How to Improve HO/TO's: An Exploratory Study on The Alignment Between Information, Technology and Crisis teams

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ABSTRACT

In the last decade, the number of crises has increased and have become more complex. Crisis response does not only focus on rescue operations, or separate stages but rather it is an integrated and continuous process. During this continuous process, several *Crisis handovers* (HO) and *Crisis Takeovers* (TO) take place, hereafter interchangeably referred to as HO/TO. A HO/TO is an important, critical but challenging moment during a crisis, due to the organizational factors that influence the HO/TO and the technology used to transfer information. Since these are crucial elements of a HO/TO, it would indicate that the alignment between these factors could lead to the improvement of HO/TO. However, certain barriers resulted in a lack of alignment. An important barrier originates from the organizational processes. These have a lack of focus on which crisis managers are involved in the HO/TO and thus create a lack of alignment between the systems and information used by various crisis teams.

Keywords

Information technology, organizational processes, information quality, crisis teams, HO/TO.

INTRODUCTION

In the last decade, the number of crises that directly affect people around the world has increased (Besiou & van Wassenhove, 2020), and these crises themselves have become more complex (Coronese et al., 2019). One reason for this is the increasing connection and dependency between societies and exposure to hazards, due to the worldwide population growth, urbanization, and environmental changes (Helbing, 2013; Huppert & Sparks, 2006). A result of this increasing complexity is that more crises in the past decade started a process where multiple factors resulted in a clustering of risks that deteriorates the situations during a crisis further (Pescaroli et al., 2014). At the same time, the response to these disruptive events has become more holistic (Sapriel, 2003). Responses do not only focus on rescue operations, or separate stages but rather it's an integrated and continuous process (McConnell & Drennan, 2006). These developments, along with other changes in the humanitarian sector, have led to an increase in the number of crisis organizations, often each with their own specialty. (Johansson & Bäck, 2017).

A clear example of this is the crisis that followed the 2010 7.0M earthquake in Haiti. A decade later the country is still dealing with the recovery and continues to receive aid from various organizations. The reason for this is that the relief efforts continued long after the initial crisis was over. After the initial crisis efforts shifted from relief efforts to the development of the affected communities (Lautze & Hammock, 1996). Not only the complexity of the disaster itself but also the complexity of the response to it resulted in multiple and longer relief missions (Kroll et al., 2021).

Crisis teams responding to these complex emergencies consist of various individuals with experience in crisis management and are sent to a crisis situation by an overarching crisis organization, like the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) (Waller et al., 2014). Specific crisis teams do not stay at a crisis scene for the entirety of a crisis, since these teams operate under a lot of stress and intense conditions with long hours (Jachens et al., 2018), therefore it's common practice for organizations to "rotate" crisis responders. Organizations like OCHA rotate their crisis responders every few weeks (Soden & Palen, 2016). When

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organizations "rotate" their teams a transfer of the situation takes place takes place. During these transfer, the "current mission team" conducts a *Crisis HO/TO* (HO) and transfers its responsibilities, operations, information, and other aspects to the "follow-up team", which conducts the *Crisis takeover* (TO), so the continuity of their activities can be ensured (Manser & Foster, 2011). For this paper terms HO/TO and TO can be used interchangeably, therefore this paper will primarily use the term HO/TO. HO/TO are a critical moment during the crisis relief efforts since it is important to have a clear structure in place to guide relief efforts so that relief efforts can be continued without delay (Bénaben, 2016; Xenakis et al., 2012).

Considering the increased number and variety of teams, and the longer-lasting response, these HO/TO have become more common in modern crisis situations. These HO/TO and efforts depend on more information than HO/TO in the past since more different kinds of processes depend on an organized HO/TO (Sakurai et al., 2014). In the last decades, information has become a more important resource during a HO/TO (Sakurai & Murayama, 2019). This is because there is an increasing amount of tools and technology available which help analyze, process, and translate data into valuable information which helped in decision making (Ristvej & Zagorecki, 2011). Therefore, the proper transfer of information and systems which are compatible, ensures that crisis teams can continue their relief efforts without any delay (Nahida et al., 2017).

