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Virtual academic conferences as learning spaces: Factors associated with the perceived value of purely virtual conferences

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Abstract

Background: The COVID-19 outbreak came with an unprecedented opportunity to investigate how the new reality of social distancing and limited international travel will affect the organization of academic conferences.

Objectives: Drawing on conceptualization of academic conferences as professional learning spaces, in this study, we examine the factors associated with the perceived value of purely virtual academic conferences and how such perceptions differ between participants from different research fields. The aim was to gain knowledge about factors that should be considered when designing a virtual conference.

Methods: Survey data from participants of three different virtual conferences were collected ($N = 311$). Kendall's rank correlation and χ^2 -analyses were performed.

Results and Conclusion: Results show satisfaction with social interaction, the extent to which presentations met participants' topics of interest and the perceived importance of learning and getting an overview on the research topic to be related to the value rating. Researchers from different research fields differ significantly in their opinion about the most appropriate conference format regarding getting an overview on the research topic. For some researchers, virtual participation might be a valuable alternative to attending a conference in person. The study serves as a first attempt to understand how and for which target groups virtual conferences serve as a valuable learning event. Further research on this conference format is needed.

KEYWORDS

conference value, COVID-19, learning among academics, online conferences, virtual academic conferences

1 | INTRODUCTION

Early in 2020, the previously unknown virus SARS-CoV-2 spread throughout the world. Within only a few weeks, the virus became a public health challenge on all continents and by March, the World

Health Organization officially declared the COVID-19 outbreak a pandemic (World Health Organisation, 2020). The worldwide effort to contain the spread of the virus and the COVID-19 disease led to major changes in people's life. Overnight, travel restrictions, lockdown and social distancing determined the new style of living and working.

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Rapidly, it became apparent that these restrictive changes would not be temporary, but long-term challenges for society. Social life, economics and public health are just a few areas that were and still are strongly affected by the keep-the-distance-order (Fernandes, 2020; Pietromonaco & Overall, 2020; Xiong et al., 2020). Adaptations of daily habits, living and working became and continue to be necessary.

One of the key approaches for tackling the effects of the pandemic was the rapid digitalization of all spheres of human activity. In many areas, digital transformation, “a process that aims to improve an organization by triggering significant changes in its characteristics through combinations of information, computing, communications, and connectivity technologies” (Vial, 2019, p. 118), became the only option to enable working and communication without personal contact. Although the process of implementing technology in daily routines and working contexts had already begun and gained importance prior to the appearance of SARS-CoV-2, the need of fast transformation was challenging for the world.

A domain that was strongly affected by the pandemic restrictions and where rapid digitalization was needed was the educational sector (Adedoyin & Soykan, 2020) and the organization of academic conferences (Viglione, 2020). Purely virtual academic conferences offered one of the very few stages for researchers to disseminate their knowledge and discuss findings with national and international colleagues of their field without meeting face-to-face (f2f). Moreover, moving events to the virtual space provided an alternative to cancelling or postponing them to an uncertain date in the future, which enabled the publication of research findings without a major time delay. Although academic conferences are mainly seen as networking events, they also serve as a platform for professional learning and development and provide learning opportunities for students, academics and practitioners of the research field (Rowe, 2018). Thus, virtual conferences provide a learning space for experts, when gatherings in physical spaces are not possible.

Although virtual conferences have existed for a long time, compared to f2f-formats, they remained a relatively infrequent format of academic conferencing. Given the significant challenges with participants' time zones, most virtual conferences were 1–2-day events limited to specific geographic regions. However, the global pandemic and international travel restrictions resulted in a massive surge of virtual conferences, which gave the opportunity to better understand their challenges and opportunities, paving the road to a better form of academic conferencing in the post-COVID world. Moreover, with growing digitization and increasing importance of technology for science communication (Darling et al., 2013; Malik, 2013; Spilker et al., 2019) and ecological awareness (Desiere, 2016; Fraser et al., 2017), virtual conferences, or at least partially virtual conferences could be expected to become a primary format for academic conferences after the pandemic. It therefore seems important to gain a more detailed understanding about virtual conferences and ways to design effective learning experiences.

In this study, we examined factors associated with the perceived value of purely virtual academic conferences and how participants of diverse research fields think about different conference formats.

Findings may contribute to the body of knowledge about how future virtual conferences should be designed to make them effective

as learning events. More precisely, findings may provide a deeper insight about which aspects and activities conference organizers should focus on to optimize learning opportunities, knowledge exchange, and interaction among participants of purely virtual academic conferences. For a more convenient reading we subsequently use the term *virtual conferences* instead of purely virtual academic conferences.

2 | BACKGROUND

2.1 | Academic conferences

An academic conference is an event, where people – mainly scientists and academics – with the same research interests meet to share and disseminate scientific knowledge within a specific community (Burgess, 2019; de Vries & Pieters, 2007). It is “a traditional platform for researchers and professionals to network and learn about recent developments and trends in a particular academic field” (Budd et al., 2015, p. 1). More precisely, participating in an academic conference is associated with the opportunity to meet other researchers and practitioners of the field to maintain networks among experts for the creation of new research ideas and professional collaborations (Chai & Freeman, 2019; Hall, 2015; Levine, 2015; Oester et al., 2017; Siemens et al., 2008; Wang et al., 2017) and the development of job and career perspectives (Edelheim et al., 2018; Kim et al., 2020; Oester et al., 2017). Moreover, the participation is associated with an increase of academic competencies and reputation, such as the presentation and publication of research findings, and receiving feedback on research work (Hansen & Budtz Pedersen, 2018). To enable these talks among participants, academic conferences are usually conceptualized as a combination of formal and informal types of social interaction and communication, such as paper presentations and keynotes (formal) and talks during breaks or social events (informal). These types of social interaction and communication mainly occur among presenters and attendees while both, presenters and attendees, are active contributors for the event (Barton, 2005).

When comparing traditional f2f-events with virtual conferences (cf. Sá et al., 2019) we see that they share a lot of similarity: different presenter and attendee roles, networking activities, along with paper presentations and discussing research work during formal interaction sessions. Both formats try to fulfil the original purpose of academic conferencing, regardless of the way in which they are organized.

