value provided in section 1.2.

2.2. Data Collection

The variables of interest analyzed in this study were extracted from the evaluation survey sent to LAK participants each year right after the event was finished. The survey has been used for many years as a means to gather participant feedback and make improvements. The surveys have been slightly modified over the years to evaluate event-specific characteristics, but the items used for the study remained constant. The pandemic forcing the conference to move online was an opportune time to expand the feedback sought for the different online formats. For this study, we use data from five consecutive conferences, LAK18 to LAK22. The data were collected anonymously within two weeks after each event. For survey-economic purposes and to keep the effort for the participants within reasonable limits, the relevant variables were collected using four single item measures (for *Overall Value, Interaction, Interest, Quality*) and additional sociodemographic items. For RQ1, the overall value of the event was rated on a single 5-point-Likert-type item (1 = no value at all; 5 = very high value). For RQ2, ratings for satisfaction with social interaction were rated on a single 5-point-Likert-type item (1 = very dissatisfied to 5 = very satisfied), and ratings for the degree to which attendee topics of interest were met were also rated on a single 5-point-Likert-type item (1 = not at all to 5 = very high). Moreover, attendees were asked to provide sociodemographic information about gender, age, conference experience, and organizational status (e.g., student, researcher, et cetera) based on predefined categories.

2.3. Sample

2.3.1. Sample for RQ1

The evaluation feedback from all five events, LAK18–LAK22, was used to compare the value of different conference formats. LAK20 was originally planned to take place as a face-to-face event. Due to the COVID-19 restrictions, however, the event was moved to the virtual space within 11 days. Compared to LAK20, LAK21 and LAK22 were organized as virtual events from the beginning. The sample encompasses $N = 759$ participants. Table 1 shows the conference format, number of participants, number of responses, and response rates for each conference year investigated.

Table 1. Format, Number of Participants, Survey Responses, and Response Rates for LAK18–22

Conf.	Conf. format	Conf. partic.	Survey responses	Response rate
LAK18	in-person	362	162	44.8%
LAK19	in-person	497	192	38.6%
LAK20	virtual	559	150	26.8%
LAK21	virtual	599	135	22.5%
LAK22	virtual	588	120	20.4%

2.3.2. Sample for RQ2

RQ2 focuses on the feedback from the virtual conference. Only the datasets of LAK20 to LAK22 ($N = 388$) were included in the analyses. For this sample, 44.8% of the study participants were female, 49.2% were male, while 5.4% chose not to disclose their gender identity, and one person indicated being non-binary. Table 2 shows the gender and age frequencies of the sample for RQ2. Table 3 shows the overall conference experience and its organizational status.

Table 2. Gender and Age Frequencies of the LAK20–22 Sample

		Gender				
Conf.	**age**	**female**	**male**	**prefer no answer**	**non-binary**	**Sum**
LAK20	21–29	14	21	0	0	35
	30–39	23	24	3	0	50
	40–49	15	15	5	0	35
	50+	6	14	2	0	22
LAK21	21–29	11	13	0	1	25
	30–39	25	27	3	0	55
	40–49	16	11	1	0	28
	50+	12	12	0	0	24
LAK22	21–29	4	9	1	0	14
	30–39	24	19	5	1	49
	40–49	14	12	0	0	26
	50+	10	14	1	0	25
Sum		174	191	21	2	**388**

2.4. Data Analysis

We used Jamovi Version 2.4.1 and SPSS Version 28 for data analysis. As the data were collected using ordinal scales with Likert-type single items, we performed nonparametric tests to answer our research questions, following the recommendations of several authors (i.e., Boone & Boone, 2012; Wu & Leung, 2017). To answer RQ1, we first analyzed differences between the perceived value mean of all five conferences using a Kruskal-Wallis test. We then investigated the differences between the perceived value of the two different formats by comparing the value rating of the LAK18 and LAK19 (both face-to-face) conferences with the value rating of the LAK20 to LAK22 (virtual). For this analysis, we conducted a Mann-Whitney U-test, as the samples showed equal variances. For RQ2, we conducted a logistic ordinal regression; specifically, we used the Proportional Odds Model to investigate significant predictors for the value rating of virtual conferences. Due to the small sample sizes for the categories *non-binary*, and *I prefer not to answer*, we included only the results of participants who categorized themselves as *male* or *female* in our analyses for RQ2.