Even though the increased use of information and technologies can improve a HO/TO itself, by improving the quantity of information that has become possible to transfer, it has also made HO/TO more challenging (Zagorecki et al., 2013). By focusing more on the use of information, the demand for information has increased as well. This resulted in large quantities of data being transferred in a relatively short time frame (Zagorecki et al., 2013). Lastly, organizations need to ensure that tools and their configurations, which are being used to process all this information, need to be transferred as well (Hsu & Lin, 2016). Information can lose its value during a HO/TO, especially when there are differences between the various tools in use (Carter et al., 2009).

In summary, a HO/TO is an important, critical but challenging moment during a crisis. This is due to the organizational factors that influence the HO/TO and the technologies used to transfer large amounts of information, which needs to be achieved in a short time frame. Since these are some crucial elements of a HO/TO, it would indicate that the alignment between these factors could lead to the improvement of HO/TO, yet certain barriers resulted in a lack of alignment (Isaksen et al., 2020).

Research Objective

To improve HO/TO's several issues need to be solved. The reason these issues haven't been solved thus far is that there currently is no proper alignment between the crisis organizations, information gathered, and technology in use. However, there are currently a few factors that prevent the alignment between these variables. What these factors are and where they come from is currently unknown. Finding these factors will help further digitize crisis teams and lead to crisis teams that are better capable of using various types of tools and software in their day to day to activities, to better utilize the various types of information gathered by crisis teams. These various types of information and technology can in turn help crisis teams improve and optimize their current processes and thus HO/TO's.

Thus, this paper aims to discover ways that lead to further improvement of technology and information used in crisis organizations. By doing so this paper looks to create a more comprehensive understanding of factors that influence the success of HO/TO's.

RELATED WORK

Crisis teams gather various sorts of information to improve their operations in response to critical events. Increasingly technologies and the general availability of data enabled these teams to gather more information and quicker. Yet due to this large amount of information gathered, various processes have become even more complex, including the HO/TO to a new team (Zagorecki et al., 2013). Research has shown that successful HO/TO's depend on a combination of technology, non-technical skills, and proper information quality within the organization systems (Jeffcott et al., 2009; Merten et al., 2017; Pezzolesi et al., 2013). Research has also stated that organizations can not improve processes, without the alignment of all aspects of a process and IT (Bessler, 2010), if there is no proper alignment, organizations can not fully utilize their available resources (Peak et al., 2005).

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Information Quality

Transferring large volumes of data does not mean that large quantities of information are transferred (Genesereth et al., 1997). Data needs to be translated, cleaned, and structured before it can be considered information (Bernstein, 2011). Initial crisis teams flooded follow-up teams during a HO/TO with large quantities of data, which resulted in an information overload (Pickering et al., 2010). Also, the initial crisis teams are exhausted upon conducting the HO/TO, which can compromise a proper transfer of information (Talbot & Bleetman, 2007).

There were instances in the past which showed that standardizing the information transfer during a HO/TO does not improve the information transfer. However, this was because the staff involved was not familiar with the transfer method (Talbot & Bleetman, 2007). Different studies have shown that a standardization method, which is familiar to both parties, does indeed lead to a qualitative information transfer (Ilan et al., 2012). A standardized transfer of data can ensure that information received would not be perceived as unambiguous (Shah et al., 2016), and most importantly information would not get lost (Bhabra et al., 2007). Thus, standardization of a responsible information transfer process, which includes the way information stored and documents how it was gathered, would lead to an improved quality of information which would be beneficial for the HO/TO (Iedema et al., 2012).

Technological Compatibility

Since the emphasis on information is increasing, the tools need to be compatible with the requirements for crisis teams (Gralla et al., 2014). The ability of technology to integrate and scale with other applications and systems is an important factor of technological compatibility (Mariani et al., 2007). This can be measured by the usage of information, without conflicting records, by different actors, and without degrading information quality (Brace et al., 1989). If technology is easy to use and integrate into the current IT environment, it will be more compatible and positively influence the transfer of information (Whitehead, 2007). Another aspect that determines technological compatibility, is the information transfer speed between devices (Scala & McGrath, 1993). If the data transfer speed is limited, or not on the desired speed of the actors during the crisis, and thus not accessible, it is a sign that software is not compatible (Lettl et al., 2006).