However, f2f and virtual conferences also differ in many ways. An important benefit of virtual format is the ability to participate without the need to be physically present at the conference venue. This is relevant not only in times of social distancing and travel restrictions but also more broadly, given the substantial carbon footprint associated with international travel (Desiere, 2016; Fraser et al., 2017). Virtual formats also put less stress on the personal lives of attendees by reducing the time away from family. There are also lower costs associated with the organization of virtual events, which are mainly due to the reduction in travel and venue hiring, a particularly important factor

for ever diminishing research funding (Anderson & Anderson, 2010). And finally, unlike f2f-conferences that have to take into account the venue's capacity constraints, virtual conferences are able to accommodate a much larger number of participants (Castelvecchi, 2020).

Despite significant benefits of virtual conferences, there are also some obvious challenges and limitations. A widely discussed limitation is the strongly affected social aspect – more precisely limitations for informal social interaction (L. Anderson & Anderson, 2010; Carr & Ludvigsen, 2017; Oester et al., 2017). Although informal interaction can be supported by the event design, for example, by organizing virtual social events, personal contact and random talks at the coffee bar cannot be replaced. Another challenge of virtual conferences is the time difference. Especially at international conferences, inappropriate times for live presentation may be unavoidable for at least some participants. The fact of not being physically present at the conference venue therefore also comes with implications for structuring and scheduling that organizers of f2f-events do not have to consider. Thus, providing the opportunity to follow all sessions of interest for all participants needs additional strategies, such as a media gallery where presentation recordings can be uploaded immediately and watched on demand. While a media gallery can be seen as a nice-to-have-option for purely f2f-conferences, for virtual conferences it is rather a must-have tool to offer the full conference experience to all participants.

As a result, virtual conferences need different designs, based on identified advantages and challenges of this conference format. For this reason, more detailed knowledge about how and for whom this format can be a valuable event is necessary.

2.2 | Designing valuable purely virtual academic conferences

Perceived value is a construct that is built by individual perceptions, needs and interests (Bowman & Ambrosini, 2000). So far, the question of which factors can be associated with the perceived value of an academic conference was mainly investigated for traditional f2f-events (Hoyt & Whyte, 2011; Verbeke, 2015), while research on the perceived value of virtual conferences is scarce. Obviously, some of the factors identified as contributors for the perceived value of traditional f2f-events – such as the quality of facilities (Hoyt & Whyte, 2011), cannot be transferred to the virtual space.

As stated by T. Anderson (1996), a “virtual conference is a professional education conference – with some changes in the technology that supports interaction and communication” (p. 122). This perspective does to some degree disregard the limitations for interaction and communication in the virtual space as described in the previous section. However, it also refers to two interesting aspects: A virtual conference (1) is a *learning event* and (2) includes *technology that supports communication and interaction*. In relation to f2f conferences virtual conferences might even enable better learning in quite some respects (Lortie, 2020). The design of a virtual conferences should therefore focus on both, the learning aspect and technology-supported interaction and communication. These aspects cannot be separated

exclusively from each other but are rather related as learning at a conference is also conditioned by communication and interaction.

Since informal interaction is limited in the virtual space, virtual conferences seem to have an inherent focus on formal interaction among presenters and attendees. As Reyhav and Te'eni (2009) described academic conferences as events in which “knowledge is exchanged in different settings” (p. 1267) and identified formal settings as the ones that lead to a more intense knowledge sharing compared to informal settings, we derive that virtual conferences focus on the personal and professional learning aspects that occur mainly during formal interaction sessions. Designs of virtual conferences should therefore provide extended formal interaction options which a number of technology providers are rushing to develop.

Up to now, virtual conferences and their designs have primarily been investigated from an individual participant perspective, limited to formal aspects of participation, such as decrease in travelling or broadening participation. We therefore see the need to investigate factors that can be associated with the perceived overall value of a virtual conference from an event-related, non-formal perspective to derive recommendations for the design of virtual events. Moreover, it seems to be reasonable to investigate whether academics and professionals of different research fields differ in their perceptions about virtual conference participation as a learning and networking opportunity to derive whether conferences of different research fields might need different designs in the virtual space.

The following study provides one of the first attempts at investigating the perceived overall value of virtual conferences and a comparison of the most appropriate conference format for learning and networking, as perceived by participants of virtual conferences from different research fields.

2.3 | Research questions

The current study investigates two main areas. The first part of the study investigates the association of the perceived overall value of virtual conferences and social interaction ratings, the extent to which presentation topics meet participants' topics of interest, and further participant-conference-related aspects. Social interaction was selected as a variable since social interaction – although mainly in formal settings – still occurs during a virtual conference and is considered an important aspect of conferences. Addressing participants' topics of interest is expected to be a predictor for discussions and knowledge sharing. Further factors were selected by assuming that they go along with different expertise, experience and expectations that might affect the perceived value of the attended virtual conference. Therefore, our first research question is:

RQ1. Is there an association between the perceived overall value and participants'

1.1 perception regarding conference-specific aspects (satisfaction with social interaction and the extent to which conference topics met participants' interest),

1.2 conference attendance experience (average conference attendance in general, average conference attendance outside their countries of residence and attendance at virtual conferences),

1.3 opinion regarding the perceived importance of learning during a conference,

1.4 opinion regarding the perceived importance of getting an overview on the research field,

1.5 opinion regarding the perceived importance of social interaction,

1.6 opinion regarding the perceived importance of contacting potential new collaborators), and

1.7 socio-demographic-related aspects (age and conference role)?

The second part of the current study provides a comparison of participants' perspective from different research fields about the most appropriate conference format for gaining knowledge and networking during a conference. Therefore, the second research question is:

RQ2. Do participants of virtual conferences from different research fields differ in their opinion about the most appropriate conference format regarding

2.1 gaining knowledge (getting an overview on the current state of research topic and discussing research topic with other researchers) and

2.2 networking (meeting new potential project partners and developing new research and project ideas)?

For the purpose of this study, we conceptualize *gaining knowledge* as getting an overview on the current research and discussing research topics with other researchers. By doing so, we are aware that gaining knowledge is linked to networking and that a clear-cut distinction between these aspects is challenging. However, we used this conceptualization as we see getting an overview and discussing as mainly focused on research topic-specific knowledge exchange that researchers actively prepare for and focus on when attending a conference. Meeting new potential project partners and developing new research and project ideas rather refer to personal contacts and potential future collaborations that arise from getting an overview on others' work and discussing.