Table 3. Overall Conference Experience and Organizational Status of the LAK20–22 Sample

Conference Experience	**Counts**	**% of Total**
0–1	100	25.7%
2–5	106	27.2%
6–10	69	17.7%
11–20	53	13.6%
20+	61	15.7%
Organizational Status		
Student	93	25.5%
Researcher	155	42.6%
Teaching Faculty	72	19.8%
Depart. or Sen. Managem.	44	12.1%

Note. n = 389 responded to the conf. experience item, n = 364 responded on the organizational status item

3. Results

3.1. Perceived Value across different Conference Formats

As a first step, we performed a comparison of all five conferences. The distribution of the ratings is shown in Figure 1, descriptive data are shown in Table 4.

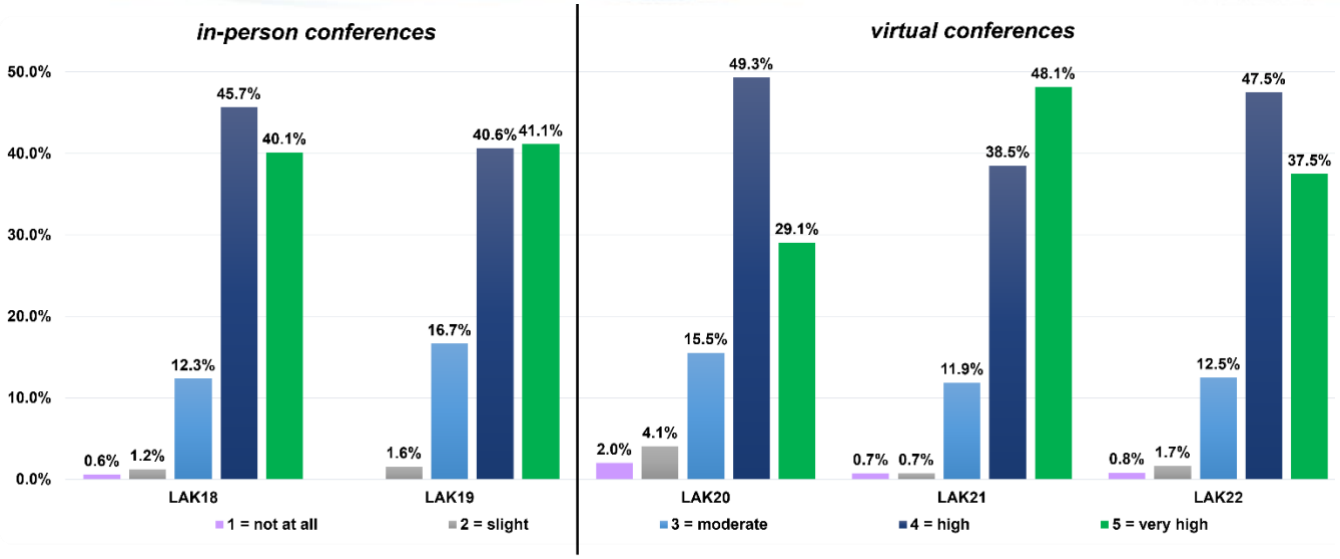

Figure 1. Distribution of overall value ratings for LAK18–22 conferences.

The Kruskal-Wallis test showed significant differences in the overall value rating for the five conferences, $H(4) = 12.1$, $p = .016$, with a small effect size of $\varepsilon^2 = .0161$. Dwass-Steel-Critchlow-Fligner (DSCF) pairwise comparison showed significant differences only for the comparison of LAK20 and LAK21, $W = 4.736$, $p = .007$, with LAK21 ($M = 4.33$, $SD = 0.77$) being significantly higher rated than LAK20 ($M = 3.99$, $SD = 0.89$).

