Managing Information Distribution in a Crisis

Characterizing Decision Making in Mobile Alerting as Part of Canada's Emergency Alert System

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Dedication

I dedicate this paper, and with it, my entire academic career to my mom, Simone Inglis. You share in every success, milestone, and accomplishment in my life. Without your unconditional support, encouragement, and love, none of this is possible. You challenge me to be the best version of myself and I am immeasurably grateful for you.

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Abstract

Purpose: The purpose of this study is to answer questions regarding the factors and considerations that influence emergency managers' decision-making in a crisis, and the procedural roadblocks that may deter effective alerting in Canada.

Design: Data to inform the conclusions is gathered via a series of qualitative semi-structured interviews with experienced practitioners in the discipline, with that data subsequently being analyzed using a theoretical framework that explores the factors that contribute to the decision-making process.

Findings: The study's findings indicate a significant lack of standardized training available to practitioners in the discipline, which negatively affects the confidence in decisions made throughout the process. The primary contributing factors to this gap in available training can be partially traced back to political, financial, and procedural roadblocks that exist in Canada.

Limitations/Implications: Future research is required to examine in more detail the extent of the above-stated roadblocks, especially pertaining to the influence of policy and politics, and the subsequent influence on the decision-making process.

Practical Implications: This study identifies a significant detriment to effective alerting in the form of a lack of standardized training for the role and suggests a potential resolution to at least partially alleviate the issue within the discipline.

Originality/value: Emergency alerting is a potentially life-saving tool that has evolved with technology. This paper contributes an original approach that helps to evaluate and characterize the role of decision-makers in the evolving discipline.

Key Terms: *Alert Originator, Emergency Management, Crisis, Emergency Alerting, Message, Mobile phones.*

Chapter 1: Introduction

Introduction

When Paul Revere took to the streets of the American colonies on horseback in 1775, his mission was simple: alert the patriots that stood with the American militia to the incoming British forces. Although Revere's famous line "the British are coming!" is commonly alleged to be an example of poetic license, the idea of Revere's public warning is an example of early public emergency alerting.

Now, in the centuries that have followed, the modern concept of alerting has become ubiquitous in society. In pop culture period pieces, we commonly see torches being lit, horns being blown, or bells being rung to alert a specific group of an incoming threat. The piece's audience typically receives little to no explanation of the warning tool being used – we simply intuitively understand its purpose. This intuition extends far beyond pop culture as well. We are familiar with the stories of air-raid sirens from World War II, and we commonly see fire alarms and emergency lighting systems in commercial buildings indicating a permanent system for alerting that is broadly understood. With the advent and technological advancement of personal communication devices such as the smartphone, we have captured the power of these alerting systems and put them in the palms of the majority of North Americans. In fact, as of 2019, there are over 30 million smartphone users in Canada, with that number projected to rise above 33 million by 2024 (Statista, 2020). This figure, when compared to Canada's most recent population estimate of roughly 38 million (Statistics Canada, 2020), shows that nearly 80% of Canadians own a smartphone. Thanks to smartphone ubiquity alone, the devices have become arguably one of the best options, if not the best, for critical message dissemination.

Figure 1 shows an example of what Canadians now recognize as an emergency alert. These critical messages are intended to alert and inform Canadian citizens to a potential threat in or near their geographical location. Such alerts can consist of weather warnings, natural disasters, wildfires, terrorist attacks, military movements, missing persons (such as AMBER Alerts), or in the case of Figure 1, ongoing police situations. Regardless of the nature of the alert, the purpose for disseminating an emergency message via this medium is typically straightforward: to provide citizens that could be affected by the emergency with information and instructions in an effort to mitigate loss or damage.

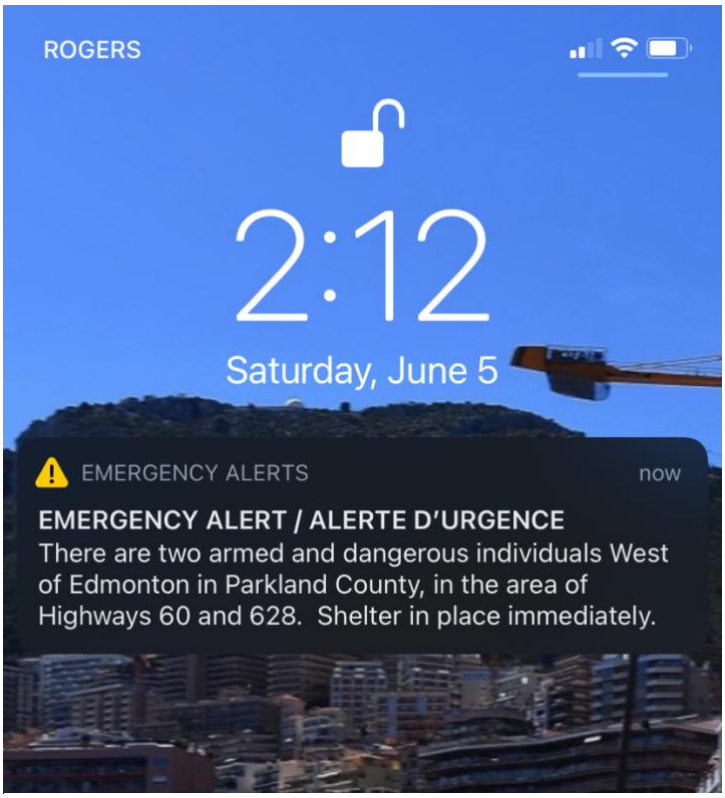

Figure 1: Ongoing police situation alert issued on June 5, 2021. Screenshot by author.

While many of the world's countries have established such systems, each nation – and often individual regions within those nations – have their own systems, policies, and procedures in place. There is an extensive collection of literature throughout academia examining these systems as a whole, as well as their components, and the outcomes of issuing alerts. This study builds on that body of literature through a different perspective that has historically received significantly less academic attention, the role of the alert originator.

Study Purpose

As this study's literature review demonstrates, there is a gap that exists in academic research when it comes to emergency alerting in Canada. Much of the literature that does exist on the topic has a focus on American or European alerting, with little focus on the Canadian counterparts. Beyond identifying that gap in the literature, it is also apparent that a second significant gap exists: focus on the alert originator or emergency manager. Paul Revere is an example of both the alert itself and the alert originator, however, with the evolution of mass communication technologies, society has advanced to a point where our emergency alerts do not come from the words of a man on horseback, but rather from an individual controlling a digital alert system potentially hundreds or thousands of kilometers from the alert's destination.