3 | METHOD

3.1 | Study context and data collection

For this study, data from three different research fields were collected: educational technologies (LAK20), economics (VHB20), and social politics (VfS20). All conferences were originally planned to take place in Germany but were moved to the virtual space. All were international events and lasted for 3 days. The conferences were selected

as they covered different research fields and their organizers agreed to send out a survey to their participants. Participation in the study was voluntary. For the data collection, an online survey, created by using SoSci Survey (<https://www.sosicisurvey.de/>), was sent out to the participants of the conferences. The data was collected within 3 weeks after the event. At the request of the conference organizers, some items were excluded from the survey. This varied between conferences. Therefore, the number of participant responses varies depending on the variable analysed (see Table 1). Items about the perceived importance of gaining knowledge and networking during a conference were answered by social politicians only.

Overall, $N = 311$ virtual conference participants responded to the online survey, $n = 150$ educational technologists, $n = 72$ of the economists and $n = 89$ of the social politicians. Gender (53.7% male, 40.9% female, 5.4% preferred not to answer) and age frequencies for all conferences and research fields are shown in Table 2. Frequencies of conference roles and prior virtual conference experience are shown in Table 3.

3.2 | Measurement instrument

For RQ1, ratings for overall value, (variable *Overall Value*), the extent to which conference topics met participants' interest (variable *Interest*), importance of learning during a conference (variable *Imp. Learning*), importance of getting an overview on research activities of others (variable *Imp. Overview*), importance of social interactions during a conference (variable *Imp. Soc. Interaction*) and importance of contacting people for future collaborations during a conference (variable *Imp. Contact*) were rated on a 5-point-likert-scale (5 = Very high to 1 = Not at all). Ratings for satisfaction with social interaction (variable *Interaction*) was rated on a 5-point-likert-scale ranging from 5 = Very satisfied to 1 = Very dissatisfied. Variables *Age* and *Average Conference Attendance* were collected as free text items (numerical input only). Regarding conference attendance participants were asked for their general average conference attendance per year (variable *Av. Conf. Att.*) and their average conference attendance outside of their current country of residence (variable *Av. Conf. Att. Out.*). For the item about the conference role, (variable *Role*) participants were asked to select between presenter, attendee, or presenter and attendee. For the item about the experiences in virtual conference participation (variable *Virtual Conference Attendance*) a dichotomous scale (yes or no) was used.

3.3 | Data analysis

Jamovi version 1.6.7 and SPSS (Version 26) were used to analyse the data. Since currently very little is known about the perceived value of virtual conferences, it was our intention to identify, on an exploratory level, factors that are generally associated with the overall value rating. Due to the ongoing debate about the level of measurement of survey data (Field, 2017, p. 11), the exploratory nature of the study and the fact that *Overall Value* was raised by a single item, we decided to use non-parametric analysis options to answer RQ1. For data

TABLE 1 Responses per item received from researchers of different research fields

| Variable | Research field | | |
|---------------------------------------|---------------------------|-----------|--------------------|
| | Educational technologists | Economics | Social politicians |
| Overall value | 148 | 72 | 88 |
| Social interaction | 113 | | 80 |
| Interest | 146 | | 88 |
| Age | 142 | 63 | 76 |
| Average conference attendance | 107 | 71 | 81 |
| Average conference attendance outside | 94 | 70 | 81 |
| Imp. learning | | | 83 |
| Imp. overview | | | 82 |
| Imp. soc. interaction | | | 82 |
| Imp. contacts | | | 82 |
| Conf. role | 140 | 70 | 84 |
| Virtual conference attendance | 143 | 71 | 85 |

| Age | Gender | Conference research field | | |
|-------|------------------------|---------------------------|-----------|-----------------|
| | | Educational technology | Economics | Social politics |
| 20-29 | Female | 14 | 7 | 14 |
| | Male | 21 | 5 | 5 |
| | I prefer not to answer | 0 | 0 | 0 |
| 30-39 | Female | 23 | 3 | 18 |
| | Male | 24 | 14 | 14 |
| | I prefer not to answer | 3 | 0 | 0 |
| 40-49 | Female | 15 | 4 | 7 |
| | Male | 15 | 10 | 3 |
| | I prefer not to answer | 5 | 0 | 0 |
| 50+ | Female | 6 | 5 | 3 |
| | Male | 14 | 15 | 10 |
| | I prefer not to answer | 2 | 0 | 2 |

TABLE 2 Gender and age frequencies for all conferences and research fields

Note: Thirteen participants skipped the gender item, 30 skipped the age item.

TABLE 3 Frequencies of conference roles and virtual conference experience for all conferences

| Research field | Prior experience virtual conf. | Conference role | | |
|------------------------|--------------------------------|-----------------|----------|----------------------|
| | | Presenter | Attendee | Presenter & attendee |
| Educational technology | Yes | 4 | 8 | 2 |
| | No | 27 | 78 | 15 |
| Economics | Yes | 1 | 1 | 4 |
| | No | 17 | 18 | 24 |
| Social politics | Yes | 27 | 11 | 15 |
| | No | 15 | 4 | 5 |

Note: LAK20 (computer science) and VHB20 (economics) were held in March 2020, Vfs20 was held in September 2020.

collected on a Likert scale, Kendall's rank correlation analysis was performed. To examine the association between the overall value rating and participants' experience attending virtual conferences, Mann-

Whitney-*U* test was performed, to examine the association between the overall value rating and the conference role, Kruskal-Wallis test was performed. To answer RQ2 a χ^2 -test of independence was

performed. Holm-Bonferroni correction was performed for α -level adjustment.

4 | RESULTS

4.1 | Results on RQ1

Descriptive results for items in the correlation analysis are shown in Table 4. Regarding items about virtual conference experience, 73.1% (of $n = 297$) responded they had never attended a virtual conference before. $n = 284$ responded on the item asking for the conference role. 33.1% were presenters, 43.0% attendees, 23.9% had both roles during their event.

Figure 1 shows the frequencies of responses for items *Imp. Learning* (a), *Imp. Overview* (b), *Imp. Soc. Interaction* (c) and *Imp. Contact* (d).

