Challenges in Organizing Online Conferences: Lessons of the COVID-19 Era

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ABSTRACT: Travel restrictions regarding COVID-19 have created new challenges for organizing international scientific conferences. Most of the conferences have to be moved to a fully online format. In our study, we analyzed what challenges it created in organizing the International Conference on Advanced Learning Technologies and Technology-Enhanced Learning in July 2020 in Estonia at the University of Tartu. The conference had 131 attendees from all over the world – this resulted in significant challenges due to differences in time zones and difficulties in engaging and socializing people in an online event. In our study, we collected feedback on conference-organization related challenges from five local organizing team members with different roles in the team. Their interviews were analyzed using an abductive approach. The results showed that the challenges could be identified through eight main categories: value, management, timing, program, people, protection, scaffolds, and money. In each of them, several sub-categories were specified. It was concluded that there were both advantages and challenges in organizing an online conference compared to a regular one. For example, fewer challenges are related to travel, accommodation, food and drinks, but more attention needs to be paid to supporting the socialization of people, especially those living in different time zones. Another major challenge appeared to be uncertainty related to the conference budget. Significant advantages were that the carbon footprint of the conference was smaller, the conference was more accessible, and it was easier to solve all the technical issues of the participants.

Keywords: Online conference, COVID-19, ICALT, Zoom, Remo, Abductive analysis

1. Introduction

Numerous guidelines on organizing conferences have been available for a long time. For example, a handbook published by the US General Secretariat Department of Conferences and Meetings Management (Department of Conferences and Meetings Management, n.d.) has specified many processes that could be systematically taken into account when preparing for a conference. For example, management topics as making an agreement with the organizers, assigning coordinators, and forming the organizing committee. Another set of process are concerned with program, e.g., specifics of plenary session. However, often many guidelines seem to be specific for a face-to-face conference, e.g., rooms, a lounge for delegates. Indeed, some of the categories of the process seem to be relevant in whatever format, e.g., establishing communication channels and support for the participants of the conference. Thus, organizing a conference is definitely a big challenge, requiring a strong team to succeed. Therefore, the aforementioned guidelines identified 12 different staff roles and responsibilities in managing and coordinating conferences. Each of them is assigned tasks to complete before the conference, during the conference and after the conference. Finally, the handbook also provides a meetings check-list consisting of 183 items. However, these are rather technical and do not focus on the inclusion and active involvement of the attendees of the conference.

IEEE as the world's largest professional organization has developed their own guidelines to support hundreds of conference organizers yearly, and their focus has been much more on the inclusion of the attendees. Their manifest states that the conference attendees should feel welcome and included in a conference and that a safe and positive environment encourages attendee participation, fosters collaboration, and builds community (Institute of Electrical and Electronics Engineers (IEEE), n.d.). As a result, they have listed specific guidelines on promoting inclusion, ensuring accessibility for all attendees, and childcare at conferences; as well as ethical guidelines and policies, but also guidelines on more technical aspects such as event emergency management, event conduct and safety statement, and financial transparency in managing expenses and travels.

When synthesizing these guidelines, we can conclude that in organizing a conference, we could systematically focus on at least 20 different categories of activities in each phase of conference organization – before, during and after the conference. In Table 1, we present a few examples of questions in each of these categories in the first phase, *before the conference*. However analogous questions could be specified or even similar follow-up

questions formulated for the *during the conference* and *after the conference* phases. For example, before the conference, we need to specify in the venue category what country would be attractive for the attendees, whereas during the conference, we need to ensure that the uniqueness of the country is highlighted systematically, and after the conference, we need to analyze what characteristics of the venue increased/decreased the attractiveness of the conference venue in order to make more informed decisions in the future. Therefore, the same guiding questions could be at least partially used in all three phases of organizing a conference.

Table 1. Examples of questions in organizing a conference (presented are only questions asked before the conference)