The procedures and policies of emergency alerting are often cited in literature, as are the outcomes. However, there is little focus on the human decision-making process at the origin of any given alert. As the Hawaii missile alert crisis[1] (Figure 2) showcases, human error can have dramatic consequences when it comes to emergency alerting (Nagourney et. al., 2018).

Figure 2: The alert issued by the Hawaii Emergency Management Agency on January 13, 2018. Image retrieved from Nagourney et. al, 2018.

Given that emergency alerting is an incredibly powerful tool with the capacity to save or disrupt lives, the entire process from

[1] The Hawaii missile alert crisis was a situation in January 2018 where a Hawaii Emergency Management Agency (HI-EMA) employee mistook a practice exercise for a real event, and issued an official alert warning the public of an incoming ballistic missile, complete with the phrase "this is not a drill." (Bean, 2019, p. 80). The alert remained active for 38 minutes before a retraction and correction was issued by HI-EMA, resulting in confusion, panic, and eventually outrage. (Nagourney et. al., 2018).

beginning to end must be examined closely by academics and practitioners alike. As the practice of alerting continues to evolve and become more consequential in both daily life and crisis situations, we must strive to better understand the decision-making component, including the human element and its role in the overall discipline.

This study initially began with the intention of answering two questions:

- How is alert effectiveness measured and evaluated by Canadian practitioners and decision makers following a crisis or emergency?
- What gaps or procedural roadblocks exist in Canadian practices, and how might they affect the efficacy of an alert message in a crisis?

As the study evolved and data and insights were collected from professionals within the field of emergency alerting, it became apparent that the question of efficacy was too broad, failing to adequately encapsulate the issues surrounding the human element of alerting. As such, the initial prompts for this study evolved into the following research questions:

- RQ1: What are the factors, decisions, and considerations that influence emergency managers' decision-making in a crisis? How do those influences affect the emergency communication efforts that are a product of those decisions?
- RQ2: What gaps or procedural roadblocks exist in Canadian practices, and how might they affect the efficacy of an alert message in a crisis?

The purpose of this study was to first review the existing literature and to collect and analyze data to bring clarity to the stated research questions, as well as address the identified gap (the human element and decision-making process of alert origination) in the existing literature.

The study that follows is limited in scope in that it examines data collected from several prominent emergency alerting practitioners with insight into North American, and specifically

Canadian, alerting procedures; however, it mainly serves as a benchmark or examination with a small sample size, and does not necessarily reflect the entirety of Canadian alerting and the multiple different agencies responsible for the practice. Additionally, despite the study's focus on decision-making in alert origination, there are significant political and policy aspects to alerting that could not be fully covered within the study's scope, such as: efforts by politicians to utilize alerting systems as a platform for virtue signalling or campaigning, inter-agency collaborations and conflicts, or territorial and jurisdictional disputes, to name a few.

Literature Preview

As noted in the previous section, existing literature rarely examines and evaluates decision-making as it pertains to alert origination. Similarly, much of the literature is focused on non-Canadian alerting. This study endeavours to provide content for that identified gap.

However, several key studies helped to inform and shape this study. Specifically, Al-Dabbagh's 2020 study, "The Role of Decision-maker in Crisis Management: A qualitative Study Using Grounded Theory (COVID-19 Pandemic Crisis as A Model" provides a framework for crisis decision-making that serves as the theoretical framework for which this study's data collection and analysis is based on.

Additionally, the work of Hamilton Bean in his 2019 book, *Mobile technology and the transformation of public alert and warning (1st ed.)* is cited often throughout this study as one of the more complete contemporary pieces of literature examining mobile alerting.

The literature discussed herein is segmented into four broad categories or thematic sections: technology, behavioural response, policy, and content and practices. These categories, while having significant overlap, were identified as being the four most common themes in the existing literature. While this study looks to add a fifth; the human element, literature in the established

categories by Sheldon (2018), Varma (2019), Mileti (1975), and the United States Government Accountability Office (2007) were especially noteworthy in helping to develop and frame the research questions herein and broaden the understanding of the discipline as a whole.

The literature review chapter explains the methodology behind the literature search and selection, followed by a deeper analysis of the four categories mentioned above. The chapter closes with a brief summary of the literature's influence on this study.

Methodology Preview

As Denscombe explains, a research method is a tool for data collection, or a type of "equipment that allow relevant data to be collected." (2014, p. 4). The key takeaway from that definition is the relevance of the data collected. As such, the methodology used for this study is semi-structured interviews. In order to collect the most relevant data for the above-stated research questions, this study considered a number of approaches, including focus groups and surveys, ultimately selecting the interview approach over the other potential approaches.

As Al-Dabbagh notes, decision-making is a complex thinking skill (2020, p. 5). As a thinking process is hardly binary or consistent between unique individuals, it was important for this study to use a qualitative methodology that could examine thoughts, perceptions, and influences of the study participants. Interviews were chosen over focus groups or surveys based on the depth of data they can provide, as described by Denscombe "interviews are particularly good at producing data which deals with topics in depth and detail." (Denscombe, 2014, p. 201).

To ensure the data collected was relevant to the study's research questions, interview participants were selected based on their experience as alert originators. The decision to proceed with semi-structured interviews with practitioners within the field was identified as the best opportunity to collect data that was most likely to provide insight into the questions of factors

and influences of decision-making and help to identify procedural roadblocks, as those interviewed have direct experience with such situations.

Summary

This study consists of five chapters: Introduction, Literature Review, Research Design and Methodology, Results and Discussion, and a Conclusion that in total, endeavour to answer the stated research questions:

- RQ1: What are the factors, decisions, and considerations that influence emergency managers' decision-making in a crisis? How do those influences affect the emergency communication efforts that are a product of those decisions?
- RQ2: What gaps or procedural roadblocks exist in Canadian practices, and how might they affect the efficacy of an alert message in a crisis?

Highly influenced by Al-Dabbagh's 2020 study, this study examines the literature through a framework of decision-making and the influences that factor into alert origination. The learnings and insights gained by the literature in the following chapter helped to determine the semi-structured interviews as a qualitative data collection methodology and shape the interview guide used throughout the data collection process.