2.77% of the respondents ranked the importance of learning as *High* or *Very high*, 98.78% – all except one person – ranked the importance of getting an overview on the current state of the research topic as *High* or *Very high*. For both items, options *Slight* and *Not at all important* were not selected (see Figure 1a,b). 79.27% ranked the importance of social interaction during a conference as *High* or *Very high* while 20.73% ranked it moderate or lower. 63.41% ranked the importance of meeting potential new collaborators as *High* or *Very high*, 36.59% as moderate or lower.

Results of Kendall's rank correlation are shown in Table 5. Significant positive correlations were found between *Overall Value* and factors *Interaction*, *Interest*, *Imp. Learning* and *Imp. Overview*. Numbers show a moderate correlation (Cohen, 1988) for *Interaction* and *Interest*. A determination of variance of around 23% for *Interaction* and around 21% for *Interest* was found. Small correlations (Cohen, 1988) were found for *Imp. Learning* and *Imp. Overview*. The determination of variance for *Imp. Learning* is around 5% and around 8% for *Imp. Overview*. Mann-Whitney- U test showed no significant differences ($r = 0.00635$, $U = 8370.50$, $Z = -0.089$, $p = 0.929$) of previous virtual conference participation experience on the overall value rating. Moreover, Kruskal-Wallis test shows no significant differences (χ^2 [2,

$N = 284$] = 5.918, $p = 0.052$) of the conference role on the overall value rating. Means for the overall value rating of the different roles are $M_{\text{Presenter}} = 3.66$, $M_{\text{Attendee}} = 3.91$ and $M_{\text{Presenter and Attendee}} = 3.76$.

4.2 | Results on RQ2

$N = 280$ participants responded on the item about the most appropriate conference format from a presenter's perspective, $n = 129$ educational technologists, $n = 71$ economists and $n = 80$ social politicians. Overall, 1116 responses were collected. Around 10% voted for the purely virtual format, 48.39% for the hybrid and 41.58% for the purely f2f-format. Educational technologists' and social politicians' most selected format was the hybrid one (50.39% of educational technologists' rating and 49.67% of social politicians' ratings), economists selected the purely f2f-format most frequently (43.31%). Figure 2 shows the overall frequencies of format selections.

Results of the comparison of presenters' perspectives from different research fields about the most appropriate conference format for learning and networking during a conference are shown in Tables 6–9.

Significant group differences (χ^2 [4, $N = 278$] = 43.533, $p < 0.001$) were found for the learning-related item *getting an overview on the current state of the research field* (Table 6). Cramer's V ($V = 0.28$) shows a small to medium effect size (Cohen, 1988). Fisher's exact test performed due to small group sizes did not lead to a significant change of results. Educational technologists' opinions differ significantly from other research fields about the purely virtual format and the purely f2f-format as the most appropriate conference format. Educational technologists show more preferences towards selecting the purely virtual format than researchers from the other fields investigated and less preference towards selecting the purely f2f-format. Significantly more educational technologists than expected rated the purely virtual format as most appropriate to get an overview on the current state of the research topic while researchers from this field rated significantly less than expected for the purely f2f-format for the same item.

TABLE 4 Descriptive analysis of items included in the rank correlation analysis

| Variables | N | Mean | SD | SE | Range |
|-------------------------------|-----|------|-------|-------|-------|
| Overall value | 308 | 3.80 | 0.925 | 0.053 | 4 |
| Interaction | 193 | 2.90 | 1.090 | 0.078 | 4 |
| Interest | 234 | 3.90 | 0.833 | 0.054 | 4 |
| Age | 281 | | | | |
| Conf. att. | 259 | 3.28 | 1.870 | 0.116 | 12 |
| Conf. att. out. | 245 | 1.93 | 1.590 | 0.101 | 10 |
| Imp. learning | 83 | 4.36 | 0.616 | 0.068 | 2 |
| Imp. overview | 82 | 4.39 | 0.515 | 0.057 | 2 |
| Imp. soc. interaction | 82 | 4.18 | 0.691 | 0.076 | 4 |
| Imp. contact | 82 | 3.80 | 1.010 | 0.112 | 4 |
| Conf. role | 284 | | | | |
| Virtual conference attendance | 297 | | | | |