Categories of activities	Before the conference
1. Venue	What country would be attractive for the participants?
	In which city to organize the conference?
	Is it better to have the conference in the rooms of the host institution or in a conference center?
2. Funding and budget	What has been the budget of similar conferences?
	What could be the participation fee?
	Who could be the sponsors of the conference?
3. Timing	What are the best dates?
	When to start and finish each day?
	When to have keynotes?
4. Program	How many conference days are needed?
	What are the presentation formats?
	What should be the social program?
5. Organizing team	What roles need to be covered?
	How to ensure good communication in the team?
	How to secure all the roles?
6. Conference rules	Who has access to the conference materials?
	What consents need to be asked from the participants?
	Is taking and sharing photos and videos allowed?
7. Benefit for the organizers	What are the benefits for the country where the conference is organized?
	What are the benefits for the host institution?
	What are the benefits for the organizing team?
8. Language and editing	What is the language of the conference?
	How to ensure good editing of all conference materials?
	How to support authors in editing their articles?
9. Invited participants	Who should be invited from the organization affiliated to the conference?
	What benefits need to be provided to the keynotes?
	How many invited participants to have?
10. Travel and accommodation	What guidelines would be expected by the attendees?
	What discounts are possible?
	How to support participants in getting visas?
11. Food and drinks	What meals are provided to the attendees?
	How to ensure appropriate food and drinks to attendees with different cultural backgrounds?
	How to ensure enough options to provide food to attendees with different allergies and diets?
12. Rooms	How many rooms are needed in parallel?
	How many seats are needed in different rooms?
	What needs to be the setup of the rooms?
13. Technical support	How to set up communication channels to be used already before the conference?
	What are the technical specifications needed in the conference rooms?
	How to provide technical helpdesk to the attendees?
14. Communication	What different channels are needed?
	What needs to be communicated?
	How to ensure an appropriate amount of information?
15. Website	Where to host the conference website?
	What information is needed on the website?
	How to keep the website up to date?
16. Consents	What copyright agreements are needed to publish conference materials?

	What permissions need to be asked to take photos and record videos of the conference?
	What general regulations of data and privacy protection need to be followed?
17. Social program	What has been organized in the previous conferences?
	What are the specifics of the host country?
	How to ensure the inclusion of most of the attendees?
18. Conference materials	What information needs to be presented on badges?
	What should be given to the attendees in the conference materials?
	What banners and signs should be used in the conference venue?
19. Sessions	What equipment and supplies are needed in sessions?
	How to support session chairs?
	How to ensure technical readiness of rooms?
20. Security and safety	How to ensure a safe physical and virtual environment for attendees?
	How to protect data of the participants?
	How to solve emergencies?

The COVID-19 pandemic has started a new era in organizing conferences, although some experiments with innovations have been done earlier as well (see Abbott, 2019). Many conferences have been cancelled or postponed (Viglione, 2020). In some other cases, the conferences have been organized in a fully online format or in a hybrid format, where a few speakers or, sometimes, some more local participants have been invited to the studio of the host but most of the attendees have indeed been participating through online environments (see Bhargava, Farabi, Rathod, & Singh, 2020). Despite the change of the format, the participants still expect to present their latest work and network with their peers (Sarabipour et al., 2020).

We assume that the same questions – and in the same categories – that normally apply in organizing a regular conference also apply in organizing an online conference. However, recent studies have already revealed some notable differences in responding to these questions in different settings. For example, Reshef, Aharonovich, Armani, Gigan, Grange, Kats and Sapienza (2020) analyzed the tips in organizing a conference with 1,100 researchers participating remotely. Their conference was organized in January 2020, before the COVID-19 lockdown period. Therefore, they focused on the idea that the traditional conference format requires change in order to better respond to the academic communities' needs derived from changes in their work-life balance as well as to the technological advances that allow fast and reliable internet connection for teleconferencing. We may also add that online conferences reduce the need for traveling, therefore reducing the conference's environmental impact. Thus, the change of the paradigm in organizing conferences is not only the result of the COVID-19 era but necessary anyway as a response to many changes in the world.

In their analysis, Reshef et al. (2020) concluded that online conferences bring clear benefits for research communities: eliminating the cost of holding in-person events, freedom offered by the use of technologies, academic meetings reaching a wider audience, reduced travel and conference attendance costs, but also a decreased impact on the families of the attendees. However, according to our knowledge, there are no systematic studies on organizing conferences in the COVID-19 era. Valuable studies on understanding the effect and challenges of virtual conferences have been made by analyzing conferences organized before the spread of COVID-19 (e.g., Veldhuizen, Slingerland, Barredo, & Giller, 2020), but in these cases, it was not possible to take into account the authentic situation we have since March 2020. Therefore, we aimed to study how COVID-19 has affected the organization of conferences in all 20 categories of questions specified in the guidelines on organizing regular face-to-face conferences. We believe that this analysis might be valuable for conference organizers, but at the same time, we understand its limitations, as every conference is unique and new lessons can be learned from each new conference.

2. Methods

In this study, we focus on the experience gained in organizing the International Conference on Advanced Learning Technologies and Technology-Enhanced Learning (ICALT, http://icalt2020.ut.ee). This ICALT conference is affiliated to the IEEE Computer Society and IEEE Technical Committee on Learning Technology. The conference has 20 years of history, and in 2020, it was organized as a fully online conference at the University of Tartu in Estonia. We interviewed five key members of the conference organizing team to understand the challenges and solutions in all three phases of the organization process: before the conference, during the conference and after the conference. The collected data were analyzed using abductive content analysis to develop generalizable guidelines on organizing online conferences in the future.