The presentation of data and analysis that follows the methodology and research design chapter is specifically intended to shine a light on the research questions and fill the identified gap in existing literature.

The literature review chapter is purposively positioned in the following section to help provide a deeper understanding of the history and context of the emergency alerting discipline, prior exploring the study's methodology or examining any data collected.

Chapter 2: Literature Review

Introduction

The literature review chapter of this study was conducted in the earliest stages of the overall project. At the time of the review, the study's provisional research questions were still in their earliest forms, as discussed in Chapter 1:

- RQ1: How is alert effectiveness measured and evaluated by Canadian practitioners and decision makers following a crisis or emergency?
- RQ2: What gaps or procedural roadblocks exist in Canadian practices, and how might they affect the efficacy of an alert message in a crisis?

As such, this chapter's purpose was to examine literature that could provide some insight into those questions, advance the knowledge and understanding of the researcher regarding the discipline, and to help determine the questions that should be asked of interview participants during the data collection stage. Several sub-questions were generated through this effort to help conceptualize the issues at the root of the research question. As I read and reviewed literature, I asked myself if the literature could provide answers to the following:

- Is mobile alerting an effective method of critical message dissemination for Canadians?
- What constitutes an effective alert procedure and message?
- Are current Canadian emergency alerting practices effective?

These questions remained fluid throughout the literature collection and review process, but the core concepts informed the search for literature from the early stages on. As is noted throughout this chapter, a gap was identified in the existing body of texts. Literature with a Canadian context was sparse, and although there are a significant number of studies on the discipline, few of those spoke to the role of the alert originator. This helped the bring the

research questions for this study into more focus, eventually evolving into the research questions stated in Chapter 1:

- RQ1: What are the factors, decisions, and considerations that influence emergency managers' decision-making in a crisis? How do those influences affect the emergency communication efforts that are a product of those decisions?
- RQ2: What gaps or procedural roadblocks exist in Canadian practices, and how might they affect the efficacy of an alert message in a crisis?

As the literature was explored, specific themes emerged that helped to classify the literature that does exist today, which are reflected in the structure of this chapter. The chapter begins with a brief overview of the field of study and an explanation of the literature search methodology, classification and grouping of literature, and the criteria used for inclusion and exclusion in the context of this study. The next section will encompass the literature review proper, beginning with a brief discussion of the Canadian approach to emergency alerting. The literature review section then introduces a broad overview of the school of study as a whole – including the identified limitations therein. The four key themes identified within the literature serve as sub-sections for this chapter: technology, behavioural response, policy, and content and practices. The conclusion is a cumulation and summary of the existing literature, with an explanation of how it impacts this study in particular, and how it may inform future research in this field.

Field of Study and Literature Search Process

Overview

As many of the studies reviewed in the following sections will show, the practice of alerting groups or audiences affected or potentially affected by an emergency has dramatically evolved in

recent decades, and even more so in just the past 10 years with the constant evolution and improvement of technology. As such, this chapter will cover literature that examines the evolution of global alerting practices, critical message dissemination, and the use of mobile technology in the field. Although alerting is now a technology-reliant discipline with significant communication aspects, the literature reviewed was drawn from a variety of disciplines and eras, including both technology and communication, but also psychology, sociology, political science, and to a lesser degree, epistemology, philosophy, and linguistics.

Despite the broad collection of literature and disciplines examined, the field of study explored for this research, and subsequently the literature review herein, can still broadly be defined as emergency alerting.

Note that acronyms are featured regularly throughout the literature, and for the sake of brevity, will be defined on first mention in this section, after which the acronym only will be used.

Overview of Literature.

While plentiful, the existing literature in this field of study is also incredibly varied. Researchers typically produce literature that falls into one of four very broad categories or themes: technology, behavioural response, policy, or content and practices. As can be expected, there is significant overlap in these categories, with literature often not fitting neatly into any one category, and often speaking to multiple. Though not all literature in the field neatly fits one or more of these categories, the focus of this review will primarily be on publications that can be delineated as such.

The literature gathered and reviewed for this study was done purposively according to the search methodology discussed in the following sub-section. The inclusion of each piece was

relevant to understanding the discipline wholistically and at thematic levels, but also to gain insight into the methodologies, theoretical frameworks, and research designs utilized by scholars in the field of study to help inform the design of this study.

Search Methodology and Classification

I initially conducted a broad search of relevant terms, such as emergency alerts and mobile alerts. This was largely conducted via the University of Alberta's online library advanced article search function, supplemented by searches in the EBSCO database and Google Scholar searches.

Focused Search.

Once trends and themes in the literature found began to materialize, I began recording my search terms to ensure complete coverage of the field of study and avoid duplication of efforts. Using Boolean logic, I began identifying piece of literature to include in my categorization and filtering process via more specific search terms, for example:

- "Public alerting" not "response"
- "emergency messaging"
- "mobile alerts" not "apps"

Despite having a focused search protocol, the most effective search method was a review of works cited sections in specific articles. This, along with input from my study's supervisor, Dr. Gordon Gow, led to the identification of several leading experts in the field, notably Dr. Dennis Mileti, Dr. Hamilton Bean, and emergency communications practitioner Art Botterell. These scholars and practitioners were oft cited, and co-authors of a number of publications, speaking to their reputation, expertise, and knowledge in the field. This led to a sub-search of their specific research.

I applied filters to these searches, such as date of publication, region, peer-reviewed, etc., and most results were considered and put forward to an inclusion/exclusion filtering stage.

Inclusion/Exclusion Criteria.

In order to manage the volume of search results, I created a scoring matrix to help determine the fit of a piece of literature in the context of this study. While the matrix was largely subjective, there were factors with binary yes/no responses that helped weight the overall score (Table 1).

Criteria	**Score**
Author Reputation	
Recency	
Methodology (Similarity)	
Sender vs. Receiver (i.e., side of the Alert)	
Focus (Policy vs. Response)	
Peer-Reviewed (Y/N)	
Publisher Credibility/Reputation/Quality (e.g., Newspaper-Grey Material-Book- Journal)	
Citations (None-Some-Many)	
Region (e.g., Europe-North America-Canada-Western Canada)	
Intuitive “fit”	
Score/100	

(Table 1: Literature fit scoring matrix. Created by author.)

