The Annual Conference on the Human Factor in Cybercrime: An Analysis of Participation in the 2018 and 2019 Meetings

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Abstract

The Annual Conference on the Human Factor in Cybercrime is a small and specialised scientific event that aims to bring together scholars from around the world to present their research advances to a select audience. Its dynamic and linear format favours group discussions since all contributions are heard by all the attendants. This, together with its tailored social scheme, promotes interaction between members, which —in turn— leads to new collaborations. However, it has not yet been analysed whether the design of the conference actually encourages varied participation and fosters collaborative networks among its participants. The purpose of this chapter is to assess participation in the 2018 and 2019 editions to determine whether this is the case. Using descriptive analyses, here we show how participation in the conference has varied and examine the composition of the collaboration networks among the participants. The results show an increased and more diverse participation in the 2019 meeting along with a greater presence of stakeholders. Furthermore, the findings reveal that members of previously established organizations play an important role in cohering the network. Yet few connections exist between academia and practice. A further analysis of the strengths and weaknesses identified in the two editions of the conference serves to elaborate a series of recommendations for future editions.

Keywords: conference; human factor; cybercrime; social network analysis; participation; ESC WG on Cybercrime, IIRCC, Division of Cybercrime

Introduction

In the land of research, there is a vast forest of academic conferences that grows thicker as we speak. In this forest, many researchers, especially the most inexperienced —and generally the youngest— get lost because they are uncertain which conferences to

attend. Generally constrained by limited budgets, researchers must choose a handful of these events at which to disseminate their work and build their networks if they want to have an impact on society. But this forest is so dense that one can easily get lost. Many trails lead to "first and only" events that are crafted with carefully chosen names so broad as to attract a wide range of participants (e.g., the 1st International Conference on Technology, Knowledge and Human Behaviour) [1]. And to accommodate many participants in a short time, large conferences need formulas that allow research to be presented simultaneously. But parallel sessions mean that most research goes unnoticed by many scholars who might find it relevant to their own research. Thus, many researchers end up in these generic events, where the task of effectively exchanging knowledge is overly complex. At these events, disguised as interdisciplinary, participants are likely to have such different agendas that it is difficult for them to find usefulness in each other's research. Amidst all this confusion, which conferences should one attend?

Fortunately, there are other formulas that bring together groups of committed participants who are both active in a discipline and have the means to put research into practice. Some groups of scholars and practitioners have tried to address the problem of abstraction by organising small conferences that are focused on particular problems [e.g., the Environmental Criminology and Crime Analysis Symposiums (ECCA) (Wortley & Townsley, 2017)]. Bringing together the most influential actors in the field, these scenarios help raise the level of discussion and advance the discipline (see Bottoms, 2012). The participants of these conferences then turn into some kind of "soft

[1] Very possibly there will never be a second edition of such conferences. Note that any resemblance to reality is pure coincidence.

peer reviewers" who help shape research designs and interpret results within the most informed context. In addition, they contribute through criticism to uncover alternative explanations, discuss results, and identify directions for future research. Sadly, such conferences are needles in the straw.

In pursuit of the same goals that advance science, the Annual Conference on the Human Factor in Cybercrime was conceived. This chapter provides an overview of the two editions of this Conference that have been celebrated to date in order to analyse their strengths and identify any aspects that could be improved in order to guide the organisation of the following editions. After introducing a description of the event and its design in the next section, the chapter presents a series of descriptive analyses that allow understanding aspects such as the Conference attendance, the origin of the participants, and the collaboration networks amongst them.

The Annual Conference on the Human Factor in Cybercrime

To learn about the origins of the Annual Conference on the Human Factor in Cybercrime, one needs to go back a few years and understand the development of intellectual movements in the context of growing interest in cybercrime research. One of the pioneering movements in this domain was the International Interdisciplinary Research Consortium on Cybercrime (IIRCC). Formally established in 2015, the IIRCC was conceived as a global initiative that aims to bring together the leading scholars in the field of cybercrime and cybersecurity with practitioners —regardless of their background— to achieve two main objectives: advancing the state of the art in the

discipline, and providing solutions for a secure Internet [2]. As prolific researchers, the original proponents of this movement had a great presence at the most important international scientific events, which constituted ideal scenarios to promulgate the principles of the IIRCC. Inspired by this initiative, researchers from all over the world began to join its ranks. According to its website, IIRCC members currently represent institutions from at least that nine different countries. And they continue to thrive.

