

Stronger Together: How Neighborhood Groups Build up a Virtual Network during the COVID-19 Pandemic

STEFFEN HAESLER, STEFKA SCHMID, ANNEMIKE VIERNEISEL, and CHRISTIAN REUTER, Science and Technology for Peace and Security (PEASEC), Technical University of Darmstadt, Germany

During crises such as the COVID-19 pandemic, people spontaneously initiate support groups, while established organizations like soccer clubs set non-regular goals, both offering help. Interested in the coordination of such help and potential challenges of collaboration, we conducted a virtual ethnography of a multi-level network located in Germany. We focused on aims, activities, and technological mediation, with Activity Theory as theoretical framework. Our findings show that the organizational aim of coordinating help was successfully achieved by connecting heterogeneous actors through digitization and institutionalization. Enabled by the context of the COVID-19 pandemic crisis, the network acted virtually, but was also able to integrate analog spaces of help. We identified six crucial implications regarding the use of technology and collaboration for building a successful volunteering network.

CCS Concepts: • **Human-centered computing** → **Empirical studies in collaborative and social computing**.

Additional Key Words and Phrases: crisis informatics, volunteers, social media, collaborative and social computing, COVID-19, pandemic, inter-organizational crisis management, activity theory

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1 INTRODUCTION

At the beginning of the COVID-19 pandemic in early 2020, people across the globe have acted spontaneously, forming support groups on social media, while already institutionalized organizations set new goals, both offering help [81, 85]. In Germany, for example, local Facebook groups were created so that users could both ask for and offer help in their neighborhoods. Related online activities have been described as an act of solidarity in light of mitigation efforts regarding the COVID-19 pandemic [81]. Here, we take a deeper look into one of these emergent networks, which is a typical example of this situation as well as an interesting case of this broad civil engagement.

In crisis situations, reaching out to neighbors facing the same or worse problems is not a new phenomenon [17]. Volunteers may fill gaps in official help by, for example, sharing food and supplies, providing shelter, or even supporting official help by stuffing sandbags during a flood [58]. Crisis volunteering is not only needed because it fills gaps in official help, it is also something that happens in every crisis as an act of humanity, prosocial behavior, and sensemaking. Many recent

Authors' address: Steffen Haesler, haesler@peasec.tu-darmstadt.de; Stefka Schmid, schmid@peasec.tu-darmstadt.de; Annemike Vierneisel, unterschuetz@hiwi.peasec.de; Christian Reuter, reuter@peasec.tu-darmstadt.de, Science and Technology for Peace and Security (PEASEC), Technical University of Darmstadt, Germany.

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works in crisis informatics have paid special attention to crowds of individual digital volunteers as well as their relationships with formal crisis management actors [3, 32, 57, 70, 76]. In view of the COVID-19 pandemic, countermeasures include physical distancing and for vulnerable groups the avoidance of risk behavior. Thus, such volunteer work may increasingly take place in virtual spaces [37]. As the term “Zoom fatigue” has emerged to describe the new challenges posed by the shift in collaborative work behavior almost exclusively to digitally held office meetings [26, 79, 83], we are interested in how the COVID-19 pandemic not only sets needs for crisis volunteering but also affects the volunteering work itself e.g. by overwhelming emerging actors in the use of tools. As different neighborhood groups emerge simultaneously, the relations between groups and the ways they can help, as well as the amount of demand for crisis volunteer work, become increasingly important. This, along with the use of technology, which is more likely to increase in the future, is a key aspect and application of *Computer-supported cooperative work* (CSCW) in crisis informatics. Research can help to better understand processes and support informal volunteers in their efforts to conduct work effectively and, if desired, create more permanent structures.

Considering the emergence of the large number of volunteer groups in March 2020 in Europe, it is particularly interesting to ask how such groups organize themselves and interact with each other and what are the particular but also common goals. The research questions ask for the motivating aims and mid-term goals of a volunteering network that emerged in the beginning of the COVID-19 pandemic crisis as well as the cooperation and collaboration conducted and mediated through technology.

These questions are answered in relation to a volunteering network. In a selection process among 80 crisis volunteer groups, we selected a network of organizations, called “Runder Tisch”, German for *Round Table* (RT), formed in Darmstadt (Germany) by different local actors. This network allows an in-depth examination of volunteer work, which aims to coordinate helpful activities and is characterized by a multi-level hierarchy with interactions between diverse actors, with the administrative team and within the participating organizations. While locally relevant actors such as the church or soccer club show a higher degree of institutionalization than personally motivated individuals, these actors bring different motivations and resources to the multi-level network. We understand an institution “as a relatively enduring collection of rules and organized practices, embedded in structures of meaning and resources that are relatively invariant in the face of turnover of individuals and changing external circumstances” [48]. Given the context of the COVID-19 pandemic, we study the local network and the respective negotiation of aims, actions, public needs, and structures. The *Round Table* (RT) has conducted volunteer work mediated by different technologies. These range from video conference calls to Slack channels, Facebook groups, and analog communication. The organization involves emergent digital groups and individuals as well as extending established organizations that set new, atypical goals in crisis response [17, 56].

To address the research questions, we chose to conduct a *virtual ethnography* of the RT during the COVID-19 pandemic crisis, relying on virtually conducted interviews with members, participatory observations of their meetings, and analysis of public and intra-institutional communication. The data collection from April 19 to May 2, 2020, allowed us to examine the activities of the RT during the disruptive initial phase of the COVID-19 pandemic, while also revealing that the situation was already easing at the end of the aforementioned study period. As the crisis has affected both our own and the network’s working process, the emphasis on virtual space through the pursuit of an ethnographic approach allowed for a deep analysis of the network’s aims, activities, and arising problems.

In line with CSCW and HCI research, we have chosen *Activity Theory* (AT) as the theoretical framework of our research [33]. AT allows us to have a lens in our *virtual ethnography* that looks at the interactions of actors through their use of tools and artifacts. The framework allows us

to decompose activities into several parts: Purposeful, need-related interactions of actors with the world in the form of an object. The interaction does not stand alone, but is mediated by the use of instruments and influenced by the environment of that action in the form of rules and the community. Activities can be split into divisions of labor, motivating goals can vary over time, and activities may become routine.

Further, we derive six implications, concerning the appropriate choice of software or needs of volunteering networks. We infer that a diverse and heterogeneous volunteering network is a successful model, not only regarding integrating analog spaces, but also in terms of different competences that are crucial in the digital realm.

This study contributes to research on digital crisis volunteering with a new extent of a crisis in Central Europe since the Spanish Flu, highlighting a diverse volunteer network which is different to previously seen crisis volunteering. Regardless of this crisis, it is an exciting case of such a heterogeneous network integrating so many different actors, e.g., individuals representing a social media group, but also established organizations such as sports clubs at a volunteering level.

In the following, we present the body of related literature (see section 2) on digital volunteerism in crises, crisis collaboration, and crisis coordination. Additionally, we elaborate on the relevance of AT, highlighting research gaps and our research questions. Then, we introduce the methodological approach (see section 3) and explain how we selected this interesting case. Further, we describe the processes of data collection and analysis with the integration of AT. In the fourth section (see section 4), findings of the analysis are illustrated and evaluated. Finally (see section 5), we discuss the results in light of related scholarly contributions, point out six implications, and consider the limitations of our study as well as the potential for future work.

2 RELATED WORK

As illustrated by Reuter et al. [58] and Palen & Hughes [52], research on social media use in emergencies has established itself as a scientific discourse, often summarized under the term *crisis informatics*, that regularly addresses issues of CSCW. As pointed out by Pipek et al. [53], complex crisis situations collide with the high number of opportunities to use communication and collaboration technologies. Today, crisis informatics as a multidisciplinary field is primarily dedicated to the use of “personal information and communication technology to respond to disasters in creative ways to cope with uncertainty” [51].

In this section, we present related work that focuses on digital volunteerism in crisis situations. First, we give examples of volunteering in different crises, especially public health crises and the COVID-19 pandemic and briefly introduce the crisis context of our work, then address the aspect of social distancing and the challenge to analog-virtual volunteering, how social media can help to maintain social scaffolding and community, and what is needed to exchange data and help in this analog-virtual context. (see section 2.1) Next (see section 2.2), we show categorizations of volunteers, their diversity, and how groups, networks, and organizations are challenged in collaboration and coordination in analog and digital spaces as well as in their formalization status. Additionally, we introduce works inspired by AT and briefly mention several related HCI theories (see section 2.3). Finally, we repeat the shown research gaps and present our research questions (see section 2.4).

2.1 Volunteering in Different Crises: Activities, Effects and Challenges

Crisis informatics scholars show that crisis volunteering is a broad phenomenon and focus on different types of disruptive situations and crises, depending on the cause, duration, visibility and expansion. Among these, works have focused on disasters such as earthquakes [22] or hurricanes [69], but also on crises like terrorist attacks [7] or mass shootings [77]. Crisis situations vary in duration, with relatively short-lived immediate incidents as well as long-term emergencies such

as war [45, 65], influencing cooperation and collaboration in crisis volunteering on social media [46, 62, 78] in crisis volunteering.

Regarding pandemics, scholars have been interested in social media collaboration between governmental and individual or collective non-governmental actors, dedicated to practical implications for public health crisis management [4, 11, 30, 40]. As the COVID-19 pandemic crisis was the first disruptive long-term pandemic in the *Global North* since the Spanish flu about one hundred years earlier, analyses of pandemics and public health crises have been mainly concerned with cases from the *Global South* [67]: Gui et al. [24, 25] have been interested in the Zika virus and individual risk perceived online. Tambo et al. [73] have examined options of digital technology and mobile applications for emergency response in the context of the Zika and Ebola epidemics. They emphasize that parts of the population may not have access to mobile phones, while decision-making based on electronic data may exclude those who are already at risk, which is also a challenge in the COVID-19 pandemic where, e.g., contact tracing apps are endorsed, but not all citizens have a smartphone or an appropriate model. Recent research [74] in the course of the COVID-19 pandemic has focused on volunteers in Thailand, illustrating the work of analog village health volunteers who empowered people and communities to care for others or paid special attention to the issue of misinformation [1].

Our work contributes with a case of a volunteering network in Germany. The disruptive situation of the COVID-19 pandemic in Germany in mid-March 2020, that determines human cooperative interactions through and with social media, is characterized by the relative invisibility of the virus and its duration, similar to prior public health crises in the *Global South*. The latter allows for a reduction of actions taken due to the unexpected nature [49] of the crisis event. At the same time, it differs from previous studies on public health crises in that affected populations may have more access to resources and the organization of local digital volunteers is of research interest.

Volunteering tasks in crisis volunteering range from purely virtual to analog on-site volunteering and also include mixed forms. Across different activities and constellations of collaboration, ranging from social media analysis during emergencies to the emergence of local volunteering communities for immediate help, the integration of virtual and analog sites has become crucial [57], with a number of challenges to overcome [58], such as information overload [42] or support of volunteer moderators of social media groups [59]. Due to the epidemiological character, crisis management measures in the context of the COVID-19 crisis entail physical distancing while immediate infrastructural or environmental destruction is absent [37]. Thus, actions that volunteers perceive as necessary, as well as the extent to which they are conducted on virtual sites, differ from crises studied in Europe.

The decline in social interactions and reduced mobility led to a lack of face-to-face contact and opened up new spaces for neighborhoods to connect locally or online. As Shklovski et al. [68] have pointed out, social media are used in times of crisis to refocus on community and produce public goods. This is particularly prevalent when individuals are locally dispersed [68]. Semaan & Mark [66] have shown that social media users who are directly affected by a crisis can benefit from online interactions by reconstructing their social network. Further, they emphasize that social media such as Facebook may be used to both offer and seek help. This help consists of the exchange of goods, labor, and information and has to be organized through a matchmaking process. For this purpose, Purohit et al. [54] have presented machine learning methods that match seekers and suppliers on Twitter. In the context of emergency management of hurricane Sandy or the European floods in 2013, they also distinguish thematically between relief items such as clothing, shelter, food or blood [54, 59].

To enable informed action, gathering data and external but also internal visibility of data is important. Focusing on information aggregation on Reddit, the ethnographic study by Leavitt & Robison [39] has investigated information visibility determined by network gatekeeping in the

context of crises. Subsequently, LaLone et al. [38] have conducted an ethnographic study of the gatekeeping role of the web aggregation community Reddit after the Boston marathon bombing and its reaction to user interface redesign. Information convergence may also prove useful in collaboration with formal emergency services to provide situational awareness [9, 13, 29]. The coordination of time-critical tasks in self-organized teams can be critical, as it is not only important to specify roles, but also the visibility of assigned tasks and their status [62, 86].

The prognosis of a longer duration as well as the principle of physical distancing distinguishes this crisis situation from others in the Global North, where the digitization of processes is advanced and related resources are still available. But also on a global level, digitization within this crisis is contrasted with a new increasing integration of virtual sites into everyday life.