Peer-reviewed articles were given the most weight, followed by region, date of publication, then the more subjective categories.

Limitations and Other Considerations.

During the search and initial review of the literature, it became clear that the rapid evolution of technology affected not only the practices and methods employed in emergency alerting procedures, but also policy and perception. As such, many articles reviewed provided historical context and signposts to compare against future research but were dated when considering current practices. In fact, much of the research in the field of study (National Academies of Sciences, 2018; Bean, 2019; Leiva, 2014) calls for additional and ongoing research and evolution of practices as it pertains to technological advancement.

Additionally, as an English-only speaker, I was limited to English language literature, potentially limiting findings and missing key concepts and practices found in other literature or employed by foreign governing bodies. Finally, it became clear from the early onset that the bulk of the English literature in this field is confined to an American context, with focus on the United Kingdom, Australia, and Canada encompassing only a small part of the field of study. This speaks to the necessity of this, and future studies, to close existing gaps in literature and broaden the understanding of the field as a whole.

Literature Review

The bulk of the literature turned up through the search process fell into one of four broad categories: technology, behavioural response, policy, and/or content and practices. While most of the literature touches on aspects of each of these aspects, it was typically straight-forward categorizing based on primary focus. Some of the more expansive literature (National

Academies of Sciences, 2018; Bean, 2019) contain in-depth, thorough discussion that covers all of the major themes to some extent.

Canadian Approach

As discussed in earlier sections of this study, scholarly research and the literature on Canadian alerting is sparse, inspiring the research questions and the methodology in an effort to fill the existing gap in literature. However, that is not to say that no literature exists on the topic. Canadian-focused academic literature is noted where applicable in the thematic sub-sections, but it is important to explicitly note some of the existing non-academic resources and government documents that exist in order to understand Canada's approach, policies, and stakeholders in emergency alerting.

A report issued in 2000 by the Working Group on Natural Disaster Information Systems Subcommittee on Natural Disaster Reduction (NSTC) recommended "a standard method should be developed to collect and relay instantaneously and automatically all types of hazard warnings and reports locally, regionally, and nationally for input into a wide variety of dissemination systems" (NSTC, 2000, p. 7). This recommendation was one of the catalysts for the formation of what is known as the Common Alerting Protocol (CAP), an internationally recognized "digital format for exchanging emergency alerts, allows a consistent alert message to be disseminated simultaneously over multiple communications pathways." (Federal Emergency Management Agency, 2021). Created at the behest of an American agency, the CAP is an attempt to standardize emergency alerting procedures. In Canada, the Canadian profile of CAP, known as CAP-CP, was similarly adopted to standardize Canada's practices.

By utilizing CAP-CP, Canadian agencies responsible for issuing alerts are able to prepare and send out alerts through an aggregator known as the National Alert Aggregation and Dissemination (NAAD) system, as demonstrated in Figure 3.

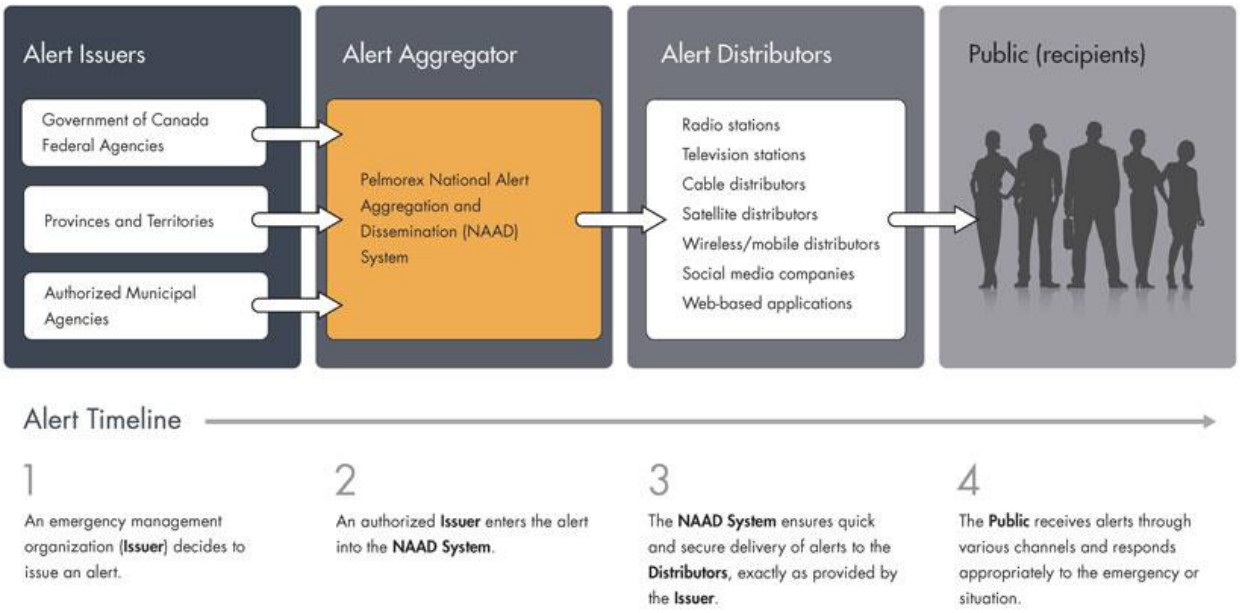

Figure 3: Canada's process flow to alerting. Image retrieved from Public Safety Canada, 2020.

Canada's public-facing alert system, AlertReady, acts as the distribution system for any alerts issued by the authorized agencies in the first step of Figure 3. This system is responsible for the alert example (Figure 1) in Chapter 1. Despite having this structure in place to disseminate alerts quickly and easily through various channels, the system is by no means perfect. As the data collected for this study will demonstrate in Chapter 4, there are still various roadblocks in place for the alert-issuing agencies and the individuals responsible for those alerts. Individual provinces and institutions throughout Canada may handle their alert issuance in vastly different ways. For example, individual institutions such as Universities or hospitals may not have access to CAP-CP feeds, and must rely on their own internal systems, policies, and procedures. Additionally, different levels of government may utilize a centralized, decentralized, or a type of

hybrid network that can pose different sets of challenges to the alert issuers, such as bureaucratic roadblocks or a lack of clarity on decision-making in the event of a crisis

The literature reviewed herein provides some insight into the practice of alerting as a whole, from the different technologies utilized, to message content, outcomes, and behaviours. Each of these themes identified within the literature plays some role in the decision-making process for emergency managers and alert originators and must be readily understood to get a full picture of the discipline and work toward an answer for this study's research questions.