In parallel, the growing interest in cybercrime research was becoming evident at the two major criminology conferences: The Annual Conference of the European Society of Criminology (EUROCRIM), and the American Society of Criminology (ASC) Annual Meetings. After two decades of history, nobody disputes that these two are the most important criminological research conferences in their respective continents [3]. Over the years, participation in both conferences has continued to grow (Aebi & Kronicz, 2019) [4] along with the presence of cybercrime researchers, setting the

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[2] It was during an informal gathering at the 2nd Annual Interdisciplinary Conference on Cybercrime —hosted by the Michigan State University, see https://global.broad.msu.edu/events/eventdisplay/20375/the-2nd-annual-interdisciplinary-conference-on-cybercrime—, when the participating scholars came up with the idea of providing a formal structure to their meetings, thus originating what is now known as the IIRCC. For more information about the IIRCC, visit: https://cj.msu.edu/iircc/iircc.html.

[3] For more information about the conferences, visit https://www.esc-eurocrim.org/index.php/conferences/upcoming-conferences for EUROCRIM, and https://www.asc41.com/annualmeeting.html for the ASC Annual Meeting.

[4] The historical ASC Annual Meeting attendance figures can be consulted in: https://www.asc41.com/history/Annual%20Meeting%20Misc/ASC_Annual_Meeting_Attendance_Figures.pdf.

tone for news initiatives that transcend territorial boundaries. In response to an increasing volume of cybercrime contributions in both conferences (Figure 1), a bunch of leading scholars in the field —including many members of the IIRCC— resolved to organise the participation of cybercrime researchers by founding the European Society of Criminology Working Group (ESC WG) on Cybercrime in 2016 and the Division of Cybercrime in 2019. As shown in

Table 1, although each has its particularities, both groups preserve the essence of the IIRCC. This is reflected in their mission of bringing together scholars from the field of cybercrime and cybersecurity to exchange knowledge from a global perspective.
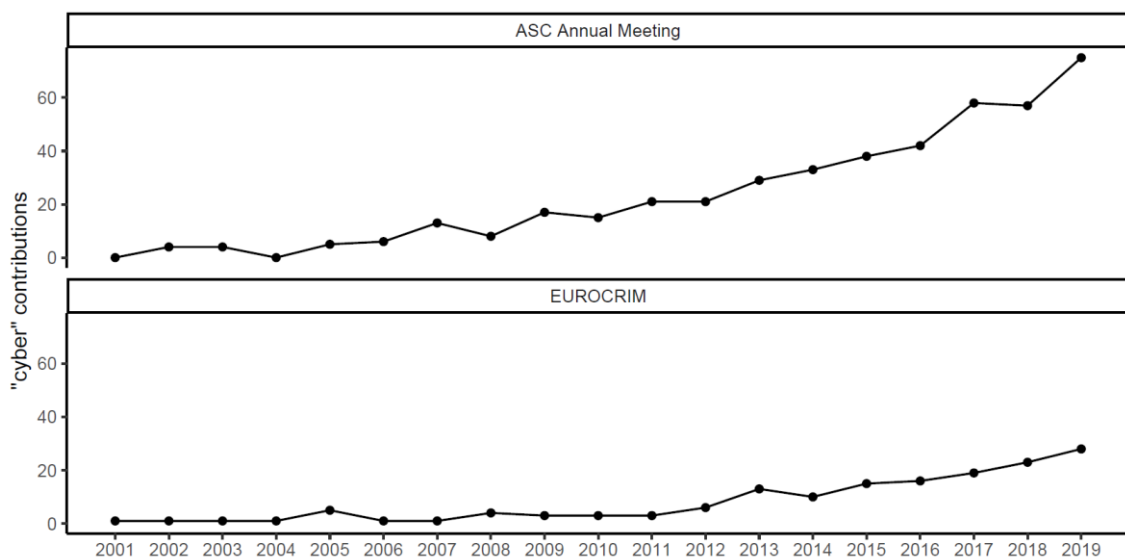

Figure 1. Number of contributions presented at the ASC Annual Meeting and EUROCRIM with the string "cyber" in the title. Source: ASC Annual Meeting and EUROCRIM final programmes (2001-2019)