Table 4. Mean, Median, and Standard Deviation of LAK18–22 Overall Value Ratings and Different Formats

	Conf.	N	Mean	Mdn	SD
Overall_value	LAK18	162	4.23	4	0.76
	LAK19	192	4.21	4	0.77
	LAK20	148	3.99	4	0.89
	LAK21	135	4.33	4	0.77
	LAK22	120	4.19	4	0.78
	Format				
Overall_value	in-person	354	4.22	4	0.77
	virtual	403	4.16	4	0.83

After the comparison of the individual events, we compared the overall value ratings for the different conference formats using the Mann-Whitney U-test. In other words, ratings of in-person conferences LAK18 and LAK19 were compared to those of virtual conferences LAK20 to LAK22. Ratings for the in-person conferences ($M = 4.22$; $Mdn = 4$) did not significantly differ from ratings for virtual conferences ($M = 4.16$; $Mdn = 4$), $U = 69296$, $z = –.735$, $p = .463$, $r = .028$. Thus, our results show that participants perceived LAK21 as significantly more valuable than LAK20. Attendee perceptions of the value of the conference did not differ based on the format, i.e., the format did not impact attendees' overall value rating.

3.2. Contributors to the Value of Virtual Conferences

To examine contributing factors to the overall value rating of virtual conferences, we performed an ordinal logistic regression using the dataset from LAK20 to LAK22. Ratings for satisfaction with social interaction *(Interaction*), the degree to which participant topics of interest (*Interest*), and the perceived quality of presentations (*Quality*) were met were set as independent variables. Sociodemographic variables *Gender*, *Age*, *Organizational Status (Status)*, and *Conference Experience (Experience)* were added to the analysis. Table 5 shows the results of the ordinal logistic regression.

Table 5. Results of Ordinal Logistic Regression for Overall Value Ratings of LAK20–LAK22

		95% Confidence Interval						95% Confidence Interval	
Predictor	**Estimate**	**Lower**	**Upper**	**SE**	**Z**	**p**	**Odds ratio**	**Lower**	**Upper**
Interaction	0.808	0.524	1.103	0.147	5.487	< .001	2.243	1.689	3.013
Interest	1.446	0.907	2.002	0.279	5.188	< .001	4.248	2.477	7.404
Quality	0.259	–0.223	0.742	0.246	1.052	0.293	1.295	0.800	2.101
Gender:									
male – female	–0.165	–0.699	0.369	0.272	–0.606	0.545	0.848	0.497	1.446
Age:									
21–29 – 50+	0.087	–0.794	0.968	0.448	0.194	0.846	1.091	0.452	2.632
30–39 – 50+	0.269	–0.493	1.028	0.387	0.696	0.487	1.309	0.611	2.797
40–49 – 50+	0.508	–0.380	1.406	0.454	1.118	0.264	1.662	0.684	4.080
Organizational Status:									
Student – Managem.	–0.110	–1.082	0.842	0.489	–0.226	0.822	0.895	0.339	2.322
Researcher – Managem.	0.508	–0.404	1.410	0.461	1.101	0.271	1.662	0.667	4.095
Teach. Fac. – Managem.	–0.179	–1.164	0.792	0.497	–0.359	0.719	0.836	0.312	2.207
Conference Experience:									
0–1 – 20+	–0.257	–1.156	0.637	0.456	–0.564	0.573	0.773	0.315	1.890
2–5 – 20+	0.164	–0.755	1.083	0.468	0.351	0.726	1.178	0.470	2.953
6–10 – 20+	–0.124	–1.100	0.851	0.497	–0.249	0.803	0.884	0.333	2.343
11–20 – 20+	0.121	–0.922	1.168	0.532	0.228	0.819	1.129	0.398	3.217