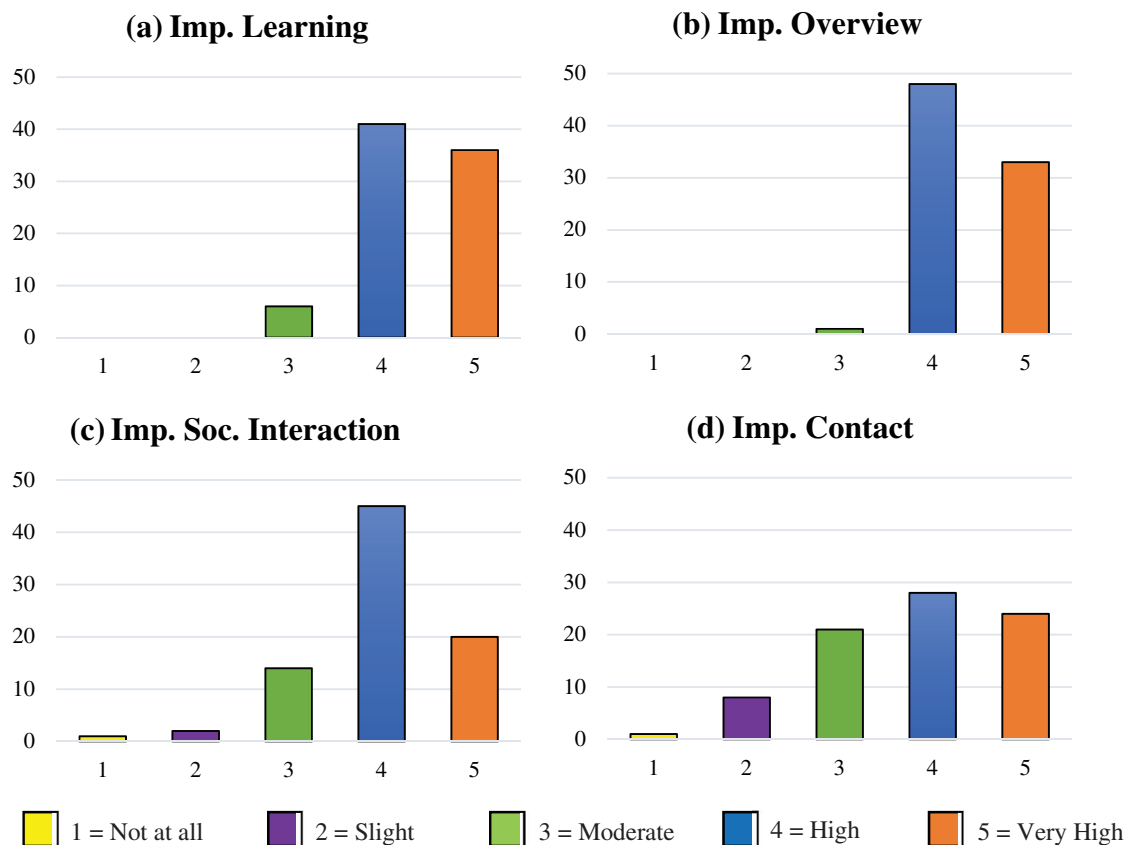


FIGURE 1 Frequencies of ratings for items asking for perceived importance of (a) learning, (b) getting an overview on the research field, (c) social interaction, and (d) contacting potential new collaborators [Colour figure can be viewed at wileyonlinelibrary.com]

No group differences were found for items focusing on networking aspects: *meet new potential collaborators* and *develop new research and project ideas*. In addition, results for the learning-related item *discussing research topics with other researchers* show no group differences. Thus, the null hypothesis, assuming independence of participants' research field and their opinion about the most appropriate conference format regarding these three aspects, cannot be rejected.

5 | DISCUSSION

5.1 | Discussion of RQ1 results

The first part of this study focused on examining the association of 11 factors with the perceived overall value of virtual conferences. Results show some interesting implications for the design of virtual conferences as a learning and knowledge gaining space. Significant association to the overall value rating of a virtual conference (*Overall Value*) was found for conference-specific aspects *Interaction* and *Interest* (RQ1.1) and participants' opinion regarding the perceived importance of learning (*Imp. Learning*) and getting an overview on the research field (*Imp. Overview*) during a conference (RQ1.3 & 1.4). No association was found for participants' conference attendance

experience (RQ1.2), participants' opinion regarding the perceived importance of networking-related activities (*Imp. Soc. Interaction* & *Imp. Contact*) during a conference (RQ1.5 & 1.6) and participants' socio demographics (RQ1.7). Especially conference-specific aspects (RQ1.1) seem to play an important role for the overall value rating.

The significant association between the perceived value and the rating for social interaction (*Interaction*) indicate the importance of social interaction even for conferences in the virtual space. As an implication for the design of virtual conferences, we see the need to enable extended formal interaction, meaning extended research work discussions. With respect to the findings by Reychar and Te'eni (2009) who identified formal settings as the ones that lead to a more intense knowledge sharing compared to informal settings, the extended formal interaction might lead to a greater learning experience for participants.

Interestingly, the overall value rating is not related to *Imp. Soc. Interaction* and *Imp. Contact*. Because academic conferences are seen as networking events one could expect that these item pairs might be negatively related to overall value rating since interaction and options to contact potential new collaborators are limited in the virtual space (Oester et al., 2017). However, the results show a contradiction to our expectations. The overall value rating of a virtual conference appears independent from participants' perceived importance of social interaction and contacting other people. These results suggest that neither

TABLE 5 Correlation analysis of factors associated with the perceived overall value of purely virtual conferences

| | Overall value | Interaction | Interest | Age | Av. conf. att. | Av. conf. att. out. | Imp. learning | Imp. overview | Imp. soc. interaction | Imp. contact |
|---------------------|-----------------|-------------|----------|--------|----------------|---------------------|---------------|---------------|-----------------------|--------------|
| Overall value | Kendall's tau B | — | — | — | — | — | — | — | — | — |
| | p-value | — | — | — | — | — | — | — | — | — |
| | n | — | — | — | — | — | — | — | — | — |
| Interaction | Kendall's Tau B | 0.482*** | — | — | — | — | — | — | — | — |
| | p-value | < 0.001 | — | — | — | — | — | — | — | — |
| | n | 193 | — | — | — | — | — | — | — | — |
| Interest | Kendall's Tau B | 0.463*** | 0.283*** | — | — | — | — | — | — | — |
| | p-value | < 0.001 | < 0.001 | — | — | — | — | — | — | — |
| | n | 232 | 193 | — | — | — | — | — | — | — |
| Age | Kendall's Tau B | -0.087 | -0.131* | -0.012 | — | — | — | — | — | — |
| | p-value | 0.091 | 0.038 | 0.843 | — | — | — | — | — | — |
| | n | 278 | 178 | 215 | — | — | — | — | — | — |
| Av. Conf. Att. | Kendall's Tau B | -0.050 | -0.120 | -0.073 | 0.261*** | — | — | — | — | — |
| | p-value | 0.338 | 0.064 | 0.240 | < 0.001 | — | — | — | — | — |
| | n | 257 | 157 | 186 | 242 | — | — | — | — | — |
| Av. Conf. Att. Out. | Kendall's Tau B | 0.007 | -0.033 | 0.058 | 0.246*** | 0.585*** | — | — | — | — |
| | p-value | 0.890 | 0.632 | 0.369 | < 0.001 | < 0.001 | — | — | — | — |
| | n | 244 | 147 | 174 | 230 | 245 | — | — | — | — |
| Imp. Learning | Kendall's Tau B | 0.233* | 0.064 | -0.009 | 0.127 | 0.078 | 0.023 | — | — | — |
| | p-value | 0.024 | 0.539 | 0.930 | 0.224 | 0.423 | 0.812 | — | — | — |
| | n | 82 | 75 | 83 | 75 | 79 | 79 | — | — | — |
| Imp. Overview | Kendall's Tau B | 0.277** | 0.173 | 0.088 | -0.015 | -0.027 | 0.031 | 0.408*** | — | — |
| | p-value | 0.009 | 0.105 | 0.399 | 0.890 | 0.785 | 0.759 | < 0.001 | — | — |
| | n | 81 | 74 | 82 | 74 | 79 | 79 | 82 | — | — |
| Imp. Soc. Inter. | Kendall's Tau B | 0.035 | 0.030 | -0.037 | -0.023 | -0.008 | 0.120 | 0.013 | 0.201* | — |
| | p-value | 0.717 | 0.755 | 0.696 | 0.814 | 0.928 | 0.189 | 0.897 | 0.044 | — |
| | n | 81 | 74 | 82 | 74 | 79 | 79 | 82 | 82 | — |
| Imp. Contact | Kendall's Tau B | 0.138 | 0.123 | 0.055 | 0.078 | 0.076 | 0.105 | 0.010 | 0.159 | 0.299** |
| | p-value | 0.159 | 0.213 | 0.572 | 0.435 | 0.410 | 0.261 | 0.918 | 0.117 | 0.001 |
| | n | 81 | 74 | 82 | 74 | 79 | 79 | 82 | 82 | 82 |