Table 1. Objectives of the ESC WG on Cybercrime and the Division of Cybercrime

ESC WG on Cybercrime	Division of Cybercrime
1. "Advancing knowledge and research on cybercrime and cybersecurity across Europe (both substantively and methodologically) and other parts of the world, including the United States, the Middle East, and Asia, with plans to expand to other parts of the world. 2. Creating a network for information exchange and international collaboration between leading scholars, starting scholars, graduate students, government agencies, and private organizations involved in cybercrime research."	1. "To bring together in one multi- and inter-disciplinary Division, those actively engaged in research, teaching, and/or practice in the field of cybercrime and cybersecurity. 2. To encourage scholarly, scientific, and practical exchange and collaboration concerning cybercrime and cybersecurity within a global perspective. 3. To develop effective cybercrime prevention strategies and practices. 4. To provide a forum for interaction and the exchanging of ideas among persons involved in cybercrime and cybersecurity. 5. To promote conference sessions pertaining to cybercrime and cybersecurity."

Source: The ESC WG on Cybercrime website, https://www.cybercrimeworkingroup.com/; and the Constitution of the Division of Cybercrime.

Because of its recent creation, the Division of Cybercrime is still in its infancy, but the ESC WG on Cybercrime has been operating for a few years now. To promote the objectives set within the framework of EUROCRIM, one of the fundamental tasks that the chairs of the ESC WG on Cybercrime undertake consists in arranging all cybercrime presentations in such a way that there are no parallel sessions, so that all scholars interested in the topic can attend every presentation. This is no easy task, as to date the working group is composed of 83 researchers, but it certainly favours cybercrime research and also creates a meeting point for cybercrime scholars. However, even these organisations succeed in this task and manage to improve the cybercrime

research scenario in their respective conferences, they would still have to solve other problems in order to achieve their goals. First, the scope of these conferences is, as their name suggest, territorially limited, and to attend such events one must become a member of the societies that organise them by paying a fee (i.e., the ESC or the ASC). Therefore, the very nature of each conference limits the networking capacity of the participants and, with it, the ability to advance the field. And second, EUROCRIM and the ASC Annual Meeting are Criminology conferences that are full of criminologists. This is important because cybercrime research encompasses too wide a field and incorporates many objects of study that are approached from very different theoretical frameworks and methodologies. It is therefore impractical to make an approach from a single discipline. Additionally, this sometimes makes communication between cybercrime researchers difficult.

To illustrate the latter, note there is a great stretch from the most technical approaches that require knowledge in computer engineering and data science, to the most theoretical approaches that require a deep understanding of phenomena from the social sciences. In such a young discipline, this divergence allows many aspects of cybercrime research to be explored. But in order to achieve greater depth and scientific rigour, it is necessary to deepen certain aspects from the standpoint of specialisation. In favour of the latter, scholars promoting a new conference model urged a more specific thematic shift: from *cybercrime* to *the human factor in cybercrime*. The Human Factor in Cybercrime encompasses several aspects: the victims who suffer from it, the offenders who commit it, the police strategies that are implemented for its formal control, the role that people and institutions have in its informal social control, the interaction between all these actors and the environment for its prevention, and the contribution of criminological theory in understanding and modelling all of them

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(Leukfeldt, 2017; Leukfeldt & Holt, 2020). The study of all these objects is primarily conducted from the social sciences but needs both interdisciplinarity to thrive and a strong venue for the transfer of knowledge.

To overcome these obstacles, two IIRCC members proposed at the 2017 ASC Annual Meeting in Philadelphia to organise a different conference scheme in 2018. The new conference would not be just continental, but global, and no membership fees would be requested, only the costs incurred by the participation. In this sense, it would be open to any academics who are active in the field and want to present their work among their peers. Submitted abstracts would then be subjected to a peer review process that would keep the conference small in participation and linear in its development (i.e., no parallel sessions). In addition to the panels, sessions would include roundtables that address hot topics, keynotes by stakeholders to identify research needs, and pitch sessions to promote collaboration on upcoming research ideas. Such format would encourage all presentations to be heard and receive input from the audience, thus generating richer discussions that enhance the knowledge produced. Furthermore, this simpler structure would facilitate the incorporation of stakeholders into these discussions, so that the research produced can be applied, reach the public and impact on society. In this way, the conference would help to strengthen the link between academia and practice, to promote international collaboration between scholars in the same field, to provide soft peer review on the scholars' work, and ultimately to provide an environment that focuses on advancing the field. This conference would have one additional peculiarity: it would narrow its thematic scope to the Human Factor in Cybercrime.