Overall, the two lowest rating categories for *Overall Value*, *Interaction*, *Interest*, and *Quality* (scale ratings 1 and 2), were chosen by only around 2% of all participants. As the analysis included 930 (79.1%) cells with zero frequencies, we decided not to rely on the *Goodness-of-Fit* measures, as recommended by Strand et al. (2011). Instead, we looked at the Model Fitting test and pseudo-R-squares. The model fitting analysis showed a significant improvement in the fit of the final model relative to the intercept model only, $\chi^2(15, N = 269) = 147.78, p < .001$. The result indicates that the full set of independent variables provides a better prediction of the overall value ratings than expected based on the marginal probabilities. With a value of .256, the McFadden Pseudo-R-Squared is within the good range (Hemmert et al., 2018), showing a 25.6% improvement in the prediction of the outcome relative to the intercept-only model. The variable *Interest* is the main predictor for the overall value rating in the model. A higher rating on the variable *Interest* increases the odds for a higher value rating by the factor 4.248. The variable *Interaction* is the second important variable in the model. A higher rating on *Interaction* increases the odds for a higher value rating by the factor 2.243. All other factors investigated showed no significant contribution to the model. In other words, the higher the attendee interests are met, and the higher their satisfaction with social interaction, the more likely attendees are to rate the conference higher, regardless of their sociodemographic characteristics or the perceived quality of the event presentations.

To gain a deeper understanding of the differences in the value ratings for LAK20, LAK21, and LAK22, we added a comparison of the variables *Interaction*, *Interest*, and *Quality* for these events. The means, medians, and counts for each rating category are shown in Table 6 and Figures 2 to 4. The data points in Figures 2 to 4 are jittered to enhance interpretability.

Table 6. Mean, Median, Standard Deviation, and Category Rating Counts of Interaction, Interest, and Quality Variables

						Very High	**High**	**Mod.**	**Slight**	**Not at all**
	Conf.	**N**	**M**	**Mdn**	**SD**	**Counts**				
Interaction	LAK20	102	3.07	3	1.08	12	20	40	23	7
	LAK21	115	3.90	4	0.97	36	43	27	7	2
	LAK22	85	3.96	4	0.92	25	40	13	6	1
Interest	LAK20	131	3.92	4	0.82	29	70	28	1	3
	LAK21	126	4.41	5	0.67	64	51	10	1	0
	LAK22	103	4.40	4	0.60	47	50	6	0	0
Quality	LAK20	131	3.90	4	0.82	30	64	33	2	2
	LAK21	126	4.39	5	0.73	65	47	12	2	0
	LAK22	103	4.34	4	0.71	47	46	8	2	0

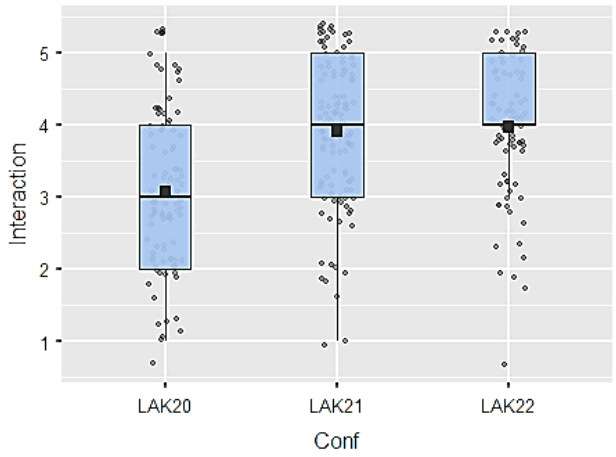

Figure 2. Interaction ratings for LAK20–22 (jittered).

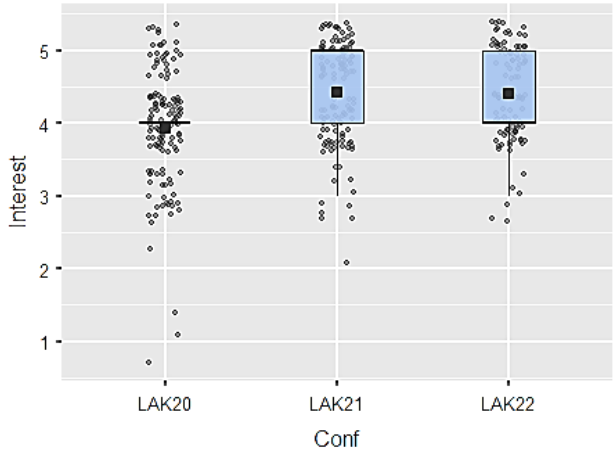

Figure 3. Interest ratings for LAK20–22 (jittered).