Organizational Processes

As stated before, there are many types of technology available that can fulfill many of the requirements crisis teams have. Yet, crisis teams still face various issues during a HO/TO, even with the use of more technology (Qadir et al., 2016). These issues stem from social organization aspects, for example, the knowledge barriers that play a factor during the HO/TO and use of technology (Shinkle, 2009). Also, the structure of processes and work methods influence the way HO/TO's are conducted (Bhabra et al., 2007).

RESEARCH METHOD

This research starts with a focus on the improvement of crisis situations with the help of information technology. As it focuses on the way crisis teams interact with technology to conduct and improve HO/TO's, therefore this research has a socio-technological focus. After conducting a literature review the scope narrowed down on the improvement of HO/TO's and how alignment would help crisis organizations make use of information technology. This resulted in approaching experts that had the proper knowledge to participate in this research. Several experts were asked about their previous experience with HO/TO's and the use of technology within their respective crisis organizations. Based on these findings the initial problems that occur during a HO/TO were formulated. This led to a better understanding of the origins of issues crisis organizations face and how these could be improved.

For this research, several semi-structured interviews with experienced emergency responders were conducted, the results from these interviews were analyzed both qualitatively and quantitatively. Through these interviews, we examined the challenges these responders faced during HO/TO's. These interviews, in contrast with other methods, like surveys or questionnaires, provided the researchers with a better understanding of these challenges and added more depth to the results (Noor, 2008).

Data Collection

In total twelve interviews were conducted. The interviewees are working for different organizations, from governmental organizations to organizations that focus on international humanitarian aid. The HO/TO's which were conducted by the various interviewees focused on the transfer of the crisis situation between teams, within the same crisis organization. The research made use of multi-stage sampling, meaning that two sampling methods were used. The first interviewees were contacted via the network of the researchers. Thereafter, various other

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interviewees were contacted via snowball sampling. The experts that were interviewed thereafter, were chosen based on their knowledge and expertise within the information management and crisis management fields. All these interviewees also have been involved with many HO/TO's related to sudden-onset disasters. Therefore, a judgmental sampling approach was used for these experts, meaning that these experts were chosen, based on their aforementioned knowledge (Alkilani et al., 2013). All these interviews were conducted between November and December 2020. The interview protocol focused on the improvement of HO/TO's, issues experts faced while conducting various HO/TO's, and the potential of technology and information to support these HO/TO's.

The interviews followed a semi-structured approach. The interviewees were asked for permission to record the interviews. The transcripts of the interview were analyzed afterward. When interviewees or findings from the interviews were contradictory, these contradictions were included in subsequent interviews. This allowed for the interviewee to explain the reason for views or experiences. All interviews started with a brief explanation of the research, followed by an introduction by the interviewee. Next, the interviews focused on the topics based on the previously discussed theoretical concepts:

- **Handover:** How the interviewee worked during a HO/TO, issues he faced, and desired improvements. Here a shared understanding of the HO/TO process, the situations, and considerations were established, used for further discussion on more detailed topics.
- **Information quality:** The role of information during a HO/TO, how information is begin transferred and issues crisis managers faced related to information.
- **Technological compatibility:** The technologies crisis managers use, which new kinds of technologies they would like to use, how technology was introduced in the past, and how technology could help improve HO/TO's.
- **Organizational processes:** The internal processes play out within crisis teams and organizations, which protocols are in place, how communication flows move and how this influences HO/TO's.

Participants

The 12 participating interviewees have all been involved in various sudden-onset disasters all over the world and have performed various HO/TO's. In Table 1 the function of interest of the interviewee, their function scope, and their number of conducted HO/TO's have been mentioned. All participants have experience in the information management and crisis management fields, but all have different backgrounds, some started their careers at the fire brigade, while others worked in IT and later moved to the crisis management field.