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

factor need necessarily be in the focus when designing a virtual conference. An interpretation might be that people are aware of the limited informal interaction and personal contact options in the virtual space and, thus, adjust their expectations accordingly. Thus, it is possible that some do not consider these limitations when rating the value of the virtual event and rather focus on factors that can be realized in the virtual space. Factors that are not majorly impacted by the format are, for example, the presentations and the extent to which these presentations meet participants' interest. The significant positive association between the *Overall Value* and *Interest* might be an indicator of this. Nevertheless, *Interest* should not only be considered for the design of virtual conferences because of its positive association with *Overall Value*. As stated by Barton (2005) the engagement in a research work discussion at a conference depends – among other factors – on the presentation. Presentations that meet topics of interest

to a larger extent might thus lead to more engagement in research work discussions and therefore to more formal interaction – see the positive association found between *Interaction* and *Interest*. As active engagement in a discussion is seen to support learning (Wilson et al., 2007), *Interest* might be an important factor to support learning during a virtual conference and act as initiator for social interaction.

However, it should also be noted that responses for *Imp. Soc. Interaction* and *Imp. Contact* range from very high to not at all (see Table 4). Although the vast majority ranked both aspects as high or very high, some ranked them as moderate or even lower, especially the importance of meeting new potential collaborators (see Figure 1c, d). For the sample investigated, we therefore derive that social interaction and personal contact to new collaborators do not serve as value-creating aspects for every single individual. There seems to be a group of people who rather focus on different aspects than socializing and gaining new contacts. For certain people, the purely virtual format might be even more valuable. This group might for example include inexperienced young researchers like master or early PhD students who prefer to focus on their current work and are not yet ready to initiate research collaborations or people who generally prefer distance to other people. For those, for example, who focus on getting an overview on the research topic and/or learning, virtual participation might be a valuable and satisfying participation option. Obviously, conference organizers cannot influence the focus of participants but participants with focus on these elements might benefit even more from a well thought out formal interaction design and a large extent of topics of interest. The observation that some participants attach only little importance to social interaction and gaining new contacts should be further investigated. If future results confirm that some individuals benefit more from the virtual conference participation than being present at the conference venue, the general understanding of how

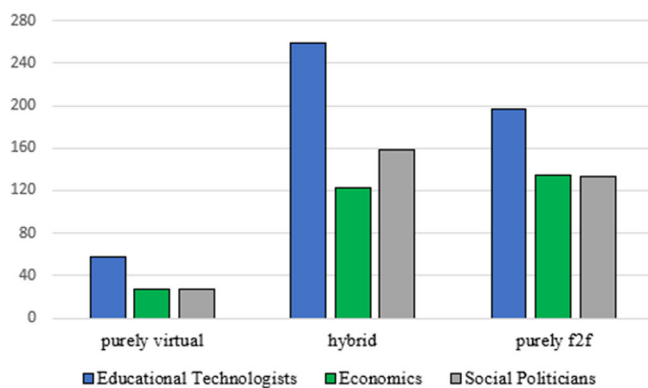


FIGURE 2 Frequencies of format selections by different research fields [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 6 Chi square analysis of participants' perspectives from different research fields about the most appropriate conference format for getting an overview on the current state of the research topic

| Overview research topic | | Research field | | | Total |
|-------------------------|-----------------|------------------------|-----------------|-----------------|---------|
| | | Educational technology | Economics | Social politics | |
| Purely virtual | Count | 39 ^a | 6 ^b | 8 ^b | 53 |
| | Expected count | 24.21 | 13.54 | 15.25 | 53 |
| | % within column | 30.71 | 8.45 | 10 | 19.06 |
| Hybrid | Count | 72 ^a | 29 ^a | 44 ^a | 145 |
| | Expected count | 66.24 | 37.03 | 41.73 | 145 |
| | % within column | 56.69 | 40.85 | 55 | 52.16 |
| Purely f2f | Count | 16 ^a | 36 ^b | 28 ^b | 80 |
| | Expected count | 36.55 | 20.43 | 23.02 | 80 |
| | % within column | 12.60 | 50.70 | 35.00 | 28.78 |
| Total | Count | 127 | 71 | 80 | 278 |
| | Expected count | 127 | 71 | 80 | 278 |
| | % within column | 100.00% | 100.00% | 100.00% | 100.00% |

Note: Each subscript letter denotes a subset of conference categories whose column proportions do not differ significantly from each other at the 0.05 level. Percentage numbers are rounded to the second decimal place.

TABLE 7 Chi square analysis of participants' perspectives from different research fields about the most appropriate conference format for discussing research topics with other researchers

| Discuss research topic | | Research field | | | Total |
|------------------------|-----------------|------------------------|-----------------|-----------------|---------|
| | | Educational technology | Economics | Social politics | |
| Purely virtual | Count | 8 ^a | 4 ^a | 5 ^a | 17 |
| | Expected count | 7.86 | 4.33 | 4.81 | 17 |
| | % within column | 6.20 | 5.63 | 6.33 | 6.09 |
| Hybrid | Count | 63 ^a | 25 ^a | 26 ^a | 114 |
| | Expected count | 52.71 | 29.01 | 32.28 | 114 |
| | % within column | 48.84 | 35.21 | 32.91 | 40.86 |
| Purely f2f | Count | 58 ^a | 42 ^a | 48 ^a | 148 |
| | Expected count | 68.43 | 37.66 | 41.91 | 148 |
| | % within column | 44.96 | 59.15 | 60.76 | 53.05 |
| Total | Count | 129 | 71 | 79 | 279 |
| | % within column | 100.00% | 100.00% | 100.00% | 100.00% |

Note: Each subscript letter denotes a subset of conference categories whose column proportions do not differ significantly from each other at the 0.05 level. Percentage numbers are rounded to the second decimal place.