2.1. Context of the ICALT conference

The ICALT 2020 aimed to bring together people who are working on the design, development, use and evaluation of technologies that will be the foundation of the next generation of e-learning systems and technology-enhanced learning environments. The conference has been organized in 20 years in many different countries. Usually, the conference attracts between 100 and 200 participants and between 200 and 300 paper submissions. About 25% of the submitted papers are accepted as full papers, making the competition quite strong. All papers are indexed in IEEE Explore digital database and indexed by several databases, including Web of Science. In 2020, the conference received 171 paper submissions from 40 countries. More authors were from China (50), Taiwan (48), and Brazil (41). Submission numbers are usually higher from the host countries: e.g., there were 33 authors from Estonia in 2020 compared to 9 and 10 in the preceding years. In 2020, a total of 33 papers were accepted as full papers (19.3% acceptance rate), 54 papers as short papers, 26 as discussion papers, and 6 papers were selected for the Doctoral Consortium. The online conference was accessed by 131 attendees.

In 2020, the conference was held from July 6 to July 9 as a fully online conference. The conference was accessible via a website where the registered participants received a password to access the restricted site. The conference proceedings and the conference program were available for downloading. The electronic program of the conference was adapted to the user's computer clock. The schedule was accommodated, as much as possible, to the time zones of the presenters in different sessions to avoid the need to give a presentation during the night. Each session in the schedule had a unique link to an online conference room in Zoom (see http://zoom.us). Several professional accounts were used to enable recording of parallel sessions in the cloud (see Figure 1). The recordings were made available in the program immediately after the end of the session so that attendees could watch them for one month. Social events of the conference (e.g., quiz about Estonia using Kahoot, guided city tour of Tartu, live concert of a local artist) were usually organized as synchronous activities in Zoom. A few local folk dance classes were provided to the participants as recordings that were played during some breaks. The Remo conference tool (https://remo.co) was used to facilitate discussions in small groups during the breaks (see Figure 2). This tool allows users to autonomously form small discussion groups around virtual round tables, share their screens and use a whiteboard for their discussions.

Figure 1. Screenshot of the opening ceremony of the ICALT2020 conference (screenshot published with the permission of the persons in the screenshot)

Figure 2. Screenshot of the Remo virtual lobby room of the ICALT2020 conference (screenshot published with the permission of the persons in the screenshot)

2.2. Context of Estonia

Organizing an online conference in Estonia might be easier than in some other countries. Internet connection is considerably good almost everywhere, and the country's schools and universities have designed their learning systems to benefit from the well-developed digital infrastructure. Significant improvements have also been made in e-learning, which provides a good basis for adapting conferences to online format. The lecture halls of the universities are usually well equipped with technology to have online conferences. The Institute of Education at the University of Tartu, the host of the ICALT2020 conference, has provided a mostly online international master's program on Educational Technology since 2017. After testing several digital tools, the staff opted for Zoom as the principal tool to be used in the learning process, as it proved to be a reliable environment for online sessions even with poor internet connection. In addition, Zoom allows sharing of screens, optimizing the video broadcast, recording of the sessions to the cloud, and dividing students in groups working in breakout rooms.

2.3. Data collection and analysis

The data for the current study were collected by five semi-structured interviews using questions about the three phases in the conference organization procedure. The interviews were conducted three months after the conference. Two questions were asked about the preparation phase: (1) "What issues/working items should be taken into consideration?" and (2) "What challenges/obstacles were faced during the preparation phase?" Three questions were asked about the implementation phase: (1) "What issues/working items should be taken into consideration?"; (2) "What challenges/obstacles were faced during the implementation phase?"; and (3) "How did you resolve those difficulties? Please share the lessons learned and provide suggestions." Two questions focused on the evaluation and feedback phase: (1) "How do you evaluate the success of the conference?" and (2) "What do you think of participants' feedback?" Three of the interviews were done by one of the authors of this article and two were conducted as self-reflections of both authors of this article.

All five respondents had key roles in organizing the ICALT2020 conference. The roles covered by the five selected persons were the following: conference general chair, local committee chair, publicity chair, financial chair, conference manager, and coordinator of technical support. The experience these people had regarding organizing and participating in different conferences varied a lot. Most of the team (except for the conference manager) had recent experience of organizing the in-person EAPRIL2019 conference (https://www.eapril.org/eapril-2019). This conference had 464 participants from 33 different countries, mainly from Europe. Only one respondent (the one in the roles of the conference general chair and local committee chair) had any experience of participating in previous ICALT conferences (in five different conferences in 2008, 2009, 2017, 2018, 2019). This person had also chaired the EAPRIL2019 conference and acted as a member of the organizing committees of many other international conferences held in different countries. In addition, he had participated in more than 100 academic conferences over 20 years and acted as a senior member of IEEE (which is affiliated to the ICALT2020 conference) and vice-chair of the IEEE Estonia section, while the experience of the other respondents was significantly more limited.