2.2 Diverse Volunteering Actors

In cases where emergency services do not have sufficient capabilities, volunteers may contribute to the management of the crisis [82]. Works have concentrated not only on the specific nature of crises, but also on cooperation and collaboration between different actors [20]. Purohit et al. [55] have categorized (disaster) response communities according to their formal status. This is consistent with the work of Schmidt et al. [64], who have differentiated between citizens and response organizations as actors in the context of emergency management. The crisis communication matrix by Reuter et al. [60] distinguishes four observed information flows of social media use in emergencies, one of which relates to citizen-to-citizen communication in self-help communities. While some volunteers carry out activities in analog spaces and can be found on-site [57], the work of virtual volunteers is characterized by processes of collective sensemaking, that involve distributed work of information gathering and sharing via social media [70]. Contributions of digital humanitarianism [8] have focused on digital volunteer networks where locals collect and share data online and international digital journalists carry out media coverage remotely. Social media can bridge cooperation among different actors to support on-site crisis help by filling gaps with off-site volunteers as a highly decentralized way of self-organization of crisis volunteering groups [63, 71].

The focus on more loosely organized digital volunteers has become prevalent, with “digital humanitarians” as a remote response network distinguished from local volunteers in the context of collaborative analytics [29], while emergent communities are considered to be constituted by many individual actors [9, 51, 68, 71].

Regarding crisis volunteer groups, Van Gorp [75] has categorized *volunteer and technical communities* (V&TCs) them into four categories based on their main activity (i.e., software platform development communities, mapping collaborations, expert networks, and data aggregators) and has identified organizational challenges in collaboration with aid organizations such as limited resources. Auferbacher & Tellioglu [3] have considered the organizational background of *emergent groups* in relation to established emergency organizations that carry out formal activities. They follow Quarantelli & Dynes [17] and investigate interactions between established and emergent disaster management groups by emphasizing institutional flexibility of an informal network. Furthermore, Goggins et al. [22] have focused on the online forum activity of a government-NGO coordination network. Starbird & Palen [72] as well as Gambo et al. [21] analyzed activities of “Humanity Road”, a non-profit disaster response organization that emerged from a loose network of virtual volunteers in the aftermath of the 2010 Haiti earthquake.

Our work is interested in the cooperation of such a network, assuming differences in activities among diverse actors. The emergent network is constituted by volunteers [82] in the context of the COVID-19 pandemic, while its nodes represent not only emergent but also extending actors already institutionalized for other purposes [17]. Coordination and collaboration among different types of actors and organizations is not just about whether volunteer groups cooperate with formal crisis

help or only internally, but also about how intra-organizational coordination and collaboration among volunteering groups needs to be managed. Especially at the beginning of a crisis, as seen with the COVID-19 pandemic in early March 2020, there are many foundations and initiatives of extending groups with the same or overlapping goals not only in social media but also in traditional analog engagement that need to collaborate somehow.

2.3 Cooperation and Collaboration Efforts through the Lens of HCI Theories

Our work follows other ethnographic approaches [70] of crisis informatics. As highlighted by Halverson [27], both *Activity Theory* (AT) and *Distributed Cognition* (DCog) are applicable HCI theories for the study of human activities as well as collaborative work and use of technology [6, 28, 36]. Yet, *Distributed Cognition* (DCog) does not privilege human over non-human actors in examining functional relationships among components of a system [27] and related studies like that of Luther et al. [43] have focused on cognitive processes distributed across people and artifacts. We have chosen AT with particular attention to human agency. This implies an analysis of the instrumental use of technology by actors, while the latter may mediate human actions. It also considers formulated goals ascribed as properties [34] of the various actors, some of which represent established institutions. Other theories could also be considered for specific aspects in the context of collaboration and coordination, e.g., *Coordination Theory* [12, 44] and *Distributed Leadership Theory* [23, 31, 43].

As shown, AT as analytic framework is not new to CSCW, but rather an exception in the context of crisis informatics. This is surprising, as human agency and technological mediation in crises is an important aspect of successful volunteering. Ethnographic applications of AT allow for an initial, holistic picture of network actors' goals as well as technologically mediated actions. In doing so, it is not presupposed that relationships exist solely when they are functional [27] or are less worthy of investigation when they challenge harmonious collaboration [44].

2.4 Research Gaps and Questions

By conducting a multi-site study with a virtual ethnography of a volunteering network in the context of the COVID-19 pandemic in Germany, we aim to investigate a novel case of digital volunteerism in the sense of a new extent of emergent crisis, a push of digitization as well as the organizational form of this network. As the network we investigate (see section 3.1) works in the context of coordinating help among local initiatives, our work is dedicated to the study of the corresponding activities and addresses gaps but also continuations of related work. (1) Previous studies on similar epidemics have focused on countries of the Global South, which may be complemented by our investigation of virtual volunteerism in the context of a relatively institutionalized network located in Darmstadt, Germany (see section 2.1). (2) This multi-level network is characterized as a collective actor integrating individuals, emergent and extending groups and allows us to focus more specifically on a certain type of informal volunteering that is primarily associated with the effort of intra-organizational work (see section 2.2). (3) Not only does our work contribute by applying AT in the context of crisis volunteering, AT also helps us to evaluate the influence of tools, identify matching or competing goals in the coordination process, and also relate them to the actors' actions in the context of the COVID-19 pandemic crisis (see section 2.3). Consequently, we formulated two research questions:

RQ1: What are the motivating aims and mid-term goals of the volunteer network?

RQ2: How is both cooperation and collaboration within the network conducted and mediated through technology?

With respect to RQ1, by focusing on network aims and goals, we distinguish between underlying long-term aims and more action-oriented, medium-term goals. In addition, as we shed light on both aims and goals of the network as a whole over the course of its and the COVID-19 pandemic's beginnings, we further derive actor-specific aims and goals which may not be consistent with each other. Answering RQ2, we are interested in network activities, less abstract actions, and procedural operations. Based on these AT concept, it is possible to systematize interactions hierarchically and in terms of their environment and initiating needs. Focusing on tasks that are performed both cooperatively and collaboratively, we are particularly interested in technological mediation. With respect to the volunteer network, it may primarily be about enabling human agency. RQ2 asks not only about successfully conducted actions, but also about the challenges of computer-supported cooperative work.

3 METHODOLOGY

Our approach allows for the consideration of multiple sites that are reflections of the envisaged network. Thereby, “the essence to multi-sited research is to follow people, connections, associations, and relationships across spaces” [19]. It stresses the context of actor networks and assumes that the interconnectedness of subjects and the context of actions are crucial [10, 19]. Virtual ethnographies offer such potential applied to works of HCI and CSCW [2, 5, 15, 16, 80]. The inclusion of virtual sites expands the boundaries of the field and offers the possibility of grasping (im)mobility or being “*here* and *there*” at the same time [5]. In the following, we describe the case selection (see section 3.1), followed by the process of data collection (see section 3.2) and data analysis (see section 3.3).

3.1 Case Selection

Since mid-March 2020, we had observed 80 different neighborhood initiatives in five German cities. The co-habitation of many people increases the spread of disease in cities of more than 100,000 inhabitants [50]. We gathered accessible data of the initiatives regarding their development of size, integration of digital and analog means, their target groups and institutional background, founding date (before or during the crisis), and their publicly accessible chats. We were also interested in their specific activities, which may go beyond dichotomous matching of demands and offers of help. The group should have been founded in the wake of the emerging crisis and should integrate not only social media groups, but also established actors from civil welfare, neighborhood clubs, or other civic engagement. Based on these preliminary data, on April 1, we selected from these 80 a group that operates digitally but also integrates analog spaces, attempts to address different parts of civil society, matches offers of help, but also conducts activities itself such as mental support for volunteers or information campaigns. Aligned with these criteria, we identified that the initiative “Runder Tisch”, *Round Table* (RT), which forms a multi-level network of actors with different degrees of institutionalization and personal skills, was the best fit and an interesting case for conducting a virtual ethnography. While observing virtual meetings of the network, which were open to existing and future actors of the network, we interviewed representatives of a Facebook group which emerged in the course of the COVID-19 pandemic, a political party, a church, and a local soccer club, all of which represent institutions with different social purposes and extending their activities and aims in light of the crisis. The RT was founded in the wake of the COVID-19 pandemic and has been active in both virtual and analog spaces. It is located in Darmstadt, Hesse, which has a population of 159,207 and an average age of around 40, a balanced ratio of young and older citizen groups, and is directly connected to an international airport as well as the national highway and railway network. The city describes itself as “*Digital City Darmstadt*” with a smart city strategy and offers multiple sites of *Information and Communications Technology* (ICT) usage in general.

3.2 Data Collection

Table 1. In the data collection process, we gathered public data of each organization associated with the interview partner, as well as data of the *Round Table* itself.

Case	Organization	Material
1,2*	<i>Round Table</i>	2 Interviews, 8 Observations of 5 Events, 1 Flyer, 1 Newspaper Article, Slack archive with 664 posts in 25 channels, 13 Protocols.
3	Facebook Group	1 Interview, 12 Facebook Posts with 109 replies.
4	Political Party	1 Interview, 3 Facebook Posts w/o replies, Website, 1 Newspaper Article.
5	Church	1 Interview, Website, 5 Newsletters.
6	Local Soccer Club	1 Interview, 10 Facebook Posts with 152 replies, Website, 1 Newspaper Article, 2 Flyers.

* = Interviews only, other data belongs to all cases because all are members of the *Round Table*

Table 2. We conducted six interviews with members of the *Round Table* doing administrative work and/or representing an organization.

Case	Pseudonym	Profession	Organization
1	Valentin	Data Scientist	Admin RT
2	Lukas	Student / Software-Developer	Admin RT
3	Maike	Student	Facebook Group & Admin RT
4	Tamara	Student	Youth Organization of Political Party & Admin RT
5	Hans	Pastor	Church
6	Zacharias	Fan coordinator	Local Soccer Club

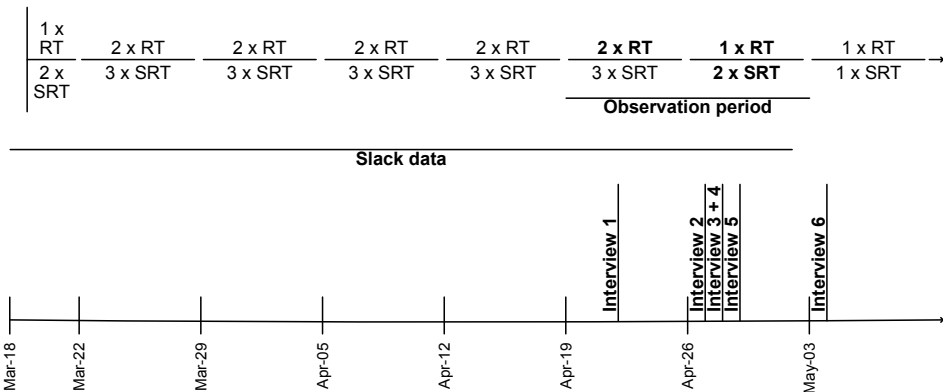


Fig. 1. Timeline of *Round Table* meetings (RT), admin meetings (SRT), and data collection that we conducted. RT & SRT printed in bold are the meetings we observed as attendees. While our observation period and interviews took place in late April, four and a half weeks after the founding of the *Round Table*, the Slack data and other documents cover the entire period of the initiative since its beginning.

For the analysis, data was collected consisting of different sites of the Darmstadt organizational network RT (see table 1) covering a period from mid-March to early May, that reflects the most stressed time period of the emerging COVID-19 crisis and the beginning of a moderate slowdown in infections. This entailed participatory observation [2] of three of the initiative's (bi-)weekly round tables and two administrative meetings, so-called "small round tables" (SRT) from April 19 to May 2, 2020 (see figure 1), as well as six semi-structured interviews with individuals representing (or even administrating) initiatives of the network (see table 2 and 3 Appendix). Both data collection processes took place simultaneously in order to benefit from the different sources by reflecting on the data among the conducting researchers. During the participatory observation, an adequate balance of closeness and distance was ensured, as it was conducted by individuals who were involved to varying degrees. The meetings took place via Skype for Business, and after consensual confirmation, relevant information was recorded with manual notes. Access to minutes of the RT meetings allowed to focus on the relevant actors. To gain insight into the collaborative work of the network, Slack communications were exported on May 4 with data from March 18 to May 2, encompassing all chats in 25 channels (see table 5 in Appendix), as well as analytic data with message and user counts. The JSON-based Slack archive was pseudonymized and converted into PDF for qualitative data analysis. Individual interviews took place via Skype and were audio-recorded and subsequently transcribed in a pseudonymized format. The interview partners were invited via e-mail, through which they also received a declaration of consent which they signed. Interviews lasted between 45 and 60 minutes and were all conducted by the same researcher. Interview partners were selected based on the structure of the RT after the first observation. We examined organizers and decision-makers as well as participants who play a particular role concerning the use of digital tools. Additionally, we collected flyers, newsletters, and communications from the key players in the network (see table 1). This provided for a holistic overview of the field.

3.3 Data Analysis

The virtual ethnography comprised participatory observation of the virtual RT. At the same time, the field was accessed not only through observation but also by posing questions to involved RT actors. Conducting semi-structured interviews and participatory observation for data collection already allowed for reflection on the aims and activities of the network. Manual coding of the empirical material in MAXQDA (MAXQDA Analytics Pro 2020, Release 20.0.8.) facilitated the extraction of insights by structuring the content in terms of Activity Theory. Analysis of the textual data was performed by labeling according to code categories and (sub-)codes (see table 6 in Appendix).

