Communication and Coordination in Crisis Management

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Preface

The basis for this research originally developed from my passion for developing better methods of safeguarding citizens from the dangers that unique events like crises pose. What is more, after participating in the Public Sector Reform course, my horizon was further broadened. Crises can spark reform in a country to change a system which is no longer suitable for modern problems, or crises can be framed to achieve a reform which suits political interests. The framing game along with my initial interest in crisis management fused together to form the goal of this research. Which is to help the public make an informed decision when appraising a crisis by presenting a good and a bad example of crisis management along with the challenges faced by those in charge and raising awareness on the importance of crisis management to those in command.

This thesis was written to fulfil the graduation requirements of the Comparative Politics, Administration and Society program of Radboud University. The groundwork of the study consists of an in-depth case-study analysis of four man-made cases of crises. My research question was devised with the help of my supervisor, Sandra Resodihardjo. The research was challenging but conducting thorough investigation has allowed me to adequately answer the devised question. Fortunately, I had a strong support group during this period.

Several people have contributed intellectually, pragmatically and with support to my thesis. Therefore, I would firstly like to thank my supervisor, Sandra Resodihardjo for her time, guidance, priceless input and support during the whole master period. Next, I would like to thank Okko Kruijshoop for his constructive feedback and his big help throughout the main part of the process. Finally, I would like to thank my family and friends for their unwavering support and comments on the concept version of this study.

I hope you enjoy your reading.

Rareș Bogdan Drăgan

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Abbreviations

AAA	Apuseni Aviation Accident
ASBI	Ambulance Service Bucharest-Ilfov
CNF	Colectiv Nightclub Fire
CPD	Coventry Police Department
DES	Department for Emergency Situations
EMS	Emergency Medical Services
ENECS	Exclusive National Emergency Calling System
FD	Fire Department
FDNY	Fire Department of New York
GIES	General Inspectorate for Emergency Situations
GIMB	Gendarmerie Inspectorate of the Municipality of Bucharest
GPDMB	General Police Directorate of the Municipality of Bucharest
HD	Hudson Ditching
IC	Incident Command
IES	Inspectorates for Emergency Situations
MERDS	Mobile Emergency, Rescue and Disbandment Service
MRS	Mountain Rescue Service
NJ	New Jersey
NY	New York
NYPD	New York Police Department
NYWW	New York Waterway
OEM	Office of Emergency Management
ROMATSA	Romania Air Traffic Administration
SNF	Station Nightclub Fire
TOC	Transylvania Off-Road Club
USCG	United States Coast Guard
WFD	Warwick Fire Department
WPD	Warwick Police Department
WWFD	West Warwick Fire Department
WWPD	West Warwick Police Department

1 Introduction

During the past two decades, humanity has been confronted with multiple crises that came in many shapes and forms, from natural disasters, vicious acts of terrorism, outbreaks of viruses, massive school shootings, migration overflows to cyber-attacks. The commonality which this kind of events possess is that they are stressful and unpleasant situations for the public. The moment when a complex system (society, economy, family or an international organisation) faces an event that puts them in a slippery and dangerous situation is when one can speak of a crisis (Bundy et al., 2017, pp. 163). In order to protect the well-being of society, it is of great importance that they are managed in the best way possible.

The term "crisis" originates from the Geek work "krisis" which, when translated has a similar meaning as the English words choice or decision (Paraskevas, 2006, pp. 893). A crisis is portrayed as any emergency situation that disturbs and destabilises a complex system while affecting an individual, a group, an organisation or society altogether. It emerges without any notice and creates a sensation of uncertainty and fear among the affected ones. It is vital for those in charge to recognise the early signals of a crisis and to inform the predisposed population and stakeholders about it. When a crisis is detected, actors must quickly act and make swift difficult choices or decisions (Mitroff et al., 2000, pp. 4-6).

When crises occur, especially without warning, they have negative impacts on society, environment, political structures, economy or (national) security. In times of a crisis, citizens look at their leaders (presidents, mayors, politicians, elected administrators and so forth) in the expectation that they will fend off the menace or at least minimise the impact it will have (Boin et al., 2005 pp. 1). In order to counter crises, crucial decision making is needed. That brings us to the notion of crisis management, which in some cases can be a matter of life and death. If the actors in charge respond well to a crisis, the damage will be limited; when they respond poorly, the impact of the crisis will increase. The concept of crisis management is commonly defined in the literature as being the process through which an organisation or state handles a disturbing and sudden event that threatens to damage an organisation, state, stakeholders or the public (Bundy et al., 2017 pp.

163-164). The quality of crisis management is essential for public representatives because it can make or break their careers.

Crisis management, put plainly, is managing the ongoing situation. For any management team dealing with a crisis, the first and primary measure is to save lives, while the second measure is damage control, and the third measure is to prevent further incidents. Vital for successful crisis management is to prepare, identify, track and manage the possible crises and control their path (Civelek et al., 2016 pp. 113). Moreover, four essential elements for an efficient crisis management response point to an interdependent and evolving process of organisational management. First, cognition grants the first meaning and mobilising connection to the following procedures of coordination, communication and control. Second, coordination implies adjusting one's actions with the ones of appropriate organisations and actors to reach a mutual goal. Third, communication involves the ability to create shared goals among individuals, groups and organisations. Lastly, control implies the capacity to maintain actions concentrated on the common objective of safeguarding lives, property and preserving the continuum of operations (Comfort, 2007 pp. 190-191).

In practice, a "common operating picture" must be established. This can be achieved by establishing a sufficient degree of shared information between dissimilar participating jurisdictions and organizations operating in different locations. Without a common operating picture, emergency response operations are inclined to backslide to hierarchy as a method of command, which leads to asymmetry in the information process. Asymmetry in information involves that organizations with superior levels of authority and responsibility send out commands to the lowest ranks without demanding or listening to feedback from these ranks. This asymmetry denies managers the functional feedback, which is indispensable to recognize and fix errors, rather than building a shared perspective on priorities (Comfort, 2007 pp.192). Thus, leading to inefficient communication and coordination in the crisis response network.

Even when facing a crisis at the local level, it is hard to establish a correct functioning crisis response network between different institutions. On a national scale, it is even harder to get multiple actors or organisations to work together to produce an efficient reaction to a threat. The research will focus on the two vital elements in directing a complex crisis, coordination and communication. The way these two factors are managed leads to a proper containment or a total failure of a crisis

that could endanger the lives of citizens. As a result, the primary purpose of this thesis is to evaluate the effectiveness of a crisis response system when dealing with an imminent threat. To do this, the following main research question will be addressed:

> ➢ *How can we explain crisis management effectiveness by looking at communication and coordination?*

With the following related sub-questions to help answer the research question:

1. What is a crisis and what does crisis management entail?
2. What are the communication and coordination requirements in a crisis response system?
3. To what extent were the crisis response systems effective in the selected cases?
4. To what degree did the crisis response systems fulfil the specified requirements in the selected cases?

In order to answer the research question and the sub-questions, four cases of man-made crises which have been dealt with will be examined. The focus will be on how the crisis response teams performed when managing the actual on-scene operations. Next, the cases will be selected on the next criteria: the time of the event (as contemporary as possible); language (English or Romanian) and availability of proper documentation. Furthermore, an in-depth case study will be performed through document analysis of available official evaluation reports.

The research provided in this thesis is relevant for society, as it will help to make the challenges in faced in managing crises, easier to understand and comprehend. If crises plague the public domain, citizens whose lives are affected, media and other voices on the political stage have displaced, biased or unreal expectations for the people in charge to make high-priority decisions and grant guidance in the most troublesome circumstances (Boin et al., 2005 pp. 7-8). When taking into account the challenges posed by a crisis and the unreal expectations of the citizens, it can be readily understood that when combined, these two factors lead to more crisis management problems. Crises regularly arise from feeble communication and coordination between responding organisations and the general public (Falkheimer & Heide, 2006 pp. 182). With poor coordination and communication being a risk factor, the addition of being put in the spotlight with unrealistic expectations intensifies the already difficult job of a crisis management team. Understanding the challenges faced by those in command, even if they prepared or not for a crisis, will probably help

the public and media not to criticize and make their already difficult job even worse and thereby leading to better crisis management.

Furthermore, the study has scientific relevance since it contributes to the already existing evaluative framework of crisis response systems. It does this by operationalizing the two closely linked together criteria that are the basis for efficient crisis management. Evaluating crisis management success and failure is slightly tricky. Undertaking the task of evaluating crisis management is full of methodological obstacles, which include the existence of uncountable probable criterions, differences in perception, and the understanding of equivocal and clashing outcomes (McConnel, 2011 pp. 64-65). Therefore, this study aims to contribute to this framework by analysing a part of the process, precisely evaluating the success or failure of coordination and communication. With the underlying assumption that crisis management effectiveness lays on these two fundamental criteria.

A short presentation of the structure of this thesis follows. The next chapter, the theoretical framework, explains what a crisis is; the crisis management stages; the requirements for communication and coordination, and answers the first two sub-questions. Next, the third chapter is comprised of: the research strategy; case selection; operalization of variables; data collection design; data analysis and a reflection on reliability and validity of the research. Furthermore, in the fourth chapter, a thorough analysis of the four man-made crises is presented. Finally, the research question will be answered in the last chapter along with recommendations and a reflection on the thesis.

2 Theoretical framework

The theoretical grounding for this research will be addressed in this chapter. The main purpose of this chapter is to give an extensive explanation of how crisis management works and identify the main variables required for its workability. The chapter is divided into five sections. In the first section, the notion of crisis will be described. Furthermore, section two will present crisis management and its stages. Next, crisis communication and crisis coordination and their requirements will be addressed in section three and four. Finally, the theoretical model derived from this chapter will be discussed.

2.1 What is a crisis?

Nowadays, we can find the word "crisis" used in newspaper articles, official government reports, policy documents and famous speeches. The term is used for a great variety of phenomena for example political scandals; urban protests; terrorist attacks; tsunamis; hurricanes; air crashes; pandemic viruses; chemical explosions; wildfires; economic depression; and it seems to be receiving more salience than ever. Many of these crises (e.g. 9/11, the Madrid and London bombings, the Great East Japan tsunami, avian influenza etc.) underline the fact that advanced public sectors, situated in advanced economic and democratic countries, do not offer crisis shelter, leaving the society exposed to their consequences (Drennan et al., 2014 pp. 14-15).

Plainly, a crisis event denotes a state of chaos in the apparently regular evolution of a system. A personal crisis marks a period of disorder that was preceded and afterwards followed by stability. An ecological crisis involves the endangering of the very existence of a population or species by modifying their environment. An economic crisis refers to a decline in an extensive period of growth and development. A political government crisis pertains to a circumstance in which institutions and political elites are at risk of being replaced by another group of actors. Crises are phases of transitions in which the usual ways of functioning do not work anymore (Boin et al., 2005 pp. 2).

The majority of people perceive these transitions as an urgent threat that policymakers must address urgently in times of significant uncertainty. Therefore, the three main components that make up a crisis are threat, urgency and uncertainty (Boin et al., 2005 pp. 2). The threat of damage, destruction or death that a natural disaster can cause, which violate the deep-rooted safety and security values of people, induces an acute perception of a crisis. In public organizations, a plain incident can trigger a crisis when it is framed by the media and external actors while not violating the core values of the people like natural disasters do. A sense of urgency entails the time compression phenomenon that appears when the leaders' time horizon is significantly shortened during a crisis. The high degree of uncertainty in a crisis involves the potential consequences and nature of the threat while also being affected by other factors such as the initial and emergent response to the situation (Boin et al., 2005 pp. 3-4).

A crisis can be local or international, economic or cultural and natural or human-made. Consequently, scholars have tried to develop typologies, using the three critical elements of a crisis mentioned above, in order to understand how they differ and how they pose different challenges in managing them (Boin et al., 2016 pp. 7). When looking at the threat element of a crisis, first a distinction can be made of what it will impact. A crisis can namely endanger the health and safety of people, but it can also be related to the performance of a public institution or organization which threatens their legitimacy. A second distinction for the threat element can be made based on where it will strike. A crisis can be local or at a national level, or it can jeopardize several geographical or policy domains mutating to transboundary crises, the latter being much more challenging to manage and control than crises that respect conventional borders. When examining a crisis as to the perceived level of urgency given to a threat, a differentiation can be made regarding the number of people that agree that a problem needs a quick resolution, the more people give salience to the issue to higher is the crisis level. Finally, crises can be distinguished by the level of uncertainty. The difference can be made between regular events and unique events. The former (e.g. moderate hurricanes, earthquakes or manifestations) are easy to be handled by local governments because they are predictable and standard operating procedures exist to deal with them while the unique events pose a high degree of uncertainty because of their short time, the high number of problems which appear at the same time and the lack of knowledge in what or whom to trust (Boin et al, 2016 pp. 7-9).

Two schools of thoughts exist about what incorporates a crisis, the objective school and the subjective one (Drennan et al., 2014 pp. 15). The first strand of policy and political science research, the objective school, is characterized by positivism which assumes that social phenomena can be quantified and measured. An ample agreement exists in literature on three conditions which are considered necessary for an event to be considered a crisis: severe threat, great levels of uncertainty and the immediate need for action (Drennan et al., 2014 pp. 15). The latter strand, the subjective school, emphasizes interpretation and construction while focusing on how humans comprehend and construct the world around them. A single event can be experienced differently by different persons, organizations and even nations (Drennan et al., 2014 pp. 17). Actors can perceive a crisis as an opportunity in order to reform the policy sector (Bannink & Resodihardjo, 2006 pp. 9). Whereas, others can experience the same crisis as a threat for their position or safety while others can treat the crisis with indifference when they are not directly affected by it (Drennan et al., 2014 pp. 17). Both schools of thought are important, while for the former it is hard to disagree that many threats are real, for the latter is hard to disagree that different actors have different perceptions of threats. Therefore, the third school of thought came into existence, the critical realist one, which comprises the core values of the former two strands. From a critical realistic viewpoint, a crisis is defined as follows: "*a set of circumstances in which individuals, institutions or societies face threats beyond the norms of routine, day-to-day functioning, but the significance and impact of these circumstances will vary according to individual perceptions"* (Drennan et al., 2014 pp. 19). This definition produces insight into the tension between palpable ordinary troublesome situations and a significant number of perceptions of these situations. For that reason, this definition of a crisis will be used for this thesis for more accurate identification of crisis cases.

2.2 Crisis management

The procedures which deal with threats can be found under different names like crisis management, disaster management or emergency management. First, we must make a distinction between these three terms. All emergencies have the capability of escalating and transforming into crises if they are not appropriately managed. Therefore, if a crisis gives life to an uncontrollable situation while

the harm induced by the disturbance cannot be controlled, disaster occurs (Al-Dahash et al., 2016 pp.9). As emergency management focuses on the ending of a threat in the early phases and disaster management concentrates in the handling of threat that has spanned out of control, crisis management deals with a threat that has exceeded the capabilities of an emergency response institution and has not yet transformed into a disaster. The cases that will be used for research are threats that have surpassed the first emergency response institution and have become crises. Consequently, crisis management is the most suitable approach for this thesis. For these three procedures, regardless of their lifespan, their core network sustainability and effectiveness rely on four intra-organizational and inter-organizational elements: communication, cooperation, coordination and collaboration (Kapucu & Garayev, 2012 pp. 315).

Crisis management incorporates the whole sum of measures taken to decrease the effects of a crisis (Boin et al., 2013 p.81). The standard way of studying a crisis is by dividing it into different stages in a crisis management cycle. The four stages, which are depicted in fig. 1, are: prevention (threat assessment, risk analysis, mitigation strategies); preparation (contingency planning, education, training); response (communications, emergency working, deployment of resources) and recovery (debriefing, rebuilding, learning) (Drennan et al., 2014 pp. 31). This cycle is not a mirror image of the entire crisis management in practice, but it should be understood as an approximation of policymaking which allows to clarify and learn about this intricate activity. The stages give a general indication of the different kinds of activities that occur at varying periods, and usually post-crisis studies use such classifications in their reports because of they are easy to understand, convenient and give the impression of object separation (Drennan et al., 2014 pp 31-32).
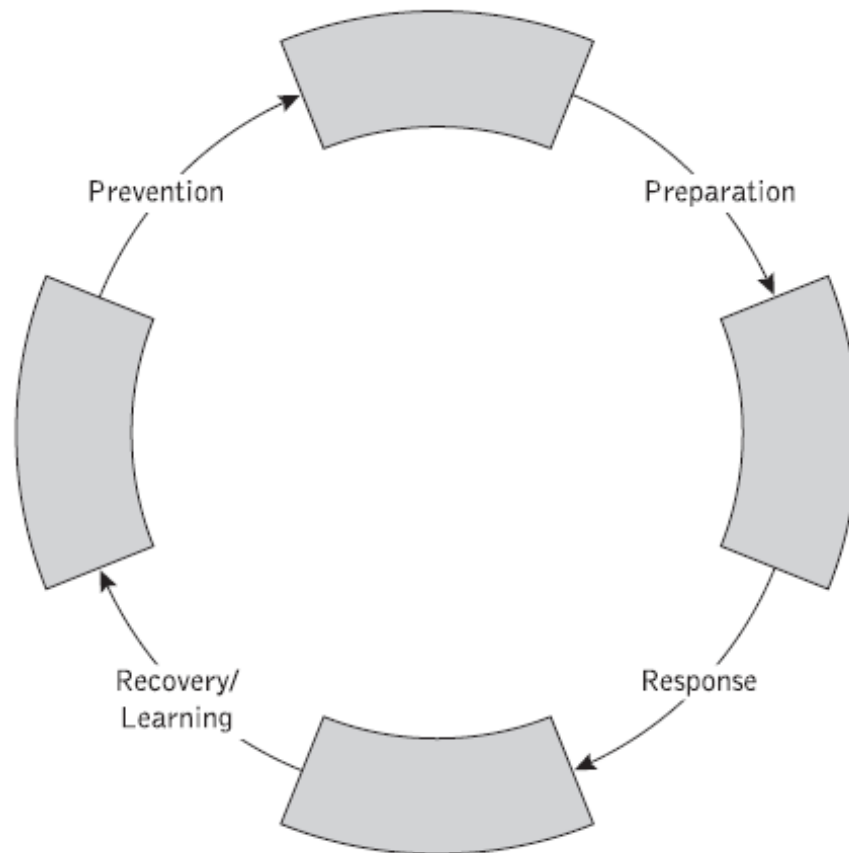
Figure 1. Crisis management cycle.

Note: Reprinted from *Risk and crisis management in the public sector*, by Drennan, L. T., McConnell, A., & Stark, A., 2014, Routledge pp. 31

Even if dealing with crises is one of the prime responsibilities of public sector executives and governments, usually, it is not perceived as a top priority. Moreover, even public administration studies on crisis management are sparse (Christensen et al., 2016 pp. 887). Crises are most of the times unpredictable, require a prompt response and usually trigger extensive debate and criticism. "Planning and preparing for the unexpected and unknown, dealing with ambiguity, and responding to urgency at the same time as dealing with citizens' expectations in the face of great uncertainty tests the limits of what bureaucratic public administration is designed to do" (Christensen et al., 2016 pp. 890). As leaders have a vital responsibility to protect society from the effects of a crisis, they should concern themselves with all the crisis stages. Therefore, an explanation of strategic crisis leadership tasks that can minimize the consequences of a crisis will follow. The five critical

tasks of strategic crisis leadership are sense making, decision making and coordinating, meaning making, accounting and learning (Boin et al., 2016 pp. 15).

Sensemaking pertains that crisis responders must detect an emerging crisis in due time so that they can alter the development of events in a more favourable direction. Usually, crises surprise leaders because it is challenging to identify from obscure, ambivalent and opposing indicators that something unusual is unfolding. Once a crisis has emerged, leaders need to understand what is going on so one may take effective response measures. They must construct systems and methods to help assess the threat and the level of urgency while identifying what is the crisis (Boin et al., 2016 pp. 23-39).

Decision making and coordinating a crisis response is one of the most challenging tasks because crises confront leaders and governments with matters that are out of the ordinary, for instance, use of deadly force or deploying the military. Crisis administrators must make hard calls while taking into consideration political, policy, ethical, organizational, occasionally personal consequences, risks, trade-offs and opportunities. During which, crisis conditions enlarge the discrepancy among the demand for and supply of public resources, while the situation continues to be volatile and uncertain, and the period needed for consultation, thinking and gaining acceptance is highly reduced (Boin et al., 2016 pp. 16). The effectiveness of a crisis response involves more than making hard decisions. The decisions must also be implemented in practice. The implementation of these decisions lays in the hands of a diffuse network which is achieved through vertical and horizontal coordination. Coordination is essential to avoid miscommunication, unneeded overlap and disputes between actors. Dissimilar jurisdictional competencies and different national or regional interests need to be taken into consideration because the organizations in a response team may be under the control of different coalitions or political parties. A well-documented phenomenon of incompatibility between dissimilar actors is the "battle of the Samaritans" that was present in response teams to massive scale disasters in which governments, NGOs and agencies forced their dissimilar approaches and methodologies of disaster response, resulting in a problematic alignment of their actions and consumption of precious energy on squabbling and impractical manoeuvring (Boin et al., 2016 pp. 17).