As a result of both a new conference format and a thematic shift, the Annual Conference on the Human Factor in Cybercrime was conceived. After the first edition

was held in 2018 in Israel, a second one was held in 2019 in The Netherlands consolidating its presence. The third edition —to be held in 2020 in Canada— is already in preparation, ensuring its continuity.

The present study

To better understand the growth and development of the Annual Conference on the Human Factor in Cybercrime, we provide an overview of the participation in its two editions of 2018 and 2019. Inspired by the work of Bichler and Malm (2008) regarding the ECCA group, in this chapter we use descriptive analyses as well as social networks to better understand the participation in the conference and its structure. The ultimate goal is to assess its strengths and weaknesses to evaluate whether the conference is directed towards achieving the objectives for which it was intended.

Data

Three main data sources were used in this paper. The first is the data retrieved from the public programme of the conferences and related emails [5]; the second is the information about the members of the ESC WG on Cybercrime and the IIRCC publicly available on their respective websites; and the third are the original participation files maintained by the organisers. The latter had to be used to complement the others because the public programme of the 2019 conference only contained the names of the presenters and not

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[5] For the 2018 programme, see https://csrcl.huji.ac.il/event/1st-annual-conference-human-factor-cybercrime-DayI; for the 2019 programme, see https://www.rechten.vu.nl/en/research/organization/research-programmes/empirical-normative-studies/human-factor-cybercrime/index.aspx.

all the co-authors. Note that data pertaining to members of the Division of Cybercrime were not included since they were not yet publicly available due to its still recent creation. In addition, informal conversations with the organisers and other secondary and external public sources were consulted to complete information on participants (e.g., Google Scholar, personal and institutional websites). All data collected includes the name of participants, their affiliation and country where they develop their professional activity, whether they are members of the ESC WG on Cybercrime or members of the IIRCC —the seeds of the Annual Conference on the Human Factor in Cybercrime— whether they are stakeholders or academics, whether they participated in each of the two meetings of the conference, whether they constituted the organising committee, and their network of co-authors in such meetings. Regarding the latter, tidy data required to explore the collaboration network is composed of two separate datasets, one for the participants and their characteristics (i.e., nodes) and another delineating the connections between the nodes (i.e., edges). Note that participation, therefore, is measured by the authorship of the contributions submitted, not by physical attendance.

Analytic strategy

A dual analysis strategy is used in this paper. Firstly, a descriptive analysis of the variation in the volume and composition of participation between the 2018 and 2019 conference editions is carried out. This includes the variation in attendance with respect to the type of participants, the type of institutions and the number of countries involved.

Secondly, Social Network Analysis (SNA) is conducted to examine the collaborative networks in each of the conference editions. SNA allows to study the individuals that compose a network and the relations that exist between them (Wasserman & Faust, 1994). In this study, the individuals that comprise the network are

the participants of the two editions of the conference, and the relationships that exist between them are the collaborations found in the contributions presented at the conference. The collaborations in each network are displayed in the form of cliques (Luce & Perry, 1949), subnetworks of participants that are connected to each other. The cohesion of the network can also be measured by calculating its density, which indicates the ratio of existing relationships (ER) to possible relationships (PR),

$$Density = \frac{ER}{PR}$$

where PR is calculated depending on the size of the network (n).

$$PR_n = \frac{n \times (n-1)}{2}$$

So, if all participants collaborated with each other forming a large clique, the density of the network would be 1, whereas individual participation in all cases would produce a density of 0.

Data transformation and data visualization were executed using the tidyverse R package version 1.3.0 (Wickham et al., 2019), the sf R package version 0.9-3 (Pebesma, 2018), and the igraph R package version 0.8.1 (Csárdi & Nepusz, 2006) in RStudio version 1.2.5042 (RStudio Team, 2019) for the R free software version 3.6.2 (R Core Team, 2020).