Technology

Literature on the technology behind emergency alerting is as robust as any of the four identified themes included in this review. It ranges from examinations of the technology itself and its limitations, to the implications of different delivery systems and the evolution of technological options for critical message dissemination methods. Botterell and Addams-Moring acknowledge that a multitude of technologies for alerting exist, but with the caveat that "…experiences and best practices from one authority's domain or jurisdiction do not easily transfer to another's." (2007, p. 59). As will be seen in the subsequent section on policy, this reality further compounds challenges to effective emergency alerting in specific cases where there is not necessarily an accepted standard or practice for specific events, as noted in reference to tornado events by Kuligowski and Kimball (2008). The claim by Botterell and Addams-Moring demonstrates the apparent need for a standardized technology to allow for best practices to be developed, shared, and refined for emergency alerting, in place of, or perhaps in conjunction with ad hoc, region-specific, or situational methods.

Despite the difficulties and challenges noted by Botterell and Addams-Moring, this literature found that there were in fact some similarities between different platforms that warranted notation in this study, despite the primary focus being mobile alerts.

Text.

Indicative of the evolution and adoption of new technologies, some older literature examines the efficacy of text messaging as a mobile alert platform. This is especially true for localized or geographically-specific emergency situations, as noted by Violino's study on how some American schools were, at the time of publication (2008), utilizing a web-based system to disseminate emergency alerts to students and faculty via text messages. This method is not uncommon in the literature, with McGee and Gow. (2012), Gow et. al. (2009), and Sheldon (2018) each touching on the method in their respective studies on campus alerting. These discussions generally cite the ease of use and rapid deployment of text messages as foundational to their efficacy.

However, as is the case with any of the dissemination platforms seen in this literature review, text messaging is not without its drawbacks and limitations. Gow et. al. argue that primarily relying on a text message alerting channel in fact carries significant risk (2009, p. 40), while Traynor surmises that a text message-based system alone may not be adequate in some situations, calling for the use of "…multiple forms of media to improve robustness." (2012, p. 991). It should be noted that Traynor also acknowledges that the advancement in mobile technology and cellular networks may render his analysis irrelevant (2012, p. 991). The discussion surrounding text messages is important to the overall alert discussion in three significant ways: 1) it demonstrates the adoption of technology, specifically the mobile phone for emergency alerting, 2) it outlines some of the uncertainty in trust in the messages and overall

network reliability (Traynor, 2012), and 3) when considered in the context of current practices, shows how quickly procedures adapt and change.

Social Media.

As alerting via social media is outside the scope of this study, literature on the topic is limited in this review. However, in contrast to Botterell and Addams-Moring's claim that best practices are not necessarily transferrable across domains (2007), the literature shows that some aspects of social media alerting are present in current mobile alerting.

Specifically, some scholars argue that access to real-time information as can be provided via social media "… can be especially helpful to increase information sufficiency" as a component of reducing stress in an emergency situation (Dijl, Zebel & Gutteling, 2019, p. 216). Sutton et. al. looked at Twitter specifically to gauge the efficacy of social media as an information source in the event of an emergency. They found that the platform, though sometimes unfocussed and lacking in information, can be a supplemental channel that aids in message amplification and information availability that could positively affect the outcome of a crisis (2014, p.784-785).

Despite the perceived favorable outcomes of social media's place in emergency alerting, future researchers would be remiss to not consider the current state of social media that heavily features high levels of misinformation and politicization that could negatively impact publics and stakeholders searching for information in a crisis.

Notifications.

Technology is undoubtedly a key factor in alerting. The National Academies of Sciences 2018 report, *Emergency Alert and Warning Systems* brings into focus the impact of the digital divide: "Although a large and growing portion of the population uses smartphones, there are still

others who cannot afford or choose not to use them." (2018, p. 18). This claim is a key consideration in evaluating dissemination methods.

In considering limitations of technology, it is important to recognize the issue of accessibility. The issue persists from a technological standpoint as well as a policy and content perspective. Yuksel et. al. identify three major challenges to public safety communications systems, especially as they pertain to radio communications: 1) lack of capacity, 2) lack of interoperability, and 3) lack of functionality (2016, p. 22). While the authors note emerging technologies such as 4G, LTE, and Wi-fi as positive developments for emergency communications, the fact remains that critical infrastructure is bound by technical limitations, especially in Canada where remote populations and severe weather can affect availability of the cellular signal and effectiveness of the technology required to broadcast emergency messages.

Behavioural Response

A significant portion of the literature returned in the searches outlined above was rooted in psychology, sociology, and the behavioral outcomes of different emergency alerts. Although this study is not intended to provide in-depth insight on behaviour and alert response, it could be argued that influencing desired behaviour is the most apt measuring stick for alert efficacy. Any holistic examination of emergency alerting systems must be done with receiver response in mind.

It should be noted that much of the literature reviewed herein are examinations of hypothetical scenarios, focus on cultures outside of Canada with different norms, values, and priorities, and/or are the subject of a specific type of alert. Therefore, any extrapolation of learnings to be applied to a Canadian context must be done so carefully. This caveat underscores the need for future research on this topic in a Canadian context, and further exemplifies the initially defined gaps in existing literature.

Influencing Behaviour Outcomes.

The importance of effective messages is echoed by nearly every scholar in this field of study. Bean et. al. (2015) succinctly captures the task at hand for emergency alert practitioners: "A lack of understanding about how audiences interpret and respond to them [mobile warning messages] could create possibilities for serious error, including the loss of life and property." (2015, p. 75). While successful emergency messaging is in essence the cumulation of timely, well-crafted content, the effective use of technology, and proactive policies that encourage and support rapid response, and understanding perception and reaction to a crisis are no less important.

In an effort to predict behaviour, and subsequently influence desired behaviours, Heath et. al. (2019) argue that a pre-emptive strategy for emergency response that encourages teaching potentially affected stakeholders about the cause and effect of a specific crisis along with the appropriate response and reaction. These findings align with earlier research done by Vitek and Berta that suggests a lack of public knowledge could be detrimental to emergency response actions (1982).