In addition, it is expected of those in command to reduce uncertainty through the medium of an official explanation of what is happening, the reason why it is occurring and what actions must

be taken in response. In the meaning-making process, leaders have to make others believe in their definition of the crisis after they made sense of the situation, reached a situational evaluation and made policy choices. If they fail in imputing meaning, their decisions will not be respected and understood, diminishing their efforts to manage the situation. Incumbent leaders' abilities to decide are also extremely constrained when other actors are successful in controlling the meaning-making process (Boin et al., 2016 pp. 78-87).

Publicly examining and displaying account of a crisis is a crucial but fragile step that needs to be taken in order to get from a state of crisis to a state of normalcy. The responsibility of liability debates belongs to the leaders who must provide unquestionable proof so that they cannot be blamed for the escalation or happening of a crisis. The liability processes induced by the crisis can without any difficulties deteriorate and become blame games focused on the identification and punishment of culprits and hence transforming and extending a crisis instead of terminating it (Boin et al., 2016 pp. 102-107).

Each crisis can be considered a wellspring of potential lessons for emergency plans, policy adjustment, administrative reform and preparation for upcoming crises. Crises offer invaluable opportunities to clean up and start fresh because crises uncover systems which are rusty, stuck, rigid, obsolete or inadequate. This exposure provides thrust for renunciation and changing them, or at least for significant adjustments and innovations inside them. Reforms following a crisis are easy to declare but hard to put into practice because many institutional and cognitive barriers to learning exist. These may develop in prevalent lessons that enter the collective memories and become a root of factual analogies for future actors (Boin et al., 2016 pp. 126-129).

2.3 Crisis communication

After a thorough examination of an extensive literature about crisis communication and coordination requirements, including requirements for effective crisis management, the most prevalent and relevant theories have been selected for the following two sections. This section is composed of two subsections. In the first subsection, crisis communication is discussed with a short

description and distinction between internal and external communication. While in the second subsection requirements for effective internal communication will be discussed.

2.3.1 What does crisis communication entail

Communication and coordination go hand in hand, without effective communication the coordination capacity is severely diminished (Comfort, 2007 pp. 190). The important part that communication plays for an effective crisis management response has been acknowledged for a great deal of time in the literature (Hale et al., 2005 pp.115). Inter-organizational and intra-organizational crisis communication aim to hamper and reduce the negative impacts of a crisis. The exchanged messages between actors stimulate the receiver to act to a likely threat or damaging effect while creating a realistic understanding of the risk. Crisis messages give clear directions on the present state of the crisis and the actions that must be taken (Spence et al., 2007 pp.541).

This thesis focuses on communication within a "common operating picture" which is defined as "*a process through which an organization sends a message across a channel to another part of the organization (intra-organizational communication) or another organization in the network (inter-organizational communication)*" (Kapucu, 2006 pp.209). Communication entails the use and share of information done in an efficient way by collecting, comparing, analysing and soon after spreading it out instantly and in a handy form. When the present situation of a community and the operations of cooperating institutions are communicated, it grants the responding actors the capability to make sound decisions on how to act simultaneously with other institutions in the network to achieve the primary goals. (Kapucu, 2006 pp.210).

Deficient communication designs, as incoherent information flows, hinder inter-organizational coordination and communication. During a crisis, stress and time pressure disrupt actors in their search for information while the volume of information that must stream through current channels dramatically increases. The increase of information is due to the number of coinciding events; the complexity of the crisis; and the importance of rapid and precise information of the occurring events. When the information flow rises, the number of standard communication channels goes down. The result of these processes is channel bottlenecks and information overload

which can result in failure of the communication system or the delay or loss of critical information in reaching the targeted members (Hale et al., 2005, pp.115).

For communication to remain effective in an active crisis environment, the flow of information across organizational borderlines must be highly effective. Information is managed effectively when it gets disseminated in a quick, accurate, direct and candid manner between organizations and to important stakeholders, including the mass media (Horsley & Baker, 2002 pp.428; Hale et al., 2005 pp. 116). The information moves through a path of four steps observation, interpretation, choice and dissemination in a crisis response communication spiral (fig. 2). In the first step, observation, entails gathering information about the progress of crisis events, while later repetitions of this step aim to better understand the impact of earlier enacted responses. In the second step, interpretation involves assessing information from the first step within the circumstances of the ongoing crisis to establish its relevance and accuracy. In the third step, choice, crisis decision makers analyse the overall picture that arose from the previous step, discuss different action options and choose what options to implement. Finally, in the dissemination step, after an action or a series of actions which emerged from the choice step are ready for implementation, those involved in carrying out the decisions are informed. This step also includes information transfer with the public (Hale et al., 2005 pp. 120-123).
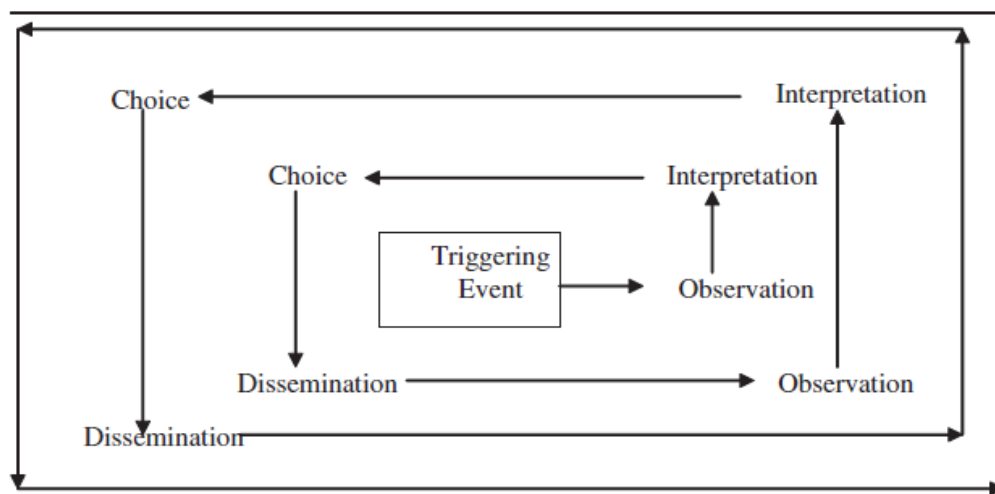

Figure 2. Spiral Crisis Communication Model.

Note: Reprinted from: *Crisis response communication challenges: Building theory from qualitative data*, by J.E. Hale, R.E. Dulek, and D.P. Hale, 2005, The Journal of Business Communication, 42(2), pp. 123

Taking into account that the main part of crisis communication literature has concentrated on external crisis communication, it is arguably to say that external crisis communication has somewhat turned into an equivalent to crisis communication. External crisis communication is comprised of a set of response strategies with the aim of influencing the perceptions of external stakeholders to rehabilitate and shield the image, legitimacy and stature of an organization (Massey, 2001 pp. 161-164; Millar et al., 2003 pp.95-96; An et al., 2011 pp. 70-76). Lately, more attention and importance has been given to internal communication by researchers, who acknowledged that among stakeholders, the most vital and predominant stakeholders in times of crisis, are the internal ones (Johansen et al., 2012 pp. 270-271; Heide & Simonsson, 2014 pp.4; Van der Meer et al., 2017 pp.426-427). The research of this thesis will focus on operational internal communication, more specific inter-organizational communication which involves the communication between responding organizations (e.g. Fire brigade, Police, Emergency response units, Virus outbreak response units etc.).

2.3.2 Requirements for an effective crisis communication

Internal crisis communication in the public and private sector is an understudied subject of crisis management. A definition for the micro level of intra-organizational crisis communication goes as follows "*an internal crisis communication perspective focuses on the need for information, communication and sensemaking among managers and employees during the acute phase of a crisis, and also on the intrinsic role of communication in crisis preparedness, anticipation and learning within an organization*" (Heide & Simonsson, 2014 pp. 1). As this study is focussed on a higher level of crisis communication, the inter-organizational one, an adaptation of the previous definition is desired "*an internal crisis communication perspective focuses on the need for information, communication and sensemaking among crisis response managers and participant organizations during the acute phase of a crisis, and also on the intrinsic role of communication in crisis preparedness, anticipation and learning within a crisis response network*". This definition clarifies the exact level and type of communication researched and the specific requirements for inter-organizational communication will follow.

The *type of governance* of a crisis response network has a great impact on its effectiveness and control of the situation. A bureaucratic system performs well when the information is simple, however, usually in crises information is complex. This complexity leads to defective communication in a bureaucratic structure (Brown & Miller, 2000 pp. 132-133). Top-down hierarchical systems found in governmental organizations do not perform properly in exceptional events where flexibility and creativity are mandatory, thus developing institutional barriers for inter-organizational communication (Kendra & Wachtendorf, 2003 pp.139-140, Alvinius at al., 2010 pp.86). Some of the barriers are intra-organisational, conflicts founded on illogical concerns such as political rivalries, inner departmental competition, personal interests and jealousies. These internal conflicts obstruct collaboration, communication, coordination and optimum use of resources within and between organizations (Drabek & McEntire, 2002 pp. 197-199; Kirschenbaum, 2003 pp.34). When in top-down hierarchy systems, people with identical knowledge and jobs gather and establish formalized networks. Nonetheless, in crisis situations, the same normal structures and boundaries can obstruct information sharing (Kendra & Wachtendorf 2003, pp.133). Overall, a more horizontal system is preferred over a hierarchical system for a crisis response network.

Working relationships which are formed before a crisis event strikes would connect responding organizations and at the same time, cross-sectoral barriers would be diminished. For that reason, actors should establish and maintain fruitful inter-organizational partnerships with other sector actors prior to crises (Seeger et al., 2003 pp.138-139; Ansell et al.,2010, pp.199). Establishing a productive inter-organizational relationship on the fly is a difficult job, an evolving and varied network requires *trust* that is usually built over time and long before crisis events. Mutual *trust* and reciprocity allow response network actors to share risks, information and opportunities with greater freedom (Kapucu, 2006 pp.210; Ansell et al.,2010 pp.197). A transparent and open decision-making process helps strengthen *trust* within and between organizations while also building credibility to organizations (McCaffrey et al., 2013 pp.18; Steelman and McCaffrey, 2013 pp.688). When organizations have healthy daily working relationships, they usually work better in crisis situations because of the high levels of *trust*. *Trust* among private, public and non-profit organizations can be best built preceding crisis situations and during crises, if actors exhibit three qualities in communication: honesty, candour and openness (Seeger, 2006 pp. 236-238; Steelman & McCaffrey 2013 pp.690). Honesty, in its basic sense, is not lying. Candour entails

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sharing the whole truth, even if the truth may have negative consequences for the organization. Openness refers to a certain extent of immediacy and accessibility that overpasses a candid response. These required traits pose perceptual barriers to organizations when in a high uncertainty context of a crisis, such as the illusion of panic; the emerging tendency of actors to withhold information; and structural barriers such as loss in communication technologies (Seeger, 2006 pp. 239). These collective relationships allow organizations to synchronize their messages and activities. To maintain networks effective, crisis planers should regularly validate credible organizations, select subject-area specialists and strengthen stakeholder relationships at all levels (Seeger, 2006 pp. 240).

In order to counter the insufficiencies of traditional top-down of governance or the lack of previous social/working relationships, *boundary spanners* are the required medicine. In practice, conventional communication channels may not work, and because of that, boundary spanners can play an essential linking role in crisis communication. They are individuals who have specific abilities and skills in communication and collaboration between and within organizations. By contributing with inexistent linkages on organizational plans, boundary spanners, ease the exchange and sharing of intelligence and connect their agency with the outside environment (Williams, 2002 pp.103-104; Alvinius at al., 2010 pp.87). The primary concern of these actors is an exchange and sharing of information while their essential task is to make decisions regarding the information gathered (Williams, 2002 pp.108; Kapucu, 2006 pp.210). A boundary spanner must be very skilful in a wide range of activities. He/she has to act as the network manager and has to build productive personal relationships with a broad range of actors. Furthermore, he/she must be able to manage in non-hierarchical decision situations through brokering and negotiation; must perform the part of policy entrepreneur by connecting problems to solutions; and must organize resources and efforts in the quest for fruitful outcomes (Williams, 2002 pp.121).

In practice, a *common operating picture* represents a cornerstone for well-defined communication and coordination. Communication inevitably includes the ability to develop a common meaning between individuals, groups and organizations. This requires achieving an adequate level of common information among different actors participating in crisis response for all organizations to comprehend the limitations on each of them and the potential conjunction of support and collaboration between them under a batch of circumstances. This can be achieved

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through years of common experience, shared training and professional interaction between personnel (Comfort,2007 pp.191; Wolbers & Boersma, 2013 pp.187-186). Communication aims to refashion the differences between the component actors in manners that permit actors to concentrate on the traits that unite them instead of dividing them. Moreover, if an organization expresses its aims and goal in manners that have importance for others, organizations and individuals from the public will react with support and resources to accomplish that goal. (Comfort, 2007 pp.194). To reach a unified *common operating picture*, this must be shaped from "incomplete, often contradictory and continuously changing information that is distributed over a large and shifting number of actors" (Ansell et al., 2010 pp.201).

A shared understanding of an ongoing situation between actors can be achieved by performing a multitude of informational and cognitive jobs ranging from crisis discovering and surveillance, via analysis to decision making, as procedural features (Ansell et al., 2010 pp. ibid.). The process, which contains the following procedural features, is called sense-making. Firstly, discovering and surveillance systems which gather main intelligence concerning the cause, dispersal and magnitude of crisis events. Secondly, the analytical capacity to analyse arriving data. This calls for a combination of experts and advanced hardware. Thirdly, real-time communications systems to gather and validate information regarding the crisis and the created damages. Most of the times, problems with the communications systems are attributed to a simple hardware failure because of the communication impeachments during the fever of a crisis. Lastly, decision support systems to support rapid still informed decision-making and overcome human limitations. A decision support system aims at helping assess information, propose decision alternatives and grant scenarios (Ansell et al., 2010 ibid.).

Communication in crisis management has concentrated on the compatibility of instruments, such as handheld data devices, cellular phones, radios, and satellite and landline telephone networks. The use of *communication and information technologies* in crisis management, in the last decade, has advanced considerably and changed the way crisis communications are performed. Ever improving and implementing new technologies will enhance the quality and speed of communication and consequently coordination of crisis response actions (Kapucu, 2006 pp. 212). When a crisis strikes, the swift deployment of communication systems for first responders and crisis management response team is needed. Better information and communication technologies

such as dual-use system can be used to overcome the multi-organizational radio compatibility. A dual-use system enables the use of both normal and crisis operation modes at the same time (Manoj & Baker, 2007 pp. 51; Reddy at al., 2009 pp. 1-2). Furthermore, in a team with disproportional experience and knowledge, low-cost tools can provide substantial support. Tools like notebooks, whiteboards, paper wall maps can be used for sharing information and tracking data. These user-friendly devices have a high degree of redundancy in cases of interrupted power or internet (Militello et al., 2007 pp.29).

2.4 Crisis coordination

Just like the previous crisis communication section, this section is also structured in two subsections. In the first subsection, what does coordination entail in a crisis response network is explained and in the second subsection, requirements for crisis coordination are presented.

2.4.1 What does crisis coordination entail

Complex problems which emerge in the present day call for collaborative resource utilizing efforts to tackle them. The use of unsegregated and reciprocal collaborations as an arrangement of inter-organizational relationships permits private and public agencies to cooperate and construct a remedy to an issue more massive than any agency can manage by itself (Zimmerman, 2012 pp. 2-4; Kettl, 2013 pp. 40-45;). Naturally, for these relations to work, coordination is needed. Most common types of coordination are network, hierarchy and market (Rodriguez et al., 2007 pp.155-157; Kapucu et al., 2010 pp. 4). Networks are loosely cooperation relations consisting of voluntary organizations. The basis of these networks is shared values, solidarity, trust or consensus and the most appreciated qualities are negotiating and bargaining (Agranoff, 2004 pp.10). On the opposite side, hierarchy advances decisions from the highest position throughout all the positions of the agency. The third type, market coordination, grants members to utilize their personal assets to attain

their different personal interests. In practice, network, hierarchy and multiple hybrid agreements of coordination usually coexist when dealing with a crisis (Christensen et al., 2015 pp. 5; Christensen et al., 2016 pp. 892-893).

Crisis coordination can be described as the lining up of an actor's actions with the actions of other compatible actors in order to accomplish a common goal (Bouckaert et al., 2010 pp.15; Koop & Lodge, 2014 pp.1313; Christensen et al. 2016 pp.888). At a maximum, crisis coordination entails a total integration of the operations of the different actors involved in crisis management, while at a minimum it entails the prompt sharing of information that these actors possess (Boin & 't Hart, 2012 pp.7). The efficiency of crisis coordination is dependent on adequate crisis communication. Supposing that communication channels do not obtain enough shared meaning amid actors in order to align their actions, the probability to obtain a *common operating picture* among numerous actors minimizes. As coordination mainly depends on communication, the following relevant definition will be used, in which "*coordination can be understood as the degree to which there are adequate networks among the organizational parts for intra-organizational communication or among the organizations for inter-organizational communication to accomplish goals*" (Kapucu, 2006 pp. 209).

Crisis coordination involves joint operations of multiple collaborating actors in order to collect, distribute and transport limited resources (McClintock, 2009 pp.302; Ansell et al., 2010 pp.202). During a crisis, a substantial number of logistical complications are not always created because of insufficient resources, usually, they arise from a deficiency in coordinating their distribution (Chan et al., 2004 pp.1232). Reaching effective coordination in a diverse group relies upon actors' access to credible, prompt information and their ability to exchange, seek and assimilate information and acclimatization (Comfort & Kapucu; 2006 pp.310; Gonzalez & Bharosa, 2009 pp.3;). Consequently, information quality is a crucial part of crisis coordination. As crisis response management organizations are information-intensive, their capability mostly relies on the available information (Bruijn, 2006 pp.267-268).

2.4.2 Requirements for effective crisis coordination

Crisis management operations are trans-jurisdictional, multiorganizational, polycentric networks which require horizontal coordination instead of vertical command and control *type of governance* (Boin & 't Hart, 2003 pp.547). The increasing amount of horizontal collaborative partnerships is the result of intricate problems which require to cross the boundaries of traditional hierarchic systems (Weber et al., 2007 pp. 194-196). Most of the crisis response networks are created as a provisional body on-demand basis, despite this, they can successfully work. A collective mindset can be created in the beginning and will become more powerful as the network maintains to work through the years (Kapucu et al., 2010 pp.5). The formation of new networks, with sparse familiarity between them, does not consequently imply that the outcome of the network is doomed or that its productivity will be limited until the actors have time to accommodate. Alternatively, if a mature shared mindset exists, then relationships of slighter formalized networks can shape new results when they are based on *trust*, shared respect, calculated communication and coordination of action (Kapucu & Van Mart, 2006 pp.297; Kapucu & Van Mart, 2008 pp.722).

Besides the usual requirements of membership to a network such as trust, respect, and routine interaction, actors require the capacity to collaborate. An actor's *capacity to collaborate* involves being in possession of suitable resources to support the common effort and being able to effectively communicate in an inter-organizational framework. In the same way, successful collaborative capacity requires that participating organization managers remain dedicated to the process without caving into the erosion of political alliances and personal preferences and line up the organization's actions voluntarily to achieve the common goal. Collaborative efforts such as partnerships and networks are intricate and hard to control because they have institutional limitations and are restricted by the actors' level of commitment to the common effort (Weber et al., 2007 pp.202-205; Kapucu et al., 2010 pp.5-6). The collaborative relationships are defined by a common interdependence on each and every one's resources and not by fighting for sparse resources (Smith, 2007 pp. 145-148; Kapucu et al., 2010 pp.9;). Achieving a high degree of dependence amid organizations will also build *trust* and enhance the system because actors acknowledge the mutual necessity of being a capable associate. Presuming that one organization does not meet its goals in an interdependent network, the other is likely to be unsuccessful too. A

fact which establishes accountability with every organization, together with the likelihood that its associate will become its most powerful stimulus (O'Toole, 2003 pp.238-239; Kapucu, 2006 pp.216-217).