Results

The results of the descriptive analysis of participation at the conferences held in 2018 and 2019, and how it varied from one edition to another, are shown in **Error! Reference source not found.**. To this end, participation was analysed at three levels of aggregation: individual, institutional and national. In general terms, participation in 2019 multiplied compared to 2018, which reflects in an increase in absolute numbers of

each of the parameters in the table. However, the percentages reveal the change in participation in relative terms. Thus, even though the number of members of the ESC WG on Cybercrime doubled with respect to 2018, their participation decreased by 12% with respect to the total number of attendees. And a similar effect is observed for IIRCC participants (- 14.2%). Meanwhile, the number of stakeholders involved increased from 1 to 8, representing a 6.3% increase over total attendance. Note that being a member of the ESC WG on Cybercrime and/or the IIRCC, and being a stakeholder are non-exclusive categories (i.e., stakeholders can also be members of these organisations). At the institutional level, the number of unique entities represented increased by 19. In this case, the variation in the distribution of participation at the institutional level implied a relative increase in the participation of government representatives (3%) and law enforcement agencies (5%) to the detriment of research entities, whether they are universities or research institutes (- 8%).

Table 2. Variation in participation records in the two editions of the Annual Conference of the Human Factor in Cybercrime

| | Conference edition | | | | Variation | |
| | 2018 | | 2019 | | | |
Attendance	n	%	n	%	n	%
Participants	26		79		53	
Organising committee	6	23.1	5	6.3	- 1	- 16.8
ESC WG on Cybercrime	12	46.2	27	34.2	15	- 12.0
IIRCC	7	26.9	10	12.7	3	- 14.2
Stakeholders	1	3.8	8	10.1	7	6.3
Institutions	14		33		19	
Law enforcement	1	7.1	4	12.1	3	5.0
Research	13	92.9	28	84.8	15	- 8.1
Government	0	0.0	1	3.0	1	3.0
Countries	5		10		5	

Finally, the number of countries represented increased from 5 to 10. While in 2018 only three continents were represented (i.e., Europe, America, and Asia), in 2019

all five continents have some form of representation. However, in both cases most participants came from Western Europe and North America.
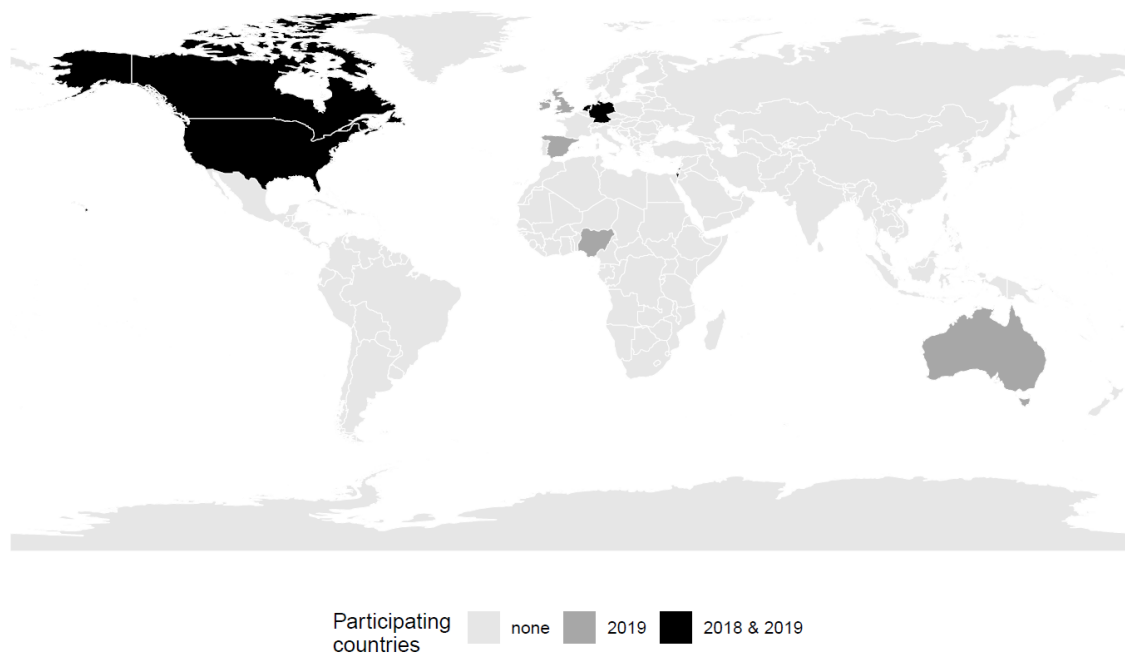

Figure 2. Participating countries in the two editions of the Annual Conference of the Human Factor in Cybercrime