TABLE 8 Chi square analysis of participants' perspectives from different research fields about the most appropriate conference format for meeting new potential project partners

| Meet new potential project collaborators | | Research field | | | Total |
|--|-----------------|------------------------|-----------------|-----------------|---------|
| | | Educational technology | Economics | Social politics | |
| Purely virtual | Count | 4 ^a | 8 ^a | 7 ^a | 19 |
| | Expected count | 8.75 | 4.82 | 5.43 | 19 |
| | % within column | 3.10 | 11.27 | 8.75 | 6.79 |
| Hybrid | Count | 53 ^a | 33 ^a | 38 ^a | 124 |
| | Expected count | 57.13 | 31.44 | 35.43 | 124 |
| | % within column | 41.09 | 46.48 | 47.50 | 44.29 |
| Purely f2f | Count | 72 ^a | 30 ^a | 35 ^a | 137 |
| | Expected count | 63.12 | 34.74 | 39.14 | 137 |
| | % within column | 55.81 | 42.25 | 43.75 | 48.93 |
| Total | Count | 129 | 71 | 80 | 280 |
| | % within column | 100.00% | 100.00% | 100.00% | 100.00% |

Note: Each subscript letter denotes a subset of conference categories whose column proportions do not differ significantly from each other at the 0.05 level. Percentage numbers are rounded to the second decimal place.

professional development for researchers occurs might need to be reconsidered. As conferences are a major aspect of ongoing researcher professional development, the importance of this should not be underestimated. Consequently, future research into this may aim for insights as to how conferences, virtual or otherwise, may be improved for different participant groups.

Regarding the variables *Imp. Learning* and *Imp. Overview*, results support our assumption about the importance of these two aspects during a virtual conference. Based on the findings about the importance of learning and getting an overview on the research topic we derive that learning serves as a value-creating factor for virtual conferences.

As there was no association between *Overall Value* and participants' conference attendance experience (RQ1.2; *Av. Conf. Att.*,

Av. Conf. Att. Out. and *Virtual Conference Attendance*) and socio demographic aspects (RQ1.7; *Age and Conference Role*), we derive that participants can gain a value from a virtual conference independent from these factors. In other words, results suggest virtual conferences to be a valuable learning space for people of different ages, conference experience and conference roles. It should be mentioned that the *p*-value for *Conference Role* exceeded the critical value only slightly. Although the mean differences miss the 0.05 significance level, the mean differences, especially the ones that appear between the ratings of *Presenters* ($M = 3.66$) and *Attendees* ($M = 3.90$), show a tendency towards different value perceptions. A possible explanation might be that presenters missed the follow up discussions that usually – randomized – take place during coffee breaks and from which many

TABLE 9 Chi square analysis of participants' perspectives from different research fields about the most appropriate conference format for developing new research and project ideas

| Develop new research/project ideas | | Research Field | | | Total |
|------------------------------------|-----------------|------------------------|-----------------|-----------------|---------|
| | | Educational technology | Economics | Social politics | |
| Purely virtual | Count | 7 ^a | 9 ^a | 7 ^a | 23 |
| | Expected count | 10.63 | 5.85 | 6.51 | 23 |
| | % within column | 5.43 | 12.68 | 8.86 | 8.24 |
| Hybrid | Count | 71 ^a | 36 ^a | 50 ^a | 157 |
| | Expected count | 72.59 | 39.95 | 44.46 | 157 |
| | % within column | 55.04 | 50.70 | 63.29 | 56.27 |
| Purely f2f | Count | 51 ^a | 26 ^a | 22 ^a | 99 |
| | Expected count | 45.77 | 25.19 | 28.03 | 99 |
| | % within column | 39.53 | 36.62 | 27.85 | 35.48 |
| Total | Count | 129 | 71 | 79 | 279 |
| | % within conf. | 100.00% | 100.00% | 100.00% | 100.00% |

Note: Each subscript letter denotes a subset of conference categories whose column proportions do not differ significantly from each other at the 0.05 level. Percentage numbers are rounded to the second decimal place.

presenters gain additional value. Although the effect was non-significant, potential differences in the perceived value for participants with different conference roles should further be investigated. Although not the focus of this analysis, the positive relationship of age and conference attendance – in general and outside respondents' current country of residence – is interesting to note. It is not surprising that older participants attended more conferences than younger ones, as age is likely a proxy for career seniority. However, the positive association found might also be related to the fact that traditional f2f-conference attendance comes with a need for travel and conference fee funding. Therefore, young researchers and especially students usually have limited options to attend academic conferences and are in turn limited in their opportunity to access a learning event and their early career development. Virtual conferences are seen to ease the barriers for conference participation due to lower event fees and no travel costs (Anderson & Anderson, 2010) but evidence for this assumption is still pending. We therefore see a need to investigate whether the virtual format provides conference access for those with limited options to attend a traditional f2f-event.

5.2 | Discussion of RQ2 results

The second part of this study focused on examining differences in the perspective of participants from different research fields about the most appropriate conference format for gaining knowledge and networking during a conference.

Regarding RQ2.1, results indicate that researchers from diverse fields differ in their opinion regarding the most appropriate format to get an overview on the research topic. The clear tendency of educational technologists towards conference formats that include virtual participation – 87.4% rated the purely virtual or the hybrid format as most appropriate – might arise due to the fact that researchers of this

field can be assumed to have a higher affinity for and greater knowledge about technological tools and might even be more used to technology-based learning, communication and interaction.

As we operationalized *getting an overview on the current state on the research topic* as gaining knowledge, a first impression could be that for gaining knowledge, conference formats including virtual participation seem to be more suitable for educational technologists than for economists or social politicians. However, the results of the item *discussing research topics with other researchers*, showing no differences among research fields, can neither confirm nor refute this hypothesis. Although this item is related to gaining knowledge, it is also related to networking and interaction. This item can therefore not be seen as a learning-related item exclusively and – as a standalone item – does not seem to be adequate to measure learning opportunities for different conferences. This also refers to our previous statement that it is not possible to draw a clear line between gaining knowledge and networking at a conference. However, there can be no doubt that gaining knowledge during an academic conference also takes place beyond formal settings and is not limited to learning about new findings and their discussion. We therefore can neither accept nor reject the null hypothesis for RQ2.1 but rather interpret the results as an indicator for the need of further investigation on the advantages and challenges of different conference formats for different research fields in terms of specific conference aspects like gaining knowledge.