The coding scheme was developed abductively, influenced both by the empirical material and by the theoretical framework of AT. Regarding the latter, we used AT concepts inspired by Leontiev [41], where various components are relevant to describe activities: an active *subject* directs the activity towards an *object* mediated by artifacts or *tools*. Subjects can be individuals who fulfill their needs through an activity towards an object [35]. Therefore, an object is based on a motive that corresponds to the need and can be material but also immaterial. An important aspect is that activities are influenced by both the need of a subject and the motive with respect to an object. Interaction between subject and object is mediated by a tool, which in turn conveys the activity itself. To analyze the complexity of activities, a three-level hierarchical structure is used [41], which allows to capture interactions of different relevance by manual categorization. At the top is the *activity*, which is directed towards a motivating object. To achieve the subject's aim, a sequence of *actions* can be executed, which are located on the second level of the hierarchy. Actions are based on concrete *goals*. Subjects are typically aware of the goals they want to achieve, but not necessarily of their foundational long-term *aims*. A set of *operations* form an action and

thus the smallest unit in the hierarchy. Operations can be seen as routine processes that allow an action to adapt to the situation. They may be initially improvised and subsequently automated [35]. Actions and operations can focus on the same goals. Accordingly, both types of behavior can occur simultaneously. The concept of *community* accounts for contextual mediation [18]. The community, which shares the same object of activity as the subject, influences the subjects through rules and norms, but also on objects through *division of labor*. Collaborative work is achieved through the distribution of actions among different actors. The *goals* of all actions are aligned with the *aim* of the overall activity.

Consensus coding [84] was conducted by an interdisciplinary group of researchers trained in informatics, HCI, psychology, and the social sciences. Diverse backgrounds contributed to deliberative, collective reflections on the qualitative analysis. In total, we tagged 9,180 codes across 87 documents. Using the AT-based coded material, we analyzed the data to identify organizational aims and goals at the network level, followed by the actor level, and then proceeded to examine cooperation. For each technological tool used by the network, we examined its usage and its mediation of actions. Our virtual ethnography allows us to derive implications that may indicate vantage points for future research focusing on concrete design implications [14].

4 FINDINGS

Based on the qualitative analysis, we report our findings by first describing the network (see section 4.1) and then relating our results to AT. We have separate sections for answering RQ1 regarding aims and goals (see section 4.2) and RQ2 on collaborative actions, concerning cooperation and technological mediation (see section 4.3). Further, we consider all aspects of AT as presented in our coding scheme (see table 6 in Appendix). For citations, we use the abbreviations of the cases listed in table 2, the observations in table 4 as well as the Slack channels in table 5, all in Appendix.

4.1 Network

The network (see figure 2) was founded under the impression of the COVID-19 pandemic in Italy, which hit very hard, and it was still unknown how Germany would be affected (I1). The COVID-19 pandemic spread in Northern Italy before it hit Germany on a large scale and led to alarming images on the news, showing hospitals at capacity levels, or military convoys transporting coffins [61]. The two members of administration, Valentin and Lukas, organized the first Skype meeting with 15 participants on March 19, 2020 to coordinate local support groups in Darmstadt (see pseudonyms in table 2 in Appendix). The RT is considered an open network that others can join and grew to about seventy members by early May, with each meeting having about 10 to 20 active members. Five members form a group of administrators, with Valentin playing a strong role as the informal leader of the RT who moderates the meetings. Lukas is the actor responsible for technical tools and the maintenance of documents. Almost none of them knew each other personally, but they connected rather spontaneously in the emerging COVID-19 crisis. The five-member administration team, all founding members, prepares and organizes the virtual meetings, moderates the Slack channels, creates content, and organizes the overall activities. The individual members represent very heterogeneous actors, including established groups such as the local soccer club, political youth organizations, a community church, an aid agency, a consumer center and a small theater. Additionally, there are individuals with special skills and backgrounds as well as administrators of spontaneously created Facebook groups, for example the public group of Maike with 2,124 members (May 13).

Due to restrictions, the meetings are held virtually using Skype for Business. Like other video-conference tools, it provides video and audio connection, chat and the possibility to use a link or dial in via phone to join a meeting. Slack is used to manage collaboration between meetings and

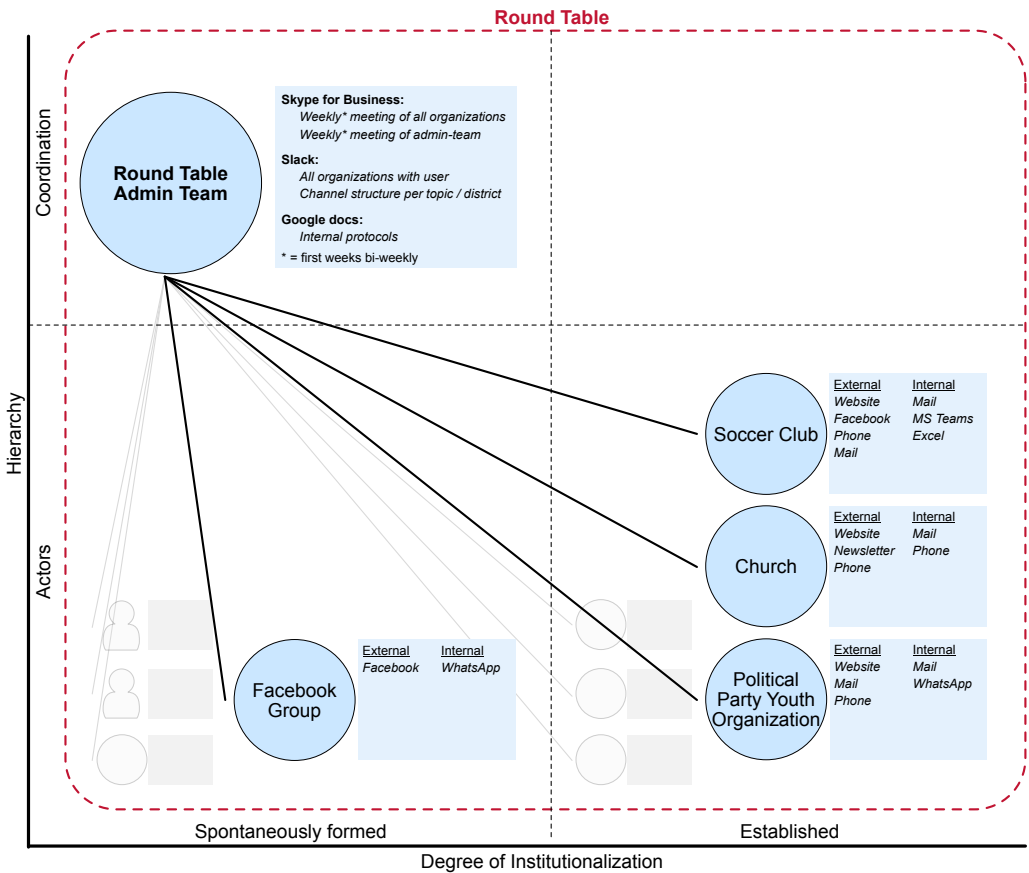


Fig. 2. The organizational network of the *Round Table* includes different actors, which also can be individuals. The RT meets on a teleconference on a weekly basis and communicates via Slack in between. The network actors show a different degree of institutionalization (horizontal) and different layer of hierarchy levels (vertical). Each actor is associated with technology used to coordinate help internally and to externally manage help requests. In this network, there is no established group that has been active in crisis management before like local authorities (top right corner).

for structuring work, with multiple channels available for neighborhoods or topics (see table 5 in Appendix). For each virtual meeting, a protocol is written down and sent to the participants by e-mail. The admin meetings are recorded with a Google Doc, which is constantly being expanded (I2). The group also created a flyer with offers of help to be distributed in every household in the city. The flyer was open for members to disseminate their offers (helping with groceries or other errands, taking dogs for a walk, or give mental help) and also provided ways to contact the RT itself (SC02).

4.2 Organizational Aims and Goals

In the following, we address RQ1 by first presenting the aims of the network considering the administrative level of the RT and subsequently the actor level, and then the mid-term goals considered necessary to achieve these goals and intersections, as well as possible conflicts of interest.

4.2.1 Aims.

A coordinating platform: While the network saw the general need to respond to the current crisis and offer help, the primary aim of the RT is to enhance coordination among the different actors. Thus, the aim of the network is not only broadly defined by successfully helping others, but also by providing a coordinating platform for actors involved in pandemic-related help activities:

“Well [...] the aim of the RT is to connect helpful initiatives and organizations to ensure that aid actually reaches those in need and that overload of single initiatives or organizations can be cushioned while free capacities can be used optimally” (I2).

This is an aim that relates to organizing activities rather than initiating own help activities. Thus, the network considers coordination based on the principle of division of labor as its foremost aim, formulating more explicitly than at the beginning a specific type of coordination. Since then, virtual meetings have been held once a week instead of twice a week, while initially the initiators met daily (O1, I1). At the same time, as the head of the RT administration team pointed out, this aim was motivated by the need to avoid a future development of the crisis similar to that in Italy, which was confronted with the COVID-19 pandemic earlier than Germany and had problems to prevent its spread:

“[...] so at the beginning, we planned a Round Table for every day, because we couldn't see what would happen in the next two weeks; would it be like in Italy in two weeks or not?” (I1)

Locality: The network sees itself as a local solution and welcomes this local character: *“We have decided against [expansion onto the county] [...]. It is better to do something useful on a small-scale than to just talk big and do nothing” (I5).* It has also structured the content of channels representing local neighborhoods: *“Lukas 2020-03-22 15:22:15 Lukas has set the goal for the channel: [...] 210 Johannesviertel, 220 Martinsviertel-West [...] <https://stadtatlas.darmstadt.de/#>” (SC14)* It is indicated that the network's aim of coordination has changed in intensity over the course of the crisis (O1). Initially, it was pointed out that networking among local actors was crucial (I1, I2, SC25). Later, this aim was elaborated more concretely, focusing on division of labor of activities. (I6).

Institutional network character: At the same time, the analysis suggests that as the network is interested in efficient coordination of the actors involved, it also aims at an institutional network character, which allows for a higher degree of diffusion of aims. However, lower formalization of institutional structures such as hierarchy or division of labor is also envisioned (I1). Thus, the network also aims at flexibility in the implementation of activities in the context of coordination. It is further possible to identify a third phase, referring to the “post-corona” period or diffusely to the future. In this respect, some network members in higher ranks anticipate a coordination network that is not only dedicated to corona-specific activities but *“wish that at some point, like, in some way, an organized society will emerge” (I1).*

4.2.2 Goals.

Publicity: As highlighted in the analysis, the RT has formulated or achieved a set of different goals in the context of the network's underlying aim of helpful coordination. These include increasing publicity, *“not [necessarily] with regards to the public but to strengthen the network's impact to ensure functionality” (I1).* To the RT it is not about general popularity for its own sake but to connect with potentially relevant actors.

Use of tools: Further, it was crucial for the administration of the RT to use technology efficiently by analyzing user statistics of Slack (O3). There are genuine goals like regular meetings (I1) or

structuring the work process with collaborative software, as “*it is a system, which is easy to grasp*”(I2). It was also seen as a goal to facilitate technology usage by providing Slack training and highlighting the absence of background noise through the silent mode during Skype for Business sessions (O5, I1). At the same time, it is about promoting good communication by offering virtual meetings, that are the main communication channel (SC02). Here, diffusion of technical knowledge is very important as well as to avoid miscommunication and two parties working simultaneously and uncoordinated on the same thing (SC02).

Risk groups: Throughout the actor network, so-called risk groups, i.e., people with pre-existing health conditions and senior citizens, were the main target groups regarding help activities (I6). In order to involve elderly people, actors tried to reach their audience through analog media like the local newspaper or flyers which were distributed to households. Overall, actors were certain that “*people over 60 use telephones, younger use e-mail, regular as clock-work*” (I6). Still, Zacharias was aware that some elderly users are skilled and actively participate in the soccer club’s Facebook group (I6), while another actor supported the impression of a digital gap according to age:

“I realized about the older generation, those who can potentially use a web portal, they can organize help for themselves, often have grandchildren who help [...] and people who call us, if you talk with them, they have no relatives nearby, or no partner, they are lonely” (I4).

Different ways of communication: Flyers referred to the actors’ phone numbers, again choosing a traditional communication technology, considering their common target audience and potential information overload regarding the flyer. At the same time, Zacharias’ goal was to offer communication via e-mail, as some people were reluctant to call in person (I6). As reaching older people was a common aim of the actors, it became one of the entire RT, as evidenced, for example, by the creation of a flyer (SC02). Even though individual goals such as offering communication via e-mail were not adopted by the RT, the network pursued Zacharias’ goal of separating Facebook Messenger communication related to the soccer club from the actor’s network activities (I6). This was taken into account by not mentioning the Facebook Group of the soccer club on the RT flyer. In the course of events, Hans introduced the possibility for church members to contact each other via e-mail (I5). In this way, one actor’s goal, being interested in technological usage, was established in the context of the RT’s work, while the organized soccer club was able to separate its activities more clearly.