In the era of New Public Management, many multi-objective bureaucracies were dispersed in several small, mainly single-objective organizations to uncouple delivery, advisory, regulatory and commercial capacities. This specialization movement has been initiated in many OECD countries. Sometimes, the current, brand new coordination structures had to be re-established because of the specialization trend which became a to big fragmentation for those structures (Bouckaret et al., 2010 pp. 3-8). Therefore, differentiation and specialization strengthen the need for coordination (Christinsen & Lægreid, 2006 pp.241-243, Halligan, 2007 pp.464-465). As it is harder to coordinate responses of numerous fragmented organizations a certain degree of centralization is needed. A lead agency model would decrease the administrative intricacy of a response network, that in turn improves efficiency and speed of crisis coordination and of the decision-making process. Although, lead agencies should assist instead of superseding, regional response actors which, most of the times have better knowledge of what is happening on the scene (Boin et al., 2014 pp.11-12; Sylves, 2014 pp.138).

In all crises, it is of extreme importance for decisions to be taken at a suitable level of authority. As crises being non-routine situations, it is not always clear who should take which decisions. The majority of administrative procedures and authority structures were not constructed to deal with crises. What is required, is an authority structure that can be launched during crises to help reduce confusion and bureaucratic discord (Egan, 2010 pp.283; Ansell et al.,2010 pp.203-204). In network systems, no single actor comprehends the entirety of a problem, but every constituent of the system probably has the comprehension and the duty to react on the finest information available. The network structure demands an adequately functioning information infrastructure with highly trained personnel. These developments have developed a unique form of a heterarchical system and the need to use it. Heterarchies are characterized by the horizontal coordination of organizational variety and shared intelligence across numerous evaluative criteria (Kapucu, 2009 pp. 3-4).

Self-organization, design and feedback are paramount for a complex crisis management response network. To reach these goals, investments in the human ability to retain and utilize

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technology to track achievements; aid in correction and detection of fallacies; and improvement of the ability for inventive problem resolving and accountable performance should be conducted (Comfort, 2007 pp. 196). Self-organizing regularly proved very effective in times of crisis (Wachtendorf & Kendra, 2003 pp.1312-133; Solnit, 2010 pp.131). This data suggests that instead of trying to control and command a response system, political leaders should supervise and support the self-organizing process of such a system. An effective coordinated response requires a complex mixture of limited central governance and a high degree of self-organization (Boin et al, 2013 pp.83-84). Therefore, policymakers and crisis managers must be adepts of contingent coordination in order to devise systems that can rapidly and effectively respond to a high number of different problems and threats. Contingent coordination requires securing collective work relations between different administrative levels, organizations and elected officials for high-priority matters, which may happen only once (Kettl, 2003, pp.367-368).

Crises give birth to a challenging environment when it comes to the logistical part of collecting, transporting and distributing resources (McClintock, 2009 pp.302). The logistical capacity necessary for a quick response at an ideal scale encompasses the following components: professional first responders; supply chain management; fast-track procedures and an integrated command centre. Professional first responders entail the rapid mobilization and deployment of first responders which must be very skilled in the art of improvisation. Secondly, supply chain management refers to the need for advanced management of supply chains enhanced by state-of-the-art software capacities (Van Wassenhove, 2006 pp.475-476; Kovacs & Spens, 2007 pp.101-106). Thirdly, fast-track procedures is concerned with the capability to promptly adjust and bypass conventional systems and procedures to mobilize and deploy resources in a matter of weeks, days or hours (Ansell et al., 2010 pp.202). Finally, an integrated command centre calls for a pre-organized and pre-designated headquarters from which, the deployment and mobilization of resources can be centrally managed (Mignone & Davidson, 2003 pp. 218 pp.19; Militello et al., 2007 pp. 30-31).

One of the main elements of coordination for effective crisis response is creating an efficient *flow of information* between actors. It is difficult to imagine effective crisis management if the information is not flowing flawlessly and respondents are not in contact with each other (Kapucu,2006a pp. 209-210). In addition to time pressure, another barrier contributing to

ineffective information flow is task complexity. Task complexity involves most of the following attributes: information load concerns the entire amount of information that needs processing for a task to be completed; the number of subtasks refers to the number of one-of-a-kind steps which require specific skills and knowledge that must be accomplished to complete the task; understanding of the task pertains to the extent of the existing of prearranged, well-known, or well-learned policies to finish the task; and task uncertainty refers to insufficient knowledge concerning the nature of the task and insufficient knowledge regarding the outcome of other possible solutions (Brown & Miller, 2000 pp.135-137).

Precise and prompt information is as important as is swift and consistent coordination between involved organizations (Van de Walle & Turoff,2007 pp.29-31; Gonzalez & Bharosa, 2009 pp. 1-2). Reaching successful coordination between different organizations is highly dependent on actors' access to prompt, credible information and their capability to search, absorb, exchange and adapt information (Comfort & Kapucu, 2006 pp.2). As information requirements raise the intellectual capacity in humans decreases, thus restricting actors' capability. Information management can be used to enhance the capability of actors and the *quality of information*. As to be effective, the information management activities need to be executed with high-quality information, making them the bridge between the quality of information and coordination. Information quality is an intricate theory, illustrating characteristics of the received data and apprehending an ample set of indicators such as timeliness, preciseness consistency, completeness, applicability and suitability for use (Gonzalez & Bharosa, 2009, pp.3). Information management must perform the next three basic activities. Searching; retrieving and converging information regarding the threat. Collating; assessing and evaluating the gathered information. Allocating, sharing and exchanging of threat-relevant information (Comfort et al., 2004 pp.64-67; Gonzalez & Bharosa, 2009, pp.4).

2.5 Theoretical considerations

The conclusion section is composed of three subsections. The first and second sub-question of this thesis will be answered here. The former in the first subsection and the latter in the second one. In the last subsection, a theoretical model derived from the above literature will be presented.

2.5.1 What is a crisis and what does crisis management entail

A crisis is an event that occurs abruptly with little or no warning and threatens the day-to-day functioning of a complex system (family, economy, society) which can be perceived differently by different individuals. These types of events give birth to high levels of uncertainty and urgency under which policymakers must make critical decisions. Crises can be local, regional, national or transboundary, expanding from a location and crossing geographic, political or policy borders. The threats perceived as crises are numerous and include natural disasters, man-made disasters, virus outbreaks, terrorist attacks, depressions and so on. Turning to crisis management, it involves all the necessary actions that need to be taken to diminish the effects of a crisis. Crisis management is composed of four crucial stages prevention, preparation, response and recovery. The underlying crucial determinants for effective crisis management are communication and coordination spanning from the first to the last stage of the crisis management cycle.

2.5.2 Communication and coordination requirements

The requirements for communication are three and will be listed and shortly explained now. Firstly, *boundary spanners*, are skilful agents that strengthen working relationships, enhance communication and counter the insufficiencies of traditional top-down governance. Secondly, *communication technology* involves the use of state-of-the-art technologies, quick set-up of the communication system and the capacity of individuals to efficiently use them. Lastly, *common operating picture*, if enough shared meaning and commitment among actors are achieved, the higher is the chance for the network to be successful.

The two crucial coordination requirements are the *capacity to collaborate* and *flow of high-quality information. Capacity to collaborate* requires actors to have suitable resources to contribute to the common effort, the ability to effectively communicate in the network and to remain dedicated to the process. Next, the *flow of information* requires the creation of a stable, reliable and timely flow of communication with high-quality information between the involved actors.

As it has been stated multiple times in this thesis, communication and coordination are two closely connected elements. Therefore, two requirements are applicable for the two vital elements of the crisis management. To begin, *type of governance* entails whether the crisis response network works under a horizontal or hierarchical system. Or a combination of the two organizational structures, a heterarchy system. To conclude, *trust* is built spontaneous or through previous working relationships and involves the sharing of basic information and sharing of delicate, possible harmful information. After this short recapitulation of the requirements, the theoretical model will be presented.

2.5.3 Theoretical model

Through the medium of a thorough examination of existing literature, deliberation of crisis management with its needed requirements for an effective response, the factors displayed in figure 3 were established as playing a vital part in governments response to threats. The theoretical model consists of one dependent variable, crisis management effectiveness, and seven independent variables which affect communication and coordination. As stated before, these two vital elements are closely linked together, this can be observed also in the model. There are specific variables for each of the vital elements, situated on the sides, and a set of common indicators which affect both crucial components at the same time, situated in the middle of the model. The model serves as a guiding schematic for the subsequent chapter.

Crisis management effectiveness

Communication

Coordination

Boundary spanner

Communication technology

Common operating picture

Type of governance

Trust

Capacity to collaborate
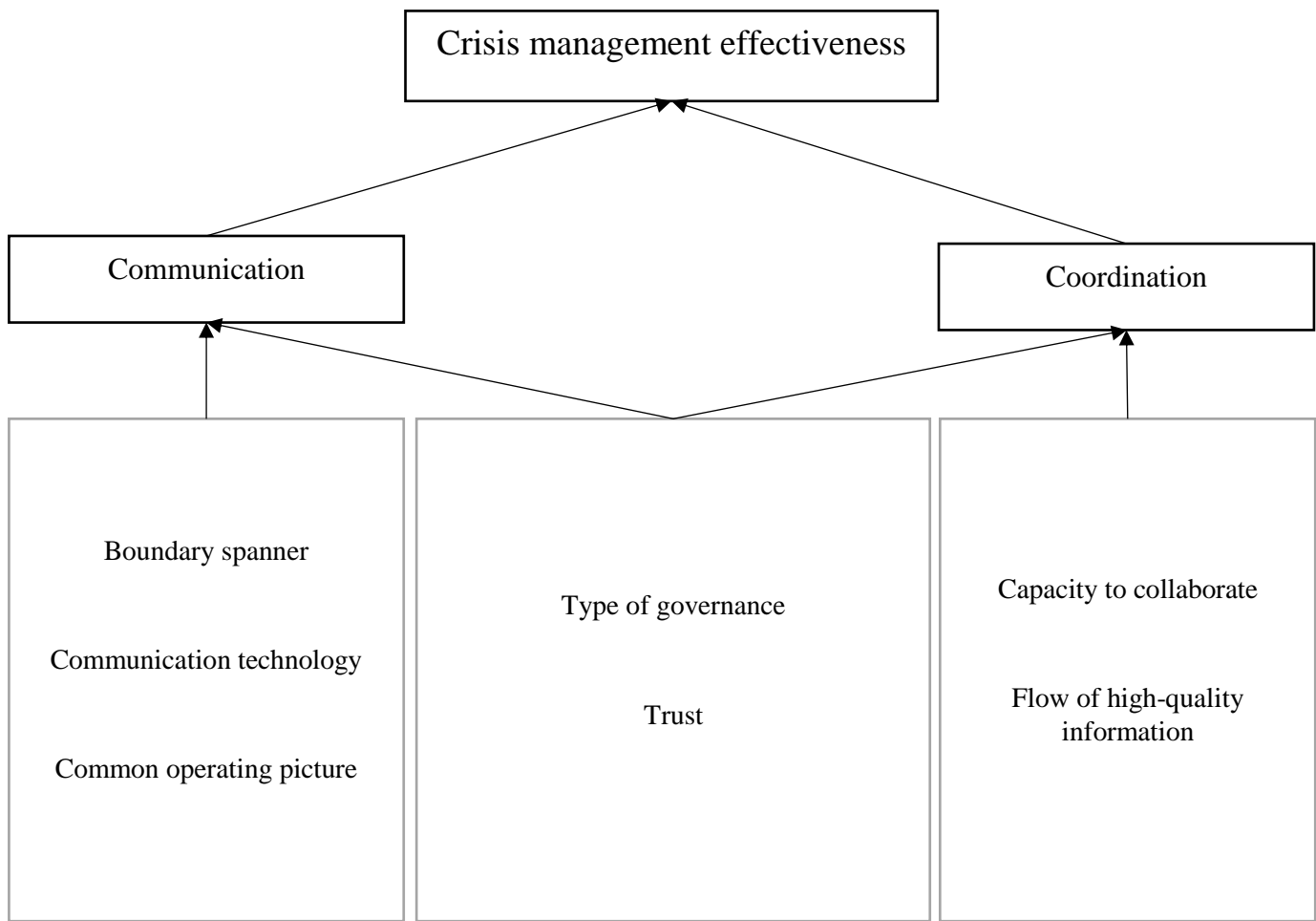
Flow of high-quality information

Figure 3. Theoretical model illustrating the requirements for effective crisis management

3 Methodological chapter

In the former chapter, the theoretical basis for crisis management and the requirements for effective communication and coordination have been presented. Moreover, the chapter finished with the theoretical model that is being used as a template for the methodological choices which will be presented in detail in this chapter. First, the research strategy with the multiple-case study design will be touched upon. Second, the case selection criteria with the selected cases will be discussed. Third, the operalization of the variables is presented. Fourth, the data collection design along with the three-stage analysis model are explained. Finally, the reliability and validity of the research are touched upon.

3.1 Research strategy

The methodology chosen to conduct the research for this thesis is qualitative research with a case study design. The research process requires the performing of empirical work or the gathering of data that can approve, contest or refute theories which in order grants for the clarification and understanding of the different observations (May 2001 pp. 28). The case study design is the most suitable study approach, in order to answer the main research question, because it enables a thorough and detailed investigation of the topic. The holistic concept of case studies allows for the description of people's behaviour and social phenomena to be explained by an intricate set of causes, something that plain casual models which are usually used in most survey studies are not good for (Swanborn, 2010, pp. 18).

The qualitative nature of this study aims to analyse the selected cases using existing theories of crisis management and to generate new insights into communication and coordination during the crisis response stage. As a result, the research materialized as a multiple case study, which generates explanatory insights as it pursues to appreciate the structure and process of the existing crisis management procedures. The research conducted as a multiple case study brings together

detailed insights and information on organizations functioning in the public sector, which may later be compared and analysed to draw a captivating conclusion. Thus, this method will be used to analyse a diversity of factors which could possibly lead to effective management of crises and possibly contribute with knowledge to the current theories on crisis management. The robust and comparative nature of this study enables researchers to uncover compelling differences between cases and to reveal obscure similarities (Yin, 1994 pp. 45). The diverse units of observation placed in multiple cases allow an explanatory and comparative in-depth investigation methods.

3.2 Case selection

In order to select cases which are relevant to answer the research question, provide the reader with interesting examples and a high degree of comparability between them, the following criteria must be met. First, a crisis must be an event that is out of the ordinary and represents a real threat to the public. Next, the time in which the event took place must be as contemporary as possible. Furthermore, the availability of official crisis response reports for the general public. In addition, the availability of official reports in Romanian or English. Lastly, the similarity between types of crises and their specific response procedures.

Four cases have been chosen that exhibit event which occurred unexpected and represented a real threat to people in a certain area. For a high degree of comparability and similarity, the chosen cases are all part of the same category man-made crises. They are contemporary as possible chosen while taking into consideration the availability of Romanian or English reports and the similarity of the events. The cases range from the year 2003 to the year 2015. The crisis events are structured as it follows: two cases of fire clubs and two cases of aviation accidents. The first case is Station Nightclub Fire which took place in 2000 in the Rode Island county, United States of America. The second case is Colectiv Club tragedy which occurred in 2015 in the Bucharest, Romania. The third case is The Apuseni Aviation Accident in which a plane crash-landed in the Apuseni Mountains, Romania. The last case is the Hudson Ditching in which an Airbus A320-214 full of passengers had to make a forced landing while flying above New York City. For most of the cases, official

reports were available for the general public except for the Apuseni Aviation Accident. Although for this case I have managed to receive an official internal evaluation report from The General Inspectorate for Emergency Situations of Romania.

3.3 Operalization

The operalization section will present how the main concepts of the theoretical model are going to be measured. It is structured with nine sub-sections each representing one of the variables and containing their definitions. The objective of this study is to determine and explain the extent of the crisis management effectiveness in the selected four cases through communication and coordination. In the end of this section, a summary of the conceptualization and operalization of the variables will be presented in table 1.

3.3.1 Crisis management effectiveness

Crisis management was previously described as being the procedure through which an agency or state handles a disturbing and sudden occurrence that threatens to damage the agency, state, stakeholders or the public (Bundy et al., 2017 pp. 163). The before mentioned process incorporates the whole sum of measures taken to decrease the effects of a crisis (Boin et al., 2013 p.81). It is comprised out of four stages: prevention; preparation; response; and recovery. From the four stages, this thesis focuses on the response stage with an interest in the two essential inter-organizational elements communication and coordination. As this research is attempting to explain the effectiveness of communication and coordination in a crisis response network, we need a reference point of crisis management per overall so we can evaluate the impact of the two aspects on the network's response. Since this variable assesses the effectiveness of crisis management in general terms, we need to find out how well did the response network performed in controlling the

crisis event in the response stage. In order to do so, mentions about how effective the crisis management networks were in the response phase will be searched for in the evaluation reports.

3.3.2 Boundary Spanners

Boundary spanners have been defined as individuals who have specific abilities and skills in communication and collaboration. Through these abilities, they contribute with linkages that were inexistent on organizational charts through which they ease the exchange and sharing of intelligence and connect their agency with the outside environment (Williams, 2002 pp.103-104; Alvinius at al., 2010 pp.87-88).

Boundary spanners can be planned or spontaneous links in the network. Acting as links, these individuals connect individuals and organisations both horizontally and vertically. Vertical communication links act between different hierarchical levels in an organization, and horizontal links act between various organizations (Alvinius et al. 2010 pp. 91-92). A planned link refers to an actor's position which is usually accepted and approved by superiors. Planned boundary spanners can be policymakers who are capable to perform outside of their agency's framework as they possess a wide crisis managing experience and organizational acceptance. For example, they can be observed in positions like coordinator, negotiator, liaison officer, information officer etc. Next, spontaneous links come into being when extreme situations necessitate them. These can occur when operations of authority, responsibility, experiences, resources and competences fail. Spontaneous boundary spanners usually appear in the field and enjoy the instant trust of the surrounding people (Alvinius et al. 2010, pp. 93-97). They can be an actor with a high-ranking position or a low-ranking position in an organisation which can act as a boundary spanner instinctively on an as-needed basis.

As far as these individuals are concerned, several important factors and influences are involved in effective collaboration, which includes the use of abilities, experience, personal characteristics and skills. Such as building productive personal relationships with a vast range of actors; the capability to operate in non-hierarchical decision settings through brokering and negotiation; and acting the role of entrepreneur to bridge problems to solutions and mobilize efforts

and resources in the hunt for successful results (Williams, 2002 pp. 121). If an actor exhibits a majority of above-mentioned skills than we can call him a boundary spanner and is positively associated with the effectiveness of crisis communication. Therefore, to asses this independent variable, we will search the evaluation reports for information about the existence of assigned or spontaneous boundary spanners which took actions that display inter-organizational contact and performed different functions in the response network context that helped to ease communication and enhance collaboration.

3.3.3 Communication technology

The capacity of inter-organizational coordination relies upon the technological structure and effectiveness of the information systems which support decision making between responding organizations (Kapucu, 2006 pp. 212). Technological innovations, electronic freedom and social media are unavoidable pieces of producing, developing and sustaining networks. Communication technology used for network goals usually reduces transaction costs, enhances network efficiency, saves time and accelerates the policymaking and execution process (Kapucu & Garayev, 2012 pp. 317-318). The major contribution of communication technology brings about enhanced, fastened, facilitated, streamlined and coordinated network operations (Kelly & Stark, 2002 pp.1531-1532). Usage of communication technology in a crisis response system is positively associated with the effectiveness of communication in a crisis event.

To assess how effective was the communication technology used in a crisis response, three crucial conditions must be efficiently met. Firstly, with which speed was communication set up between the actors right after the crisis event took place. Through this factor, we can assess the efficiency of the used technology in informing actors to achieve timely coordinated action in the early phase of the response stage. To evaluate the speed of the communication set-up, comments about when the responding actors started communicating with each other in order to deal with the crisis, will be searched in the evaluation reports. Moreover, mentions of the timely response of the involved actors would demonstrate high-speed communication set up in the initial phase of the response stage. The start time of the crisis event being the reference point.

Next, how well did the communication technology work between actors in the response stage. This factor will determine how reliable the used communication technology was during the response stage in keeping actors in touch with each other through the various coordinated actions. This can be determined by searching for mentions in which the technology used in the crisis response network obstructed the direct communication channel between actors. For example, information overload, channel bottlenecks, system break down and delay or loss of information in reaching targeted members.