Another school of thought that is far beyond the scope of this study is message receiver characteristics. The National Academies of Sciences (2008) report that an individual's protective action initiation time could be influenced by a number of characteristics, including: "… an individual's age, gender, ethnicity, socioeconomic status, race, and disability status." (2018, p. 32). Overall, there are huge variety of factors that may play into affecting not only desired response, but whether a response even occurs, including the perception of the message.

Perceptions of Alerts.

A number of scholars that examine the behavioural aspect of emergency alerts found that the outcome and message receivers' perceptions were highly variable but were often linked to the degree of perceived danger (Gutteling et. al., 2018; Sheldon, 2018).

Conversely, in a number of studies, scholars and researchers have found that alert recipients are known to ignore or disregard emergency alerts in some circumstances (Kim et. al., 2019; Gutteling et. al., 2018). The reasoning for this avoidance or hesitance to participate in an alteration to behaviour ranges from unpopularity of a system (i.e., AMBER Alerts; Sicafuse and Miller, 2012) to a lack of public knowledge (Vitek and Berta, 1982) or disbelief/lack of trust (Mileti and Beck, 1975).

Throughout the literature, a common theme that emerged is that behaviour can be closely linked to message characteristics. This further demonstrates the overlapping themes that exist in the literature, and how a holistic perspective is needed to fully evaluate alerting as a discipline.

Policy

How governments and third parties handle their emergency alert procedures and practices is heavily influenced by policy and legislation. Calls from scholars for revisions to policies that impact how publics are provided with emergency alerts have been echoed since as early as Vitek and Berta in 1982 and Mileti and Beck in their 1975 publication. These calls are exacerbated by ongoing technological innovations and capabilities, as well as the deeper understanding gained into the challenges of emergency alerting that come with each new publication and the experience of practitioners over time. Cheek's 2004 publication provides a historical background of how the United States' emergency alert system has evolved over time, but importantly, serves as one of the more indicting pieces of critique of the system, specifically with regards to the lack

of an efficient public warning mechanism available at the time of the September 11 terrorist attacks in New York City. Literature that focuses on the United States has echoed Cheek's call for a reworked public alert system over the past two decades, even as improvements have been made. An opinion piece by practitioners in *Fire Engineering* (2005) cites disaster experts that claim "… the United States still lacks an overall strategy for effectively responding to natural disasters." (Friel, B. & Singer, P, p. 44). A 2007 report to the Congressional Committees from the United States Government Accountability Office is aptly titled *Emergency Preparedness: Current Emergency Alert System Has Limitations, and Development of a New Integrated System Will Be Challenging.* This report recommends the development of an audit plan to verify dependability and effectiveness of the relay distribution system, provide training to emergency alert system practitioners, and establish a forum with stakeholders involved in emergency communications to stay ahead of emerging issues and work toward an integrated system (2007, p. 31).

The literature reviewed for this study is generally consistent in the call-to-action for one or more of: additional research, expanded training efforts, a more concerted effort to improve the existing alert systems, improve public education, and so on. Levia provides one of the more recent examples of a call for "… government officials and emergency managers need to become more proactive." (2014, p. 3). Beyond expanded policy and public information, some scholars are more specific in their ask, for example, Woszczynski et. al. examine the implications of cybersecurity on emergency alerting systems, positing that "using the army of cybersecurity researchers and writing a good CVD [coordinated vulnerability disclosure] policy will strengthen the U.S. emergency alert systems, which benefits society." (2020, p. 13). The most common theme among all of these critiques and suggestions amongst scholars is that they are largely

focused on the system in place in the United States. Recommendations and identification of gaps within other emergency alert systems do exist in the literature, of course. Camara et. al. (2010) propose a unique mechanism to help speed up and broaden the alert distribution process in France through the integration of built-in vehicle communication. Dijl et. al. (2019) examine alternatives and improvements to the system in the Netherlands, and Bean (2019) devotes a chapter to International Developments that compares and contrasts the systems of Australia, Canada, Japan, and the Netherlands, but he too, does so through the lens of the American system. In fact, Bean concludes the chapter with an anecdote, "One Japanese citizen interviewed for this project speculated that the United States does not really have a mobile alert and warning system problem-it has a public education problem." (2019, p.129). While this lends credence to the claims of Vitek and Berta (1982) that public education and training is lacking with regards to emergency alerting, it is an incredibly limited perspective when trying to garner a holistic view of the Canadian system.

This is perhaps the most glaring gap in literature in this field of study. Of the literature reviewed in this chapter, only Gow (2007) has a publication dedicated to a review and update on the Canadian system. This too, is problematic however, because the proposed system being considered by the government at the time of Gow's publication in 2007, CANALERT, was never operational, eventually giving way Canada's current system, Alert Ready.

Although the existing literature, foreign policies, and scholarly calls to action can, and perhaps should, be points of reference for Canadian policymakers, the fact remains that dedicated academic literature with a Canadian context is sparse.

Content and Practices

As has been the case with the preceding sub-sections of this chapter, little literature exists speaking specifically to Canadian best practices on the actual content of emergency alert messages disseminated in Canada. However, similarly to conclusions drawn from technology, behaviour, and even policy literature with a United States focus, themes can be established and extrapolated across borders to get a sense of what scholars consider the key components of effective emergency alerts. To that end, the literature relating to this theme is deep, comprehensive, and in no shortage. In my review, I identified four different components of alert content: accessibility, emergency type, length, and trust. While content and the practices employed to disseminate alerts is somewhat constrained by technology and policy, the components below are widely consistent across publications, as will be demonstrated.

Importantly, this theme introduces the work of Al-Dabbagh (2020), and the theoretical framework on decision-making in a crisis used for this study.

Accessibility.

The National Academies of Sciences (2018) note age, gender, ethnicity, socioeconomic status, and language and culture as accessibility concerns that emergency managers should be cognizant of. Scholars such as Bennett et. al. (2018) have examined restrictions stemming from accessibility at a greater degree than others in this review. They note that while individuals with sensory disabilities have historically had less (or no) access to emergency information, the United States have made strides in passing legislation that accounts for this part of the American population. As a general note, a truly efficient emergency alert system must be one that endeavors to make each alert as accessible and easy to understand as possible. This may be especially true for a bi-lingual nation such as Canada that embraces and utilizes both of its

official languages in government publications. With geolocation-based notifications, this task becomes somewhat simpler, as the Alert Ready system supports English and French and preferred language is determined by the issuer (Pelmorex Corp., 2020), but this still risks the alienation of foreign language speakers and/or minorities within any geographical location.