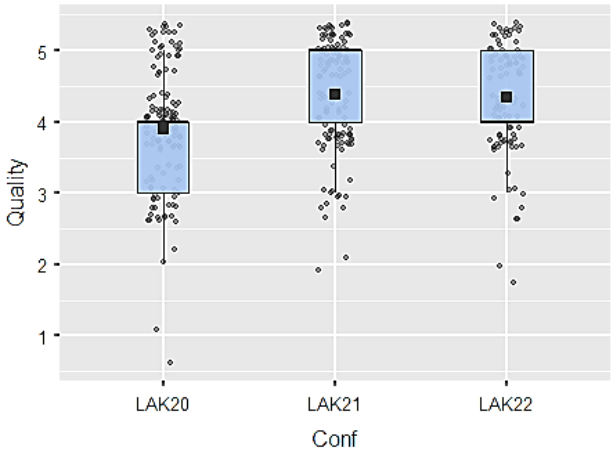

Figure 4. Quality ratings for LAK20–22 (jittered).

The Kruskal-Wallis test showed significant differences in the ratings for all variables for the different events. For *Interaction* $H(2) = 43.5$, $p < .001$, with a small effect size of $\varepsilon^2 = .014$, for *Interest* $H(2) = 33.3$, $p < .001$, with a small effect size of $\varepsilon^2 = .009$ and for *Quality* $H(2) = 30.7$, $p < .001$, with a small effect size of $\varepsilon^2 = .009$. The DSCF pairwise comparison showed significant differences for the comparison of LAK20 and LAK21, as well as for LAK20 and LAK22, while the comparison of LAK21 and LAK22 showed no differences for all three variables (see Table 7).

Table 7. Comparison of Ratings for Interaction, Interest, and Quality for LAK20–22

	Conf. comparison		W	p
Interaction	LAK20	LAK21	7.986	< .001
	LAK20	LAK22	8.064	< .001
	LAK21	LAK22	0.607	0.904
Interest	LAK20	LAK21	7.24	< .001
	LAK20	LAK22	6.613	< .001
	LAK21	LAK22	–0.666	0.885
Quality	LAK20	LAK21	7.107	< .001
	LAK20	LAK22	6.097	< .001
	LAK21	LAK22	–0.953	0.779

4. Discussion

The current study investigates the impact of the conference format and event-related factors on the perceived overall value of the conference. First, we compared the perceived value of five editions of the same conference series, two held in the

traditional face-to-face and three in the virtual format (RQ1). Second, we investigated contributors to the perceived value of virtual conferences (RQ2).

4.1. Assessment of Findings

The analysis of the perceived value of face-to-face and virtual conference formats (RQ1) indicates no significant differences in the two different formats. As the limitations for social interaction in the virtual space are widely criticized (Carr & Ludvigsen, 2017; Oester et al., 2017; Sá et al., 2019), we assumed there would be higher value placed on the face-to-face events. However, this was not the case. While there is a minor decrease in the perceived value of LAK20 (see Table 4), the first fully virtual conference, LAK21, was considered even more valuable than the face-to-face events (LAK18 and LAK19). We consider that a key factor explaining this is the following: LAK20 took place at the beginning of the COVID-19 restrictions and was moved to the virtual space within only 11 days as worldwide travel restrictions and lockdowns were set in place. Due to this time pressure, additional virtual social interaction activities could not be implemented. LAK20 was originally planned and organized as a face-to-face event, and people expected to attend in person when they registered. In contrast, LAK21 was the first LAK conference planned as a virtual event from the beginning. It included social networking events and facilitated random encounters of participants in the virtual space using Gather.town, networking tables in Whova, and breakout sessions in Zoom. As social interaction plays a vital role even for virtual conferences (see results RQ2), a perceived lack of social interaction options for LAK20 might have reduced the perceived value of the event. The results of the comparison of social interaction ratings for LAK20 and LAK21 support this assumption.