The five interviews yielded 80 idea units containing a total of 2904 words (an average 36 words per idea unit). The number of idea units in an interview ranged from 6 to 32. The highest number of idea units came from the most experienced respondent; the number of idea units from other respondents varied from 6 to 17.

The interview data were analyzed using abductive content analysis. Abductive analysis (Tavory & Timmermans, 2014) enables to connect theory and empirical data by combining the deductive and inductive process. It is a process of theorizing grounded in pragmatism to make sense of the data. In this case the researcher should have a very good overview of theories on the research topic and then he/she needs to move recursively back and forth between observations and theory. In our case the "theory" was an extensive experience of the article's first author's participation and organization of international conferences in face-to-face settings. It was extended by the guidelines provided by several associations for organizing conferences. This practical and theoretical knowledge was taken into account in analyzing interviews by thinking on all 20 categories of conference organization activities derived from literature (described in the introduction of the article) and combining this with more inductive content analysis by finding the main themes in the responses of the interviewees and categorizing these into larger units. Thus, the recommendations for the future, as the new "theory" were developed in synthesizing theory and findings. The abductive process was conducted by one researcher and the other author of the paper reviewed the analysis and conclusions based on her experience and knowledge. Thus, a limitation of this method might be replicability of the findings because these depend very much on the researcher conducting the analysis. However, its validity should be increased due to the extent of the theoretical and practical knowledge of the researcher.

3. Findings

We started the analysis of the idea units using the 20 categories identified based on the aforementioned conference organization guidelines (Department of Conferences and Meetings Management, n.d.; IEEE, n.d.). The analysis showed that the respondents focused on almost all categories of activities in their feedback. There were only 3 categories that were not mentioned: language and editing, invited participants, and food and drinks. These could be considered topics that caused fewer challenges in organizing an online conference. However, this could also indicate that there were no particular memories regarding these categories. Each respondent could provide more than one idea unit in each category; in a few cases, one idea unit covered two categories. The most frequently mentioned categories were *venue* and *funding and budget* (both 9 times), followed by *sessions* (8), *social program* and *security and safety* (6), *organizing team*, *technical support*, *communication* (5), *timing*, *travel and accommodation* (4), *program*, *benefit for the organizers* (3), *website*, *consents* (2), and *conference rules*, *rooms*, *conference materials* (1). The main categories found were (1) management, (2) protection, (3) timing, (4), people, (5) scaffolds, and (6) money (see Figure 3).
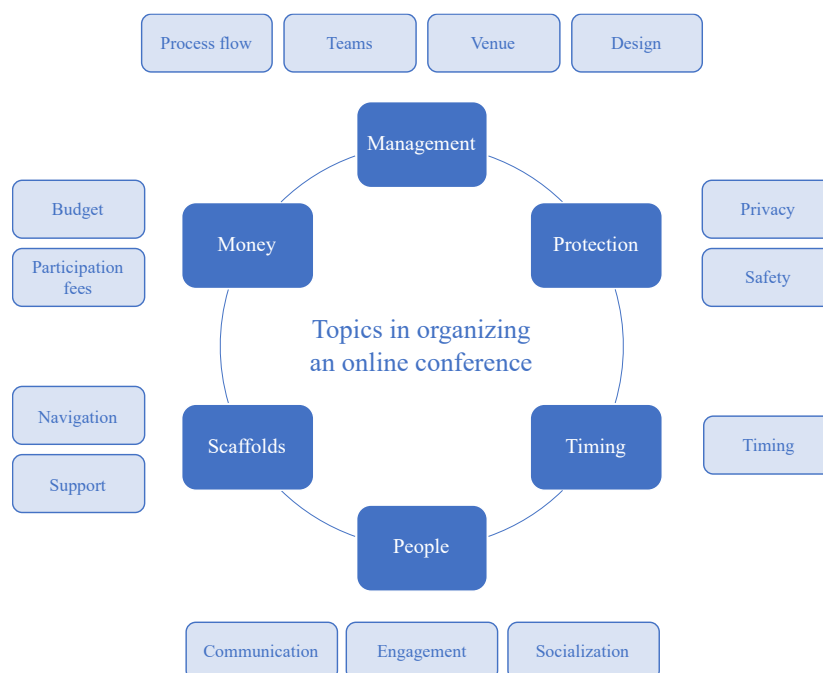

Figure 3. Main categories and sub-categories of topics of attention in organizing an online conference

3.1. Management

The first general theme specified in the analysis was *Management*. It was found that the organization of a conference should start with designing a clear process flow. The respondents indicated that it would have been very useful if that had been provided by IEEE as a professional organization affiliating hundreds of conferences every year. If the flow is clear then it is easier to adapt a regular conference for an online format and to plan activities that should be completed as an input for other people in completing their tasks. The tasks according to the process flow need to be assigned to different teams were several people can support each other or take over the roles if needed.