Below, the second part of the analysis serves to graphically illustrate conference networking and to examine it in detail. Figure 3 shows the collaborative networks for the 2018 and 2019 meetings. Three features were used to characterize the participants in the network: the size, to distinguish the organising committee; the colour, to indicate whether the participants belong to the ESC WG on Cybercrime and/or the IIRCC; and the shape, to differentiate whether the participants are stakeholders or not. The existing collaborations in the network are displayed as cliques of two or more nodes, which increased from 7 in 2018 to 24 in 2019. For both conference editions, such collaborations are generally mixed between ESC WG on Cybercrime and/or IIRCC members and non-members. In contrast, stakeholders are rarely involved in collaborations with academics, a circumstance only observed on two occasions at the

2019 meeting. Apparently, the members of the ESC WG on Cybercrime and/or IIRCC play a fundamental role in promoting the cohesion of the network, as they are usually the nexus between various collaborations. Some of them also integrate the organising committee in both editions, which seems more engaged in collaboration in the 2019 meeting. Regarding the cohesion of the network, density analyses yield a value of 0.07 in the 2018 network versus 0.03 in the 2019 network. This means that the ratio of collaborations per participant was higher in the first edition.
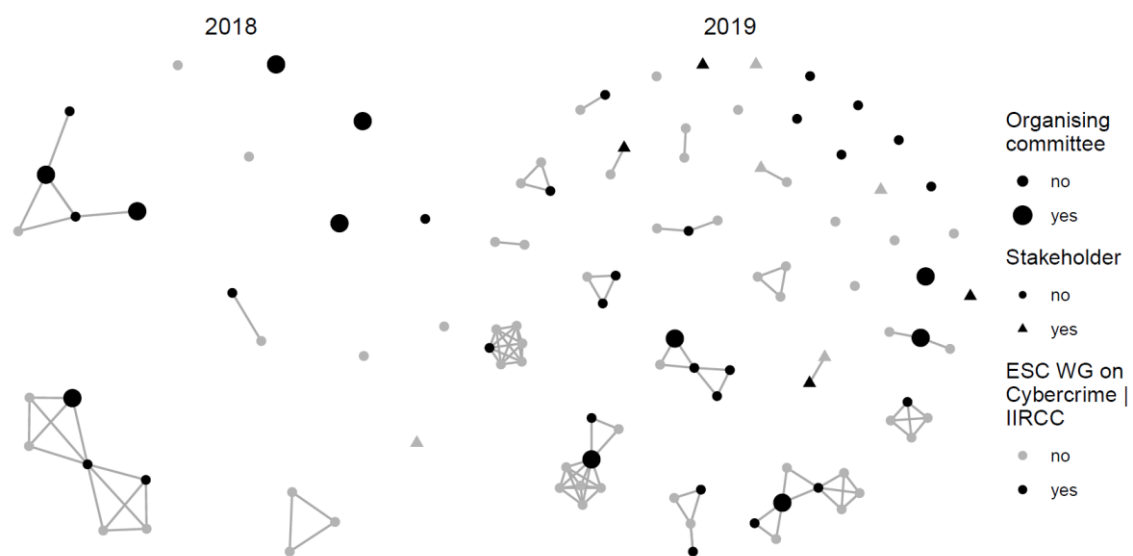

Figure 3. Collaboration networks in the two editions of the Annual Conference of the Human Factor in Cybercrime

Discussion

Although research on the development and purpose of academic conferences is scarce, such an object of study constitutes a cornerstone for the exchange of knowledge that allows for the advancement of scientific disciplines. Research pieces such as Bichler and Malm (2008) on ECCA Symposiums are as infrequent as they are undervalued. In their paper, the authors identify some weaknesses in the social structure of the symposia that allows for their reinforcement in the future. At the very least, the most relevant

conferences should consider appointing a commission to conduct this type of research, which serves to evaluate their function and reorient their design. For this reason, we dedicate this chapter to the analysis of the participation in the two Annual Conferences of the Human Factor in Cybercrime held in 2018 and 2019 and the collaboration networks generated within them. Such action allows us to outline some important aspects to be taken into account for the organisation of future editions of the conference.