Finally, how old was the communication system used in the crisis response. Contemporary and state of the art communication technology enhance the speed of communication in crisis response operations. How novel a communication system is, will be determined by seeking information about the model used, the manufacturing date, or the date when a certain system was assigned for use. The required information could be found in evaluation reports.

3.3.4 Common operating picture

Communication inevitably includes the ability to develop shared meaning between individuals, groups and organizations. This requires achieving an adequate level of common information among different actors participating in the crisis response network for all organizations to understand the limitations of each of them and the possible mergers of support and collaboration between them under a batch of circumstances. (Comfort,2007 pp.194; Wolbers & Boersma, 2013 pp.187). A shared meaning among network actors naturally leads to a common operating picture of an evolving crisis. Actors responding to a crisis must permanently find out what is going on due to the ever-changing environment of a crisis. Therefore, constructing an adequate degree of shared meaning is mainly a sense-making activity in which actors construct, reconstruct and deconstruct information in order to find out what is happening in a period of great uncertainty (Weik et al., 2005 pp. 415-416).

Reaching an adequate common operating picture is positively associated with the effectiveness of crisis communication. First of all, to reach a shared understanding of the crisis events, actors must have access to a database of information or an information bureau which

transmits all the relevant data to each, and every actor involved. This factor will determine if all participating actors had access to the information available in the network in order to make sense of the overall picture. Evaluation reports will be examined for mentions about the actors' ability to access the database or to receive data from the information bureau.

Furthermore, actors have to interpret the information in the correct way to reach a common operating picture. Therefore, if an adequate level of shared understandings is achieved, then the crisis response network should have appropriate coordinated actions too. In order to determine the level of shared understanding, we need to look at how well coordinated have been the actions of the crisis response network. This requires seeking information in the evaluation reports about inefficient coordinated actions, for example, all actors not responding to the same location or not responding at all for a specific intervention. If actors reached a high degree of shared understanding, then the network should not have unorganized actions when responding to crisis events.

3.3.5 Type of governance

The type of governance helps us identify which organizational structure was used in the crisis response network. Three types of governance have been identified in the literature: top-down hierarchical systems, horizontal network systems and heterarchy systems. In a top-down hierarchical system, decisions are advanced from the highest position down through all the ranks of the organization and it has been acknowledged in the literature that this system could impede the effectiveness of a crisis response network. We can establish if there is a hierarchical system being used if we can see that one actor in the response network commands and controls all the other actors without demanding or listening to feedback from the lower levels. Second, horizontal network systems are based on loose cooperation of voluntary organizations, this leading to fragmentation and a harder way to coordinate every actor's actions to achieve the common goal. A horizontal network system can be assessed on the basis that no entity of command and control exists in the network and all actors are at the same level of authority and communicate and coordinate their actions in order to achieve the common goal. Finally, heterarchies are a mixture of the top-down system and horizontal network system in which the commanding organization supports rather than supersedes the inferior ranks. This hybrid governance system is based on the

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existence of a command and control entity which steers the actions of the actors to achieve the main goal but leaves the responsibility of acting accordingly in the hands of every actor, in their specific area. A heterarchy network is highly positively associated with the effectiveness of crisis communication and coordination; a horizontal network is moderately positively associated with the effectiveness of crisis communication and coordination; while a top-down hierarchical system is negatively associated with the effectiveness of crisis communication and coordination. In order to assess the type of governance of a crisis response network, the information will be sought in the evaluation reports about which organization commands or not the coordination of activities and decision-making in the network, for the first two types of governance. While for the heterarchy system, information about which organization guides the coordination and decision-making of the network will be sought in the evaluation reports.

3.3.6 Trust

Unique events pose a high degree of uncertainty because of their short time, the high number of problems which appear at the same time and the confusion in what or whom to trust (Boin et al, 2016 pp. 7-9). Trust can be defined as "one party's willingness to be vulnerable to another party based on the belief that the latter party is 1) competent,2) open,3) concerned, and 4) reliable" (Mishra, 1996 pp. 5). Reaching a high degree of trust is positively connected to the effectiveness of crisis communication and coordination.

The level of trust in a network can be measured in practice if a substantial amount of regular information and delicate information is being shared in the network by the participating actors. By sharing basic information in the network, actors would show the mutual and reciprocal trust that is usually required for collaborative actions. Furthermore, the sharing of delicate information in a network puts the actors in a vulnerable position because other actors might take advantage of the situation or the information could fall in the wrong hands. If sensitive information is shared, then a high level of openness and honesty between actors should be present. Therefore, if sharing of sensitive information is found, trust should be very high in that certain network. To assess the information shared in the network mentions about regular information such as actors' location; available resources; their response time, and sensitive information such as an actor's mistake;

incapability of performing a task; the lack of resources during the response phase will be searched for in the evaluation reports.

Next, working relationships prior to a crisis event build a significant level of trust, greater freedom in sharing risks, information and opportunities when a crisis responding network is formed. These past relationships affect the collaborative relations of the crisis response network, they could be training exercises, former crisis responses or informal relationships. Although, these interactions should not be outdated. If they occurred a long time before the crisis event happened trust will not be high. This is due to the long period of non-interaction in which the personnel with which the contact was made during the work interactions may not be present in that certain organization anymore. In addition, this long period also raises a high degree of uncertainty because of non-interaction between actors that leads to a low level of trust. Consequently, a timeframe must be set for this indicator. Prior working relationships which are older than 5 years, taking as a reference point the crisis event, will not be taken into consideration. The evidence for prior cooperation between actors will be searched for in evaluation reports.

3.3.7 Capacity to collaborate

The capacity to collaborate involves being in possession of suitable resources to support the common effort and being able to effectively communicate in an inter-organizational framework (Kapucu et al., 2010 pp.5-6). An actor's capacity to collaborate negatively or positively affects the entire network. If an actor does not have the necessary resources and it is not able to communicate effectively, it will become a foot-dragger for the network. Having actors with a well-developed capacity to collaborate is positively associated with the effectiveness of crisis coordination.

The resources which an actor must possess can be human, technological, financial or transportation ones. Not every actor must have abundant available resources on every one of the overall above-mentioned categories. This is due to the dependency of actors, in a collaborative network, on each other's resources for coordinated action in achieving the common goal. Moreover, even if the network substantial complementary resources were available in the network, we need to establish if they were used in the response operations. If an insignificant number of

action failures are present in a response network attributed to actors' lack of resources, efforts or skills, then we can assume that the network had an overall efficient collaborative capacity. An indicator which will assess the network's capacity to contribute to the common effort. Therefore, we will look in the evaluation reports for mentions about the network's available resources and the usage of these resources in the response phase and for mentions about failed response actions due to actors' skills or efforts.

Furthermore, in an inter-organizational context, members must be able to effectively communicate. Actors should use the already established communication methods. If actors happen to use other methods of communicating, precious information could arrive too late for situations when a timely response is needed. If most of the actors communicate through the established communication methods, then the network's capacity to communicate is found to be effective. In order to assess the overall ability to communicate, mentions about failures to communicate important information and mentions about failing to communicate through the established communication methods of the network will be searched for in evaluation reports.

3.3.9 Flow of high-quality information

As it was stated throughout this thesis, a stable, reliable and timely flow of high-quality information is a must for effective crisis coordination. Information flow can be defined as "global flow of information from module A to module B through a global data structure D if A deposits information into D and B retrieves information from D" (Henry & Kafura, 1981 pp. 512). Among the essential activities which a crisis response system has, is to assure that essential resources are efficiently and effectively distributed to the affected areas. To correctly collect and distribute resources, actors depend on precise ground information, precise information of the network's resources, and precise information about logistics, including also information about the whereabouts of first responders and their access to available resources (Pan et al., 2012 pp. 33). Therefore, an effective flow of high-quality information is positively associated with successful coordinated actions.

First and foremost, the information must be collected and analysed before being shared in the network. This can be achieved through two informational and cognitive tasks: surveillance of

the crisis events, and a veracity analysis of the incoming information. The surveillance task involves the gathering of information about the crisis events by collecting from the first responders and other available sources, all the data about the intensity, origin and distribution of the crisis event. While the analysis task refers to the examination of the incoming data and discovering its veracity. To uncover if these tasks were performed, mentions will be searched in the evaluation reports about the existence of a surveillance and analysis system in the response network. If the two tasks are performed in the network, then we can assume that the main barrier to information flow, task complexity, was overcome.

Secondly, the processed data requires high-quality reliable information. The quality of the existent information is established upon its accuracy and completeness about the available resources in the network, the crisis events, logistics and locations of first responders. The accuracy of data is paramount for evaluating the possible threats of a crisis event, the damage produced and the scale of the impact. Furthermore, completeness of information enhances the usage of resources, contributes to a better appraisal of risks and communication breakdowns are significantly reduced (Gonzalez and Bharosa, 2009 pp. 3-4). Therefore, mentions of inaccurate and incomplete information about resources, logistics, first responder's location and crisis events will be searched for in the evaluation reports.

Finally, for the flow of information to be complete, the processed information must be stored in a common database. The processed information can be stored in an online database where every actor has access to it or in an information bureau, which transmits all the relevant data to every actor of the network. To discover if the information was stored in an appropriate manner, mentions about the existence of a common database or an information bureau will be searched for in the evaluation reports.

Conceptualization of the variables	Predicted evidence	Type of evidence used to measure prediction
1. *Crisis management effectiveness* in the response phase	Expect to see mentions regarding the effectiveness of the response procedure.	Measured using official evaluation reports of the response procedures
2. *Boundary spanners* connect disparate crisis response system organizations	Expect to see planned or spontaneous boundary spanners in a crisis response team.	Measured using official evaluation reports of the response procedures
3. *Communication technology* reduces transaction costs, enhances network efficiency and saves time.	Expect to see quick set up of the communication system, good communication between actors and usage of advanced communication technology.	Measured using official evaluation reports of the response procedures
4. A *common operating picture* involves making sense of the unravelling crisis events.	Expect to see an accessible database and coordinated response actions	Measured using official evaluation reports of the response procedures
5. The *type of governance* of a crisis response network limits or enhances its capabilities	Expect to see one of the three governance types used in the crisis response	Measured using official evaluation reports of the response procedures
6. *Trust* smoothens the cooperation between different responding organizations	Expect to see prior interaction, sharing of basic and delicate information	Measured using official evaluation reports of the response procedures
7. *Capacity to collaborate* of actors has a great impact on the whole crisis response network	Expect to see a substantial amount of complementary resources and the use of the established communication method.	Measured using official evaluation reports of the response procedures
8. *Flow of high-quality information* contributes to an effective and efficient distribution of resources	Expect to see the two informational tasks performed, accurate and complete information and a common database	Measured using official evaluation reports of the response procedures

Table 1. Conceptualization and operalization of variables

3.4 Data collection design

Six sources of evidence are usually used in case studies: documentation, interviews, archival records, participant-observation, direct observation and physical artefacts (Yin, 2009 pp. 101). Each of the above-mentioned sources can be the correct way of collecting data in a case study. By comparing the advantages and disadvantages of the six techniques it becomes obvious that none of them is superior over the others. Moreover, these sources of evidence are complementary to each other (Yin, 2008 pp. 102). Despite the undeniable advantage of multiple sources of evidence, this research will be limited to just one method, documentation. This is due to financial, time and language constraints.

Documentation is a suitable data collecting method in virtually any case study (Yin, 2009 pp. 101-102). Firstly, the strength of the documentation method relies on its stability, it can be re-examined and revisited time after time without losing data. Secondly, documentation has an unobtrusive character, not being purposefully created for a specific case study. Thirdly, this method is accurate and detailed consisting of references, names and details of an event. Lastly, documentation provides extensive coverage by stretching over a long time period and a multitude of events and settings. Nonetheless, a couple of problems exist with using the documentation method. The issues include biased selectivity, reporting bias, retrievability and access. However, because of the ever development of the internet and information technology, documentation has become more easily accessible through online databases or websites (Yin, 2009 ibid.).

Another problem with using documentation is that of overreliance, assuming that the documents contain the complete truth. What investigators should realize, when reviewing any document, is that they were written for a particular reason and a particular audience different from those conducting the case study. This making the investigator an indirect observer with the documentation evidence reflecting the communication between other parties seeking to achieve different objectives. It is therefore crucial, when reviewing and analysing documentation, to constantly keep in mind the objectives and audience in order to be correctly critical in deciphering the elements of such evidence (Yin, 2009 pp. 105).

Finally, the complex and exhaustive research design derived after the examination of the existing literature on crisis management. The use of documentation and the used research design

resulted in a limitation of cases. Numerous evaluation reports of various cases were examined in order to find the ones which fulfil the thorough research design and case selection criteria. After the examination, only four cases were found to have appropriate and detailed documentation and fulfilled the case selection requirements. The reason why these cases have extensive evaluation reports could be attributed to their major severity and the media attention that they received. Media salience was high in the two Romanian cases. The public demanded answers for the Colectiv Nightclub Fire's huge death-toll and for the Apuseni Aviation Accident's long period of time needed to rescue the victims. Things which prompted the authorities to closely investigate the events. We can assume that this was the case for the other two crises. The Station Nightclub Fire also had a huge death toll while the Hudson Ditching, although both engines were disabled, had no fatalities but occurred in the heart of a megacity.

3.5 Data analysis

The most challenging and least developed part of using a case study approach is the analysis of evidence. In most cases, researchers start case studies without having an idea of how to analyse the evidence. It is crucial to develop tools in order to obtain the desired analytic result. Nevertheless, these tools are usually most helpful if the researchers know what they are looking for. Much depends on the researcher's unique type of exact empirical thinking, together with an adequate presentation of evidence and attentive awareness of alternative interpretations (Yin, 2008 pp. 127).

The qualitative analysis consists of data that materializes in words instead of numbers. The data used can be collected in different ways, such as observations, extracts from documents and interviews. The data usually goes through a processing method before being used. For example, data could be processed through editing, dictation or transcription. However, the three most important concomitant flows of activity for qualitative analysis are data condensation, data display and conclusion drawing/verification (Miles et al., 2014 pp. 11-12).

Data condensation entails the procedure of focusing, choosing, simplifying, and compressing or transforming the information which exists in the body of fieldnotes, documents,

interview transcripts and other empirical materials. Data condensation is not separate from the analysis, but it is a part of it. It should include analytic choices, such as which data chunks to leave out and which ones to use, what the evolving story is, and which patterns to summarize. The data condensation sharpens, sorts, focuses and organizes raw data, to such a degree that final conclusions can be drawn out of it. Condensation does not unquestionably refer to quantification. Qualitative data can be reconstructed by summary or rephrase, by subsuming it in a larger design, through selection et cetera (Miles et al., 2014 pp. 12).

Data display is the second major flow of the analysis activity. Generically speaking, data display is a compressed and organized information assembly which grants conclusion drawing and action taking. Good displays, such as matrices; graphs; charts and networks, are a major asset for robust qualitative analysis. They are created to convene data into an instantly available and condensed form so that the researcher can understand what is happening and either draw rationale conclusions or move to the following step which the display may suggest as being useful. As well as for data condensation, the production and usage of displays is part of the analysis (Miles et al., 2014 pp. 12-13).

The last flow of the analysis activity is the conclusion drawing/verification. The qualitative researcher interprets, from the beginning of data collection, what things represent by observing patterns, causal flows, explanations and propositions. The final conclusions may only appear when the collection of data is over. This depends on the corpus of the coding storage; field notes, and retrieval methods used; the experience of the researcher; and any essential deadlines which need to be met. As the researcher proceeds with the analysis, conclusions are also verified. The meanings arising from the analysed data need to be assessed for their sturdiness, plausibility and confirmability (Miles et al., 2014 pp. 13-140).

This three-stage model will be used in this study for the analysis of the qualitative data. The accumulated information will undergo the three-stage cyclical process in order to draw valid and reliable conclusions. The research will focus on within case analysis, where the comparisons are conducted between cases and between analysed data and the compiled concepts of the theoretical framework.

3.6 Reliability and validity

A research approach is presumed to depict a rational series of statements. Thus, one could as well, be able to determine the quality of a design according to clear logical tests. Such examples of concepts are trustworthiness, confirmability, credibility and data dependability. However, four tests are usually utilized to determine the value of each and every factual social research. These tests are applicable to this study due to the same form of research of case studies. The four tests are construct validity, internal validity, external validity and reliability (Yin, 2009 pp. 40).

Construct validity determines veracious functional procedures for the studied concepts. It is the most challenging test in case study research. To meet this test, a researcher must cover two steps. First, he must define the dependent variable as in terms of specific concepts, and second, he must determine the operational measures which match the concepts. Furthermore, three tactics are available to strengthen construct validity. The first tactic is the usage of multiple sources of evidence in order to establish convergent lines of analysis. The second tactic is to determine a chain of evidence. And the third tactic is to have peers or major stakeholders to evaluate the draft case study report (Yin, 2009 pp. 41-42). In this research, citations and referencing to specific evidentiary sources have been provided in order to establish and verify the evidence chain, and peers appraised the draft of the thesis.

Internal validity seeks to determine a causal relationship, through which particular conditions are supposed to lead to other conditions. The test is mainly applicable to causal or explanatory studies. One of the most helpful techniques for internal validity is to use a pattern matching logic (Yin, 2009 pp. 42-43). This specific logic involves the comparison of an empirically based pattern to a predicted pattern or several alternate patterns. This will strengthen the internal validity of the study since solid conclusions will be drawn from the comparison of the various patterns (Yin, 2009 pp. 136). Therefore, the aim is to use pattern matching to compare the collected data with the appropriate theories.

External validity elucidates the problem caused by the uncertainty of the extent that a study's results can be generalized beyond the direct case study. This test is usually a major barrier in qualitative case studies research (Yin, 2009 pp. 43). Two main tactics can be employed to improve external validity, the utilization of several replication logic when using more than one case

study, and the usage of theory in a single case study. The replication logic is similar to the one used in multiple experiments. Every case has to be chosen so that it either anticipates divergent outcomes or it anticipates similar outcomes. Whenever using a multi-case design, this must follow a replication design and not a sampling logic which is frequently used in surveys (Yin, 2009 pp. 47-60). This study will focus on and use a multiple replication tactic in the 4 cases to provide compelling support for the theoretical framework.

Reliability relates to the display of proof that the procedures of a research can be duplicated by a later researcher on the same cases and reach the same results and conclusions. The test reduces the biases and errors of the study. Two specific tactics can be used to increase reliability, to develop a case study database or to use a case study protocol (Yin, 2009 pp. 45). This study will present a case study table with the relevant official reports of the chosen four cases and the sources of the retrieval (table 2). This alternative method of developing a database was chosen because the storing of the official documents in a database, without the consent of the issuing organizations, could fall

Case	Document	Retrieved from
1. Station Nightclub Fire	Report of the technical investigation (Vol. 1)	https://www.nist.gov/el/station-nightclub-fire-2003
2. Colectiv Nightclub Fire	Report of the intervention procedures	http://gov.ro/fisiere/comunicate_fisiere/raport_c.pdf
3. Apuseni Aviation Accident	Unpublished internal report of the intervention procedures	The General Inspectorate for Emergency Situations of Romania
4. Hudson Ditching	Aircraft accident report	https://www.ntsb.gov/investigations/AccidentReports/Reports/AAR1003.pdf

Table 2. Official documents of the analysed cases

outside the law. Therefore, similar research can be performed on the same cases with ease. All the above-mentioned tests will be implemented for the credibility of the research to be enhanced.

4 Analysis

This chapter will present the analysis for each of the selected four cases. It is comprised of five sections. The first four sections contain the description of each case followed by its analysis and a short conclusion. While in the last section a comparison between cases will be performed in order to find similarities or dissimilarities in the analysis results.

4.1 Station Nightclub Fire

The Station club fire occurred on the night of Thursday, February 20, 2003, inside the nightclub, which is situated in West Warwick, Rhode Island, United States of America. The fire commenced when the tour manager of the evening's featured band, the Great White, set off pyrotechnic effects. The fireworks set on fire a plastic foam which was used for the soundproofing of ceilings and walls around the singing stage. In less than one minute the blaze reached flashover and set all the nearby combustible materials on fire. The club was engulfed in thick black smoke in circa 5 and a half minutes (Grosshandler et al., 2005 pp. 1-1). In the first minutes of the fire, Rhode Island Emergency 911 Center started receiving phone calls reporting a fire, while a West Warwick Police officer situated near the nightclub reported the fire to the police dispatcher. The information was transmitted to the Fire Department (FD) of West Warwick which assigned and dispatched five engines, one ladder and one rescue units to the fire scene. The Battalion Chief 1 activated the Warwick Task Force which involves a mutual aid agreement through which seven extra engine/ladder companies were dispatched from neighbouring communities (fig. 4). Battalion 1 also requested 12 additional ambulance units. After approximately two hours the fire was contained and all the patients had been safely transported to the nearby hospitals (Grosshandler et al., 2005 pp. 2-1 – 2-2). The poisonous smoke, extreme heat, and the resulted panic that led people piling up and blocking the main entrance killed 100 persons while 230 persons were wounded and 132 escaped without injuries. Most of the victims have suffered delayed stress syndrome because of emotional

shock (Andersen., 2012). The Station club fire was the fourth most deadly fire in the United States history, and the second most deadly club fire in New England, outmatched only by the Coconut Grove fire that ended in a death toll of 492 people (Miller, 2016).