Emergency Type.

As pointed out in studies from Gutteling et. al. (2018) and Sheldon (2018) in an earlier section of this chapter, the type of emergency can have a dramatic effect on perception and response to an alert. In Canada, where opt-out is not an option for emergency alerts (Pelmorex Corp., 2020), there is less of a risk of a missed alert, but the risk of individuals ignoring or dismissing alerts, as posed in Gutteling et. al. (2018) and Sheldon (2018), still exists.

Canada's Alert Ready system supports alerts for fires, natural events (tornado, floods, earthquakes, hurricanes), biological risks, hazardous substances and devices, environmental warnings, terrorist attacks, and civil crises (Pelmorex Corp., 2020). In theory, this service provides comprehensive coverage for most emergencies that would require an alert, but as the literature has shown, technological, social, and situational limitations and responses can be unpredictable and should be considered when evaluating efficacy of a system. The National Academies of Sciences report, albeit not inclusive of the Alert Ready system, lists Hazard Type as a key message characteristic potentially influencing response to an alert (2018, p. 27).

Length.

There is some disagreement amongst scholars on message length. While it is generally agreed upon as a key competent of emergency alert systems for consideration (National Academies of Sciences, 2018; Casteel and Downing, 2016; Sutton and Kaufmann, 2018), some academics argue that character restrictions can be a detriment (McGee and Gow, 2012, p. 707)

while others have argued message character restriction does not necessarily undermine a message's effectiveness, but may hinder its total potential (Casteel and Downing, 2016).

Trust.

Scholars across the literature examined the concept of trust in more or less the same manner. A message is generally perceived as more effective if the receiver knows the source and trusts the information. Additionally, as Woody and Ellison (2014) note, trust is beyond simply acknowledging the source of information is credible and the crisis in question is in fact real, trust extends to the technological aspects of an emergency alert system. Policymakers, practitioners, and the public must all trust that a system is secure, reliable, timely, and accurate (Woody and Ellison, 2014).

Trust is in part earned through consistent, informative information. Canada's Alert Ready system offers information describing a situation and where to find more information. However, as Bean notes: "Both systems [Alert Ready and America's Wireless Emergency Alert WEA] offer false promises of technological control and the disappointment of unmet expectations." (2019, p. 121). When a system falters, trust is lost, and by extension, some degree of the systems' overall efficacy. Canada makes a concerted effort to build that trust, a contrast to the United States' system, as explained by Bean: "Canadian and Dutch citizens routinely receive mobile system test messages to promote familiarity and trust." (2019, p. 130).

Decision-Making.

Although not a specifically identified theme spanning the literature reviewed thus far, decision-making is the key component of this study. The literature reviewed thus far provides insight into many of the facets of emergency alerting, but the work of Al-Dabbagh (2020) is among the only literature reviewed for this study that speaks specifically to decision-making.

The influence of Al-Dabbagh on this study will be more evident subsequent chapters. The Al-Dabbagh study does not specifically focus on alerting, but rather the meaning and role of decision-making in a crisis, which has been adapted for this study. Specifically, the study makes a number of claims and recommendations regarding decision-making based on Al-Dabbagh's framework. Additionally, Al-Dabbagh's work influenced this study's data collection instrument, and provided a framework for which the data could be analyzed through. Through the Al-Dabbagh study, it can be determined that an emergency manager, or in the context of this study, an alert issuer, has a number of roles (Figure 4) that are key to adequate alerting.

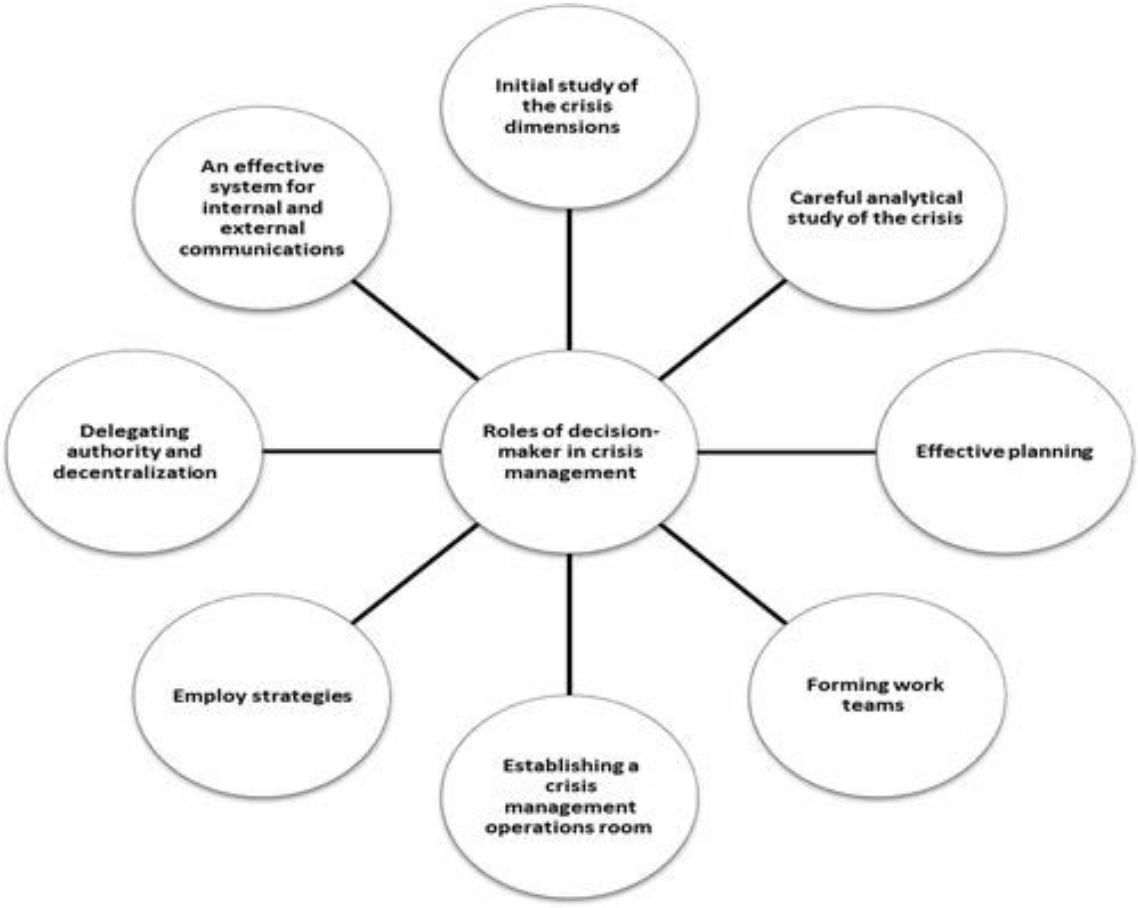

Figure 4: The multiple roles of a decision-maker in a crisis. Image sourced from Al-Dabbagh, 2020, p. 5.