One of the tasks for the teams according to the flow is the management of the venue. In case of online conferences it consisted of topics as physical headquarters, online tools for sessions and social events, the technical setup of the online rooms. The challenges regarding the conference *venue* were distinctly different compared to a regular conference. Something was mentioned by all respondents. The main challenge was finding an online tool that would make it possible to provide all the services of a regular conference in an online format. Another challenge was time – there was not enough time to search for the best tools and test them all. Therefore, we had to be very focused. Third, the conference team also searched for professional conference organizers, but their solutions had some limitations in spite of high cost. Therefore, in the end, we had to select a set of different tools based on the existing experience. The conference manager noted the following:

Functionality was our first consideration, so that everything that is part of a conference could also be part of the conference in the online version. The fewer different apps a participant has to use, the better. We decided in favor of Zoom, where all sessions and social events took place.

The fourth topic categorized under management was design. It mainly concerned the design of the conference website so that all relevant information about the process flow, teams and venue is also available for the potential participants clearly and attractively. In our case, it was found that the website was very functional but with a simple design that could have been improved. Again, it was mentioned that it would have been good if, for a conference organized under the umbrella of a large organization as IEEE or a conference that has been organized already 19 times before, it would have been good to design a website that could be reused from year to year with small improvements made as needed.

We used a password-protected website, where participants were able to access all sessions in Zoom using links in an electronic agenda. Additionally, Remo was used as a tool for small group discussions during breaks between parallel sessions. However, it would have been best if the tools had been integrated into one system. In addition, we set up physical conference headquarters in one of the university's buildings and offered the local presenters an additional opportunity to give their presentation at the headquarters. However, this option was only used by a few presenters.

3.2. Protection

Protection-related topics focused on two sub-categories. Main challenges were about privacy but a few comments were also made on safety. The challenge was to get informed consent from all participants of the online conference to record the sessions to make them rewatchable for the registered participants following the General Data Protection Regulation (GDPR). We prepared for blurring parts of videos in case someone would not agree to be recorded. However, it was not needed in the end. We simply stopped recording the session when a person was presenting who did not agree to be video recorded. There were only a few of such persons. When this person participated in sessions where others were presenting, we asked him/her to close the camera. We also prepared for security attacks in the sessions (e.g., each session had a technical assistant always present in the role of host with the rights to remove any participant from the session if needed), but this time these plans were not needed. No issues were reported. A minor issue that we encountered was sharing screenshots taken in the sessions using personal social media accounts, even though we had informed each participant that making or sharing any recordings of the conference sessions was not allowed.

Safety was mentioned less but meant more different aspects. First, it was noted that participants felt themselves safe because of the technical support available in the sessions. Second, some presenters had concerns about hacking the sessions by some unwanted people who may start to attack the people with inappropriate comments or content. Titipat, Tulakan, Isil, Wyble and Kording (2020) has noted this behavior and named it "Zoombombing." Therefore, we instructed technical support on how to deal with these issues (e.g., dropping out

these people and blocking them to of re-joining) but we did not have such cases. Third, we had to ensure that the conference is only for these people who have paid the conference fee or who are granted with free complimentary access (e.g., the conference chairs, track chairs or local organizing committee members). Therefore, we disseminated login information only shortly before the start of the conference and asked everyone to identify themselves at the first login. Later, the technical support also checked in the sessions if there are only the people who have checked in. Of course better solution might have been to create individual access accounts for everyone, but the webpage solution we used did not have such feature and we did not have time to start to build up a webpage from scratch.

3.3. Timing

The timing was challenging because of the different time zones of the participants in an online conference. Therefore, it was very important to adapt the program to the presenters' time zones and to make the recordings of the sessions available as soon as possible after each session. The technical support saw that the number of participants in synchronous sessions was about the same as the number of people who watched the recording. Thus, the idea to make the recordings available for the ones in very different time zones worked well. In general, we decided to start the conference day in the morning according to Greenwich Mean Time and to finish in the evening so that the local committee did not have to work during nights. Indeed, the conference days were very long for the local organizers.

3.4. People

The main category *People* had more notes than any other category. First, it was challenging to communicate the conference to the target group. In the end, we had quite many participants and according to our interpretation, there are two main reasons of this: (1) the ICALT community is well established so that many people have attended many previous conferences and are "loyal" to the conference, (2) the accepted papers are published in the conference proceedings and indexed in databases only if at least one author of a paper registers to the conference and presents the paper in the conference.