The first aspect to be highlighted from the conferences is that participation increased considerably in the second edition. One possible explanation is that the success of the first meeting held in Israel increased its popularity among researchers, but it is also likely that the venue for the second meeting (i.e., The Netherlands) was more accessible to participants given their predominant Western background. A dominance that has also been observed in similar conferences (Bichler & Malm, 2008). Here it should be noted that participation is mediated by the organising committee. Since its members are responsible for selecting the contributions presented at the conference, it is possible that their preferences bias participation. For example, they may prioritize those contributions in which they collaborate, or they may favour some methodological approaches over others based on their own expertise (e.g., quantitative vs qualitative). This, in turn, would affect participant diversity. A second relevant aspect to be discussed is the increased presence of stakeholders representing law enforcement agencies and government entities in the conference. Although they still constitute a small percentage of the total number of participants (10.1%), their presence has escalated in the 2019 meeting, even resulting in some joint collaborations with academics. A third aspect to be noted is that the participation of representatives from other countries also increased, bringing a greater diversity of perspectives to the debate due to the more diverse background of the participants (Bichler & Malm, 2008).

Together, this resulting expansion is also reflected in the collaborations between scholars, which have increased in total numbers with respect to the first meeting.

Such growth causes the cohesion of the network to decrease in the second meeting, since an arithmetical increase in participation requires a geometric increase in collaborations to maintain the same density. For example, a conference with five participants forming one clique would have a density of 1. If the following year this conference doubled the participation to 10, it would not be enough to also double the collaboration by forming two cliques of five participants, since the potential collaborations would be many more in the second case (i.e., $PR_5 = 10$ compared to $PR_{10} = 45$). For this reason, a lower density does not necessarily mean that there is less collaboration among conference participants in the 2019 meeting compared to the 2018 meeting, but rather that it is the result of the growth of the network. Given that the two networks analysed differ so greatly in size, it is appropriate to consider network density as an individual measure and not as a comparative one, at least for the time being.

Having assessed the strengths and weaknesses of the conference, a number of recommendations can be listed to help improve its future orientation. Firstly, it appears that the work of the organising committee is bearing fruit by increasing the popularity of the conference in terms of participation and outreach. Future meetings will have to find the balance between size and cohesion so that communication between participants is fluid and encourages both the formation of new collaborations and the enrichment of scientific discussions. A good practice in this regard is the central role assumed by the organising committee in the collaboration networks of the 2019 edition. Upcoming meetings could benefit from the committee's position to cohere the network of participants. Secondly, the participant networks of both editions show that collaboration between researchers and stakeholders is still scarce. Although the involvement of

stakeholders is not an objective of the conference, for the research presented to be applied, it is important to encourage the presence of stakeholders that constitute the link between academics and practitioners for two reasons: so that research can be used to solve real problems and so that strategies to solve such problems are evidence-based. After all, actors working to mitigate cybercrime and contribute to a better society benefit from working together. Thirdly, the diversity of participants is essential. Participants from different backgrounds can help the network of academics to identify research needs and provide stakeholders with new perspectives on solving existing problems. Keeping the conference focused on interdisciplinarity would be a step forward in this direction.

However, there are some aspects that were not addressed in this chapter and that —at the same time— pave the way for future research. Note that this chapter only measures collaborations within The Annual Conference on the Human Factor in Cybercrime network, so any other existing collaborations not reflected in the conference programmes were not considered in the analysis. Therefore, it is likely that collaborations between the members of the network are more frequent than what is shown here. Participation of young researchers was not examined either. Future research should address this issue by devoting special attention to the definition of young researcher and collecting appropriate data. Generally, it is indispensable that participants' affiliation and membership data are up to date for a rigorous analysis. In this regard, along with continuing to use open data sources, it is advisable to design a specific instrument to collect the data required for evaluating participation in future editions of the conference (i.e., a questionnaire that includes the informed consent of the participants and that complies with current data protection regulations).

Conclusions

This chapter assessed the participation in the two editions of the Annual Conference on the Human Factor in Cybercrime. Two main conclusions can be drawn from the analyses: (1) that the 2019 edition enjoyed a more numerous and varied participation, both in terms of individuals, institutions and countries; and (2) that the members of the ESC WG on Cybercrime and the IIRCC are instrumental in sustaining collaborative networks among participants, despite the fact that there are still many isolated nodes. Overall, it seems that the latest edition of the conference is closer to achieving the objectives for which it was conceived.

Of course, the fact that only two conference meetings were held limits the scope of the recommendations presented in this paper. Nevertheless, with the information available, small structural patterns in participation can be observed that allow useful recommendations to be made. Data from future editions of the conference will allow for more robust analyses that will in turn serve to make more reliable prescriptions.

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