Matchmaking: Furthermore, Maiké, who is both part of the network’s leading group and an administrator of the public Facebook group, expanded the network’s goal of being a present actor in civil society by focusing on the accumulation of individual volunteers. This is accompanied by her aim of enhancing a vivid matching process between individuals who need help and those who offer it: “*The goal is simple: matching help-seekers and help-suppliers*” (I3).

Intersecting and conflicting goals: While the matchmaking indicates that one actor’s interaction-determining aim may constitute a goal of the RT, Zacharias, working for the local soccer club and thus for a relatively established institution, has the additional aim of managing the fan base in a supportive way. As this rather deviates from the network’s aim and is less useful for the network than public communication on Facebook, the RT has not set any respective goals (I3). Actors of the RT range from volunteering individuals with personal motives to highly established actors such as a German protestant church parish or youth groups of political parties. The underlying aims and more concrete goals of these actors dominantly define the network’s work (I1, I2). Nevertheless, as the findings indicate, the goals are often overshadowed by the long-term aims and medium-term

goals of the individual actors. This is also evident when considering that the network as a whole encompasses a very broad, rather undefined target audience of its activities, actions and involved objects. More specific target groups of help activities are also strongly determined by the aims of the individual actors. Intersections of varying aims may also occur with regard to the local church's involvement. Here, a clearer differentiation of the respective goals can be identified, because the actor explicitly shares the same basic normative motive of helping in times of crisis and more clearly distinguishes between relevant social groups like "[...] *the homeless [...], women [...], asylum seekers*" (I5), as well as the church community, which receives religious guidance (Church Newsletter). However, as the analysis reveals, individuals with little institutional backup have significantly less influence on the overall network's goals than more established institutions. Representatives of established institutions, such as the pastor, target their own audiences by considering suitable aims and goals for the network. Party members have formulated goals consistent with their political background, with conservatives focusing on shopping help for the elderly with their own branding and platform (I4).

4.3 Collaborative Actions

Here, we present our findings regarding RQ2 about the cooperation of the network, collaborative actions, and the use of technology.

4.3.1 Cooperation. In this section, we show results from our ethnography concerning cooperation and collaboration with aspects of hierarchy, actor roles, division of labor, community, and time pressure.

Hierarchy: The RT may be defined as a multi-level network, comprising hierarchical relationships among different actors. Two levels decisively shape the network, the administration of the RT, which consists of a group of five people and other more regularly engaged actors. While not picturing himself as the group leader officially, Valentin actively moderates and manages the video-conference calls. Not entirely comfortable, he also ascribes himself, and is externally defined as the leader of the administration team. Open for deliberation, the moderator, at the same time coordinator, often directs discussions in a colloquial manner (O4). His highlighted position is indicated when duration of a meeting is defined by his personal fitness and Claudia refers to "*Valentin and his sheep*" (O5). Still, this hierarchy is often flattened by informal friendly interactions. Further, it is artificially held up as the size of the organization team is not proportionate to the number of actors that are not part of it (O4).

Actor roles: The network is characterized by a differentiation of actor roles in the context of cooperation. The diverse roles match the network actors' backgrounds. In general, main activities concentrate on local sites as all involved network actors share the same geographical site. Across the network, it is found practical to conduct activities mainly in the respective local area (2020-03-12 21:10 Maike, Facebook Group), which is mirrored in the classification of many Slack channels analogous to neighborhoods: "*It is best if you use the single neighborhood channels [...]. Then, we have, besides the very good map, more insight and local initiatives can proceed on a more detailed basis*" (SC02). Technological skills and media literacy of individuals of the administration team determine the distribution of both activities and actions. For example, Lukas' main activity of optimizing the coordination process by technological means is due to his computer scientific background (I2). Maike's familiarity with Facebook is useful for conducting actions related to the administration of the public Facebook group (I3). At the same time, it is revealed that organizational actions of managing the group took some time before they became routine operations: "*We have main posts for every neighborhood [...] where help offers are posted below*" (I3). While at first glance, the

network actors' activities may be defined by skills, it becomes clear that personal motives based on socialization may be decisive as well. As Maïke points out, her network activity is heavily influenced by previous engagement in the context of the 2015 "refugee crisis" (I3). While gender imbalances are comparatively high regarding individual users of the public Facebook group, with almost exclusively female users offering help, skills like social intelligence as well as care as a motive are rather balanced across the network's higher hierarchical ranks. Thus, network actors fulfill their roles defined by skills and, where these may not be entirely present, motivation to help. Motivation to acquire skills may be strengthened by sharing the same primary aim of helping as well as a lower degree of an actor's institutionalization.

Division of labor: Further, the network's coordination of activities is characterized by a relatively high degree of division of labor, entailing only minor overlaps. Depending on the conducted activities, actors have integrated virtual spaces to varying degrees. On the one hand, Valentin, conducting the self-referential task of network coordination, has integrated Skype for Business into his work, repeatedly sharing his screen (O3). Other network members, such as the Slack or Facebook group administrators, have also actively integrated virtual sites and performed a variety of actions on them (I2, I3, I6). For example, many actions have taken place on the soccer club's Facebook page, including the administrator addressing users: "Yesterday, our initiative #hashtag [Anonymized] has started and we are speechless" (2020-03-21 11:22 Zacharias, Soccer club on Facebook). On the other hand, the church pastor and the psychologist mainly carry out actions in the analog world and have thus, rather passively but plausibly integrated virtual sites into their work (O7,I5). Manual labor such as distributing flyers across the city is accompanied by repetitive technical operations, for example, posting in Facebook groups (2020-04-24 15:36 Maïke, Facebook Group). Even though the workload of the respective individuals may not be more visible than that of one individual distributing flyers, more specific skills are needed to initiate an automated workflow.

Community: The main activities of help are determined by community, i.e., social context. These activities have included coordination of neighborhood help, more specifically entailing actions related to shopping, (pharmacy) deliveries, dog walks, mental support, masks, light entertainment (O6, SC02, SC07, SC17). Our analysis reveals that the network's activities oscillate between the community characterized by the COVID-19 pandemic and actors' particularistic aims. First, measures were taken regarding grocery stores, surrounded by a debate of which businesses are systemically relevant. Grocery stores, pharmacies, and clinical infrastructure were declared most important and related help activities were in the focus of the RT in its beginnings (I4, SC15, SC11). Subsequently, as the public discussion about COVID-19 and respective political measures' consequences developed, issues like mental health and do-it-yourself masks were on the network's agenda (O2, O3). This becomes clear not only in relation to traditional news, but also when considering Facebook communication within the locally defined public Facebook group led by one member of the RT (2020-03-30 12:16 Maïke, 2020-03-31 18:09 Maïke's co-admin). Overall, then, the network's actions reflect community embeddedness. At the same time, some actions and activities were guided by aims and goals of single actors, which is indicated by the RT's interest in helping refugees, advocated by Maïke (O3).

Time pressure: Network activities were also highly influenced by increased time pressure. This is indicated by the very spontaneous creation of the public Facebook group of one actor (I3), which only established itself as a RT communication channel to the public afterwards, and by the emergent nature of the RT, which adopted institutional structures in the course of the COVID-19 pandemic (I2).

4.3.2 Technological Mediation. In this section, we focus on technological mediation of cooperation and collaboration. This allows us to show not only the use of technology in general, but also the implications of choosing a certain tool and its limitations. In general, the RT uses several tools to fulfill its aims and collaborative actions. The central actors of the admin team have a highly technical background (student of computer science and software developer; statistician) and are therefore able to use and understand technological tools, while members of the RT are new to some tools or have little technical background. Central tools are Skype for Business and Slack, with specific minor operations, more related to the admin team, conducted in Google's office suite, via phone calls or e-mail.

Choice of tools: The administrative team, actively driven by Lukas and Valentin in a spontaneous manner, decided which tools the RT should use. Within the group, there was a brief brainstorming session about which goals should be supported by the tools:

"We thought, what do we want to achieve? What should be our goal? How to reach this goal? Then we brainstormed: Mailing list, difficult. Only Google docs, also difficult. A Telegram or WhatsApp group? Then, you exclude everyone who does not have these systems and so we decided for cooperation platforms" (I2).

Inclusion was equally important opting for video conferences: *"[...] Skype for Business has the possibility to dial in via phone" (I1).* The central tools, Slack and Skype for Business, were adapted from the work context, the latter being chosen as it was already known by Valentin (I1), while Lukas *"forced it [Slack] a bit, because I know it from work and know it is a good tool to support a network of people [...]. [...] I know how it works and am able to administrate it well" (I2).* The same criterion was decisive choosing Doodle later on (I1). Although driving the decisions, the administrative level saw a need that everyone should feel comfortable using these tools (O3). Because of having no budget, money was also critical, which led to the choice of Google docs, which is free of charge (O5). Regarding Slack,

"[...] the only limit in Slack, a cost factor, is the history; that means starting with a soft limit of 10,000 messages, old messages begin to disappear, but with respect to many other features there is no limit, for example, the number of users" (I2).

Actors were willing to put some personal effort in it, which becomes clear referring to Lukas, who uses his private Nextcloud, and Valentin's access to Skype for Business (I1, SC03).

In the following, we illustrate how technology has been used by the network, mediating actions by its specific characteristics, missing features, and technical issues. We also highlight crucial, and sometimes problematic, aspects regarding within-network cooperation and collaboration through tools.

Videoconferencing: As described in section 4.1, there are (bi-)weekly meetings with 10 to 20 participants as well as meetings of the admin team, both in Skype for Business. Because of the restrictions during the COVID-19 pandemic, meeting virtually was the only reasonable way. As an operated action, each meeting is written down in a protocol by an administrative RT member and subsequently sent to other participants by e-mail. Because the administrators as well as most of the members did not know each other before, network actors share the goal of not only doing operative work during the meetings, but also creating an open and friendly atmosphere to establish a connection among RT members. Prioritizing group identity while concealing its technological character is indicated when meetings are not perceived *"[...] as phone conferences, but as a place to come together [...]" (O5),* reinforced by many short humorous conversations in-between topics and also corroborate by the wish *"[...] if there would be the possibility like you truly sit on a table together and see the other person in a virtual or similar space; that would enhance the communication on many levels (I2).*

In contrast, technological mediation often becomes visible due to connectivity or audio problems, for example, indicated by Ricarda asking in the related chat whether she was dropped out (O1) or Valentin not fulfilling his role as a moderator, not noticing that his connection is poor (O1). This leads to typically adapted behavior linked to the uncertainty whether the connection is working correctly with respect to the problem of synchronicity [47]. For example, Maike repeatedly asked, if everyone could understand her (O3) or if something is not understood by others, and so Janina repeated her statement (O1). And even though the administrators want to create a friendly atmosphere, the video function is rarely used, sometimes prior to the official start by Valentin during small talk, but then switched off at exactly 6 pm (O3). Maike reflects on this aspect broadly in the Interview:

“Yes, so a thing which is new to me is that the RT meets only virtually. That’s something I can’t deal with through my work background. This has always been face-to-face and I realize that this [i.e., virtual interaction] is very strange. You imagine people differently, yes? Because of the virtual, and audio only. For example, I just realized, I met Claudia in person recently, and had imagined a different person. That’s very interesting, if the video is off, how differently people are perceived. In addition, you have a feeling based on Slack, then you imagine something and it is totally different. I think it is interesting and nevertheless, I wonder why it works so well. I didn’t expect that. And this is ascribed to the organizer Valentin, who does it very very well” (I3).

There could be different reasons for the actors to do so, such as saving bandwidth but also engaging the possibility for participants to acknowledge their privacy (O5). Even though they have a backup (I2), they did not choose to use the alternative as they have to cope with the connection problems. This may be because of too much effort to switch platforms as well as the functionality of Skype for Business to integrate telephone calls.

Slack: Slack is used as the central team collaboration tool and therefore structures collaborative actions and influences interactions in the Skype meetings of the RT. While the virtual meetings in Skype have fewer active attendees, the number of Slack users has increased to 74. The Slack analytical report shows that by May 02, 2020, an average of about 28 users actively wrote or read messages or posts.