The two other sub-categories were even more related to the conference days – engagement of participants in the main sessions and socialization during the breaks and in social events. In an online conference, both are challenging. In the sessions, we allowed participants freely to start discussions in the chat and we also allowed to use their microphones to have audio-discussion. More challenging was supporting the follow-up discussions during the breaks. It turned out that it is not a good solution if people need to move between different apps. The social program seemed to be appropriate (not too heavy or with too few events) but we learned that it need be advertised more in the scientific program or even by the sessions chairs at the end of their sessions. First, we planned to use Remo for follow-up discussions and open the Zoom rooms only a few minutes before the sessions and close them immediately after the sessions to allow technical support to update links to recordings in the schedule and prepare for the next session. However, during the conference, it turned out that Remo was not convenient, because it was a different tool. It was much easier to come to Zoom a few minutes before the start of the session and stay there a bit longer to have an additional discussion. Thus, we revised the plan. The coordinator of technical support concluded:

Questions were asked at the end of the session, but there was also a small period of time when the session had not started yet and participants were chatting as well. At first, we thought that all this kind of social chat and discussion would happen in Remo, but it did not work out as planned. Also, some participants seemed to know each other and they connected better. Remo failed because you have to go there separately, Zoom was like a common corridor between the sessions' "rooms"…

In the *social program* we expected more active participation. It turned out to be not as important as in regular conferences. One explanation for this could be that often, people did not see each other's images, did not see the emotional reactions, and this decreased active communication and participation. The conference manager found that the aim of the social events was not to "imitate" the events of a real conference but to provide something that should work in an online event:

With the live concert of Puuluup [a local artist] we wanted to do something that would be Estonian enough, but with a twist. The quiz and the video tour of the city of Tartu were to introduce our university city. Comedy Night was also Estonian-themed and, in my opinion, relatively successful.

The other respondents also found that those who participated in social events (usually around 20 people) were satisfied and engaged. Thus, it might also be the case that people are not yet used to participating in the social events of online conferences. Therefore, these need to be advertised more in the case of future events.

3.5. Scaffolds

Next, we identified two types of *Scaffolds* of an online conference. First, there was available a built-in scaffold that was named navigation – the web-site, electronic program and guidelines had to make navigation during the conference as simple and intuitive as possible. In general, it worked out well. The main issue was that people did not use actively Remo tool that was meant to enable small-group discussions between presentations. Second, there were many notes about technical support. It turned out that the support provided by technical assistance in every session was very much needed. There were no complaints regarding this. It has been noted in other studies as well that in an online format it is easier for moderators and technical support to control the flow of the discussions (see Price, 2020). The general helpdesk was even almost not needed – email turned out to be enough to cover the more specific needs. However, it was found that the support of the organization affiliating the conference might be stronger, e.g., the set of tools, template for a website.

Technical support seemed to be sufficient. In each parallel session, there was a technical assistant who was often approached with many different questions, not only with the technical ones – this role appeared to be very important. As technical support was attending every Zoom session then they were easily reachable and visible all the time. The same people formed a team who planned all the technical details of the conference. There we also prepared guidelines describing the conference flow and use of different tools, e.g., how to make a presentation or participate in a session. In addition, we provided the helpdesk using different communication channels (email, Zoom and phone) but this was even not needed – very few people contacted this.

Communication appeared to be a bit more difficult. In an international conference there had been used in the past some communication channels in case of what it was not clear who has access to the accounts and who are the target groups. It caused a bit of confusion. Also, it was not always clear what information needs to be communicated, when it need to be communicated, who provides this information and who has to submit it to a different channel. Even the local organizing team was sometimes in lack of information. The publicity chair found:

People cannot be flooded with information. Of course, you never know what is enough for whom, what is too much for someone. Due to the change in format, the timeline was very tight and therefore sharing of information was sometimes left to the last minute. A lot of effort was later put in preparing the certificates to the participants.

3.6. Money

Finally, there were also two categories of *Money*-related comments. A challenge was caused by the uncertainty in the registrations. It was not possible to estimate the number of participants and plan the costs without knowing the income. Also, it was not possible to reduce the conference fee without a revised budget although it was very clearly expected by the participants. Thus, we had to take risks and be conservative in budgeting and the end we did not use all of the income.

The conference budget was first prepared for a regular conference. In March 2020, we decided to wait a bit to see how the developments regarding COVID-19 unfold. In April, we had to develop different scenarios for the conference, all of which also affected the budget: (1) the conference will be held as planned, but the number of participants will be smaller than expected because people are afraid of travelling; (2) the conference will be organized in a fully online format; (3) the conference will be organized in a mostly online format; (4) the conference will be canceled; (5) the conference will be postponed. By that time, the submission deadline had already passed, and even the results of the reviews had been announced to the authors. Thus, the registration period had to start and some of the participants had already registered according to the original conference fees. Finally, we decided that considering the situation, we would have to organize the conference in a fully online format.