However, 78.4% (LAK20), 86.7% (LAK21), and 85.0% (LAK22) of the survey respondents rated the overall value of the virtual events as *High* or *Very High*. Anderson and Anderson (2010) and Estien et al. (2021) suggest one factor that might have supported these ratings for both virtual events: making presentation recordings available might complement the virtual experience and put the lack of personal contact in the background. All three conferences, LAK20–LAK22, made recordings available during and after the events, enabling participants to watch every presentation and ask questions of the presenter. Another factor impacting the high and very high ratings might have been that participants were simply glad the event took place, especially in 2020 when many conferences in March and April got cancelled. The virtual event offered opportunities for knowledge exchange and research presentations at a time when personal meetings were not possible due to COVID-19 restrictions.

As the results for LAK21 and the comparison of the conference formats indicate, the lower perceived value for LAK20 cannot be attributed to the format. Instead, a well-prepared virtual conference with a conference theme and presentation topics that fit participant interests and suitable social interaction options seems to create a valuable event for participants and can, therefore, serve as a relevant event for professional development. Virtual conferences are, therefore, not just temporary alternatives to face-to-face conferences but rather an additional valuable option to participate in an event. A well-planned conference design that enables participants to share their research findings and encounter colleagues serendipitously—even in the virtual space—is essential for a valuable virtual conference. Nonetheless, it could also be considered that people had different—maybe fewer—expectations of virtual events regarding social interaction and the overall event in general, i.e., they did not set the bar as high as they would have for a face-to-face event. Being aware of the drawbacks of virtual events before the event even started might have led participants to set a different focus—such as learning—when evaluating the event. Consequently, the benchmark for evaluating virtual events may differ from that of in-person events. Even limited options for social interaction might have been perceived as valuable just because interaction was possible at all.

Regarding the factors contributing to the overall value of virtual conferences (RQ2), the results indicate that *Interest* and *Interaction* are significant predictors of the overall value rating. Although the reviewed literature highlights the importance of social interaction (e.g., Oester et al., 2017), our results show *Interest* is the more critical factor in predicting overall conference value. A potential explanation for these findings is that attendees have distinct expectations for virtual conferences compared to in-person events. Participants exhibit an awareness of the constraints inherent to social interaction within virtual spaces, recognizing that such interactions cannot fully supplant in-person engagements. Consequently, there appears to be a heightened emphasis on the acquisition of knowledge and topics of interest for professional development when individuals engage in virtual events. Thus, the extent to which conference talks and presentations meet participant interests seems to play an even more significant role in virtual events. However, although participants know that social interaction in the virtual space is limited, it still plays an important role, even in virtual conferences. The results of our additional analyses that found higher ratings for *Interest* and *Interaction* for LAK21 and LAK22 than for LAK20 might align with this assumption. Moreover, *Interest* could be a moderator variable for *Interaction.* Participants who are interested in the same or similar topics are more likely to exchange ideas with each other and are thus encouraged to interact. More research is needed to gain a deeper understanding of the role of *Interest* for the perceived value of conferences for participants.

Different than expected, our analysis does not show *Quality* as significant predictor for the overall value of the conferences investigated. Although this result may initially imply a diminished importance of quality, we caution against drawing such a conclusion. A possible explanation for the non-significant result might be the small standard deviation, which

shows only a small variety of data points for *Quality*, as most participants rated the quality high. The low standard deviation could, in turn, be the result of only slight differences in the mean of the groups. Consequently, this could lead to a non-significant *p*-value, as there is insufficient variation to detect statistically significant differences between the groups. However, we found a similar standard deviation for our main predictor, *Interest*. Instead of diminishing the importance of *Quality* as a predictor of the value of a conference, we underscore the crucial role of quality assurance measures within the context of scientific conferences, notably the double-blind review process for the acceptance of submitted research. Most of the research presented aligns with the quality expectations of conference participants. In terms of percentages, 71.8% of LAK20 participants, 88.9% of LAK21 participants, and 90.3% of LAK22 participants rated the presentation quality as high or very high. Thus, the quality reached a satisfying level at all conferences—even if the quality was rated lower for LAK20. However, since it was rated as high or very high by most participants, it does not serve as a factor to explain different ratings of the conference's value.