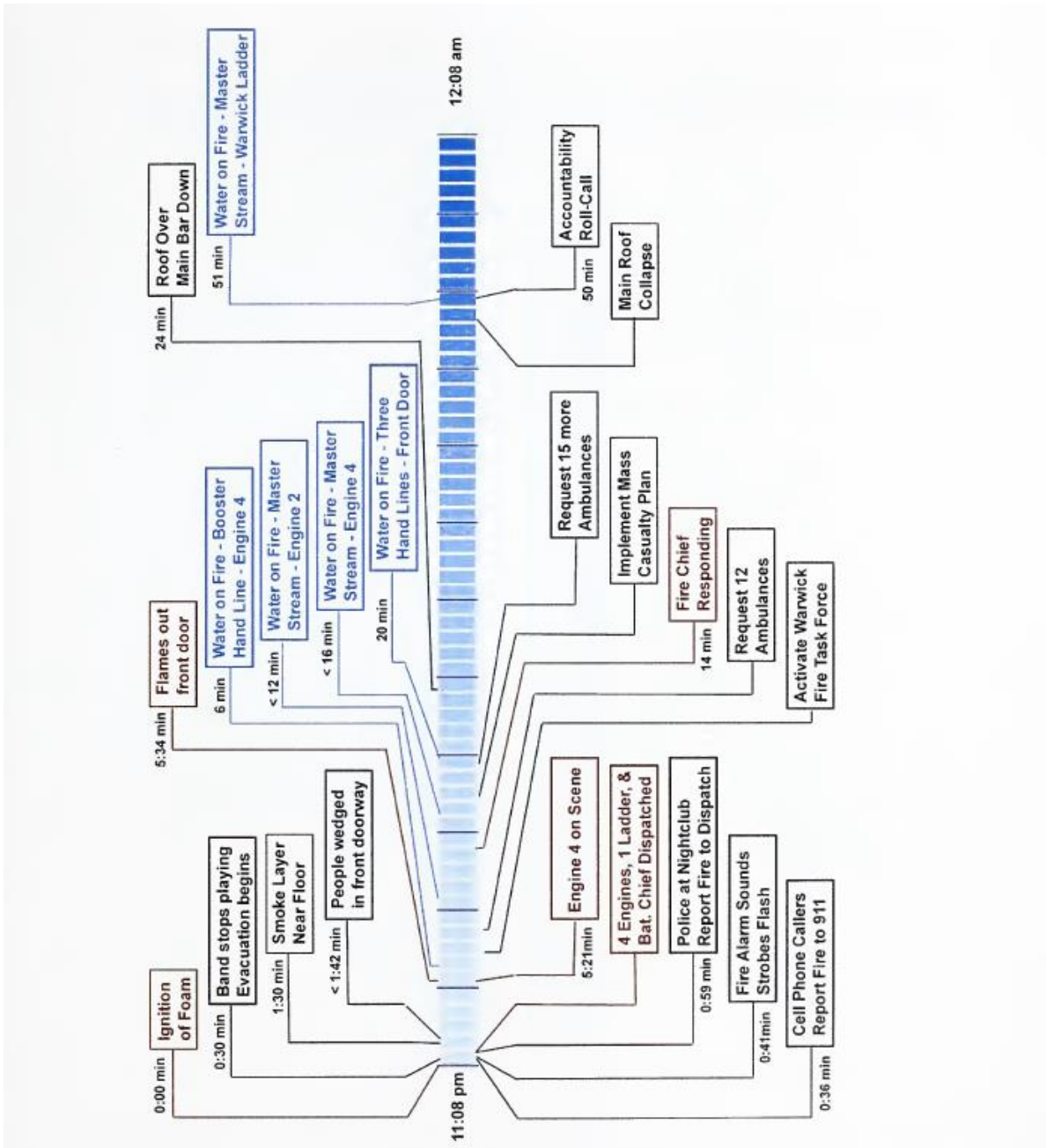

Figure 4. Overview timeline of the Station Nightclub Fire.

Note: Reprinted from *"Report of the technical investigation of the station nightclub fire"* (Vol. 1) by Grosshandler, W. L., Bryner, N., Madrzykowski, D., & Kuntz, K., 2005, pp. 2-3.

4.1.1 Crisis management effectiveness

Crisis management incorporates the total sum of measures taken by an agency or state to decrease the impact of an occurrence which threatens to damage the agency/state, the public or the stakeholders. Mentions about the accomplishment or inability of performing the network's response objectives in the response phase will be searched for in the evaluation reports.

The response phase of this accident is comprised of three simultaneous operations: fire suppression; mass casualty care and transport; and scene security with traffic management. The main actors responding to the crisis were the West Warwick Fire Department (WWFD), West Warwick Police Department (WWPD), Warwick Police Department (WPD), Coventry Police Department (CPD) and the Emergency Medical Services (EMS). The West Warwick Fire Department allocated fire suppression and emergency medical assistance to a population of roughly 30,000 civilians. The Department engaged with four stations with a combined response capacity of four engine companies. The WWFD was supported by a mutual aid agreement with the Warwick Fire Department (WFD); Cranston Fire Department; and the Coventry Fire Department to respond to its working fire structures. The fire was put out slightly over one hour after the start of the incident. Next, the WWPD with the WPD and CPD played important parts in directing and aiding the event security, traffic and access management efforts required to efficiently access, stage, set up and enable egress for the numerous EMS and all the other fire units that responded. Finally, the major mass casualty plan completed its pre-hospital and on-scene care operation (casualty assemblage, triage and transport) stage in lesser than 2 hours after the fire outbreak. The entire operation was achieved due to the unified efforts of numerous organizations, around sixty EMS and countless private care providers. Taking in account that all the high-priority objectives were fulfilled with the fire being put out in less than 1 hour and the evacuation of the final casualty was performed in less than 2 hours we can assume that the overall crisis management operation was highly effective (Grosshandler et al., 2005 pp. 3-2 – 3-12).

4.1.2 Boundary Spanners

Boundary spanners are individuals who establish new linkages between organizations through their specific skills and abilities in communication and collaboration in order to ease the exchange and sharing of information in the network. Therefore, information will be searched in evaluation reports about the existence of assigned or spontaneous boundary spanners which took actions that display inter-organizational contact and performed different functions in the response network context that helped to ease communication and enhance collaboration.

As far as the Station Nightclub Fire case is concerned three crucial boundary spanners were found. These are the Warwick FD, Cranston FD and Coventry FD chiefs and are all planned links. When arriving at the scene, the WWFD on-duty Chief established the initial Incident Command (IC) by positioning his vehicle in a good vantage point from which he evaluated the ongoing fire and the surroundings. The IC was promptly joined by the department chiefs of Cranston FD and WFD at the front of the building. The two chiefs, part of the mutual support departments, acted as command group in supporting the IC and transmitted through their respective communication channels commands to their department assets. Furthermore, at the time of the Coventry FD Chief's arrival, the IC solicited the Coventry Chief to evaluate and report the developing EMS activities in the vicinity of Cowesett Inn. Through this position, the Coventry Chief emerged as a liaison between the EMS and IC throughout the whole response (Grosshandler et al., 2005 pp. 3-4 – 3-5). The three chiefs are considered boundary spanners because they bridged problems to solutions and mobilized efforts and resources to obtain successful results. Moreover, they are considered planned links because of their appointed roles in the network, in which, through their abilities and experience contributed as communication linkages between the responding organizations.

4.1.3 Communication technology

The use of effective technological structure and information systems produces enhanced, fastened, smoothened, streamlined and coordinated network operations. Three crucial conditions were established for the assessment of communication technology. The speed with which

communication was set up, how well communication functioned between actors and the oldness of the communication system.

The standard structure fire response of the WWFD was initiated 2 and a half minutes after the fire outbreak. The WWFD Engine 4 reached the scene in 3 minutes after dispatch and reported heavy fire conditions and heavy volumes of thick black smoke. Next, 14 minutes after the fire, the WWFD chief operating Engine 4 announced dispatch of his fire suppression response and solicited any free rescue-ambulances to respond. Moreover, he called for 15 supplementary units besides the ones already deployed and responding and activated the Mass Casualty Incident. The Warwick and Cranston Fire Departments joined the WWFD Chief in short order with additional fire suppression and EMS units. Thus, resulting in quick transmission of the Mass Casualty Incident plan to the relevant actors (Grosshandler et al., 2005 pp. 3-5 – 3-6). Therefore, we can estimate that the communication technology used in the initial phase of the response stage worked efficiently to achieve a coordinated response. On the contrary, in the following actions, many of the responding units experience great interoperability challenges. This was due to the high volume of communications required in this crisis. Since no collective channel was accessible to manage the mass of radio traffic arising from the incident scene, every responding organization relied on its own communication channels. A fact which led to hampered coordination of the responding units (Grosshandler et al., 2005 pp. 3-5). Finally, mentions about the manufacturing date or model used in the network were not found. Overall, we can assume that communication technology had a moderate efficiency.

4.1.4 Common operating picture

A common operating picture, in its basic form, is achieved by having an adequate level of common information in the network available to all responding actors. Constructing an adequate degree of shared meaning is mainly a sense-making activity in which actors construct, reconstruct and deconstruct information in order to find out what is happening in a period of great uncertainty. Two indicators will be used to assess the establishment of a common operating picture, the capability of every actor to have access to the available information and the degree of coordination in response actions.

The dispatchers of each mutual aid company transmitted all the relevant data to the responding units. Because of jurisdictional dissimilarities in tactics, machinery and communications equipment, interoperability problems can appear in the use of mutual help assets (Grosshandler et al., 2005 pp. 3-10). Only one mention was found of actors being unable to access information. Direct coordination between EMS and regional hospitals was hampered because the transportation officer was unable to communicate with the hospitals and determine their capabilities and status. Making the transportation officer incapable to guide EMS crews to the most suitable medical premises (Grosshandler et al., 2005 pp. 3-12). Having found only one referral of information access incapacity we can assume that the overall majority of actors had access to the available data. Next, mentions about units not responding to the same location or lack of no response for coordinated actions were not found. The WWFD responded at the scene in 5 and a half minutes with the other fire departments arriving shortly after and giving them support. While the law enforcement responded immediately to secure the accessibility of the EMS in order for the mass casualty operation to take place as efficient as possible (Grosshandler et al., 2005 pp. 3-6 – 3-12). As a consequence, we can conclude that the involved actors reached a high degree of shared understanding of the ongoing situation as no mentions of actors responding to different locations were found.

4.1.5 Type of governance

The three governance types identified in the literature are top-down hierarchical system, horizontal network system and heterarchy system. The different types of governance may impede or enhance a network's effectiveness when dealing with a crisis. As was established before, top-down governance may negatively affect a response network's effectiveness; a horizontal network may moderately enhance a response network's effectiveness, and a heterarchy may greatly enhance a response network's effectiveness.

As already stated, the IC was established by the WWFD Chief on his arrival at the scene. The Chief saw a rapidly growing fire with many casualties entrapped at the main entryway, with an unidentified number probably still inside the premises and many casualties with visible trauma dispersed all over the operational zone. The coinciding and developing operational goals of

rescuing victims, mounting fire suppression and allocating mass casualty care and transportation, became obvious to the Chief who promptly requested additional assistance. After which he started responding and coordinating Engine 2 and 4 of the WWFD in suppression operations. He remained in charge of the IC after the two other FD chiefs arrived. He organized the resources on the scene and instructed the other two chiefs in assigning their assets. Moreover, he solicited the Coventry Chief to report and asses the development of EMS operations. Action through which he could concentrate on the fire suppression with all his resources and have the EMS dealing with the mass casualty operation. Even though he did not announce his assumption of command his presence was evident to the responding staff and dispatchers (Grosshandler et al., 2005 pp. 3-4 – 3-5). The use of standard IC structures and procedures signifies the use of a top-down hierarchal system because decisions were advanced from the highest position down through all the ranks of the organization.

4.1.6 Trust

Trust involves the willingness of one party to be vulnerable to another party built on the assumption that the latter party is competent, open, concerned and reliable. Building a spontaneous productive relationship is a daunting task, an evolving and diverse network requires trust which is built over time and way before crisis events. The level of trust is measured in this thesis by the amount of basic and sensitive information sharing and prior interaction between responding actors.

Mentions about basic information sharing in the network were found. The responding Engines, Battalion 1 and Ladder platform shared information's about their departure, arrival on the scene and response actions such as running supply hoses, fire suppression operations and accountability roll calls. Next, the dispatchers informed the triage and IC about the operating hospitals which were still capable of receiving victims. The EMS reported their locations whether being at hospitals or at the scene (Grosshandler et al., 2005 pp. 2-2 – 2-7). Moreover, details about the three triage areas were also made available. The locations and persons who were in charge of every one of the areas. The first area was staged on Cowesett road near The Station and was commanded by an officer and his team from Hopkins Hill FD from Coventry. The second one was set on the outdoors of the Cowesett Inn with a Cranston FD officer and his crew in command. The last one was established indoors of the Cowesett Inn under the management of an officer from

WFD (Grosshandler et al., 2005 3-11 – 3-12). About the three police departments present at the scene, mentions about their quick response and implications at the scene have been found. The police departments played important roles in directing and aiding the scene security, access and traffic operation (Grosshandler et al., 2005 3-13). Although, no mentions about them sharing basic information were found. Comments about the sharing of sensitive information and evidence about prior interaction were not found in this case. As only basic information was found, which is usually required for collaborative actions to function, we can assume that the level of trust was moderate to low.

4.1.7 Capacity to collaborate

Capacity to collaborate entails that every responding actor must have suitable resources to contribute to the common effort while also being able to effectively communicate in the network. An actor's capacity to collaborate negatively or positively affects the entire network. The networks capacity to collaborate is assessed along the number of complementary resources, and how effectively did they communicate in the network.

Firstly, the whole response network had at its disposal a considerable amount of technical and personnel resources (Grosshandler et al., 2005 pp. 3-10). The WWFD Chief responded to the fire with four engine companies, a rescue ambulance and a tower/ladder company. The WFD responded with a task force of three engines, two rescue ambulances, one truck and one chief officer (Grosshandler et al., 2005 pp. 3-3). Besides the WFD's initial response, the Cranston FD and Coventry FD contributed with many crews and about 100 firefighters and command officers (Grosshandler et al., 2005 pp. 3-11). Secondly, mentions about the lack of resources, efforts or skills have been uncovered. The WWFD unit staffing was roughly only half of the minimum human resources required for operating each apparatus (Grosshandler et al., 2005 pp. 3-3). One attempted rescue effort through the exits and broken windows on the north face was not pursued due to the lack of protective hose lines. Moreover, another action failure occurred when WWFD's Tower/Ladder 1 was situated in a location which inhibited its suppressing capability due to pole mounted powerlines. On top of that, when relocating and engaging in the suppression effort, the apparatus was missing pump capability on board which made its attempt ineffective due to low

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water pressure (Grosshandler et al., 2005 pp. 3-6 – 3-7). Finally, mentions of actors using other communication methods than the ones established in the network were not found. Taking into account the abundant resources available in the network, the low number of actions failures attributed to actors' lack of resources, efforts or skills and apparent use of the network's communication methods we can consider that the capacity to collaborate was moderate to high.

4.1.8 Flow of high-quality information

In order for resources to be effectively allocated to the afflicted regions, a stable, reliable and timely flow of high-quality information is required. Information flow was defined as a "global flow of information from module A to module B through a global data structure D if A deposits information into D and B retrieves information from D" (Henry & Kafura, 1981 pp. 512). The flow of information is assessed along the existence of two informational and cognitive tasks, the quality of the information and the existence of a common database or information bureau.

Firstly, the dispatchers of every responding organizations acted as an information bureau. They performed the surveillance task through gathering information of the crisis events from the initial emergency calls, information from responding units and polling departments for information about resources (Grosshandler et al., 2005 pp. 3-6 – 3-12). On the contrary, no evidence was found of them performing the veracity analysis. Secondly, one mention about substandard information was uncovered. A general disorder vis-a-vis which EMS crews had reacted, and which were still free was caused by the general request for any available unit by the mutual aid companies to the different dispatch centres. This phenomenon produced inaccurate and incomplete information leading to less effective use of resources. Patients who only required Basic Life Support crews were looked after and taken by Advanced Life Support crews on first come first served premise and vice versa (Grosshandler et al., 2005 pp. 3-5). Finally, we cannot assume that a common database exists because of the different dispatch departments which acted as information bureaus. In short, we have to assume that the information flow was moderate because only one informational task was performed, the different information bureaus and only one mention of low-quality information.

4.1.9 Conclusion

The major challenge faced in this crisis event was the lack of common communication channel due to differences in communications systems of the mutual aid responding organizations. In the initial phase of the response, evidence that communication technology was highly effective in achieving the first response action was found. While, during the actions throughout the response, the interoperability of the communication systems led to inefficient usage of some mutual aid assets. To overcome the interoperability challenge and avoid total ineffectiveness, boundary spanners have been employed. Three fire department chiefs have been assigned and acted as planned links between the responding actors to ease the exchange and sharing of information.

We can assume that the use of boundary spanners played an important role in the network to reach a common operating picture with a high level of shared understanding. Although different communication systems were used in the network, only one mention was found of inhibited access to the network's available data and no mentions about major uncoordinated response actions due to misinterpretation or lack of access to information were found. Moreover, in relation to the information flow, only one mention could be found about low-quality information, as such, we can assume that most of the information was high quality. In contrast, we can only assume a moderate to low level of the information flow because the responding network was lacking a common database and only one of two informational tasks was performed.

Some minor challenges were presented by a couple of resources, technical and skill shortcomings. The technical resources available for the entire network were more than enough while in the initial phase of the response stage the human resources were insufficient. This challenge was overcome when the mutual aid organizations arrived on the scene, supplementing the WWFD with their staff. Next, one rescue attempt was not followed through due to a lack of efforts to provide protective hose lines for rescuers. While another action failed due to lack of skill and equipment of Tower/Ladder 1. This problem was dealt with by rerouting the water supply to one of the WWFD's unit. Therefore, having substantial resources and an insignificant number of minor action failures in the whole response network but not being able to use a common communication channel, we can assume the capacity to collaborate was moderate.

Using standard Incident Command procedures and standards the type of governance used can be assumed to be a classical top-down hierarchical approach. It has been already established that this type of governance could impede crisis management effectiveness. Despite the inter-organizational difficulties posed by the incident and the use of top-down governance, the critical requirements were achieved by the responding actors with the fire being put out in less than one hour and all victims being evacuated in less than two hours.

4.2 Colectiv Nightclub Fire

The Colectiv Club fire took place on the night of Friday, October 30, 2015, inside a club located in Sector 4 in Bucharest, Romania in a building that formerly belonged to Pionerului factory. The fire broke out during a free entry concert of the band Goodbye to Gravity, on the occasion of launching a new album called "Mantras of War".According to investigations, the fire was caused by the pyrotechnics employed during the show, which led to the ignition of the polyurethane foam, a very flammable material, utilized to soundproof the pillars and walls of the building. The flames spread very quickly throughout the club, causing injuries and death through combustion, asphyxia, poisoning and other gases, to a significant number of concert participants ("Filmul tragediei din Colectiv: au avut 153 de secunde ca să se salveze", 2016). The first emergency call was received by the Exclusive National Emergency Calling System (ENECS) in the first minutes of the fire and was redirected towards four specialized intervention agencies. The four major agencies responding to the incident were the General Inspectorate for Emergency Situations (GIES), the Gendarmerie Inspectorate of the Municipality of Bucharest (GIMB), the General Police Directorate of the Municipality of Bucharest (GPDMB) and the Ambulance Service Bucharest-Ilfov (ASBI). Several crews on their respective intervention trucks from the four agencies were deployed in a matter of minutes to the scene. Once arrived there, the first responders communicated a large number of victims and heavy fire. The magnitude of the event prompted the Prefect of Bucharest to establish the Red Plan for intervention. A couple of minutes over two hours from the beginning of the emergency operations the fire was extinguished, and all the victims safely transported to hospitals (The Prime Minister's control body, 2016 pp. 34-41). After the incident, the Romanian

Government decreed three days of national mourning. Because of the substantial protests succeeding this incident, Prime Minister Victor Ponta left his office, together with his cabinet, on November 4, 2015. Moreover, due to the same reason, the Mayor of Sector 4 Cristian Popescu Piedone, also resigned ("Klaus Iohannis a primit demisia premierului", 2015). The death toll of the Colectiv Club fire reached a total of 64 people. Besides the 26 people who died in the club and one person that passed away en route to the hospital, 186 injured persons were identified in the initial phase, 146 of whom were hospitalized. A total of 37 people died in the post-fire weeks. It was the worst club fire in Romania and the second worst accident in the country after 1989 ("Cea mai mare catastrofă a României de după accidentul aviatic de la Baloteşti", 2015).