We anticipated that the change of the conference format might have a significant effect on the potential income, but also costs. First, it turned out that potential sponsors were not interested in supporting an online conference. For example, Enterprise Estonia and Tartu City Government support conferences if the participants stay in local

hotels for a certain number of nights (at least 300 or 200 nights per conference, respectively). This reflects the idea that they support local conferences if the participants spend enough money in Estonia by buying the services and goods of Estonian companies. This is not the case at online conferences; therefore, they are not interested in sponsorship.

The benefit of the online format of the conference was that we did not need such a large budget anymore for conference rooms, meals and hosting keynote speakers and other international guests. Therefore, we tried to define a reduced fee for participants, but it was difficult, because it was not possible to estimate the number of paying participants based on the experience of previous years. Indeed, we finally decided to reduce the author fees by about 30% and introduced a completely revised very low fee for non-presenting authors. However, it took the financial manager more time than expected to reorganize everything that had already been planned: to cancel preliminary agreements, pay back part of the already paid fees and communicate with participants that you never meet in person. Also, some issues rose from the fact that IEEE expects the budget in US dollars, but in Estonia, we had to calculate everything in euros. Thus, the financial manager concluded three months after the conference:

We had all the rooms planned ... It took extra hours to rearrange the original plans. Because of COVID-19, people had to do some unexpected additional tasks, it was not pleasant but had to be done to adapt to this new situation. The money had to be reimbursed and it took some effort to get all the required correct bank details … It continues to this day, I am currently putting the last invoice on track. Due to the change in exchange rates between the euro and US dollar, we need to transfer money to IEEE. In addition, more documents were expected due to coronavirus … Every little thing took more time than initially planned. Communication with both banks and our university accountants…

Finally, however, it turned out that some profit had been made that had to be paid to the IEEE and could be used for the next ICALT conferences. This was because we had underestimated the number of registered participants. We were more conservative than needed. We assume that the high number of paying participants was the result of the conference policy. The conference general chair explained:

Budget-wise it was important that the conference registration was bound to publishing the article in the conference proceedings; otherwise it will not be indexed in the databases (it has always been so, but the risk of decreased number of participants is higher for online events, where there seem to be fewer other benefits for the participants).

4. Discussion

In combining the findings from our abductive analysis and guidelines provided earlier for organizing face-to-face conferences revealed eight main categories of activities of organizing a conference (see Table 2). The guidelines for face-to-face conferences indicated two categories that were not highlighted by our interviewees. First, in online conference management, there were not indicated challenges regarding travel and accommodation or food and drinks. This is good in many aspects. For example, Titipat et al. (2020) have indicated several disadvantages of the regular conference, e.g., they have a massive carbon footprint, they are time-consuming, and there are high costs involved in attending the conference – as a result, these might be not so accessible for early career researchers or participants from country with a lower level of economic development. Besides, there might be other reasons why some people do not want to attend a regular conference but are register to a virtual one (see Price, 2020). Thus, the shift of conference from offline to online might have significant value-related pros as well.

Second, the value of the conference for the organizers was not highlighted in the interviews. The reason for this might be that the program was not compiled by the interviewed local committee members and the value of the conference was not the topic to discuss in this team. The value has been specified through the years the conference has been organized within the ICALT community. The value for the local team is more evident for these people who are active members of the academic international community of this particular conference and only the conference chair / local committee chair belonged to this group.

Indeed, it could be easily argued that the program and the value of the conference are also important topics for any online conference. Thus, in conclusion, we can say that there are eight main categories of topics to take into account in organizing a conference. We found these in analyzing the feedback on an online conference but we

believe these could well cover the categories needed in regular conferences as well. Of course, the challenges in each category might be different.

Table 2. Categories of activities of organizing a conference

Sub-categories from the abductive analysis	Main categories	Sub-categories from the analysis of guidelines for organizing face-to-face conferences
Design	Management	Website, conference materials
Process flow		Timing
Teams		Organizing team, invited participants
Venue		Venue, sessions, rooms
		Travel and accommodation
		Food and drinks
Privacy	Protection	Security and safety, consents
Safety		
Timing	Timing	Sessions, timing
Communication	People	Communication, website, conference materials, language and editing
Engagement		Sessions
Socialization		Social program
Navigation	Scaffolds	Conference rules, conference materials
Support		Technical support
Budget	Money	Funding and budget
Participation fees		
	Program	Program
	Value	Benefit for the organizers

By reflecting the experience in organizing ICALT2020 online conference we propose that organization of an online conference should start from discussing the *Value* of the conference to the participants, organizing team, and to the organization affiliating the conference. Next, there needs to be set focus on the *Management*, starting from specifying the process flow, teams, invited participants, venue, website and if needed then also travel and accommodation plus food and drinks. Third, focus should be shifted on the *Program* and related to this to *Timing*. Finally, the people-related topics need be decided on the level of details – how to ensure communication, engagement and socialization of *People*, how to provide *Scaffolds* they need, and how to build *Protection* to have a secure and safe conference. In parallel of all of the other categories is the discussion on *Money*. Many decisions depend on the availability of the budget and the budget depends very much on the value for the participants, the attractiveness of the program, the timing and venue of the conference – even in case of an online event.