In total, there are 25 channels, which remain relatively constant from March 28, 2020, already having 20 channels established (see figure 3 and table 5 in Appendix). The number of messages varies on weekdays but does not show a strong pattern to be linked to the days with video calls and is higher in private chats than in public posts (see figure 3). The channel structure includes a general channel, a channel regarding psychological aid, an input and output channel for documents, and channels for emerging topics such as flyers, masks, website, donations, and local neighborhood channels: *“We have a channel for each neighborhood, based on the statistical neighborhoods of the city, which are luckily reported online” (I2).* This is also made persistent by the function to set a goal for each channel (SC21). Additionally, the members of the RT relied on a bot channel of the German Robert Koch Institute (SC15). The neighborhood structure was also set up earlier (March 14) on Facebook. This might have been a blueprint for Slack, where channels were created one week later. In addition, the administration team tried to establish its own internal channel but observed that they operated at the admin meetings or bilaterally, speaking against having operated internal communication in Slack. This is undermined that they also forgot to undertake the action of adding an admin member: *“We have a closed admin channel in Slack, but it is rarely used because we have met each other so often [...]. A week ago, I noticed that Tamara is not even in the channel” (I1).*

Slack is used as a central file storage, which is also indicated by the two channels *“datenstream-input” (SC04)* and *“datenstream-output” (SC10)*, which are described as *“channels for data storage,*

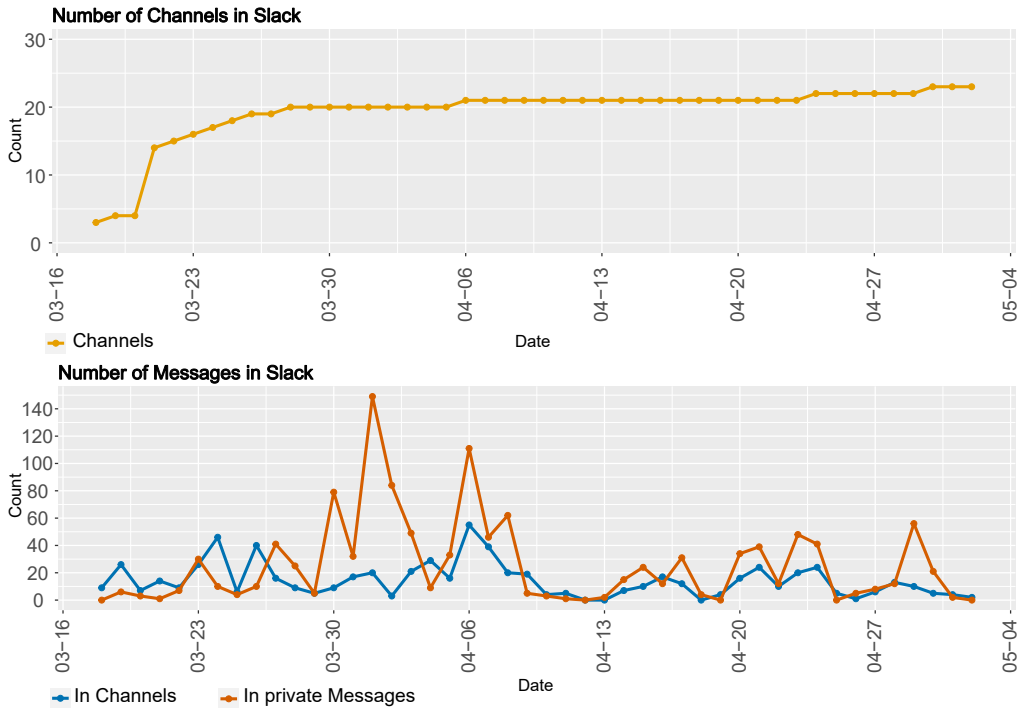


Fig. 3. Slack has been used as a central tool of *Round Table* from the start. Top: Number of channels (orange) over time. The channel structure remains relatively constant since March 26, 2020. Bottom: Number of messages in channels (blue) and private messages (red) over time. Peaks during the weeks do not always cover specific meetings but fewer messages are sent on weekends than on working days. In general, more communication was sent in private messages than in public groups, the former showing more style of a chat than public groups, often structured in threads.

where everyone can add text or files.” (I2). Nevertheless, we observed members asking for information in Slack during pre-existing meetings (O1, O3). Protocols of the meetings are not stored in a respective Slack channel. Even though Slack is centralized and everyone has access, posts are sometimes actively screen-shared during video conference calls to ensure that everyone is on the same page (O3, O4). This indicates that not all actors are entirely aware of the content in Slack and therefore the RT could not realize the full potential in the course of collaboration in Slack.

Further findings show that topics debated in Skype meetings were actively promoted to be created as channels. For example, during a video conference, Hans proposed creating a new channel dealing with face masks (O3). Referring to Lukas, it is also indicated that Slack may mediate the network’s activities: “We have a channel for all important topics, like the current topic of masks, where we created an own channel” (I2). The aim of increasing efficiency by division of labor becomes prevalent relying on Slack as a space for discussions, in which not all actors are involved or interested in organization (O2). Further, some feedback on issues that arise during Skype meetings is ascribed to be conducted via Slack (O4).

Discussions may also be moved from the general discussion channel in Slack to a new one (SC01). Yet, considering the number of messages and newly created channels, many topics in the general

channel remain unstructured (see table 5 in Appendix). Thus, while division of labor may have increased using Slack, individual communication structures of actors hinder its deeper integration.

There was skepticism about whether Slack would be easy to use: *“I have known it before and was skeptical that it might be too complicated to use”* (I1). Yet, it was generally accepted very well: *“It has proven to be good, even though people aren’t skilled with computers”* (I1). Emerging problems were actively addressed by the administrators, for example, Conrad having problems organizing Slack (O3) and Valentin showing support: *“Keeping in mind people who have never worked with it before [...] we have offered to give a short training”* (I1). The pastor, who is in his sixties, showed great excitement about Slack in view of the potential use by his church:

“I would like to use it in my community [...] I have already scheduled an introduction with my musician [...] I just have to convince my secretary, she is a bit more shy” (I5).

Other tools: While Skype for Business and Slack are the central tools of the RT and the Google office suite is used for protocols, we observed that when discussing a new schedule for meetings, although admins had already proposed Wednesday and Thursday, they introduced Doodle to ensure that the decision was accepted on a broader level and nobody was excluded even though they did not attend the respective meeting (O1). For bilateral communication, they mainly use Slack, but not all members monitor Slack regularly, so they bypass it through WhatsApp or telephone calls: *“To each other, we write via Slack or WhatsApp and if it is urgent, we give each other a call”* (I1). Meeting Protocols are sent out via e-mail, indicating that more traditional operations of societies are not conducted with collaborative software but mediated through already established ways of communication actors are used in other contexts, for example top-down actions in work. Calls are also used for bilateral coordination when Slack communication does not fulfill the needs or a more personal conversation is required: *“Ricarda 2020-04-16 21:10:01: If there are questions left, please call”* (SC06). Recognizing the limitations of Slack, Valentin also used phone calls to contact members who are rarely in meetings and for the same reason do not react to a reminder via Slack (O8).

Communication with the Public: As part of the multi-level network’s goal of increasing publicity (see section 4.2.2, it created a website and used one of the actor’s Facebook group, formerly not associated with the RT: *“Maike is a bit like our mouthpiece, because she has founded a Facebook group”* (I1). The Facebook page is not named after the RT, indicating its individual agency, but is internally seen as a link to the public. One RT member further notes that her COVID-19 pandemic-related Facebook group has *“the broadest range at the moment.”* (I2). The Facebook group was spontaneously created by Maike, who *“didn’t really think about it”* (I3) before joining the RT. Rationalizing this decision, she highlights:

“Retrospectively, it is great because you just use your profile, with no phone number or whatever, you just can join. That means there is no need of prior communication to be granted.[...] People are free in their choice” (I3).

The website was never mentioned in the interviews, but the Slack channel SC25 is about the website, which shows that one member already had a COVID-19 pandemic-related website. There was a controversial discussion about whether a merged website should be created and which content should be presented. The discussion about layout and content included consideration of RT aims. In the end, the website remained mostly static and simple.

5 DISCUSSION

The RT is a spontaneous network which benefits from the different actor roles according to personal and institutional backgrounds [82]. Both collaboration and cooperation of heterogeneous actors seem to be effective when there is a flexible network structure and an agreement on the overall aim.

First, we discuss the results regarding our research questions, followed by a theoretical reflection of AT and the network structure. Then we derive six implications based on our findings. Some of our implications about the collaboration within the network but also the dependence on resources go along with the implications of Van Gorp [75] although the latter has a focus on the collaboration between V&TCs and aid organizations.

5.1 Volunteerism of the Network

Interested in both aims and goals of the RT network and the related actors (RQ1), we illustrated that the overall aim of helping people in the community determines RT activities, with many actions becoming routine operations. However, while the network formulates the aim of institutionalization in the course of events, it is hindered by its flexible nature, with already institutionalized, i.e., extending [17] actors' having individual aims. Asking about cooperation within the network (RQ2), we found that while there are activities of promoting the network, many actors do not state in public communications that they are members of the network. At the same time, the multi-level character of the RT promotes institutionalization, with actors adapting to and conducting actions in virtual spaces [72]. Even though the network was formed spontaneously [3, 42], volunteers have been able to organize themselves under the banner of a common aim and with the help of technologies. In contrast to individualized social media users, the diverse network actively acted and operated with collaboration tools. While the network's flexibility allowed the integration of virtual and analog spaces to varying degrees, activities among actors were mediated through the network's main communication channels into collective agency.

The use of technology and the choice of tools depend not only on the personal experiences of the actors but also on uncertainties regarding restrictions, which in our case was Slack's limit of 10,000 messages. At the time of our data collection, it was considered suitable; however, it was already an issue that tied up mental and organizational resources. As the COVID-19 crisis is still ongoing, it could demand a change of the used tools or the collection of money to use a paid option. It is also considerable that platforms address demands by making changes to their software, e.g., the user interfaces, as we have seen in the case of Reddit after the Boston Marathon Bombing of 2013 [38, 39].

Furthermore, we found that cooperation within the network is largely determined by community, i.e., the social context of the network. With activities being defined by crisis management measures regarding risk groups, shopping, or improvised self-protection, actions were directed towards nursing homes, food and masks. The unpredictability at the beginning as well as longer duration of the crisis also influenced the spontaneous formation of the network and the subsequent aim of institutionalization [46, 72]. Thus, the pandemic character of the crisis influenced activities, differing from other crises in terms of the absence of physical destruction and enhancement of digitization [55, 78]. As volunteerism often emerges when national emergency services or authorities fail to take the necessary actions, the RT may contribute to the collective resilience of the city. This may also be the case regarding public health crises in the Global South, where people may also have organized themselves relying on digital technology and taken on more active roles than data collectors or vulnerable non-users of smartphones or social media [8, 73].

5.2 Activity Theory and Network Structure

Inspired by AT, our virtual ethnography focused on the activities of the volunteer network based on collaborative software and social media. At the same time, the method also allowed for investigation of analog actions in times of the ongoing pandemic. We considered investigating the network based on a framework of Distributed Cognition which may foreground the role of technology in relation to cognitive processes that occur in the context of functional relationships between human actors

and technology as components of an established system [27, 43]. However, we decided for AT as our work privileges human actors over non-human agency [27]. Supporting this decision, we focused on a volunteer network initiated by individuals, and whose members perceive themselves as agents using technology purposely.

In a next step, focusing explicitly on interdependencies of activities and actions may contribute to the design of new coordination techniques [12]. As the group assigned roles and tasks [86], it could have supported this effort by not only urging accurate self-description in profiles and channels, but also using a transparent task assignment plug-in in Slack. While we have indicated hierarchical structures of the multi-level network, consisting of a group of administrators and comparatively less strongly associated members, different leadership roles may be studied prospectively. Even though the RT does not explicitly elaborate different leadership roles besides the assignment of a group of administrators, actors possibly differ in terms of responsibility and impact.

5.3 Implications for Virtual Collaboration in Crisis Volunteering

Based on our findings, we have six implications for virtual collaboration in crisis volunteering. We derived these implications by uncovering problems that arose when activities, actions, or operations were not ideally directed at objects and thus both aims and goals were not achieved optimally. At the same time, however, crucial implications could be derived looking at instances of successful actions, which are determined by the various actors' properties.

- (1) Networks should expand their abilities by integrating people's skills as resources.
- (2) Groups should support community building.
- (3) Actors should not overlook suitable software solutions when adapting from other contexts.
- (4) Groups should not orientate too much on external structures and look constantly at their needs.
- (5) Virtual groups should consider the integration of analog or analog-virtual groups to empower their capabilities.
- (6) Companies should support crisis volunteering.

Regarding the AT-based analysis, we saw that the choice of tools is influenced by the communities of actors, which includes the individuals' workplaces and experiences in former volunteering actions (Implication 1 and 3), as the founders had mentioned in the interviews. Technological mediation challenges the actions to reach goals and establish rules and operations (Implication 2), which we can see with respect to the need to interconnect deeply with each other in video calls, although having never met physically. Even though the community has an influence on how the network organizes itself, it can be tricky if it is not matching the aims while fulfilling a goal, for example, when creating the Slack channel structure (Implication 4). The combination of different actors, which consist of emerging social media-based groups on Facebook and extending analog operating groups like the church, soccer club, or political party, enhance the overall power to reach goals and enable actions and operations, as they already have established ways of communication, administrative capabilities with offices, and a pool of people who could be sent to places. As the analysis has shown, such resources may be highly decisive and allow for effective activities (Implication 5). Community may determine an actor's needs; thus, it is relevant to gather support in the form of financial resources, as we have seen when considering inefficient actions like long discussions regarding funding or social pressure within the network to spend money on printing a flyer (Implication 6). In the following, We explain each implication in more detail.

(1) Networks should expand their abilities by integrating people's skills as resources. With technical problems being prevalent in the beginnings of the RT virtual meetings, it became clear that individual skills are relevant for successful cooperation. It is crucial which technical skills are available within

the group. While incidents of disruptive background noise and questions regarding audibility re-occurred, skilled members of the administration team offered Slack training and repeatedly advice on Skype for Business settings. Cooperation in a diverse network depends strongly on the skills of the individual actors, but also on the individual motivation to learn, which is sometimes triggered by network interactions.