Table 1. Interviewee background

Code	Function	Scope	HO/TO #
I	*Crisis management advisor*	Regional, National	>5-10x
II	*Emergency response officer*	International	>20x
III	*Former chief innovation officer*	National, International	>5-10x
IV	*Former emergency coordinator*	Regional, National,	>10-20x
V	*Chief operational information*	Regional, National,	>5-10x
VI	*Program manager in the field of security issues*	International	>5-10x
VII	*Program officer*	International	>5-10x
VIII	*Trainee crisis management*	Regional, national	<5x
IX	*Professor information technology*	National, International	<5x
X	*Project manager safety region*	Regional, National	>20x
XI	*Disaster management software expert*	International	>5-10x
XII	*Professor crisis management*	International	<5x

ANALYSIS

After the interviews were conducted and transcribed, the mentions of specific factors were documented, by following an open coded approach, to identify the various factors and which had the biggest impact related to the improvement of HO/TO's. Afterward, it was documented how many times certain factors were mentioned in coherence with the other factors to see if there was a clear relationship between certain factors.

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For this research 30% has been chosen as a valid coding percentage, from the highest co-occurring variables. This would mean that sub-variables with an individual occurrence below 20 have been scrapped from the results of this research, as they were deemed insignificant for the primary variable. The percentage of 30% has been chosen based on research by Campbell et al. (2013), this research used the same method for analyzing his interviews. Campbell et al. (2013), state that the minimum percentage for claiming valid results is an occurrence between 10% and 20%, and that the maximum percentage would be 75%, to add more validity to the research results a percentage in the middle of the two extremes was chosen, which was 30%. The complete co-occurring table can be found in Table 2. In Table 2 the variables which co-occurred more than five times together are marked to indicate a stronger relationship between variables.

Table 2. Code co-occurrence

Code Category	Information responsibility	Information sources	Information accountability	Information goals	Technology connectivity	Technology complexity	Technology accessibility	Technology scalability	Knowledge barriers	Organization factors	IT Governance	Total
Information responsibility	-											
Information sources	10	-										
Information Accountability	4	3	-									
Information goals	3	4	2	-								
Technology connectivity	3	5	4	1	-							
Technology complexity	3	5	5	1	5	-						
Technology accessibility	2	5	4	2	2	8	-					
Technology scalability	3	3	0	0	3	5	5	-				
Knowledge barriers	5	9	2	1	8	13	9	8	-			
Organization factors	3	9	2	2	3	8	4	4	9	-		
IT Governance	1	3	0	2	0	0	0	0	2	3	-	
Total	37	56	26	18	34	53	41	31	66	47	11	435

To further analyze the qualitative results the various interview outcomes were categorized so that not only the topics discussed became clear, but also the relevant information was ordered. These categories, the same as the codes of the quantitative part, were later segmented. This resulted in overarching results between the various categories which helped formulate a proper conclusion. Based on the way the various interviewees expressed themselves, more relevant findings became clear than just the number of mentions of a topic (Noor, 2008).

Coding

During the conducted interviews the relevant codes, as can be seen in Table 3, were analyzed. These codes can be further divided into sub-codes. Based on the findings in Table 3, it becomes clear that information quality indeed is considered an important element during HO/TO's. But it also shows that more crisis managers mention that the organizational processes play a bigger factor than technological compatibility during HO/TO improvement. The primary codes will be further expanded in the following paragraph.

Table 3. Coding results

Code	Primary occurrences	Definition	Sub-codes	Sub-occurrence
Information quality	82	*The impact that high-quality information has on the improvement of important elements of a HO/TO.*	Information responsibility	27
			Information sources	55
Technological compatibility	74	*The different properties of technology make it possible to read and use high-quality information during a HO/TO.*	Technology complexity	31
			Technology accessibility	23
			Technology scalability	20
Organizational processes	86	*Internal human-driven processes within crisis teams are important for linking technology to improving HO/TO's.*	Knowledge barriers	53
			Organization structure	33