4.2.1 Crisis management effectiveness

Like the previous case, the response phase of the Colectiv fire required the same three concomitant operations: fire suppression; mass casualty incident and scene security with traffic management. Mentions about organizations which performed well in the response and which exhibited deficiencies were found. The organizations which had a good performance were the Prefecture of Bucharest; the Special Communications Service; the Mobile Emergency, Rescue and Disbandment Service (MERDS); the GPDMB; the GIMB and ASBI. The organizations which presented deficiencies are three and will be enumerated with short descriptions of the defects. First, the Inspectorate for Emergency Situations "Dealul Spiri" Bucharest-Ilfov did not adhere to the procedures in respect of a possible early activation of Red Intervention Plan, did not inform all crews of the support services, there was a big succession of persons in commanding the response operations and was not able to effectively communicate the exact number of intervention trucks used. Second, the Department for Emergency Situations failed to coordinate all the response actions of the participating organizations, only focusing on the first aid and healthcare activities. Finally, almost all the hospitals which hospitalized victims had problems because of the inexistence of the White Plans for assistance in emergency situations and contradictory information about the hospitalized victims and nosocomial infections. The Clinic of Plastic Surgery and Reconstructive Microsurgery from the Emergency Clinic Hospital Bucharest was not used at its full capacity. Because important actors in the network have presented severe deficiencies, the general

effectiveness of this crisis management operation was appreciated as being medium to low (The Prime Minister's control body, 2016 pp. 78-79).

4.2.2 Boundary Spanners

Within the Ministry of Internal Affairs, the Department for Emergency Situations (DES) was established as a permanent operational structure, without legal personality, with coordination powers at the national level. The DES has to supervise the prevention and management processes of emergency situations and the coordination of human, material, financial resources or any other kind of needed resources in order to reestablish a normalcy state. Because of the department's operational structure without legal personality, it does not have in its organizational structure an extensive administrative apparatus. Therefore, in the DES there is seconded personnel from GIES which support the DES when managing emergency situations and keep the department in touch with the responding organizations (The Prime Minister's control body, 2016 pp. 18-19). Mention about one planned link has been found in the evaluation report. Lt. Col. Radu Cristian, head of the national operational centre of GIES arrived on scene and cooperated with the state secretary Raed Arafat and the chief inspector of IES in coordinating the intervention procedures (The Prime Minister's control body, 2016 pp. 43). By acting as a communication bridge between the command organizations and the other actors and his appointed role, we will consider Radu Cristian a planned boundary spanner.

4.2.3 Communication technology

The first established communication between the responding actors was made by ENECS which received a call about the incident at 23:32 and transmitted the information to the four essential responding organizations. Two police cars from the GDPMB arrived 5 minutes after the first emergency call and initiated the first measures in evacuating the victims. Six minutes after the arrival of the police cars, the first ambulance from ASBI arrived on scene shortly followed by other 4 ambulances from the same organization. At the same time of the arrival of the first ambulance of

ABSBI, eight different intervention trucks arrived from the IES and six police cars arrived from GPDMB (The Prime Minister's control body, 2016 pp. 35-36). Next, after analyzing the existent information about the event, the head inspector of IEU proposed the activation of the Intervention Red Plan to the prefect which approved its triggering at 22:50 and the plan was immediately implemented (The Prime Minister's control body, 2016 pp. 37). From, the existent information on the briefing about the incident of the involved actors and their timely arrival at the scene, we can make the assumption that the communication set up occurred swiftly. Finally, no referrals about the communication technology obstructing communication between actors were found. However, we cannot speak of a common communication channel, the network relying on a central dispatch to transmit info to every organization's separate dispatch. Therefore, direct communication between actors did not exist. No comments about how old the communication system used were found in the report. Taking everything into account, we can assume that communication technology was moderate to low.

4.2.4 Common operating picture

The ENECS is the common dispatch bureau which receives and transmits all the available data to the relevant organizations. Between 22:32-22:43, the organization received 78 calls regarding the Colectiv fire out of the total number of 114 calls received in that evening. The Bucharest Local Police was informed only 25 minutes after the first call (The Prime Minister's control body, 2016 pp. 62). Next, a high number of calls received by the common dispatch should have prompted ENECS to immediately inform the head inspector of IES about the situation, but this was done only after receiving information from the first responders (The Prime Minister's control body, 2016 pp. 74). The Intervention Red Plan entails the application of the collaboration procedure and announcement of every mutual aid organization through the common dispatch by the head of the rescue operations. The GPDMB, ASBI, GIMB and the Bucharest Local Police did not receive the message regarding the activation of the Red Plan (The Prime Minister's control body, 2016 pp. 75). Hence, because crucial information was not transmitted to or it had delays in reaching organizations, we can assume that actors' access was moderate. Moreover, when the head of the DES arrives at the scene, he must coordinate all required intervention procedures for the event. In

this case, the head of the department focused only on the first aid and medical assistance on the scene (The Prime Minister's control body, 2016 pp. 7). Although no mentions about actors having uncoordinated responses such as not responding to the same location or not responding at all for collective actions were found, the unskillful command of the response operations by DES and the failure to transmit crucial information to key actors leads us to the assumption that the shared understanding was moderate to low.

4.2.5 Type of governance

In case of emergencies, the prefect is the government's representative on the local level having multiple assigned duties. The military and local authorities of the Ministry of Internal Affairs are obliged to inform and support the prefect for the resolution of any events which affect the safety of the people, assets and the local environment. When crisis events occur, the prefect is operationally guided by the state secretary, the head of the DES. The prefect is the one which has the task of triggering the Red Plan (The Prime Minister's control body, 2016 pp. 15 - 16). Furthermore, at 22:43 the first responding units were under the command of Lt. Duminică Mihai. The command position was taken several times by different persons as it follows: at 22:45 command was taken over by Capt. Olteanu Ștefan: at 22:59 the next in command was Col. Dumitrescu Dan; at 23:10 the command position was taken over by the first deputy chief inspector of IES Col. Șchiopu Orlando; afterwards at 23:10 chief inspector of IES Col. Guță Mihai-Mirel took command; next to take the position was the secretary of state Raed Arafat head of DEU at 23:20; and finally, at 23:29, the last in command was the deputy prime minister for national security Gabriel Oprea (The Prime Minister's control body, 2016 pp. 42 - 43). Moreover, the police forces and gendarmerie forces on the scene also experienced rapid succession in command (The Prime Minister's control body, 2016 pp. 42 - 44).In conclusion, the type of governance used in this case was a classic top-down system which obstructed the effectiveness of the network due to the rapid successions of command in short time intervals which inhibit an adequate taking over of the position.

4.2.6 Trust

Firstly, a brief overview of the regular information which has been shared in the network will be presented. The GDPMB's first two police crews arrived on scene at 22:37 called for backup and started the first actions to evacuate victims. Next, at 22:43 the first ambulance from ASBI arrived on scene and communicated the gravity of the situation. At the same time of the ambulance's arrival, IES arrived with one first aid crew, three water foam firetrucks, two trucks for height rescue interventions, one truck for heavy extrication and one command truck for first intervention. Five more ambulances form ASBI arrived in the minutes after. Between 22:42 and 22:46, six police cars from GDPMB reached the scene and began security operations of the incident. Moreover, between 22:43 and 22:50 ten additional first aid medical crews arrived, three from IES and 7 from ASBI. Afterwards, at 22:50 two gendarmerie special intervention trucks from GIMB made their presence and constructed a working perimeter to allow exclusive access of the responding actors. At around 22:55 seven more ambulances arrived from ASBI. These were followed by 4 gendarmerie trucks at 23:03 and another 3 gendarmerie trucks at 23:20 from GDPMB (The Prime Minister's control body, 2016 pp. 35 - 39). The above information shows a substantial amount of basic information being shared in the network. Secondly, mentions about actors sharing sensitive information were not found. Finally, for the Intervention Red Plan of Bucharest municipality, it is mandatory for a training exercise to be held once a year with all the involved organizations. In 2015, before the event, one exercise was held for the verification, validation and updating of the Red Plan of the entire network and two smaller exercises to test the viability of a few segments of the plan (The Prime Minister's control body, 2016 pp. 61). In brief, with a substantial amount of basic information and prior interaction found in the network, we can conclude that the trust was moderate to high.

4.2.7 Capacity to collaborate

The entire response network had considerable technical resources at its disposal: the IES had a total number of 78 different intervention crews ;the GDPMD had 232 policemen, 67 police cars and 2 criminalistic laboratories; the GIMB had 9 intervention trucks; and ASBI intervened with 29

ambulances (The Prime Minister's control body, 2016 pp. 65 - 66).). Although a considerable amount of technical and human resources was used, an abundance of inefficient response actions attributed to actors' lack of resources, efforts or skills were found. Many individuals and mass-media representatives, which were not involved in the rescue operations, were present on the scene during the whole response stage (The Prime Minister's control body, 2016 pp. 37). As a result, these persons hampered the reception and transportation of victims by the ambulances (The Prime Minister's control body, 2016 pp.68). A fact which denotes that the police and gendarmerie forces which should have secured the perimeter failed in doing so. Furthermore, the IES had 48 ambulances out of which only 28 were operational and the crews on six of them were coupled with other intervention assets due to lack of personnel (The Prime Minister's control body, 2016 pp. 18). While ASBI had a total of 152 ambulances, 76% of them were old and met the cessation conditions and had 50,11% personnel deficit due to the low salaries (The Prime Minister's control body, 2016 pp. 22 – 23). On top of the understaffing issue, a decision was taken to not install the advanced medical posts for first aid (The Prime Minister's control body, 2016 pp. 77). Things which led to normal civilians and police forces in transporting the victims on pallets or just carrying the victims. While first aid and resuscitation of victims being performed directly on the ground and without the use of oxygen masks and defibrillators. We can assume that the misuse of these apparatus could be due to old equipment not working properly or lack of standard equipment entirely. Moreover, the responding organizations did not open the lateral exits of the club and the latched gate which was on the opposite side of the access path to the location, measures that would have improved the rescue operations (The Prime Minister's control body, 2016 pp. 73). Finally, the Clinic of Plastic Surgery and Reconstructive Microsurgery from the Emergency Clinical Hospital Bucharest, which is completely equipped and functional, was not used to its full capacity although it is the most modern of the hospitals in Bucharest (The Prime Minister's control body, 2016 pp. 9). Furthermore, mentions about actors actively communicating through different means than the network's communication networks were not found. Overall, the substantial number of action failure due to lack of resources, efforts and skills we assume that the network had a moderate to low capacity to collaborate.

4.2.8 Flow of high-quality information

Two organizations acted as information bureaus. In the first phase of the response stage, ENECS collected all the incoming calls, analyzed the information and transmitted it further to the appropriate organizations. Before contacting the prefect for the activation of the Red Plan they checked the data about the incident with the information from first responders (The Prime Minister's control body, 2016 pp. 34). Therefore, as they did in this case, we can assume that they performed the surveillance and veracity tasks for all the received data. During the response phase, the National Centre for Management and Coordination of Emergency Interventions from the Ministry of Internal Affairs was supplemented with personnel and acted as a crisis centre, organized on permanent shifts. The personnel maintained permanent contact with the responding actors and the hospitals which were receiving patients, centralizing the gathered information and actively solving problems of the responding actors and hospitals (The Prime Minister's control body, 2016 pp. 44). Next, a couple of remarks about substandard information were found. Some of the ASBI ambulance personnel panicked and transmitted chaotically information to dispatch (The Prime Minister's control body, 2016 pp. 67). Also, Cpt. Olteanu Ștefan reported at 22:48 to the IES dispatch that the fire was put out. While the GIES operative officer and general inspector were announced only two hours later, at 00:45 by the IES dispatch about the same matter (The Prime Minister's control body, 2016 pp. 66). To summarize, we can assume that the flow of information was moderate to high because of the existence of a common information bureau, the informational tasks being performed and the low number of substandard information.

4.2.9 Conclusion

The lack of flexibility and creativity in a top-down bureaucratic system had a major impact at the start of the intervention procedure. In the first response action, the ASBI ambulance and the eight IES trucks had a timely response but they were insufficient for the proportion of the event. This was because of the late reaction of ENECS to inform the head inspector of IES although numerous emergency calls were made. ENECS waited for intel from first responders to confirm the veracity of the information received in the emergency calls. It is a standard procedure of the organization's

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emergency procedures. Moreover, the used communication technology was efficient in the first phase of the response stage in alerting all vital actors. As no mentions were found about a direct communication channel between responding actors' in the time of response operations, we have to assume that the communication technology used was inefficient.

The flow of information in the network was working efficiently but a substantial amount of low-quality data was present. Actors did not share sensitive intel but shared a significant amount of basic information in the network. Having prior exercises and adequate standard information shared between actors, trust should have been moderately high. Although trust was considerable high, the capacity to collaborate with the network was moderate to low. Inappropriate first aid was due to lack of resources and personnel on the responding ambulances. The decision to not install advanced medical posts on the scene led to victims being treated on the directly on the ground. The failure in securing the response intervention scene can be attributed to lack of skilful personnel of the police and gendarmerie. During the response phase, the commanding structure of the operations was the DES.

The organization assumed its role in the network but coordinated only the mass casualty operations and had a rapid succession in command. Moreover, the police and gendarmerie forces also experienced rapid succession in command. We can assume that the classic top-down governance inhibited coordination. On top of that, a leading organization requires a direct communication channel with all responding actors to efficiently coordinate the response actions. Such a communication system was absent in the network. As mentions of only one boundary spanner being used were found, the interoperability communication problem could not be fixed with only one link due to the scale of the network.

4.3 Apuseni Aviation Accident

The event took place on January 20, 2014, when a Britten-Norman Islander light aircraft carrying a humanitarian flight, made a forced landing in a forested area of the Apuseni Mountains, Romania, at an altitude of about 1,600 m, near the Petreasa village of the Horea commune, situated at the

border between the Cluj and Alba counties. The light aircraft, which belonged to the Superior School of Civil Aviation of Romania, took off from the international airport of Bucharest at 13:35 and was scheduled to land at 16:35 on the international airport of Oradea. The aircraft's mission was a charitable one and was piloted by the 55 year old commander, Adrian Iovan who had accrued 16.000 hours of flying background and Răzvan Petrescu as co-pilot. On board was a team of five professional medics, all from different hospitals across the country, and a student from the Military Medical School of Bucharest. The crew's mission was to recover organs for a transplant operation from a donor ("Accidentul aviatic din Munţii Apuseni", 2014). Between 15:45 and 15:49 an operator from the Romania Air Traffic Administration Service (ROMATSA) tried to contact the aeroplane but was unsuccessful. The plane's crash site was estimated somewhere in Scărişoara – Beliş area, between Alba and Cluj counties in the Apuseni mountains. Between 16:00 and 16:10, the Inspectorates for Emergency Situations (IES) of the following four counties Bihor, Alba, Cluj, and Mureş were alerted. Over 600 individuals with numerous vehicles from the responding organizations alongside a considerable amount of civilians took part in the search and rescue operation. After approximately five hours the crash site was found by a local. The last victim arrived at the Cluj-Napoca Emergency Clinical County Hospital at 04:38 and the operation finished after the extrication of the pilot and the transportation of his body to the Câmpeni City Hospital morgue at 06:20. In this accident, the commander and student of medicine Aurelia Ion died, and the co-pilot and the four doctors were injured (The General Inspectorate for Emergency Situations, 2018 pp. 42-62). The cause of the crash was severe ice on the carburettors which led to a complete stop of the engines. The causes leading to this outcome have been the erroneous assessment of the specific risk factors for the flight, as well as several erroneous decisions of the aircraft commander (Centrul de Investigaţii şi Analiză pentru Siguranţa Aviaţiei Civile, 2015).

4.3.1 Crisis management effectiveness

This incident posed unique challenges due to the unclear information of the crash site, the long distances required to get to the scene and the mountainous terrain. ROMATSA was unable to give clear whereabouts of the crash site and the responding organizations had major difficulties trying to pinpoint the exact location even with constant contact with one of the victims. The long distances

of the professional intervention forces from the counties of Alba, Cluj, Bihor and Mureş to the intervention site, as well as the poor state of the road on some portions, corroborated with unfavorable weather conditions, dense fog, the fact that the action took place at night, in rough and wooded land, led to increased travel times and made it harder for intervention. The responding actors travelled impressive long distances: IES Alba 1850 km; IES Cluj 2388 km; IES Bihor 1736 km; and IES Mureş 836 km. (The General Inspectorate for Emergency Situations, 2018 pp. 61). The search and rescue operations of the network to find the crash site were made continuously and did not record undue delays attributable to the rescuers or those who led the intervention. Furthermore, the operational alert times, displacement at the intervention site, organizing and conducting wreck search and rescuing victims were appreciate as being in line with the distances and unfavourable conditions in which they acted (The General Inspectorate for Emergency Situations, 2018 pp. 62). Overall, we can deduce that the crisis management effectiveness of this case was moderate to high.

4.3.2 Boundary Spanners

The unprecedented challenges posed by this incident led to the use of numerous boundary spanners. The first link was the first deputy chief of IES Alba, which was assigned to lead the operations on the ground and maintain communication with the commanding group (The General Inspectorate for Emergency Situations, 2018 pp. 45). Furthermore, three search parties were established to scout the surroundings, by the first deputy chief. In charge of the first team was an officer from IES Cluj and was composed of 50 to 70 people from the Mountain Rescue Service (MRS) Cluj; IES Cluj; Transylvania Off-Road Club (TOC); MERDS Cluj; the Gendarmerie Department from Huedin; with rangers and locals from Mărişel town who knew the area. The second team was commanded by the head of Mountain Rescue Service Ştei and was composed of 30 to 40 persons from MRS Bihor; MERDS Alba; MRS Alba; also accompanied by rangers and locals. The third team was led by the head of Câmpeni FD and was composed of 30 to 40 people from IES Alba; MERDS Alba; the Gendarmerie Inspectorate of Alba county; along with rangers and locals from the area (The General Inspectorate for Emergency Situations., 2018 pp. 47). For each search team, a contact person with the on-scene command point and a courier in case of loss of telephone or radio signals

were established. Moreover, at the commanding point were co-opted: IES staff, MERDS physicians, representatives from the Apuseni National Park and representatives of the involved search structures in order to ensure the effectiveness of communication and act as liaison officers with the search teams (The General Inspectorate for Emergency Situations, 2018 pp. 48). The above information shows a large number and active use of planned boundary spanners by the network.

4.3.3 Communication technology

The Head Inspector of the General Inspectorate for Emergency Situations (GIES) began alerting the appropriate organizations ten minutes after ROMATSA lost contact with the aircraft. The first organization to be announced was IES "Crişana" Bihor at 16:00 about a possible aeroplane crash. At 16:06 the head inspector confirmed the crash (The General Inspectorate for Emergency Situations, 2018 pp. 44). The second announced organization was IES Alba at 16:07 while the third one, IES Cluj, and the fourth one, IES Mureş have been alerted at 16:10 (The General Inspectorate for Emergency Situations, 2018 pp. 44). Following the information received, the four inspectorates alerted the organizations that were under their subordination. Furthermore, IES Alba dispatched first responders, the intervention guard from the Câmpeni FD at 16:10 (The General Inspectorate for Emergency Situations, 2018 pp. 45). IES Cluj dispatched first responders from Cluj Napoca FD, Colina FD and Huedin FD at 16:13 (The General Inspectorate for Emergency Situations, 2018 pp. 49). Next, IES Bihor dispatched first responders from Ştei FD, Oradea FD and Aleşd FD at 16:25 (The General Inspectorate for Emergency Situations, 2018 pp. 51). Finally, IES Mureş sent one helicopter from MERDS Târgu Mureş and one special truck for personal assistance and multiple victims at 16:30 (The General Inspectorate for Emergency Situations, 2018 pp. 52). Given the available remarks presented above, we can assume that the speed of the first communication set up was high. Moving on, communication between the responding actors and command group was difficult because the area does not have telephony or TETRA coverage except at certain high points. Moreover, contact between the on-scene command point and the search parties in the forest was extremely difficult and could only be achieved temporarily with the communications systems when they were operating in higher areas (The General Inspectorate for Emergency Situations,

2018 pp. 61-62). Finally, no mentions about how old the communication system was were found. From the above information, we can assume that the communication technology used in the network was moderate to low.