(2) *Groups should support community building.* As indicated by actions determined by adaptation at the beginning of the RT video conferences, actors need to pay special attention to verbal performance. Especially if actors have no prior personal relationships, speech acts may determine emotional interconnectedness across the network. This may also have an impact on cooperation, as problems are presented euphemistically and less clearly defined. Chat conversations allow for more open discussions and quick positive feedback. While observations of Skype for Business sessions implied analog strong performers contribute asymmetrically to conversations, interactions in virtual space should also be guided by privacy concerns.

(3) *Actors should not overlook suitable software solutions when adapting from other contexts.* People use tools and processes they know from other contexts. The tools used were adapted from work due to the feeling of time pressure and because they adopt the processes that work in other contexts to crisis volunteering. This can be seen not only in the use of Slack, Skype for Business and Doodle, but also in structuring of meetings with a formal protocol and sending it via mail to the participants and not integrating it in a collaborative way, for example, by using web-based collaborative real-time editors like Etherpad or the persistence of results by adding protocols in Slack.

(4) *Groups should not orientate too much on external structures and look constantly at their needs.* Adopting external structures like the official city's district mapping into Slack channels did not work well, considering the number of messages used. Even if the aim of being a local initiative has a high anchorage in the districts, for example, the church is operating in their district, activities do not end at the local borders. Organic creation of hyper-local channels, for example SC12 (Johannesviertel, where the church is located), which has been archived due to new district channel structure, seems to be an odd choice with a top-down approach. While distributing the flyer, they used a topic-related Slack channel and a map coordinating the action to a hyper-local level, which seems to be a better approach. Thus, being flexible and open to have a dynamic root-based channel creation does support aims, goals, and activities and encourages members to participate.

(5) *Virtual groups should consider the integration of analog or analog-virtual groups to empower their capabilities.* Social media-based groups can be helpful in connecting with users, but most of the power lies in personal and organizational networks. Online interactions can mostly be pursued intuitively and take place between previously unknown actors. Yet, even if they are members of a group, users still constitute individualized actors and it may become difficult to work towards collectively formulated goals and aims. In contrast, organizational networks, building on regular virtual meetings and accessible collaborative systems like Slack carry a greater potential of agency. This is accompanied by both public and private spaces for affirmative personal interaction.

(6) *Companies should support crisis volunteering.* Money is a factor and could be seen from two perspectives: First, spontaneous support groups, if not covered by an institution, have no budget which is evident not only in the choice of tools but also in discussions about the costs of printing the flyer, where members donated personal money. As a result, they are dependent on sponsors when choosing proprietary tools or have to use freemium models. Slack, for example, has a limit of 10,000 messages and it is difficult to estimate whether this limit will be reached in the context of crisis volunteer work. During crisis, Slack could remove this limit to give volunteers more confidence

in the choice of tools. For example, Zoom withdrew their 40-minute barrier and mobile phone providers increased their data volume. Second, companies could support crisis volunteering not only by lowering financial barriers but also by implementing features to support crisis volunteering, such as better management of offerings and requests for help as Facebook did as part of their “Crisis Response” feature.

5.4 Limitations & Outlook

Our work comprises the RTs interactions from its foundational beginnings and does not yield deeper insights with respect to the entire development of the network in the course of the crisis. This is due to the ongoing spread. Future long-term studies may complement our focus on the initial establishment of the network structure, including the procedural use of technologies. Therefore, we still accompany the network by observations. We did not pay special attention to technological mediation within an individual network actors’ perspective and volunteers on-site. Comparative studies on inter-organizational collaboration between volunteer groups vs. collaboration between V&TCs and professional aid organizations could be helpful to connect inter- and intra-organizational collaboration. Additionally, not only crisis informatics may benefit from a more critical perspective on gender roles or female leadership in the context of crisis volunteering but also feminist HCI studies focusing on collaboration efforts in general. Prospectively, works may have a closer look at technology use causing tensions and aim for the generation of concrete design implications. Since only one network is studied in this work, we did not investigate other networks despite the pre-selection of 80 groups in the case selection. From what we have seen about these groups, this work represents a typical case of COVID-19 crisis volunteering in terms of the broad anchoring in society by all different types of members, but is integrated under one multi-level organizational roof.

6 CONCLUSION

At the beginning of 2020, when the COVID-19 pandemic appeared in Germany, people acted spontaneously and created support groups on social media and already institutionalized organizations extended their purpose to new goals (e.g., sport clubs sewing masks instead of organizing tournaments), both offering help. This led to a highly dynamic situation where coordination of activities was crucial. We were interested in how groups proceed and first observed 80 initiatives during the COVID-19 pandemic in five German cities and then decided to conduct a virtual ethnography of a multi-level network *Round Table* (RT) based in Darmstadt, Hesse. We investigated multiple sites through interviews of members, participatory observations of their (bi-)weekly Skype based meetings, and data analysis of chats in Slack, social media and public communication. Based on two research questions about aims and cooperation, the qualitative analysis of the data was conducted with *Activity Theory* (AT) as a theoretical frame of reference. As a common theory of CSCW and HCI, we contribute with the application of AT to crisis informatics. This helped to structure the focus of our on interactions, needs, actors, technologies, and the division of labor and community. Further, we complement existing work on virtual volunteers in crises by shedding light on technological mediation within the emergent network. We have found that the organizational aim of coordinating help was successfully achieved. This was done by connecting heterogeneous actors through digitization and institutionalization, considering Facebook groups, soccer club fans, church communities or political parties as well as individuals. Inherent to the crisis-specific circumstances, the network acted across virtual spaces, using collaborative software and video-based meetings, but was also able to integrate analog spaces. We identified six crucial implications for building a successful network with the ability to use technological tools and form a multi-level network, without budget but personal skills and institutional backgrounds as resources. In times of public

health crises, volunteering networks and related activities may be crucial when it comes to local resilience and self-identification of communities.

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REFERENCES

- [1] Araz Ramazan Ahmad and Hersh Rasool Murad. 2020. The Impact of Social Media on Panic During the COVID-19 Pandemic in Iraqi Kurdistan: Online Questionnaire Study. *J Med Internet Res* 22, 5 (19 May 2020), e19556. <https://doi.org/10.2196/19556>
- [2] Massimo Airoidi. 2018. Ethnography and the digital fields of social media. *International Journal of Social Research Methodology* 21, 6 (April 2018), 661–673. <https://doi.org/10.1080/13645579.2018.1465622>
- [3] Daniel Auferbauer and Hilda Tellioglu. 2019. Socio-Technical Dynamics: Cooperation of Emergent and Established Organisations in Crises and Disasters. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland Uk) (CHI '19). Association for Computing Machinery, New York, NY, USA, 1–13. <https://doi.org/10.1145/3290605.3300448>
- [4] Elizabeth Avery Gomez, Katia Passerini, and Karen Hare. 2006. Public Health Crisis Management: Community Level Roles and Communication Options. In *Proceedings of the 3rd International Conference on Information Systems for Crisis Response and Management* (Newark, NJ (USA)) (ISCRAM 2006), Bartel Van de Walle and Turoff M. (Eds.). Information Systems for Crisis Response and Management, Washington, DC, USA, 435–443.
- [5] Sangeeta Bagga-Gupta, Giulia Messina Dahlberg, and Annaliina Gynne. 2019. Handling Linguaging During Empirical Research: Ethnography as Action in and Across Time and Physical-Virtual Sites. In *Virtual Sites as Learning Spaces: Critical Issues on Linguaging Research in Changing Eduscapes*. Palgrave Macmillan, Cham, Switzerland, 331–382. https://doi.org/10.1007/978-3-030-26929-6_12
- [6] Jakob Bardram and Afsaneh Doryab. 2011. Activity Analysis: Applying Activity Theory to Analyze Complex Work in Hospitals. In *Proceedings of the ACM 2011 Conference on Computer Supported Cooperative Work* (Hangzhou, China) (CSCW '11). Association for Computing Machinery, New York, NY, USA, 455–464. <https://doi.org/10.1145/1958824.1958895>
- [7] Pete Burnap, Matthew L. Williams, Luke Sloan, Omer Rana, William Housley, Adam Edwards, Vincent Knight, Rob Procter, and Alex Voss. 2014. Tweeting the terror: modelling the social media reaction to the Woolwich terrorist attack. *Social Network Analysis and Mining* 4, 1 (Dec. 2014), 206. <https://doi.org/10.1007/s13278-014-0206-4>
- [8] Dmitry Chernobrov. 2018. Digital Volunteer Networks and Humanitarian Crisis Reporting. *Digital Journalism* 6, 7 (2018), 928–944. <https://doi.org/10.1080/21670811.2018.1462666>
- [9] Camille Cobb, Ted McCarthy, Annuska Perkins, Ankitha Bharadwaj, Jared Comis, Brian Do, and Kate Starbird. 2014. Designing for the Deluge: Understanding & Supporting the Distributed, Collaborative Work of Crisis Volunteers. In *Proceedings of the 17th ACM Conference on Computer Support & Social Computing* (Baltimore, Maryland, USA) (CSCW '14). Association for Computing Machinery, New York, NY, USA, 888–899. <https://doi.org/10.1145/2531602.2531712>
- [10] Simon Coleman and Pauline Von Hellermann. 2011. *Multi-sited ethnography: problems and possibilities in the translocation of research methods*. Routledge advances in research methods, Vol. 3. Routledge, New York, NY, USA. <https://doi.org/10.4324/9780203810156>
- [11] M. Crane. 2019. The invisibles: the role of volunteer emergency service members in human health emergency response. *Global Biosecurity* 1, 1 (2019), 116–118. <https://doi.org/10.31646/gbio.11>
- [12] Kevin Crowston, Joseph Rubleske, and James Howison. 2006. Coordination Theory: A Ten-Year Retrospective. In *Human-Computer Interaction and Management Information Systems – Foundations*, Ping Zhang and Dennis Galletta (Eds.). Routledge, New York, Chapter 7, 120–139. <https://doi.org/10.4324/9781315703619>
- [13] Dharma Dailey and Kate Starbird. 2015. “It’s Raining Dispersants”: Collective Sensemaking of Complex Information in Crisis Contexts. In *Proceedings of the 18th ACM Conference Companion on Computer Supported Cooperative Work & Social Computing* (Vancouver, BC, Canada) (CSCW'15 Companion). Association for Computing Machinery, New York, NY, USA, 155–158. <https://doi.org/10.1145/2685553.2698995>

- [14] Paul Dourish. 2006. Implications for Design. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Montréal, Québec, Canada) (*CHI '06*). Association for Computing Machinery, New York, NY, USA, 541–550. <https://doi.org/10.1145/1124772.1124855>
- [15] Paul Dourish. 2014. Reading and Interpreting Ethnography. In *Ways of Knowing in HCI*, Judith S. Olson and Wendy A. Kellogg (Eds.). Springer New York, New York, NY, 1–23. https://doi.org/10.1007/978-1-4939-0378-8_1
- [16] Nicolas Ducheneaut and Robert J. Moore. 2004. The Social Side of Gaming: A Study of Interaction Patterns in a Massively Multiplayer Online Game. In *Proceedings of the 2004 ACM Conference on Computer Supported Cooperative Work* (Chicago, Illinois, USA) (*CSCW '04*). Association for Computing Machinery, New York, NY, USA, 360–369. <https://doi.org/10.1145/1031607.1031667>
- [17] Russell R. Dynes and Enrico L. Quarantelli. 1976. *Organization Communications and Decision Making in Crises*. Technical Report. Disaster Research Center, Columbus, Ohio, USA. <http://udspace.udel.edu/handle/19716/1274>
- [18] Yrjö Engeström. 1987. *Learning by expanding: An activity-theoretical approach to developmental research*. Orienta-Konsult Oy, Helsinki, Finland.
- [19] Mark-Anthony Falzon (Ed.). 2009. *Multi-sited Ethnography: Theory, Praxis and Locality in Contemporary Research* (1st ed.). Routledge, London, UK. <https://doi.org/10.4324/9781315596389>
- [20] Ramian Fathi, Dennis Thom, Steffen Koch, Thomas Ertl, and Frank Fiedrich. 2019. VOST: A case study in voluntary digital participation for collaborative emergency management. *Information Processing & Management* 57, 4 (Nov. 2019), 102–174. <https://doi.org/10.1016/j.ipm.2019.102174>
- [21] Najeeb Gambo, Mark Perry, Armin Kashefi, and Daniel Azerikatoa Ayoun. 2020. Harnessing social and collaborative tools in digital disaster response work: Implications for design and practice. *Information Development* (2020). <https://doi.org/10.1177/0266666920932268>
- [22] Sean Goggins, Christopher Mascaro, and Stephanie Mascaro. 2012. Relief Work after the 2010 Haiti Earthquake: Leadership in an Online Resource Coordination Network. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work* (Seattle, Washington, USA) (*CSCW '12*). Association for Computing Machinery, New York, NY, USA, 57–66. <https://doi.org/10.1145/2145204.2145218>
- [23] Alain Gourdin, Niki Lambropoulos, and Aneesha Bakharia. 2011. Distributed leadership collaboration factors to support idea generation in computer-supported collaborative e-learning. *human technology* Volume 7 (06 2011), 72–102. <https://doi.org/10.17011/ht/urn.201152310900>
- [24] Xinning Gui, Yubo Kou, Kathleen Pine, Elisa Ladaw, Harold Kim, Eli Suzuki-Gill, and Yunan Chen. 2018. Multidimensional Risk Communication: Public Discourse on Risks during an Emerging Epidemic. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (Montreal QC, Canada) (*CHI '18*). Association for Computing Machinery, New York, NY, USA, 1–14. <https://doi.org/10.1145/3173574.3173788>
- [25] Xinning Gui, Yubo Kou, Kathleen H. Pine, and Yunan Chen. 2017. Managing Uncertainty: Using Social Media for Risk Assessment during a Public Health Crisis. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (Denver, Colorado, USA) (*CHI '17*). Association for Computing Machinery, New York, NY, USA, 4520–4533. <https://doi.org/10.1145/3025453.3025891>
- [26] Janine Hacker, Jan vom Brocke, Joshua Peter Handali, Markus Otto, and Johannes Schneiderb. 2020. Virtually in This Together—How Web-Conferencing Systems Enabled a New Virtual Togetherness during the COVID-19 Crisis. *European Journal of Information Systems (EJIS)* (2020), forthcoming.
- [27] Christine A. Halverson. 2002. Activity Theory and Distributed Cognition: Or What Does CSCW Need to DO with Theories? *Computer Supported Cooperative Work* 11, 1–2 (April 2002), 243–267. <https://doi.org/10.1023/A:1015298005381>
- [28] Ari Hautasaari. 2013. “Could Someone Please Translate This?”: Activity Analysis of Wikipedia Article Translation by Non-Experts. In *Proceedings of the 2013 Conference on Computer Supported Cooperative Work* (San Antonio, Texas, USA) (*CSCW '13*). Association for Computing Machinery, New York, NY, USA, 945–954. <https://doi.org/10.1145/2441776.2441883>
- [29] Daniel Hellmann, Carleen Maitland, and Andrea Tapia. 2016. Collaborative Analytics and Brokering in Digital Humanitarian Response. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing* (San Francisco, California, USA) (*CSCW '16*). Association for Computing Machinery, New York, NY, USA, 1284–1294. <https://doi.org/10.1145/2818048.2820067>
- [30] Diná Herdi, Elaine Carvalho, Claudia Motta, Marcos Borges, José Gomes, and Paulo Carvalho. 2019. Social Networks Applied to Zika and H1N1 Epidemics: A Systematic Review. In *Proceedings of the 20th Congress of the International Ergonomics Association (IEA 2018)*. Springer International Publishing, Cham, 679–692. https://doi.org/10.1007/978-3-319-96089-0_74
- [31] Jeanne Pau Yen Ho, Der-Thanq Victor Chen, and David Ng. 2016. Distributed leadership through the lens of Activity Theory. *Educational Management Administration & Leadership* 44, 5 (2016), 814–836. <https://doi.org/10.1177/1741143215570302>