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RESULTS

HO/TO's experienced by interviewees usually follow the same format. The initial crisis team arrives on a crisis and leaves after a week. During this week the initial team tries to gather various types of information and tries to set up information streams, which help the crisis managers in the field. After this week, this team is relieved by the follow-up team. The team managers of the follow-up and the initial team discuss the situation at the point of the HO/TO, transfer all the information which has previously been gathered, and give the new team the authority to manage the crisis situation. However, all interviewees expressed that this is the ideal situation, there have been situations where follow-up teams either received no information or were flooded with information. Interviewees have also expressed that they often don't receive the relevant contact information to keep the information streams flowing, which complicates the work efforts of the follow-up teams the first few days. The worst-case scenario, which has also occurred, is when all the relevant person of the initial crisis team has already left the crisis. In this case, the follow-up has to translate all their notes, systems, and previous information but lacks routines and agreements with other teams. Follow-up teams try to solve this by contacting members of the initial team.

Information Quality Issues

As stated by almost all interviewees information is a valuable source during a crisis. However, many initial crisis teams gather a lot of data during a crisis, which they want to transfer to the follow-up team. But this initial team does not filter their acquired data, they transfer this data to the follow-up team, without thinking about the future use of this data and the usability of this data, as is stated by an interviewee:

> *"If you go on a mission, you are only focused on the task. You acquire a lot of information and want to transfer this afterward, but many teams just throw it at you, without filtering data first or thinking about the follow-up situation." - Chief operational information*

The data that is transferred might not contain useful information after all. Other interviewees state that sometimes valuable information is transferred, but isn't fully used. The use of information is often narrowed and thus after a HO/TO, the usability of this data gets lost. There is often a focus on the single use of information, but this same information could be used for many more purposes if it is of a strong enough quality. As stated by an interviewee:

> *"There is a primary focus on the use of information to fuel platforms, to share this information, but good information has more functions, like being used as a coordination tool. A part is a situational awareness, a part is the situation reports information delivered and a part is an overview for involved parties." - Chief innovation officer*

This shows that the focus crisis teams have on their data is an important factor in the quality and thus usability of this data. According to some interviewees, there is a wrong focus on the available information. As stated by an interviewee, information is a valuable asset, as long as crisis teams can make use of this information to pursue crisis goals.

> *"Information is always a valuable asset, even in a dire crisis. However, Information is part of the complete crisis ecosystem. So it should not be the main focus, if you have the correct information you can operate with a strong focus. But, you can say that the use of technology is not a valuable asset, the big question is can you link the information available to the processes that pursue the crisis goal?" - Disaster management software expert*

This interviewee gives some insight into the role technology plays during a crisis in combination with the information quality of available information. Information and technology are only important if the technology enables the use of information to further the crisis goals.

Technology Compatibility Issues

As stated by the previous interviewee, technology needs to add value to pursue the crisis goal, thus a HO/TO. However, many interviewees expressed that there are indeed many types of technology available, ranging from applications like MS Excel to elaborate dashboards, they need to be careful not to be inundated with new technology and tools.

> *"We have to be careful with software that we are not inundated with new software every time." - Emergency coordinator*

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It has occurred in the past that crisis teams were approached, to make use of technology and that this technology was not of added value. There are many types of technology, but the proper compatibility is missing. Different types of technology offer various benefits and would help solve issues regarding the handling of information, but this large amount of different tools has made it difficult to acquire compatible technology.

> *"People will maybe be greeted with skepticism, not because they are not collaborative, but they heard it so many times, where magical tools were proposed and it did not make the big difference they were promised or it just was not relevant." - Emergency coordinator*

According to interviewees, it is clear that there needs to be a stronger focus on true compatible technology. Especially when it comes to the use of technology to further digitize HO/TO's.