Results for RQ2.2 show a rather uniform picture. Participants of virtual conferences from different research fields do not differ in their opinion about the most appropriate conference format regarding networking. We see the clear tendency – for the research fields investigated – towards conference formats that include personal contact as a confirmation of previous findings and statements that f2f-events are superior to virtual ones in terms of personal contact and social interaction (Oester et al., 2017). It is not surprising identifying the purely

virtual format as least appropriate for networking-related aspects, including discussion with other researchers. But results also show some interesting numbers that we perceive to be in need of further investigation.

For meeting new potential project collaborators, that is, the one of the four items that is mostly related to personal contact, most economists and social politicians rated the hybrid conference format as most appropriate while educational technologists rated the purely f2f-format as most appropriate. Although educational technologists can be assumed to have a greater affinity for technology, personal contacts seem to be important for these researchers too. Thus, with its undeniable focus on networking – next to learning – we see participating in traditional f2f-conferences to remain an important activity in the future for most researchers, even for technology-savvy ones. Exceptions might be researchers as identified for RQ1.5 and 1.6, who perceive social interaction or meeting new potential project collaborators during an academic conference as slightly or not important at all but rather focus on knowledge gaining activities.

5.3 | Limitations and perspectives for future research

The current study investigated the association of 11 variables with the perceived overall value of a virtual conference. We were able to identify some of them as relevant for the value rating. For these variables, we see the need to identify causal relationships and a more detailed understanding to what extent these variables might impact the overall value rating. It should be noted that data for *Imp. Learning*, *Imp. Overview*, *Imp. Soc. Interaction* and *Imp. Contact* could only be collected from social politicians. We therefore see the results for these variables as restricted to the field of social politics and recommend extending the correlation analysis on further research fields. Additionally, we recommend examining the moderating role of *Interest* on *Interaction* and *Overall Value* as *Interest* and *Interaction* can be assumed to be mutually dependent.

To extend the knowledge about affecting factors on the value rating we further see a need for the investigation of additional variables that might be associated with the value rating. Further variables to investigate could be divided into two categories: (1) Variables relevant for all research fields in general, such as satisfaction with technical access, to extend the general knowledge about impacting factors on the value rating of virtual conferences. (2) Research field or even conference-specific variables, such satisfaction with event design, to help organizers of the same conference series to conceptualize upcoming events.

The current study primarily used items valid for different conferences and different research fields and provided first insights on the value of virtual conferences. However, the items were related to learning but did not explicitly focus on it. Taking results of RQ2 into account, showing some differences in the perception of the conference formats, it seems to be reasonable to investigate learning during an academic conference for specific research fields. Further studies

should investigate, for example, perceived differences of the extent of learning by listening to presentations and by active engagement into discussions. A pre-post-design, asking, for example, for perceived knowledge about a research topic prior and after the event might also help to get a more detailed understanding about learning at academic conferences and virtual academic conferences in specific. These studies should also include a more specific conceptualization and differentiation of learning – or gaining knowledge – and networking at a conference.

Generally, the perceived overall value of virtual conferences should also be investigated after the pandemic times. Data from two of the three conferences investigated (LAK20 – educational technology and VHB20 – economics) took place at the very beginning of the restrictions in March 2020. At this point, people might have perceived the event as valuable just because it took place at all, since many conferences got cancelled at this time. Thus, it is reasonable to keep on investigating virtual conferences to generally extend scientific knowledge about this format but also to identify a possible pandemic-induced rating bias.

5.4 | Practical implications

Regardless of the limitations in the virtual space, a virtual conference can be a valuable event for participants. With respect to factors investigated the following aspects should be considered when designing a virtual conference:

1. interaction opportunities for formal conference interaction settings and.
2. meeting participants' topics of interest.

An option to support interaction opportunities for formal settings (1) could be to extend the question and answer sessions that follow a research work presentation and usually last for only a few minutes or plan additional discussion sessions. Making the research works available even prior to the actual presentation, for example, publishing the full paper or at least an abstract on the conference website, could encourage participants to prepare questions and feedback for the presenters and contribute to the expert discussion after the presentation. In terms of learning, both presenters and discussants could benefit.

To meet participants' topics of interests (2) the conference theme and relevant topics of a specific conference should clearly be stated on the conference website and within the call for papers published via further platforms prior to the paper submission deadline. Moreover, reviewers should take the fit of the submitted work to the conference topics as a criterion for their evaluation. Making the accepted conferences papers – or at least their abstracts – and the conference schedule available as early as possible before the conference might help potential attendees to decide whether the conference could be of interest to them. Especially for people focussing on learning and getting an overview on the research topic, these recommendations seem to be important.

However, when planning to host an academic conference and having the opportunity to choose between different conference formats (after the pandemic), using a hybrid concept seems to be the best and most preferred choice to address preferences of those who focus on learning and networking, gaining knowledge and personal contact respectively.

6 | CONCLUSION

Results provide first impressions about factors affecting the perceived overall value of a virtual conference from participants' perspective. Satisfaction with social interaction, the extent to which research topics presented met participants' topics of interest and the perceived importance of learning and getting an overview on the research topic are positively associated with the overall value rating of a virtual conference. Due to undeniable limitations for informal social interaction in the virtual space and the fact that all factors found to be associated with the overall value are learning related, we see virtual conferences to be more focused on learning than traditional f2f-events. They serve as space for informal learning by using formal settings. Perceptions about the most appropriate conference format regarding certain conference aspects differ among researchers from different fields. Further research is needed to investigate the factors influencing the overall value rating on virtual conferences and the perceptions on the most appropriate conference format regarding typical conference activities among researchers from different research fields.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

INFORMED CONSENT

Informed consent was secured from all participants in this study.

PEER REVIEW

The peer review history for this article is available at <https://publons.com/publon/10.1111/jcal.12614>.

DATA AVAILABILITY STATEMENT

Data available on request from the authors.

ETHICS STATEMENT

Ethical clearance for this study was granted by the first author's institution 'DIPF|Leibniz Institute for Research and Information in Education'.

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