- [32] Amanda Lee Hughes and Andrea H. Tapia. 2015. Social media in crisis: When professional responders meet digital volunteers. *Journal of Homeland Security and Emergency Management* 12, 3 (2015), 679–706. <https://doi.org/10.1515/jhsem-2014-0080>
- [33] Victor Kaptelinin and Bonnie Nardi. 2012. Activity theory in HCI: Fundamentals and reflections. *Synthesis Lectures Human-Centered Informatics* 5, 1 (2012), 1–105. <https://doi.org/10.2200/S00413ED1V01Y201203HCI013>
- [34] Victor Kaptelinin, Bonnie Nardi, Susanne Bødker, John Carroll, Jim Hollan, Edwin Hutchins, and Terry Winograd. 2003. Post-Cognitivist HCI: Second-Wave Theories. In *CHI '03 Extended Abstracts on Human Factors in Computing Systems* (Ft. Lauderdale, Florida, USA) (CHI EA '03). Association for Computing Machinery, New York, NY, USA, 692–693. <https://doi.org/10.1145/765891.765933>
- [35] Victor Kaptelinin and Bonnie A Nardi. 1997. Activity theory: basic concepts and applications. In *CHI'97 Extended Abstracts on Human Factors in Computing Systems*. Association for Computing Machinery, New York, NY, USA, 158–159. <https://doi.org/10.1145/1120212.1120321>
- [36] Karrie Karahalios. 2012. Session Details: Tabletop Displays: From Activity to Activity Theory. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work* (Seattle, Washington, USA) (CSCW '12). Association for Computing Machinery, New York, NY, USA, 1. <https://doi.org/10.1145/3256327>
- [37] Erik L. Lachance. 2020. COVID-19 and its Impact on Volunteering: Moving Towards Virtual Volunteering. *Leisure Sciences* (2020), 1–7. <https://doi.org/10.1080/01490400.2020.1773990>
- [38] Nicolas J LaLone, Jess Kropczynski, and Andrea H Tapia. 2018. The Symbiotic Relationship of Crisis Response Professionals and Enthusiasts as Demonstrated by Reddit's User-Interface Over Time. In *Proceedings of the 15th International Conference on Information Systems for Crisis Response and Management (ISCRAM 2018)*, Kees Boersma and Brian Tomaszeski (Eds.). Rochester Institute of Technology, Rochester, NY, USA, 232–244.
- [39] Alex Leavitt and John J. Robinson. 2017. The Role of Information Visibility in Network Gatekeeping: Information Aggregation on Reddit during Crisis Events. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing* (Portland, Oregon, USA) (CSCW '17). Association for Computing Machinery, New York, NY, USA, 1246–1261. <https://doi.org/10.1145/2998181.2998299>
- [40] Taejun (David) Lee, Hyojung Park, and Junesoo Lee. 2019. Collaborative accountability for sustainable public health: A Korean perspective on the effective use of ICT-based health risk communication. *Government Information Quarterly* 36, 2 (2019), 226 – 236. <https://doi.org/10.1016/j.giq.2018.12.008>
- [41] Aleksei N. Leontiev. 1978. *Activity, Consciousness, and Personality*. Prentice Hall, Englewood Cliffs, New Jersey, USA.
- [42] Thomas Ludwig, Christoph Kotthaus, Christian Reuter, Sören Van Dongen, and Volkmar Pipek. 2017. Situated crowdsourcing during disasters: Managing the tasks of spontaneous volunteers through public displays. *International Journal of Human-Computer Studies* 102, C (June 2017), 103–121. <https://doi.org/10.1016/j.ijhcs.2016.09.008>
- [43] Kurt Luther, Casey Fiesler, and Amy Bruckman. 2013. Redistributing Leadership in Online Creative Collaboration. In *Proceedings of the 2013 Conference on Computer Supported Cooperative Work* (San Antonio, Texas, USA) (CSCW '13). Association for Computing Machinery, New York, NY, USA, 1007–1022. <https://doi.org/10.1145/2441776.2441891>
- [44] Thomas W. Malone and Kevin Crowston. 1990. What is Coordination Theory and How Can It Help Design Cooperative Work Systems?. In *Proceedings of the 1990 ACM Conference on Computer-Supported Cooperative Work* (Los Angeles, California, USA) (CSCW '90). Association for Computing Machinery, New York, NY, USA, 357–370. <https://doi.org/10.1145/99332.99367>
- [45] Gloria Mark, Mossaab Bagdouri, Leysia Palen, James Martin, Ban Al-Ani, and Kenneth Anderson. 2012. Blogs as a Collective War Diary. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work* (Seattle, Washington, USA) (CSCW '12). Association for Computing Machinery, New York, NY, USA, 37–46. <https://doi.org/10.1145/2145204.2145215>
- [46] Wendy Norris, Amy Volda, Leysia Palen, and Stephen Volda. 2019. “Is the Time Right Now?”: Reconciling Sociotemporal Disorder in Distributed Team Work. *Proceedings of the ACM on Human-Computer Interaction* 3, CSCW, Article 98 (Nov. 2019), 29 pages. <https://doi.org/10.1145/3359200>
- [47] Kristine L. Nowak, James Watt, and Joseph B. Walther. 2017. The Influence of Synchrony and Sensory Modality on the Person Perception Process in Computer-Mediated Groups. *Journal of Computer-Mediated Communication* 10, 3 (07 2017). <https://doi.org/10.1111/j.1083-6101.2005.tb00251.x> JCMC1038.
- [48] Johan P. Olsen. 2009. Change and continuity: an institutional approach to institutions of democratic government. *European Political Science Review* 1, 1 (2009), 3–32. <https://doi.org/10.1017/S1755773909000022>
- [49] Alexandra Olteanu, Sarah Vieweg, and Carlos Castillo. 2015. What to Expect When the Unexpected Happens: Social Media Communications Across Crises. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing* (Vancouver, BC, Canada) (CSCW '15). Association for Computing Machinery, New York, NY, USA, 994–1009. <https://doi.org/10.1145/2675133.2675242>
- [50] World Health Organization. 2016. Global report on urban health: equitable healthier cities for sustainable development. (2016). Retrieved 2020-09-17 from <https://apps.who.int/iris/rest/bitstreams/909311/retrieve>

- [51] Leysia Palen and Kenneth M. Anderson. 2016. Crisis informatics — New data for extraordinary times. *Science* 353 (Jul. 2016), 224–225. <https://doi.org/10.1126/science.aag2579>
- [52] Leysia Palen and Amanda L. Hughes. 2018. Social Media in Disaster Communication. In *Handbook of Disaster Research*, Havidán Rodríguez, William Donner, and Joseph E. Trainor (Eds.). Palgrave Macmillan, Cham, Switzerland, 497–518. https://doi.org/10.1007/978-3-319-63254-4_24
- [53] Volkmar Pipek, Leysia Palen, and Jonas Landgren. 2012. Workshop Summary: Collaboration & Crisis Informatics (CCI'2012). In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work Companion* (Seattle, Washington, USA) (CSCW '12). Association for Computing Machinery, New York, NY, USA, 13–14. <https://doi.org/10.1145/2141512.2141520>
- [54] Hemant Purohit, Carlos Castillo, Fernando Diaz, Amit Sheth, and Patrick Meier. 2014. Emergency-relief coordination on social media: Automatically matching resource requests and offers. *First Monday* 19, 1 (Jan. 2014). <https://doi.org/10.5210/fm.v19i1.4848>
- [55] Hemant Purohit, Andrew Hampton, Shreyansh Bhatt, Valerie L. Shalin, Amit P. Sheth, and John M. Flach. 2014. Identifying Seekers and Suppliers in Social Media Communities to Support Crisis Coordination. *Computer Supported Cooperative Work (CSCW)* 23, 4–6 (Dec. 2014), 513–545. <https://doi.org/10.1007/s10606-014-9209-y>
- [56] Enrico L. Quarantelli and Russell R. Dynes. 1985. Community response to disasters. *Disaster and Mental Health: Selected Contemporary Perspectives*, Rockville, MD, National Institute for Mental Health (Jan. 1985), 158–168.
- [57] Christian Reuter, Oliver Heger, and Volkmar Pipek. 2013. Combining Real and Virtual Volunteers through Social Media. In *Proceedings of the 10th International Conference on Information Systems for Crisis Response and Management* (Siegen, Germany) (ISCRAM 2013), Tina Comes, Frank Fiedrich, Stephan Fortier, Jutta Geldermann, and Tim Müller (Eds.). Karlsruhe Institut für Technologie, Baden-Baden, Germany, 780–790.
- [58] Christian Reuter, Amanda Lee Hughes, and Marc-André Kaufhold. 2018. Social Media in Crisis Management: An Evaluation and Analysis of Crisis Informatics Research. *International Journal of Human-Computer Interaction* 34, 4 (Apr. 2018), 280–294. <https://doi.org/10.1080/10447318.2018.1427832>
- [59] Christian Reuter, Thomas Ludwig, Marc-André Kaufhold, and Volkmar Pipek. 2015. XHELP: Design of a Cross-Platform Social-Media Application to Support Volunteer Moderators in Disasters. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (Seoul, Republic of Korea) (CHI '15). Association for Computing Machinery, New York, NY, USA, 4093–4102. <https://doi.org/10.1145/2702123.2702171>
- [60] Christian Reuter, Alexandra Marx, and Volkmar Pipek. 2012. Crisis Management 2.0: Towards a Systematization of Social Software Use in Crisis Situations. *International Journal of Information Systems for Crisis Response and Management (IJISCRAM)* 4, 1 (Jan. 2012), 1–16. <https://doi.org/10.4018/jiscrm.2012010101>
- [61] Reuters. 2020. *Reporting on Covid-19 in Italy: 'Life as we've known it has stopped'*. Retrieved 10/01/2020 from <https://www.theguardian.com/membership/2020/mar/28/coronavirus-reporting-italy-death-toll>
- [62] Aleksandra Sarcevic, Leysia Palen, and Randall S. Burd. 2011. Coordinating Time-Critical Work with Role-Tagging. In *Proceedings of the ACM 2011 Conference on Computer Supported Cooperative Work* (Hangzhou, China) (CSCW '11). Association for Computing Machinery, New York, NY, USA, 465–474. <https://doi.org/10.1145/1958824.1958896>
- [63] Aleksandra Sarcevic, Leysia Palen, Joanne White, Kate Starbird, Mossaab Bagdouri, and Kenneth Anderson. 2012. "Beacons of Hope" in Decentralized Coordination: Learning from on-the-Ground Medical Twitterers during the 2010 Haiti Earthquake. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work* (Seattle, Washington, USA) (CSCW '12). Association for Computing Machinery, New York, NY, USA, 47–56. <https://doi.org/10.1145/2145204.2145217>
- [64] Arjen Schmidt, Jeroen Wolbers, Julie Ferguson, and Kees Boersma. 2018. Are you Ready2Help? Conceptualizing the management of online and onsite volunteer convergence. *Journal of Contingencies and Crisis Management* 26, 3 (Aug. 2018), 338–349. <https://doi.org/10.1111/1468-5973.12200>
- [65] Bryan Semaan and Gloria Mark. 2011. Technology-Mediated Social Arrangements to Resolve Breakdowns in Infrastructure during Ongoing Disruption. *ACM Trans. Comput.-Hum. Interact.* 18, 4, Article 21 (Dec. 2011), 21 pages. <https://doi.org/10.1145/2063231.2063235>
- [66] Bryan Semaan and Gloria Mark. 2012. "facebooking" towards Crisis Recovery and beyond: Disruption as an Opportunity. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work* (Seattle, Washington, USA) (CSCW '12). Association for Computing Machinery, New York, NY, USA, 27–36. <https://doi.org/10.1145/2145204.2145214>
- [67] Farhana Shahid, Shahinul Hoque Ony, Takrim Rahman Albi, Sriram Chellappan, Aditya Vashista, and A. B. M. Alim Al Islam. 2020. Learning from Tweets: Opportunities and Challenges to Inform Policy Making During Dengue Epidemic. *Proc. ACM Hum.-Comput. Interact.* 4, CSCW1, Article 065 (May 2020), 27 pages. <https://doi.org/10.1145/3392875>
- [68] Irina Shklovski, Leysia Palen, and Jeannette Sutton. 2008. Finding Community through Information and Communication Technology in Disaster Response. In *Proceedings of the 2008 ACM Conference on Computer Supported Cooperative Work* (San Diego, CA, USA) (CSCW '08). Association for Computing Machinery, New York, NY, USA, 127–136. <https://doi.org/10.1145/1460563.1460584>