The category-based approach on defining the challenges in organizing an online conference might help to structure the challenges and to reduce the risks. This is something that has been not often used. For example, Reshef et al. (2020) list different categories, e.g., the format, the team, the infrastructure, the program, the hubs, the poster session but these are not systematized. Both Reshef et al. (2020) and (Department of Conferences and Meetings Management, n.d.) have distinguished between processes before the conference, during the conference and the latter also the process after the conference. However, this is a general question about the workflow that could be applied in case of all the categories identified in our analysis. For example, communication needs to effective in all these three phases.

Regarding the challenges we also need to agree that sometimes the first impression might be not as clear as looking from distance. Reshef et al. (2020) found in their study that the initial reaction of their community after the event was overwhelmingly positive but more challenges revealed in the post-event surveys. As in case of our study socialization appeared to be one of the major challenges, they found that emotional engagement due to the lack of in-person interaction remained still an open question; e.g., the lack of applause after each talk and stimulation in small-group discussions. "Socialization challenge" is the only generalizable challenge in organizing online conferences based on our study. It has been noted in other studies as well. For example, Salomon and Feldman (2020) found that chat rooms with speakers after the session of during the break would give time for additional questions and debate. In our case we tried to introduce Remo as a special tool to support small-group discussions. However, we failed because it was a separate tool and it was not easy to navigate in the system to use it. In addition, based on the findings of Salomon and Feldman (2020) it might be suggested for the future that the presenters need to come to a specific room after the session for follow-up discussions (or the online room of the session could be kept open for a longer time).

Thus, it seems that the online format supports well one of the main goals of the scientific conference – presenting the work of the participants – but still fails a bit in the other main goal – to provide participants with a platform for networking with their peers (see Sarabipour et al., 2020). The same has been indicated by Abbott (2019) who found that the virtual conferences help to significantly decrease carbon footprint of humans but usually the people still would like to have at least one face-to-face annual conference to forge personal connections and collaboration because of the psychological needs of the humans. However, Titipat et al. (2020) provide for consideration one more idea to support networking. They used in their online conference a matching algorithm to facilitate one-on-one meetings. This could help to find the participants with whom you have a common interest and if these meetings are set up by artificial intelligence behind the data then it could enhance networking. Of course, there might be hidden some new privacy-related issues in applying these algorithms.

One more benefit found in organizing ICALT2020 conference online is that we did not have any issues with visas. In the previous years, it has been one of the major issues and; therefore, we assigned a person in our organizing team to support all attendees with visa-related questions because as it is also noted by Hu (2018) that these issues might hinder scientists to participate due to bureaucracy or even travel bans. According to these aspects, online conference might be more inclusive to provide solutions for flexible accessibility in case of different needs and restrictions.

5. Conclusions

Our analysis of the feedback collected from organizers of the ICALT2020 conference showed that it is indeed possible to organize conferences in COVID-19 era. There are some cons but also pros. We found that in case of an online conference there are not so many challenges with travel and accommodation or food and drinks but significantly more important are the issues of protecting participants' privacy and ensuring a safe online environment – one of the major challenges before the conference and during the conference. One of the biggest challenges during the conference seemed to be to support socialization, especially when the participants live in very different time zones. The program could be adapted to the time zones and the video recordings even increase flexibility in participation but the challenge of connecting people remains. The third remarkable challenge of online conferences is uncertainty in the budget. It is more difficult to estimate the number of participants and to predict the income from participation fees. The technical challenges are important in case of both formats – regular and online – but in case of the online conference, it seemed that it was even easier to handle all these issues immediately. When the participants are online then they can always ask questions from technical support and they could be supported without disturbing the presenter of the session.

The conclusions of our study need to be indeed taken with some cautions. One of our limitations was that we did not use a questionnaire to get evaluations of a larger number of conference participants, including the ones who have experience in organizing previous ICALT conferences. Second, we did not interview all organizing team members, e.g., the international team members responsible in the program. However, we indeed covered the representation of all major roles in the team.

Further studies could focus also on collecting logfile data and data about participants' satisfaction in the conference and with different formats of sessions. Also, it would be valuable to compare different platforms in enabling all processes of conference management, e.g., Crowdcast (see Goodman, Wyble, Achakulvisut, Bilgin, Van den Bossche, & Kording, 2020; Titipat et al., 2020) in contrast to a solution where different tools were combined as in our case Zoom, Remo, online schedule, and website.

Acknowledgement

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