Regarding the sociodemographic factors we added to our analysis, we conclude that *Gender*, *Age*, *Organizational Status*, and *Conference Experience* have no impact on the perceived value of virtual conferences. In other words, the perceived value of LAK20 to LAK22 is independent of the investigated sociodemographic categories. Results for *Age* and *Conference Experience* differ from our expectations that higher age and more conference experience—mainly from face-to-face conferences—might lead to a lower perceived value of virtual conferences. In our understanding, these results could be explained again by the assumption of a different reference point and focus for the value rating.

Overall, we derive from these results that virtual conferences can provide an opportunity, time, and space for learning and a satisfactory experience for all participants. The extent to which participant topics of interest are met and social interaction are the main drivers for a valuable virtual event.

4.2. Limitations

While the study presents interesting findings, it is essential to contextualize these results by acknowledging its limitations. As the items for this study were included in conference evaluation surveys, data were collected through single items that were not originally designed for research purposes but for the quality management of the conference series. The items were not validated or tested for reliability. We are aware of the potential challenge in replicating the findings and further drawbacks but also see the benefit of an increased response rate due to less time and effort required to complete the survey (Allen et al., 2022). For more sophisticated quantitative approaches, we see a need for multi-item scales to increase the power of statistical analysis. These scales should be developed based on qualitative research methods, such as interviews, and represent constructs like perceived value, social interaction, and satisfaction with topics of interest using several subscales. Moreover, the dimensions of self-promotion, professional growth, and learning at conferences need further investigation. Also, the reference point for ratings needs to be specified. As people are aware of limitations for random and personal social interaction activities in the virtual space, they might adapt the rating process to the given situation—knowing that personal contact will not happen—and perhaps other conference experiences.

Generally, results about the overall value of virtual conferences should be interpreted within the COVID-19 pandemic context. The data about the perceived value of virtual conferences was collected during times of worldwide lockdown, travel restrictions, and health concerns. Many attendees were at risk of missing out on the opportunity for knowledge exchange with and academic feedback from their scientific peers, while options for professional development at conferences were rare. There is a need for research to investigate whether overall value results can be replicated outside of pandemic restrictions. Especially hybrid conferences, with their inherent challenge to "connect" virtual and face-to-face participants, will be interesting to explore as their investigation enables researchers to evaluate the perceived value of the same event from the perspectives of face-to-face versus virtual participants.

When interpreting the results about the contribution of *Interaction*, *Interest*, and *Quality* (RQ2), the high number of zero-frequency cells should be considered. The validity of the model fit is uncertain and needs further investigation. For future investigation, a larger sample would be useful. However, we also expected a high number of zero-frequency cells as the research presented at this conference series is always checked for quality and fit-of-topic as part of the double-blind review process.

Additionally, we recommend considering that the LAK community is a technology-savvy and innovation-prone community. Technical innovations and new formats for working, communication, and social interaction are widely accepted in this community. This might not be similarly true for other scientific disciplines and communities. Considering this, generalization to different disciplines and fields, as well as the preferred conference format, should be treated cautiously.

However, we see our study as an important contribution to increasing knowledge about virtual conferences in general and the factors contributing to their perceived value. It offers new research possibilities for future virtual academic conferences and provides the first insights into how researchers benefit from virtual events.

4.3. Practical Implications and Future Work

Results show virtual conferences as valuable events for academics. Participants gain values from the virtual events that do not differ from their face-to-face pendant. However, as the lower LAK20 ratings show, transferring research papers and poster presentations to the virtual space may not be sufficient to create events that are comparable in terms of participant value perceptions. Instead, a well-thought-out preparation and conference design that address participant interests and enable social interactions in the virtual space are needed.

Our study showed that the main variable that affects the perceived value of a virtual conference is whether the conference meets participant interests. Therefore, we propose that if participants are aware of the conference focus before registration, they are more likely to set appropriate expectations and make an informed decision about participating.