4.3.4 Common operating picture

The Operational Group belonging to the Command County Intervention Centre, activated at IES Alba, allowed the realization of a complex operational image in real time, providing the decision-makers with the information needed to manage the intervention and organize the cooperation of the concentrated forces from the four counties: IES, MERDS, volunteers, fire departments, gendarmerie, MRS, TOC etc. (The General Inspectorate for Emergency Situations, 2018 pp. 62). As no mentions about actors being unable to access information, we can assume that the Command County Intervention Centre Alba was effective, and all actors received all the required data. Next, all engaged forces arrived at the set meeting point on the border between the two counties, Cluj and Alba, to set up the junction of the forces. Some forces which arrived earlier were directed to search other areas, such as Câmpeni FD Alba and Colina FD Cluj, to verify possible locations of the aeroplane. After the junction of the involved forces, the on-scene Command Point was established by the first deputy chief of IES Alba, who split the forces into three teams and sent them in three different directions (The General Inspectorate for Emergency Situations, 2018 pp. 45-49). Information about uncoordinated actions during the response phase was not found. In conclusion, the responding network had a well-developed common operating picture.

4.3.5 Type of governance

At the same time when announcing the accident, the Head Inspector of GIES ordered IES Mureş to alert and send the helicopter of MERDS Târgu Mureş, within the perimeter bounded by Huedin and Abrud, in the Scărişoara Glacier area. Short after, the Operational Group is activated at the General Inspectorate for Emergency Situations, which, under the coordination of the Inspector General of the GIES, ensures the mobilization of resources and the coordination of intervention

resources of the Alba, Cluj, Bihor and Mureș counties. The IES head inspectors from the Alba and Cluj counties implemented the intervention plans, activated the Command County Intervention Center and led, along with the prefects of the two counties, the interventions in the Alba and Cluj counties, according to the territorial competences. The command of the on-site intervention was provided by the First Deputy Chief Inspector IES Alba. The Red Intervention Plan was activated and MERDS and County Ambulance Service medical resources from Alba, Cluj, Bihor and Mureș counties reached in the shortest time the intervention site (The General Inspectorate for Emergency Situations, 2018 pp. 44). The clear structure of authority reveals that a classic top-down governance system was used in this network.

4.3.6 Trust

The responding forces shared the following basic information in the network. From the four counties all the fire departments, the mountain rescue services, ambulance services along with the task force of IES Alba, the TOC and the MERDS helicopter from Târgu Mureș communicated their departure, arrival on the scene and search actions performed (The General Inspectorate for Emergency Situations, 2018 pp. 45-52). Moreover, at 16:10, the IES Dispatcher Alba contacted the IES Cluj Dispatcher to communicate the event and trigger searches in Cluj County, taking in consideration that the area described included large areas of land in Alba and Cluj counties. According to the event announcement procedures, the event and the measures taken at the level of the county of Alba at 16:25 were announced to the General Inspectorate for Emergency Situations - the National Operational Center and the Operational Center for Control of the Ministry of Interior. At the same time, there is an exchange of information with ISU Cluj, related to the accident, in order to determine the details of the action, areas, the location of the junction of the intervention forces, intervention needs, and the fact that they do not hold any other information on where the accident occurred (The General Inspectorate for Emergency Situations, 2018 pp. 46). No mentions about prior working relationships between the actors of the four counties and no evidence of sensitive information being shared in the network were found. As a result, we can assume that trust, in this case, was moderate to low.

4.3.7 Capacity to collaborate

Through the whole search and rescue operation, a total of approximately 600 persons participated. The inspectorates of the four counties responded with a total of 299 personnel staff, 5 dogs, 17 different kinds of ambulances, 24 all-terrain vehicles and normal vehicles, 22 various special intervention trucks and one helicopter. Approximately 300 people from the Voluntary Service for Emergency Situations Alba-Iulia and locals from Horea village with over 20 off-road vehicles and 6 tractors also participated in the search operations. While, TOC, Apuseni Natural Parc and Horea Apuseni Private Forrest District participated with 13 individuals and 11 all-terrain vehicles (The General Inspectorate for Emergency Situations, 2018 pp. 61). Furthermore, a couple of action failures due to the lack of resources, efforts or skills were found. In order to reach the crash site and evacuate the victims, the rescue personnel had to walk or to rely on the vehicles belonging to locals or TOC. Moreover, when heading to the crash site, the two trucks from Câmpeni FD were not able to advance. Extrication equipment was transferred in two vehicles of TOC and continued to move up to about 500 m from the wreckage of the plane, from where they walked with the equipment on their arms (The General Inspectorate for Emergency Situations, 2018 pp. 58-59). Finally, because of the rugged terrain and poor coverage of the area with Special Communications Service and mobile telephony networks, it has been difficult to communicate with the search and rescue forces, and in some cases, couriers had to be used to transmit orders and messages (The General Inspectorate for Emergency Situations, 2018 pp. 61). Although communication between actors was difficult, no mentions were found of actors communicating through different communication means than the ones already established. In conclusion, the network had sufficient general resources with a few action failures, with actors using the established communication procedures, leading us to the assumption that the capacity to collaborate was moderate to high.

4.3.8 Flow of high-quality information

The Operational Group Alba was supplemented with personnel at 16:14 and started the centralization activities of data and gathering information from all sources to organize the search actions. Moreover, the Exclusive National Emergency Calling System 112 (ENECS) Cluj was in

contact with one of the victims. ENECS Cluj held four conferences including the participating forces when talking to the victim, in order to pinpoint the location of the aircraft. In the last conference with dr. Zamfir Radu at 19:38, a local was added in order to get a more detailed description of the area in which the victim was situated. Through the last conference, all the forces were oriented in the right area of the crash site and the plane was found by locals at 21:13 (The General Inspectorate for Emergency Situations, 2018 pp. 46-48). The Operational Group Alba acted as the common database and performed the two informational tasks alone or with the help of the other organizations. No mentions were found about inaccurate information in the network; therefore, we can assume the quality of the information was high. In contrast, low-quality information about the aeroplane's location was present during the response phase. Because of severe icing, the pilot flew under the flight level which ROMATSA controls. Which led to poor communication with the aeroplane and the imprecise coordinates of its location. However, it cannot be attributed to the responding organizations because the data was unavailable before the network was alerted and can be associated with external factors. (The General Inspectorate for Emergency Situations, 2018 pp. 43). Moreover, all the relevant information received about the possible crash site was processed and checked in the field with the help of numerous organizations, such an example is the attempt made by the Romanian Intelligence Service to find the crash site by trying to pinpoint the location of the cell phones belonging to the victims (The General Inspectorate for Emergency Situations, 2018 pp. 46). All the searched areas are illustrated in figure 5, the green area is the last zone checked in the field where the aeroplane was found. All in all, we can assume that the flow of information was moderate to high.
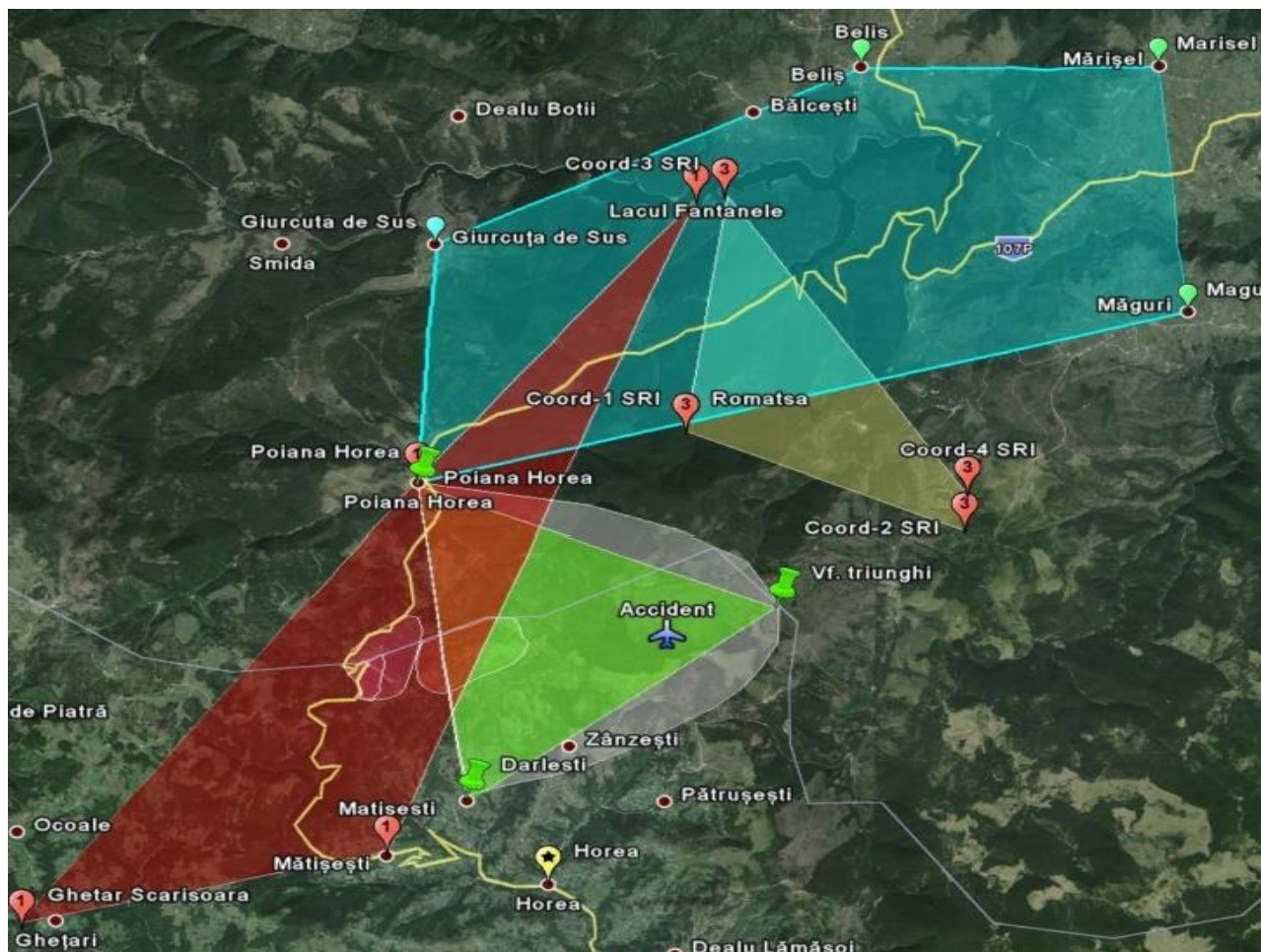
Figure 5. Speculated areas of the possible crash site according to information indications.

Note: Reprinted from "Information material regarding the intervention procedures in Apuseni aeroplane crash accident 2014" by Inspectoratul General pentru Situații de Urgență, 2018, pp. 57.

4.3.9 Conclusion

The response network faced very different conditions in the woodland than the usual ones present in an urban setting. The mountainous area posed major communication and accessibility problems. The communication interoperability was caused by a lack of telephony or TETRA coverage signal, except at certain high points. This challenge was overcome by using a high number of boundary spanners in the network in order to connect the responding actors. Moreover, the accessibility problem was due to the lack of appropriate all-terrain resources. This challenge was overcome by

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collaborating in the search and rescue operations with the Transylvania Off-Road Club and with locals.

On top of the terrain conditions problems, exact coordinates about the planes crash were not available. Several organizations tried to locate the aeroplane using different methods. The Romanian Intelligence Service and the Exclusive National Emergency Calling System 112 tried to locate the position of the telephone of the victim with which they were in contact with. While multiple citizens provided possible information about the crash site. For example, one citizen communicated the finding of the plane, but it was not found, and several suggested locations too far from the last known position of the aircraft. The Operational Group of IES Alba collected and then analyzed all the data for its veracity. After the analysis made, a part of the leads was checked in the field while the rest were not considered valuable. The efforts of the group conceived an efficient flow of high-quality information with all actors having access to it.

The common database along with an overall considerable amount of resources resulted in coordinated actions throughout the response procedures. Still, a few action failures existed due to a lack of adequate resources, but these were too insignificant to affect the network's capacity to collaborate. Moreover, the absence of shared sensitive information and prior working relationships makes us assume that the trust in the network was moderate to low. In addition, the use of a classic top-down governance system was found, but no mentions about the used system impeding the network's actions exist. In spite of the shortcomings in the response phase, the overcoming of the unique and troublesome challenges leads us to the assumption of a moderate to high crisis management effectiveness.

4.4 Hudson Ditching

On January 15, 2009, US Airways Flight 1549 was due to take off from LaGuardia Airport (LGA) New York (NY) and land in Charlotte Douglas. The Airbus A320-214 aircraft was commanded by the 57 year old pilot Chelsey B. Sullenberger, a previous combat pilot who since leaving the United States Air Force had been an airline pilot and had logged in 19.663 flight hours. The co-pilot was

the 49-year-old first officer Jeffrey B. Skiles who had accumulated 15,643 hours of flying experience but this was his first time on an Airbus A320 since obtaining the license to fly this kind of aeroplanes. In the climb phase, right after taking off from LaGuardia Airport, the plane hit a group of birds, more precise Canadian geese, and consequently lost all the power to the engines. Incapable to reach any nearby airports, the two pilots glided the aeroplane into a water landing in the Hudson River off Manhattan (fig. 6).

Figure 6. Flight track of the aeroplane.

Note: Reprinted from "Loss of Thrust in Both Engines After Encountering a Flock of Birds and Subsequent Ditching on the Hudson River" by National Transportation Safety Board, 2010, pp. 4.

After the forced landing, the three flight attendants along with the two pilots started the evacuation procedures. One hundred and fifty passengers, along with an infant exited from the plane along the over the wing and forward exits on the plane's wings. Immediately after, all the victims were rescued by the area responders. Four passengers alongside a flight attendant experienced serious injury, and the plane was heavily damaged (National Transportation Safety Board, 2010 pp. 1-5). This accident, which had a fortunate outcome, became known as the "Miracle on the Hudson"

while the National Transportation Safety Board catalogued the event as the greatest water landing in the recorded history of aviation (Olshan, 2009).

4.4.1 Crisis management effectiveness

Right after ditching the aeroplane in the river, the flight attendants commenced the evacuation swiftly, and, although every one of them experienced problems at their exists, they still succeeded in obtaining an effective and prompt evacuation (National Transportation Safety Board, 2010 pp. 106). In addition, the post-crash environment which contained 5 degrees water temperature and -16 wind chill factor, represented a direct threat to the lives of the passengers and crew. Even though the plane remained afloat for a while, the passengers who were situated on the wings were subjected to water up till their abdomen in approximately 2 minutes. The occupants which were on the wings and the ones which jumped or fell in the water were the most at risk. In medical literature it is shown that immersion in very cold water produces cold shock, that is able to kill an individual in less than 5 minutes, and swimming failure that is able to kill an individual in a period of 5 to 30 minutes (fig. 7). Therefore, if the emergency response would not have been timely and efficient, aeroplane occupants would have died due to swimming failure or cold shock (National Transportation Safety Board, 2010 pp. 103). For this reason, the effectiveness of the crisis management of this case can be understood as high.

Figure 7. Aeroplane occupants on the wings and in the slide/rafts after the evacuation.

Note: Reprinted from "Loss of Thrust in Both Engines After Encountering a Flock of Birds and Subsequent Ditching on the Hudson River" by National Transportation Safety Board, 2010, pp. 5.

4.4.2 Communication technology

LGA's air traffic control tower personnel triggered the Emergency Alert Notification System through standard procedures at 15:28. When the crash alarm is activated a demand for emergency apparatus is instantaneously passed on via a conference call to different airport agencies and emergency response organizations incorporating the Fire Department of New York (FDNY), New York Police Department (NYPD), the U.S. Coast Guard (USCG) and Emergency Medical Services (EMS). At the time of the notification of the accident, a level three mobilization, that prescribed a prearranged group of equipment and personnel to respond to an incident, was communicated to the FDNY, NYPD, New York Office of Emergency Management (OEM), EMS, Federal Bureau of Investigation and Red Cross. In addition to these organizations, personnel from Port Authority of NY and New Jersey (NJ), New York Waterway (NYWW), New Jersey OEM and Weehawken Police Department likewise responded to the accident (National Transportation Safety Board, 2010

pp. 44-45). Next, the USCG undertook incident command and maintained communications with NYPD and NJ OEM and NYWW ferry captains. We can assume that the communication between actors was efficient because no comments about obstructed communication were found. On top of that, no mentions of how old the communication technology used were found. As a result, taking into account the fast communication set up and no mentions of obstructed communication, presumably the communication technology effectiveness was moderate.

4.4.3 Common operating picture

Countless NYWW passenger boats were functioning across regular routes in the regional watercourse when the water landing happened, while some captains observed the incident, others have been informed regarding the crash by the director in charge of the ferry operations. Even though the personnel of the ferries was not prepared to react to an aeroplane incident and were not associated with the NY or NJ OEM structure of emergency response organisations, the captains were the firsts to reach the crash site and to save the passengers from the cold water and the aeroplane's slide/rafts or wings. The first ferry was on scene in around three minutes of the crash followed in 7 minutes by six more ferries. While one rescue boat belonging to FDNY reached the accident location in eight minutes and the other two rescue boats from USCG arrived on location in seventeen minutes (National Transportation Safety Board, 2010 pp. 103). No mentions of involved actors not receiving crucial information were found. Hence, the network had a well-established common operating picture due to the proximity of ferries and easily visible aircraft which led to quick coordinated response actions with all actors having access to the available information.

4.4.4 Type of governance

The New York OEM employees a Citywide Incident Management System, that determines the responsibilities and roles and appoints jurisdiction for city organizations operating and assisting

emergency responses. Citywide Incident Management System applies the National Incident Management System which issues a proactive, structured concept to guide departments and organizations from all levels of authority, nongovernmental organizations, and private companies to work flawlessly to counter, safeguard against, respond to, recover from, and diminish the impact of accidents, loss of property and life, and damage to the environment. When New York's public safety organizations react to an intricate, multijurisdictional and multiagency event, the management of the Citywide Incident Management System decides how the emergency response will be organized. Following the accident alarm, the New York OEM staff started organizing the resource demands from NYPD, FDNY and Red Cross (National Transportation Safety Board, 2010 pp. 45). From this information, we can assume that the type of governance for this network was a top-down system.

4.4.5 Trust

Referrals of basic information being shared in the network were found. The responding vessels to the event transmitted their arrivals to the aircraft and the drop off locations of the rescued victims (National Transportation Safety Board, 2010 pp. 46). Next, mentions about sensitive information being shared in the network were not found. Finally, in October 2008, NYWW took part in a preparation table-top exercise alongside the Port Authorities of NJ and NY. Moreover, just a few months prior to the event, the emergency response organizations NJ and NY took part in a multiple casualty exercise at Port Imperial Ferry Terminal. NYWW had requested to partake in this kind of exercises alongside the NJ and NY response organizations, but their request was not accepted. Following the incident, the Port Authority of the NJ and NY notified the NYWW that they are going to be comprised in the upcoming multiple casualty exercises amid the two states. NYWW also organized a set of periodic exercises, live trainings, and realistic rescues previously to the incident (National Transportation Safety Board, 2010 pp. 47). Therefore, with a significant amount of basic information shared in the network and prior working relationships, we can assume that the trust was moderate to high.

4.4.6 Capacity to collaborate

In the response phase seven ferries from NYWW, one rescue boat from FDNY, two small boats from USCG, and a rescue boat from LGA were used to safely transport the victims to land. The Port Imperial Ferry Terminal was nominated the main triage area for the accident. In the beginning, the port was an ideal drop-off location, but, as the aeroplane was drifting with the river current, several vessels dropped occupants in different, more accessible locations. All occupants have been rescued within 20 minutes of the water landing (National Transportation Safety Board, 2010 pp. 44-47). Furthermore, mentions about action failures and mentions about actors not actively communicating through the network's communication channel were not found. Although the overall technical resources were sufficient, the majority of them belonged to the NYWW which were not part of the response network. Taking this into account and the post-crash environment, we can assume that the capacity to collaborate was moderate to low.