> *"Technology needs to be compatible with our virtual world, this is something that needs more focus."- Chief innovation officer*

Organizational Issues

As mentioned before many crisis managers have been offered software that would solve all possible issues they faced. However, this was often not the case, according to interviewees. According to interviewees, there should be more focus on the social aspect of HO/TO improvement. As can be seen by a quote by an interviewee:

> *"Common sense always takes precedence over technology or information, I keep bringing that up, but often it is not listened to" - Crisis management advisor*

Common knowledge and experience, in other words, the crisis managers themselves, are the most important factor during a HO/TO. The fact that the proper people are in the right place is a crucial factor during a crisis. Technology or information cannot get the proper people in the right position. There are many different crisis managers within the crisis ecosystem, many of these have their own technology and own tasks.

> *"Every organization has its own view and wants to pursue different tasks and of course their own technology." - Project manager safety region*

Not only do crisis teams have their own tasks and technology, but their overarching organizations are also splintered. There is no clear strategy for improvement and many teams operate on their own. These organizations also face issues regarding the transfer of information and the HO/TO. Not only the knowledge level of the receiver plays a role in the transfer process, but also the method. During a crisis, crisis teams experience more benefits when communication flows and information is shared in a downward method, instead of the hierarchical upward method, which takes too long in a crisis. This also results in the fact that more decisions are made with a focus on initial teams instead of the follow-up teams. Decisions concerning follow-up teams are only made when the HO/TO draws near. Due to the hierarchical communication the HO/TO's increase in complexity for the follow-up teams.

> *"You see that they (crisis organizations) are affected by a lot of splintering and that many parties operate on their own. Many parties share information in an upward manner and have a hard time with sharing in a downward manner." - Emergency coordinator*

It has also become clear that the complexity of the technology, which is partially based on the knowledge level of the crisis organization plays a role when improving the HO/TO. There are various different complex tools available that can help during a crisis. Many of these are however complex to use. If technology is too complex, an expert is needed to make use of it or explain it to a different end-user. Since this is a clear barrier that crisis organizations need to consider, it is important that the technology, which is made available to crisis teams can be understood by all crisis managers in the field, regardless of their background or knowledge level.

> *"If technology is complex, you need an expert to use, or explain it. However, experts are not always available." - Professor crisis management*

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All crisis managers involved in a crisis are experts in the field of crisis management, but all of them also have their own expertise. There are many practical-oriented members within crisis teams that only have a limited amount of knowledge about technology, but there are also members which are technology experts. These diverse teams have many benefits, but they also make it difficult for teams to make use of technology that can be understood and used by all members since there is a considerable knowledge gap between crisis team members. Which complicates digitizing crisis teams and improving HO/TO's.

DISCUSSION

The lack of alignment between information quality, technological compatibility, and organizational processes, prevents crisis teams from successfully digitizing and improving HO/TO's. However, the issue here is not the lack of information or technological tools available. It is a combination of the information overload teams perceive during a HO/TO and the overload of available tools, but both of these perceived barriers can be traced back to the knowledge levels of current crisis managers. Furthermore, even if these barriers can be bridged, it will not solve all issues regarding HO/TO's, since issues regarding these HO/TO's have a human nature.

Use of Tools

There is a stark contrast between information managers within various crisis teams. There are crisis managers that have a more practical background and previously served within organizations like fire brigades ambulance workers, these crisis managers often have less affinity with technology. Other crisis managers have a more theoretical background and have a stronger affinity with technology. This affinity with technology has various effects, there are crisis managers that have a wide scale of tools available which they can use during a crisis but are too complex for others. This knowledge barrier might be a reason why digitization within crisis teams is a difficult process. On the one hand, there are crisis managers that have knowledge about various tools and know which to use, on the other hand, there are crisis managers that prefer a more paper-based approach since they deem these tools as too complex. This knowledge barrier may thus hinder the introduction of tools available within crisis teams. It is important to note that it is, therefore, more important to make use of tools that are widely used and recognized by all crisis managers. Instead of a new tool, that can only be operated by a handful of people, crisis teams should make more use of tools like Excel to store information. These more common tools like Excel or google drive may seem less impressive compared to elaborate tools available, but they will help initiate the digitization process within crisis teams. The use of these more common tools may also help standardize the transfer of various types of information and information sources, which helps information retain its quality. Tools like Excel can help crisis managers in the field gather and HO/TO the required information and document where this information comes from. This can help improve the transfer of important information, so follow-up teams do not experience a data overload, or lack of information when they arrive on the crisis scene.