Organizers then should consider several aspects as critical: a well-designed conference should consider the importance of the content of the presentations and communicate early and clearly a conference theme (if any), which should be in line with the current topics and research interests of the community. The extent to which a paper or poster submission fits the theme could be an evaluation factor for reviewers to consider when deciding whether to accept a submission. Also, authors should be encouraged to explain the relevance of their submission to the conference theme. After the paper review process, organizers could enable attendees to find research talks of interest by publishing the conference schedule and presentation abstracts as open-access information on the conference website as early as possible. The information might even help people decide whether they want to attend a conference they have never attended before. Specific conference, session, and presentation titles might also be helpful. Obviously, this implication also applies to traditional face-to-face conferences. However, our results show its special importance for virtual events when social interaction is limited. Organizers should not only focus on enabling virtual social interaction and neglect the importance of presentation content for virtual events but rather focus on the fitting—and quality—of the presentations.

Conference organizers should offer virtual networking sessions, scheduled according to topic, to support social interaction activities during a virtual event and ensure options for professional development. Since informal talks, usually occurring during coffee breaks or other social events, are unlikely to happen without moderation by organizers in the virtual space, scheduled discussion topics linked to or detached from prior presentations might support social interaction. With respect to the perspective of Anderson and Anderson (2010), who see even greater formal interaction options during purely virtual events due to presentation recordings being available, organizers could ask presenters to be available for an additional question-and-answer session at a scheduled time for attendees who could not attend the live discussion due to time zone differences or other conflicts.

Future studies should include additional factors, like organizational or funding aspects, into the model to gain a deeper understanding of factors impacting the overall value rating—for academic conferences in general and virtual academic conferences. Moreover, as many LAK participants are active in the field of educational technologies, we assume them to be technology-savvy people. We therefore recommend the investigation of conference samples generally less inclined towards technology, as skills and ties to technical tools might also affect the perception of virtual events and their contribution to their academic professional development. Moreover, we recommend investigating the role of the variable *Interest* and its moderating role for social interaction at conferences and how the conference design contributes to participant satisfaction more deeply.

For generalizable results regarding the conference design, we recommend considering conference series from different research fields. Researchers from different fields and communities might focus on different aspects of conferences and will, therefore, have different reference points of what creates a value for them. A more detailed aspect of the conference design, which needs deeper investigation, is the way research talks and additional sessions are scheduled. Some experiences of the past months, such as screen fatigue—the phenomenon that communication and interaction are more exhausting in the virtual space (Foramitti et al., 2021)—raises the question of whether virtual conferences should keep traditional schedules, i.e., several days fully packed with scheduled activities from nine to five or even longer.

Overall, we see the need to further investigate conferences as learning events. As described in section 1.1.1, conferences are informal learning spaces with a variety of learning opportunities. The learning analytics community, as a research community that investigates informal learning at the workplace (Society for Learning Analytics, n. d.) and specialized in the analysis of learner data, seems to be the appropriate community to investigate learning networks at conferences and deepen our understanding of how and what can be learned at and from conferences. We would like to appeal to the learning analytics community and other research fields for more analysis of learning at conferences.

5. Conclusion

The present study provides the first insights into whether and how purely virtual conferences can be events for academic professional development. Our results showed that virtual conferences can be as valuable as traditional face-to-face events, the format does not have a systematic impact on the perceived value. However, simply transferring research papers and poster presentations to the virtual space is not sufficient for a valuable virtual event. We identified the degree to which

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presentations met participant interest *(Interest*) and satisfaction with social interaction (*Interaction*) as the main factors influencing participants' perceived overall value of a virtual conference. We explained these results by assuming that social interaction is important for participants even in the virtual space, but—as they are aware that social interaction is limited in the virtual space—participants seem to focus on gaining knowledge and learning about new findings in their field. The degree to which presentations met participant interest is, therefore, a principal factor for their perceived overall value for professional development. Attendees seem to have identified some advantages of virtual conferences and virtual participation. We recommend extending the research about the virtual and hybrid conference formats and factors contributing to participants' professional development.

Declaration of Conflicting Interest

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