4.4.7 Conclusion

The "Miracle on the Hudson" is one of the rare cases in which the skills of the pilot coupled with favourable circumstances and quick intervention of the responding organizations converged in a positive outcome. In the initial phase of the response stage, communication was set up in a quick manner and was well maintained during the response stage. The high number of neighbouring ferries and quick reaction of the other vessels resulted in a quick response. Previous collaborations and sharing of basic information coupled with an easily visible aeroplane and accessible information led to coordinated rescue actions. No evidence of obstructed rescue operations due to the use of a top-down system was found. Moreover, no mentions about boundary spanners were found and not enough data to assess the flow of information was available, this could be because of the short timeline of the event. All in all, as the rescue operations ended in about 20 minutes with successful evacuation of all of the aeroplane occupants, we can assume that the network's effectiveness was moderate to high.

4.5 Comparison of the cases

The four cases have been analysed in the previous sections of the chapter. In this section, the cases are going to be compared in the interest of revealing similarities and differences between them. A sketch of the findings from the four cases is being presented in table 3.

	Station Nightclub Fire (SNF)	Colectiv Nightclub Fire (CNF)	Apuseni Aviation Accident (AAA)	Hudson Ditching (HD)
Crisis management effectiveness	Moderate to high	Moderate to low	Moderate to high	High
Boundary spanners	Moderate to high	Low	High	N/A
Communication technology	Moderate to low	Moderate to low	Moderate to low	Moderate
Common operating picture	Moderate to high	Moderate to low	Moderate to high	High
Type of governance	Top-down	Top-down	Top-down	Top-down
Trust	Moderate to low	Moderate to high	Moderate to low	Moderate to high
Capacity to collaborate	Moderate to high	Moderate to low	Moderate to high	Moderate to low
Flow of high-quality information	Moderate	Moderate to high	Moderate to high	N/A

Table 3. Table of the results after the analysis

In both SNF and CNF cases, the fire started when pyrotechnics were used which lit the material used to soundproof the walls and ceiling. The soundproofing material used in both nightclubs did not adhere to the safety regulations and was not fireproof, on the contrary, it was highly flammable. On top of that, each club had only one small entrance that also served as an exit. The poorly designed exits resulted in a bad egress of the locations. People panicked and blocked the doors, a fact which caused the high number of casualties in these unfortunate events. Both cases required the same three coinciding response operations: fire suppression; mass casualty care and transport and scene security with traffic management. The difference between the two is how the events have been managed by the response networks.

In the two club fires, a classical top-down system was used. According to the literature, this classic bureaucratic system is the most likely type to hamper crisis management operations. In the SNF, the WWFD Chief was the first on scene and established the Incident Command. When the chiefs from the other departments arrived, they acted as a command group to support the WWFD Chief, who remained in charge of the operations throughout the response phase. On the contrary, in the CNF case, the first person in command of the operations was Lt. Duminică Mihai, but during the entire response phase, he was succeeded by other six persons in the command position. This phenomenon also occurred in the command of the police and gendarmerie forces. The rapid succession of command in short time intervals did not allow an adequate taking over of the position. Furthermore, in both cases, the communication technology was inefficient because the responding organizations relied on dissimilar communication channels. This challenge was overcome only in the SNF case with the help of multiple boundary spanners which maintained a permanent contact between organizations. Although in the CNF case, boundary spanners are designated from GIES through the law to support the DES, only one such planned link was used. An approach which did not overcome the communication interoperability problem. Next, considerable overall resources were available for the two crisis management networks during the response stage. Despite this, the capacity to collaborate was found to be very different between the two. This difference is because in the CNF case, a substantial amount of action failures due to lack of resources, efforts and skills of the participant actors were present while in the SNF case only a negligible amount was found. Almost the same situation as for capacity to collaborate can be found when looking at the common operating picture. Both cases relied on dispatchers to transmit information to the actors and no mentions of uncoordinated actions were found. While the SNF had only one instance of

inaccessibility to information, the CNF had several. One of the important instances is when crucial information about the activation of the Intervention Red Plan did not reach all the relevant actors of the network. On top of that, because of the unskillful command of the response operations by DES, we can assume that the intervention actions were mostly uncoordinated. Moreover, sharing basic information required for collaborative networks was found in both cases, whilst no sharing of sensitive information could be revealed. Whereas, prior interaction between the responding actors was discovered in the CNF case only. Thus, resulting in a higher trust level in the CNF case than the SNF case. Finally, the dispatchers of the response networks acted as information bureaus, the only difference was that in the SNF case they performed only the surveillance task, and, in the CNF, they performed the surveillance and veracity tasks. Hardly any substandard information was present in the networks, with the CNF having an organization which acted as a common information bureau, and, the SNF not having one. Taking into account all the differences and similarities, the crisis management of the SNF case was more effective than the CNF one.

Moving on, the AAA and HD cases have more differences than similarities when it comes to the course of events. Both engines of the planes stopped working while flying, but this was because of different reasons. In the HD case, the plane crash landed in the heart of New York while in the AAA the plane crash landed in a remote mountainous area. The unknown coordinates of the plane prompted search and rescue operations, while in the HD case the plane was visible as well as accurate information of its location was available and only rescue operations were necessary. In addition, long distances had to be travelled to reach the supposed crash site in the AAA case, while in the other case, the responders were already in close vicinity of the aeroplane. In both cases, civilians and organizations which were not part of the response network were actively and efficiently used. The biggest difference between them is that that one responding network faced unfavourable circumstances, while the other encountered more favourable circumstances than troublesome ones.

Just like in the previous cases, the classical top-down system was also used to manage the response operations for the aviation accidents. In both cases, despite working in a top-down system, the actions taken by the preassigned organizations in charge with the mobilization and coordination of the resources and intervention procedures along with the on-site command headquarters did not impede the response actions. Next, the communication technology worked effectively in the HD

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case, whilst in the AAA case, it posed problems. Contact between the responding actors and the command group was possible only in high places because of the lack of proper telephony or TETRA coverage in the mountainous area. This problem was overcome, just like in the SNF case, by using boundary spanners. The only difference here is that they used a greater number of planned links than in the SNF case to achieve fruitful communication between actors. As the HD case is concerned, no evidence of boundary spanners being used was found. This could be explained by the short timespan of the event and the well-functioning communication technology. Per overall, both cases had a substantial amount of resources and very few action failures due to lack of resources, efforts or skills. Even so, only the AAA received a positive score, while the HD received a negative score. The reason is that most of the vessels belonged to the NYWW, organization which that time was not part of the response network. If we take in consideration post-crash environment, which posed a great risk to the live of the victims, the large number of victims, and the pretty late arrival of only three boats belonging to the emergency agencies, we can state the fact that this event could have had a tragic ending if the ferry captains would not have responded on their own initiative. In contrast with the capacity to collaborate, a clear-cut common operating picture was obtained in both cases. Uncoordinated response actions were not found in any of the cases and all actors had access to the network's data from the information bureau or favourable circumstances. Next, in both cases, the sharing of sensitive information could not be found. While the sharing of basic information was found in both cases, in the HD case, prior interaction was also uncovered. A fact which led to the positive score of trust in the HD case. Moreover, the flow of high-quality information was positive in the AAA case because the two informational tasks were performed, and no inaccurate information was present in the network. Unfortunately, in the HD case, this variable could not be measured because of insufficient data. To conclude, in both cases, crisis management effectiveness was high even if major challenges were faced.

With reference to a comparison between the four cases, a couple of peculiarities stand out when analysing the independent variables which had major impacts in the management of these crises. First, boundary spanners have been confirmed as a very effective method to achieve better communication between actors. Secondly, the use of top-down governance system does not impede response operations as much as it was expected. Thirdly, high levels of trust are not required for a crisis response network to be effective. Lastly, the communication technology was inefficient in

three out of the four cases, validating the need for ultra-modern communication technologies in crisis response networks.

5. Conclusion

This last chapter is comprised of three different sections. The first section is going to reintroduce and answer the research question. A reflection on the research will be presented in the second section. Lastly, in the third section, recommendations for further research will be discussed.

5.1 Results

Crises are local or international phenomena which appear unexpected and put in jeopardy the health and safety of the public. These events interrupt the day to day functioning of the institutions and societies and prompt the public, media or other political voices to have biased or unreal expectations for the people in charge when managing them. The management of a crisis is already a difficult task to perform without having additional external pressures. As crises have become more frequent and diverse, are able to cross state boundaries and affect larger populations, a more reasonable public opinion on crisis management and better preparation of the response networks are mandatory. The entire sum of activities taken during, before and after a crisis by responding actors is divided into four dissimilar stages in a crisis management cycle. The stages are prevention; preparation; response and recovery. The response phase was deemed the most tangible of the four to evaluate the effectiveness of crisis response networks by examining the two main inter-organizational elements communication and coordination. The aim of this thesis was twofold: it strived to raise awareness on the challenges faced in crisis situations and the public opinion's impact on crisis leadership while emphasizing the importance of crisis management to those in charge by analyzing cases which can set an example.

Following this argumentation, the research strived to answer this main question: *How can we explain crisis management effectiveness by looking at communication and coordination?* To answer this question an extensive literature search on crisis management was performed. Firstly, the term crisis was deliberated and how people perceive these events. After a discussion about the three dissimilar schools of thoughts, a crisis was defined as "*a set of circumstances in which individuals, institutions or societies face threats beyond the norms of routine, day-to-day*

functioning, but the significance and impact of these circumstances will vary according to individual perceptions" (Drennan et al., 2014 pp. 19). Secondly, a distinction was made between the three procedures dealing with unexpected events: crisis, disaster and emergency management. This distinction demonstrates that crisis management is the most suitable approach for this thesis which was defined as the whole sum of measures taken to decrease the effects of a crisis. As well, the four stages of crisis management and the five essential tasks for strategic crisis leadership have been further elaborated. In addition, the focus of the thesis on communication and coordination in the response phase was likewise reinforced.

Moving on, the requirements for communication and coordination which influence crisis management effectiveness were established in the theoretical framework. For inter-organizational communication, three independent variables were chosen. *Boundary spanners* are the required medicine to ease the exchange and sharing of information in a complex setting. *Communication technology* is a necessary element to produce, develop and sustain networks. *Common operating picture* involves reaching an adequate level of common information in the network for the actors to make sense of the event. Next, two explanatory variables were selected for coordination. *Capacity to collaborate* represents actors' contribution with suitable resources to the common effort and effective communication in the network. And an effective *flow of high-quality information* is a necessity in order to achieve a successful distribution of resources. Finally, two independent variables were established to affect both communication and coordination. The *type of governance* used may enhance or may impede the response operations. And, *trust* which can be built before or spontaneous during the crisis, enhances collaboration and communication in a network.

After the literature review and the explanation of the requirements, the variables were operationalized and the analysis of the four compatible cases was performed to answer the central research question. First, the explained variable, *crisis management effectiveness* was operationalized as the network's performance in controlling the crisis event in the response stage. Second, *boundary spanners* have been defined as the existence of planned or spontaneous links which, through their actions enhanced communication. Third, for *communication technology,* three indicators were established: initial communication set-up speed, the efficiency of the technology; and its oldness. Fourth, *common operating picture* was determined as actors' access to information

and level of coordination of the response actions. Fifth, *type of governance* was set as the organizational structures used for administrating a response network and their known impact on its effectiveness. Sixth, *trust* was determined as the amount of basic and sensitive sharing of information and prior interaction. Seventh, *capacity to collaborate* was established as the amount of complementary resources; failed response actions due to actors' skills, efforts or lack of resources; and actors' ability to communicate. Finally, for *flow of high-quality information,* three indicators were identified: performing of the surveillance and veracity tasks; quality of the information; and the existence of a common database.

As far as the analysis is concerned, it indicates that the variables which positively affected communication in the analyzed cases are *boundary spanners* and *common operating picture*. Both variables confirming the literature in their impact upon crisis management effectiveness. Next, *communication technology* had a negative influence on inter-organizational communication. It had a negative impact on three out of four cases, thereby confirming the theory that avant-garde communication and information technologies are a necessity in crisis management. Furthermore, coordination was found to be positively influenced in the analyzed cases by the *capacity to collaborate* and moderately positive by the *flow of high-quality information.* Both validating the literature to different extents. Moreover, the *type of governance*, top-down found in all cases, was found to positively influence communication and coordination in three out of four cases. This finding contradicts existing literature which states that top-down hierarchical systems found in governmental institutions do not function well in crisis situations. In addition, a high degree of *trust* was not found to have a significant impact on the two essential elements, contradicting the existing crisis management literature in which high levels of *trust* are needed for an effective response.

The positive score of the crisis management effectiveness of the SNF, AAA and HD cases can be explained evaluating the explanatory variables which had a positive impact. In all three cases, two out of the three variables for communication were high or moderate to high. They used a top-down governance system that did not impede the operations while trust was on the low end in the SNF and AAA cases. All three cases had abundant resources and a moderate to high flow of information which influenced coordination. On the contrary, the CNF case had negative crisis management effectiveness. This can be explained by the all three variables of communication on the low end of the spectrum, a top-down governance system which hindered the response

operations, and a lack of resources, although trust and the flow of information were moderate to high (table 4).

	Variables	Station Nightclub Fire (SNF)	Colectiv Nightclub Fire (CNF)	Apuseni Aviation Accident (AAA)	Hudson Ditching (HD)
Dependent variable	*Crisis management effectiveness*	Moderate to high	Moderate to low	Moderate to high	High
Communication	*Boundary spanners*	Moderate to high	Low	High	N/A
	Communication technology	Moderate to low	Moderate to low	Moderate to low	Moderate to high
	Common operating picture	Moderate to high	Moderate to low	Moderate to high	High
Communication and coordination	*Type of governance*	Top-down	Top-down	Top-down	Top-down
	Trust	Moderate to low	Moderate to high	Moderate to low	Moderate to high
Coordination	*Capacity to collaborate*	Moderate to high	Moderate to low	Moderate to high	Moderate to low
	Flow of high-quality information	Moderate	Moderate to high	Moderate to high	N/A

Table 4. Communication and coordination effectiveness in analysed cases

5.2 Reflection

Firstly, a comprehensive research design to evaluate the response phase through communication and coordination in a crisis could not be found in the current literature. Almost all literature is concentrated either on a broad aspect of all four crisis management stages or on very specific topics within it. Therefore, theories from public administration and organizational management of private businesses on crisis management have been used to construct the desired research design. As a result, seven independent variables were chosen which seemed most relevant to explain communication and coordination in a crisis network. The distinction between which explanatory variable affects communication and which one affects coordination was hard to make. Also overlapping of indicators between concepts and their practical application affected the choice of these variables.

Secondly, the operalization of the concepts posed some problems. Overall, the indicators were on a fine line between the two elements, communication and coordination and were hard to differentiate. When operationalizing some of the concepts, indicators were clear and easy to apply to a documentation-based study while some could have different interpretations. The concepts which were most problematic are boundary spanners, capacity to collaborate and flow of high-quality information. In literature, it was clear that boundary spanners positively affect communication, but it was difficult to establish a modality to identify them. This was because other individuals, especially those in management positions, can be easily confused as boundary spanners when relying on the common definition found in the literature. This problem was fixed by making a distinction between planned and spontaneous boundary spanners and specifying the exact abilities and skills which such individuals necessitate in real life. After analysing the four cases, it turns out that planned boundary spanners are easier to identify than spontaneous ones. This can be accounted to their clear-cut positions in the networks. Next, capacity to collaborate was created by the authors at the individual level. As we are evaluating crisis management effectiveness at the network level, conceptualizing it to this level posed difficulties. These were overcome by firstly looking at the resources available for the whole network and then searching for mentions of action failures caused by actors' absence of resources, efforts or skills to assess the network's capacity to contribute to the common effort. Moreover, the network's capacity to communicate was established as being

effective if most actors are communicating through the established communication methods. Lastly, the flow of information in a collaborative network put simply, is concerned with how information is transmitted from a source to a receiver or target through a medium. This concept can easily be attributed to communication, while its effects really influence coordination. The first challenge was to asses if task complexity inhibited the information flow. This was dealt with by evaluating the performance of two basic informational and cognitive tasks, surveillance of the crisis events to gather information and the veracity analysis of the gathered information. The second challenge was to move away from the communication side to the coordination side and not to assess the same elements as in the communication technology variable. The issue was adjusted by establishing an indicator for a database or an information bureau from which all actors should have access to the necessary information. Lastly, even if a network has a highly effective flow of information, the condition of the existent information in the flow has a major impact on actors' coordination. Therefore, the flow of information concept and the quality of information concept were mixed, and the accuracy and completeness of information indicators were developed.

Moving on, in the analysis process, limitations of the variables were uncovered. The indicators: oldness of the communication system; the sharing of sensitive information; and the usage of other means of communication could not be evaluated. On top of that, enough details of how the governance system worked were not available to appraise if top-down systems used in the cases were a heterarchy or not. These limitations are attributed to a lack of information in the official evaluation reports of the cases. As these reports are constructed as a historical account of the events, they do not rely on an evaluative framework and therefore they are not examining all the details we would like to study. The constraints led to an imperfect appraisal of the explanatory variables: communication technology, trust and type of governance. The majority of the concepts were visible in the documentation and were found to have an impact on the effectiveness of crisis management while the case study method proved to be appropriate in order to explain crisis management effectiveness through communication and coordination. For future research to provide more detailed insights of qualitative elements, like people's experiences and perceptions, and exhaustive database, more sources of evidence should be utilized. One method is to use interviews, through which explanatory variables which posed problems in this study can be uncovered through direct questions with key actors regarding these details. Another possible method would be direct observations of the events, although crises tend to occur without warning,

which clearly is not in the advantage of a researcher. Observations could be realized for crises which have a sufficient time frame for an individual to reach the scene and perform them.

5.3 Recommendations

As studies on government capacity to deal with crises, from public administration scholars are scarce, this thesis aims to spark interest for more elaborated investigations on this subject and to contribute to the existing evaluative framework of crisis management. With hope, the four-case study done through documentation with the help of the developed research framework demonstrates the added value that it brings to crisis management literature. The research framework of the thesis can be used, in a simplified or improved version, as a template for further in-depth case studies. Further studies can be done on different kind of crises and should employ more sources of evidence to further strengthen this research domain and uncover undetected causal inferences. This thesis, with the help of further studies, can raise awareness on the importance of crisis management to those in charge and on the challenges faced when dealing with such events so that people will have more realistic expectations on what can be achieved in some cases.

A more informed view on crisis management from the public can be accomplished through a comparison of external circumstances which affected different cases, for them to understand the challenges faced during operations. The AAA and HD cases can serve as such an example. In the AAA case, the crisis response network faced unfavourable circumstances such as the long distances the responding teams had to travel, the rough mountainous terrain, the communication interoperability deficiencies, and the inaccurate whereabouts of the crash site. This case received a lot of media attention with mainly negative comments regarding the long time needed for the intervention procedures while the operation was effective when considering the external influences. Next, the HD case faced favourable circumstances: a successful ditching, the proximity of first responders, and the accurate location of the crash site. In addition, the plane was luckily equipped with extended overwater equipment even though it was on operating on a route which did not require such equipment (National Transportation Safety Board, 2010 pp. 107). We are not saying

that the success obtained in the HD case is because of favourable circumstances. Both cases had effective response operations, and this should be attributed to the responding crisis networks. All in all, the public had very high expectations and negative criticism in the AAA case without considering the external influences, even though the management of the event was effective. Element that can make the managing of such operations much more difficult for those in charge.

Not only that these two cases can serve as an example of how many other external influences can alter response operations, but they can also serve as a model for the public and those in charge. In these two cases, civilians and civilian organizations were involved and had a remarkable result. In the AAA case, the most important contributions brought by civilians was a better localization area of the plane, finding the plane and using their off-road vehicles where the vehicles of the response teams failed. While in the HD case, if the seven ferries would not have responded on their own initiative, the small number of boats mobilized, and their time of arrival coupled with the post-crash environment could have led to a worse outcome. This implies that the public should criticize less and get involved more, and those in charge should not refute the help of civilians in such unique events like crises.

Turning to the other two cases of this study, the comparison of the two nightclub fires tell another story. Similar when referring to the conditions that led to the fire, building layouts and response operations required, but different in their outcomes. These two cases can serve as an example of how to and how not to manage this kind of crises. This comparison can help the public to better evaluate the management of a crisis and can trigger the people in charge to invest more consideration and time in the crisis management field.

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