Stricter Documentation of Methods and Tools

Various crisis managers have expressed their concerns towards the harmony in methods. The working methods operated by various crisis managers and teams within the same organization differ strongly, which impacts the HO/TO. This in combination with the fact that most crisis managers prefer their own tools, makes the interaction between crisis teams chaotic. Stricter documentation of methods and tools may improve the interaction between various crisis teams. An important change in methods may be the focus on the nearing HO/TO, as explained by various crisis teams, teams only start working on a HO/TO when the moment of the HO/TO is insight, this further adds to the chaos of interaction between crisis teams. Crisis teams should keep the HO/TO in mind from the start of their mission, so the proper information streams are established and documented, and the relevant information is transferred. It should also be kept in mind who will manage the situation after the HO/TO. The expected knowledge levels of the follow-up teams should be an indication for the initial teams in how well they should document the HO/TO and which kind of tools they should use which are compatible with the follow-up teams.

Organization Structure

The aforementioned issues regarding the working methods and tools can be attributed to the overarching crisis organizations. Currently, these overarching organizations have a hierarchical structure. Due to this structure, decisions making takes longer, and communication and thus changes are slower. A change in structure, where communication flows bottom-up, can have a positive effect on communication and decision-making by the crisis organizations. This may also enable crisis teams to operate more proactively in the field and in collaboration with other teams, from other organizations, where the overarching organizations were previously unaware of. Currently, these crisis organizations offer crisis teams technology with limited success, instead of offering crisis teams tools that are available, they should focus more on the desires crisis teams have and thus focus more on the human aspect in the introduction of software. This may improve the technology adoption process of crisis teams since crisis teams will be offered the technology, they actually desire.

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CONCLUSION

During the setup of information systems in crisis response, various decisions are made. The decisions to use specific tools, software, information, and so on, are based on the experience and knowledge of the members of the crisis teams. The result is that the technology used is compatible with the initial crisis team. However, these decisions, are made with a focus on the initial team and not on the possible follow-up teams. Crisis teams only start looking at the HO/TO when it becomes time for this HO/TO to occur.

Decisions that are being made at the beginning of a crisis have consequences for the HO/TO later on. These decisions will have to be based on the difference in knowledge and experience between the initial and follow-up teams, the greater this barrier, the more consideration must be put in the decisions for the use of certain technology. This knowledge barrier further enlarges the barriers crisis teams perceive and prevents them from adopting the proper information technology. Crisis teams need to act proactively on the future HO/TO, instead of waiting for it to be time to HO/TO the crisis situation. The increasing amount of technology and information which can be used is a welcome development. But, if the follow-up crisis teams receive tools that are not compatible with their tools and processes, then all this technology becomes obsolete, due to this misalignment. The primary focus should be on which technology and information are relevant for all crisis teams, regardless of their knowledge and experience and not only for the initial crisis team.

This research is a first step towards the improvement of HO/TO through improved information management. This research recognizes that technology opens up many possibilities within crisis teams and can help crisis teams improve their processes. But this research also shows that the reason why the introduction of technology has currently met limited success is that there is limited alignment between the relevant elements, which are relevant during the HO/TO. Further research should focus on two topics, one on diminishing these perceived barriers and the second on how organizational processes need to be improved so the benefits from technology can truly be harvested by crisis teams.

In conclusion, previous research showed that there are many tools available that can help crisis teams. This research has expanded on this research by focusing on the alignment between Information quality, Technical compatibility, and Organizational processes. Specifically, this research showed that the socioecological aspect plays an important role in ensuring the selection of the correct technology and its implementation. The correct alignment between technological compatibility, information quality, and organizational processes is critical in ensuring an effective transference of information during a HO/TO. The challenge specifically in HO/TO is that this alignment is not only within the current team but has to match with the incoming team as well. The choices the incumbent teams make in the tools, processes, and systems used, directly influence this alignment, and therefore warrant a conscientious approach from the early start.

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