- [69] William R. Smith, Keri K. Stephens, Brett Robertson, Jing Li, and Dhiraj Murthy. 2018. Social media in citizen-led disaster response: Rescuer roles, coordination challenges, and untapped potential. In *Proceedings of the Information Systems for Crisis Response and Management (ISCRAM 2018)*, Kees Boersma and Brian Tomaszewski (Eds.). Rochester Institute of Technology, Rochester, NY, USA, 639–648.
- [70] Kate Starbird. 2012. Crowd Computation: Organizing Information during Mass Disruption Events. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work Companion* (Seattle, Washington, USA) (CSCW '12). Association for Computing Machinery, New York, NY, USA, 339–342. <https://doi.org/10.1145/2141512.2141615>
- [71] Kate Starbird and Leysia Palen. 2011. “Voluntweeters”: Self-Organizing by Digital Volunteers in Times of Crisis. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Vancouver, BC, Canada) (CHI '11). Association for Computing Machinery, New York, NY, USA, 1071–1080. <https://doi.org/10.1145/1978942.1979102>
- [72] Kate Starbird and Leysia Palen. 2013. Working and Sustaining the Virtual “Disaster Desk”. In *Proceedings of the 2013 Conference on Computer Supported Cooperative Work* (San Antonio, Texas, USA) (CSCW '13). Association for Computing Machinery, New York, NY, USA, 491–502. <https://doi.org/10.1145/2441776.2441832>
- [73] Ernest Tambo, Adama Kazienga, Michel Talla, Chengho CF, and Fotsing C. 2017. Digital Technology and Mobile Applications Impact on Zika and Ebola Epidemics Data Sharing and Emergency Response. *J Health Med Informatics* 8 (03 2017), 254. <https://doi.org/10.4172/2157-7420.1000254>
- [74] Phudit Tejavivaddhana, Wichukorn Suriyawongpaisal, Vijj Kasemsup, and Thunwadee Suksaroj. 2020. The Roles of Village Health Volunteers: COVID-19 Prevention and Control in Thailand. *Asia Pacific Journal of Health Management* 15, 3 (2020), 18–22. <https://doi.org/10.24083/apjhm.v15i3.477>
- [75] Annemijn F Van Gorp. 2014. Integration of volunteer and technical communities into the humanitarian aid sector: Barriers to collaboration. In *Proceedings of the Information Systems for Crisis Response and Management (ISCRAM 2014)*, Starr Hiltz, Mark Pfaff, Linda Plotnick, and Patrick Shih (Eds.). University Park, PA, USA, 622–631.
- [76] Sarah Vieweg, Amanda L. Hughes, Kate Starbird, and Leysia Palen. 2010. Microblogging during two natural hazards events: What twitter may contribute to situational awareness. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Atlanta, Georgia, USA) (CHI '10), Vol. 2. Association for Computing Machinery, New York, NY, USA, 1079–1088. <https://doi.org/10.1145/1753326.1753486>
- [77] Sarah Vieweg, Leysia Palen, Sophia B. Liu, Amanda L. Hughes, and Jeanette N. Sutton. 2008. Collective intelligence in disaster: Examination of the phenomenon in the aftermath of the 2007 Virginia Tech Shooting. In *Proceedings of the 5th International Conference on Information Systems for Crisis Response and Management* (Boulder, Colorado, USA) (ISCRAM 2008), Frank Friedrich and Bartel Van de Walle (Eds.). Information Systems for Crisis Response and Management, Washington, DC, USA, 44–54.
- [78] Adriana Vivacqua, Ana Cristina Garcia, José Canós, Martina Comes, and Vaninha Vieira. 2016. Collaboration and Decision Making in Crisis Situations. In *Proceedings of the 19th ACM Conference on Computer Supported Cooperative Work and Social Computing Companion* (San Francisco, California, USA) (CSCW '16 Companion). Association for Computing Machinery, New York, NY, USA, 503–508. <https://doi.org/10.1145/2818052.2855520>
- [79] Lena Waizenegger, Brad McKenna, Wenjie Cai, and Taino Bendz. 2020. An affordance perspective of team collaboration and enforced working from home during COVID-19. *European Journal of Information Systems (EJIS)* (2020), 1–14. <https://doi.org/10.1080/0960085X.2020.1800417>
- [80] David Waldecker, Kathrin Englert, Wolfgang Ludwig-Mayerhofer, and Oliver Schmidtke. 2019. Media Ethnography and Participation in Online Practices. *Media in Action* 1 (Sep. 2019), 9–22.
- [81] Deutsche Welle. 2020. *Coronavirus: How Germany is showing solidarity amid the outbreak*. Retrieved 2020-09-17 from <https://www.dw.com/en/coronavirus-how-germany-is-showing-solidarity-amid-the-outbreak/a-52763215>
- [82] Joshua Whittaker, Blythe McLennan, and John Handmer. 2015. A review of informal volunteerism in emergencies and disasters: Definition, opportunities and challenges. *International Journal of Disaster Risk Reduction* 13 (Jul. 2015), 358–368. <https://doi.org/10.1016/j.ijdr.2015.07.010>
- [83] Brenda K Wiederhold. 2020. Connecting Through Technology During the Coronavirus Disease 2019 Pandemic: Avoiding “Zoom Fatigue”. *Cyberpsychology, Behavior, and Social Networking* 23 (2020), 437–438. Issue 7. <https://doi.org/10.1089/cyber.2020.29188.bkw>
- [84] Tom Wilson, Kaitlyn Zhou, and Kate Starbird. 2018. Assembling Strategic Narratives: Information Operations as Collaborative Work within an Online Community. *Proceedings of the ACM on Human-Computer Interaction* 2, CSCW, Article 183 (Nov. 2018), 26 pages. <https://doi.org/10.1145/3274452>
- [85] Wired. 2020. *Amid Social Distancing, Neighbors Mobilize Over Facebook*. Retrieved 2020-09-17 from <https://www.wired.com/story/coronavirus-social-distancing-neighbors-mobilize-facebook/>
- [86] Zhan Zhang and Aleksandra Sarcevic. 2018. Coordination Mechanisms for Self-Organized Work in an Emergency Communication Center. *Proc. ACM Hum.-Comput. Interact.* 2, CSCW, Article 199 (Nov. 2018), 21 pages. <https://doi.org/10.1145/3274468>

A APPENDIX

Table 3. In the semi-structured interviews we posed eleven main questions derived from our research questions.

Interview Questionnaire
1. What is the name of your initiative?
2. What has led to your initiative's engagement in the context of COVID-19?
3. Who is active in your initiative?
4. Please describe briefly the goal of your initiative.
5. If you would have to determine exactly who the target group of your initiative is, who would it be?
6. Which platforms do you use? Both internally in the initiative and for the external communication?
7. What kind of contact do you have with other groups or initiatives?
8. In case you do not have any contact with other initiatives: Do you follow the engagement of other groups?
9. Are you active at the Round Table? If yes, how did your contact with other initiatives develop?
10. Have you heard about nationwide or statewide initiatives, and how do you see them?
11. Do you experience support or difficulties with employers, politics or the media?

Table 4. We made five participatory observations of the *Round Table* meetings (each with two researcher) and two of the admin team meetings (each with one researcher), taking notes.

Observation	Date	Meeting	Researcher
O1	2020-04-20	Round Table Meeting	Researcher 1
O2	2020-04-20	Round Table Meeting	Researcher 2
O3	2020-04-23	Round Table Meeting	Researcher 2
O4	2020-04-23	Round Table Meeting	Researcher 3
O5	2020-04-28	Admin Meeting	Researcher 1
O6	2020-04-29	Round Table Meeting	Researcher 2
O7	2020-04-29	Round Table Meeting	Researcher 3
O8	2020-04-30	Admin Meeting	Researcher 2

Table 5. The channels in the Slack export of the *Round Table* with the number of messages and users until May 2, 2020.

Channel	Name	# Msg	# User	Description
SC01	allgemein	206	74	General Channel
SC02	flugblatt	166	74	Channel about flyer
SC03	websites	64	7	Channel about website
SC04	datenstream-input	43	74	Channel for received data
SC05	lokaler-einzelhandel	34	74	Channel about shopping help
SC06	carepäckchen-teestube	33	6	Channel about donations
SC07	community-masken	22	74	Channel about Masks
SC08	landkreis-darmstadt-dieburg	19	74	Channel for a neighborhood
SC09	test-und-demo-stream	18	10	Test channel
SC10	datenstream-output	17	74	Channel for published data
SC11	zielgruppen-erreichen	17	74	Channel about target groups
SC12	johannesviertel*	6	0	Channel for a neighborhood
SC13	darmstadt-bessungen	4	74	Channel for a neighborhood
SC14	darmstadt-nord	4	74	Channel for a neighborhood
SC15	newsstream-rki	4	72	Bot channel from Robert Koch Institute
SC16	darmstadt-stadtmitte	2	74	Channel for a neighborhood
SC17	psychologische-supervision	2	74	Channel for internal psychological help
SC18	danke-sagen	1	74	Channel to thank volunteers
SC19	darmstadt-eberstadt	1	74	Channel for a neighborhood
SC20	darmstadt-west	1	74	Channel for a neighborhood
SC21	darmstadt-arheilgen	0	74	Channel for a neighborhood
SC22	darmstadt-kranichstein	0	74	Channel for a neighborhood
SC23	darmstadt-ost	0	74	Channel for a neighborhood
SC24	darmstadt-wixhausen	0	74	Channel for a neighborhood
SC25	website*	0	0	Channel about website
Total		664	74	

* = archived, not active at time of export

Table 6. The coding scheme we used in our qualitative analysis of the collected data, including interviews and observations, is oriented by the *Activity Theory*. It was developed abductively, influenced both by the empirical material and by the theoretical framework of AT. We tried to fit the hierarchy to the AT vocabulary and where needed added more specific codes.

Level 1	Level 2	Level 3
Interactions	Activity, Action, Operation, Agency	
Needs	Aims Goals, Motivation	Post_Corona
Subjects	Meta_Organization Individuals, Economic_Actors, Medicals, Clubs, Lose_Groups, Facebook_Group, Initiatives, Pol_Party, Institutions, Cultural_Organizations, Public_Organizations, Religious_Organizations, State_Government, Newspapers, Characteristics, Sociodemographic_Features	Cooperation, Round_Table
Objects	Things Technology	Brochure, Data, Media Mediation, Paypal VideoConference_System, Communication_Technology, EMail, Phone, Messenger, SocialMedia, Facebook, Slack, Website, Online_Training
Help	General_Volunteering, Mental_Support, Shopping, Restaurant_Retail, Masks Care_Packages, Financial_Support	
Division_Labor	Efficiency, Immaterial_Labor, Manual_Labor, Specialized_Skills, Sanctions	
Community	Corona_Specific, Darmstadt_Specific	
Problems	AnalogDigital_Mismatch, ActionReaction_Mismatch, Demands_Public, Internal_Group, Organizational_Scepticism, RoundTable_Promotion, Money, Time	
Rhetorics_Sentiments	Rhetorics, Positive, Disappointment, SelfReflection, Personal_Opinion	

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