While literature in the discipline can oftentimes focus on the steps taken in process of alerting, the role of the decision-maker is rarely examined outside of brief notes of alert origin. This is perhaps the most significant gap identified in the literature, and the central theme for this study.

Summary

As pointed to at various points in this chapter, the lack of recent literature specific to emergency alerts in Canada reinforces the necessity of this study, as well as any future research. This chapter intended to provide insight, background and context to the discipline of emergency alerting. Through a purposive selection of literature as described at the beginning of this chapter, it became clear that despite an abundance of literature in the field of study spanning psychology, sociology, engineering, mass communications, linguistics, etc., there is little in the way of academic literature specific to Canada's approach to emergency alerting, though government documentation and resources do provide some insight. The existing literature spans specific instances of alerting (such as reviews of past emergencies; Gutteling et. al., 2018) to policies, procedures, and message structure and content. However, the bulk of the literature seems to focus on the behavioural outcome of an emergency alert, creating a gap in literature that misses the opportunity to examine the role of the emergency manager in decision-making.

Despite this, the scholars that do report on this field have provided me with a deeper understanding of the practice of alerting and its historical roots. Importantly, literature such as that by Al-Dabbagh provides a theoretical framework from which to base this study (and future research) on.

This can be seen as a detriment, or an opportunity to contribute to the field of study. This literature review helped to identify existing best practices, limitations in foreign emergency alert

policies, systems, and practices, and provided historical context on the field of study as a whole. Though little of the literature review was explicitly rooted in specific communications or social science theory, the sheer volume of publications from a wide variety of academics, practitioners, and governments alike did provide insight into the different ways to frame a study in this field. Additionally, the exposure to different disciplines also provided insight which contributed to the formation of this study's data collection and analysis methodology.

Finally, and most importantly to this study, the literature contributed to the formulation and refinement of the study's research questions: RQ1: What are the factors, decisions, and considerations that influence emergency managers' decision-making in a crisis? How do those influences affect the emergency communication efforts that are a product of those decisions? And RQ2: What gaps or procedural roadblocks exist in Canadian practices, and how might they affect the efficacy of an alert message in a crisis?

Chapter 3: Research Design and Methodology

Introduction

The literature review chapter preceding this section demonstrated that significant research already exists on the topic of emergency alerting via the mobile phone. However, as indicated previously, the breadth of research often focuses on a specific theme, category, or sub-topic (i.e., technology, behavioural response, policy, message content, and alerting practices). Each piece of the existing literature helps scholars, policy-makers, and practitioners understand the phenomenon more holistically and refine how the practice is approached. Many of the findings of this research can be applied across the emergency alerting discipline as a whole, but as is often the case in contemporary social sciences, despite some similarities, there are specific differences and nuances between how cultures, governments, and practitioners approach a topic. That reality is evident in emergency alerting, where Canadian practices and policies are not researched at the same volume as their American counterparts.

This study was designed to bridge that gap in literature and provide insight and context from a Canadian perspective. Specifically, it is the intention of this study to answer two specific research questions about Canadian emergency managers:

- RQ1: What are the factors, decisions, and considerations that influence emergency managers' decision-making in a crisis? How do those influences affect the emergency communication efforts that are a product of those decisions?
- RQ2: What gaps or procedural roadblocks exist in Canadian practices, and how might they affect the efficacy of an alert message in a crisis?

Scholars in the field of emergency alerting consistently examine outcomes and behaviours associated with emergency alerts (Vitek and Berta, 1982; Gutteling et. Al., 2018; Sheldon,

2018), but less focus is given to the alert originators and the practices and procedures followed during a crisis. Bean notes that human error surrounding emergency alerting is a legitimate concern, and many alert systems (including Canada's) have experienced issues in their alerting, which leads to distrust in the system, ignoring alerts altogether, and can potentially have fatal consequences (2019, p. 10-12). The significance of the emergency manager's role in the alerting process cannot be understated, and requires ongoing study in attempts to continuously improve the internal workings of each region's specific system.

With this significance identified and the research questions determined, this study utilized a semi-structured interview tool to gather data on Canada's emergency alert system and the practices undertaken by emergency managers. As such, it was logical to speak with those most familiar with Canada's internal process, the emergency managers of various Canadian systems for the richest data and insight.

This chapter consists of eight sub-headings that provide insight and justification for study design, participants, setting, instrument, procedures, analysis, and finally, a summary of the chapter. Throughout the chapter, I relied on two theoretical frameworks and models to help guide the design of the study, particularly the data-gathering instrument and associated interview prompt questions. These models help us to understand key components to crisis and emergency alerts, such as *information source* and *involvement* (Austin, Liu & Jin, 2012) and crisis management and the role of the manager (Al-Dabbagh, 2020). Specific applications and influences of these theories and models are noted in the subsequent sections.

Research Design

The initial selection of the broader research topic and early planning stages pointed to semi-structured interviews as a likely methodology. The existing literature in the field of study

provided some influence on data collection methodology as well. Surveys were briefly considered as a viable data collection method for this study, as they were successfully utilized in some of the literature in the field of study already published (Gutteling et. Al., 2018; Dijl et. Al., 2019; Sicafuse & Miller, 2012); but as the research question became more refined and pointed, it became apparent that the direction of this study would likely be on the decision-making processes and those involved, rather than target audience perceptions and behaviours. As such, the need for a wide variety of multiple data sources became less apparent, and more in-depth knowledge and experience was increasingly necessary to answer the research questions.

The decision to conduct qualitative research rather than quantitative was made with a strong consideration of the topic and subject matter. As Chandra notes, "there is a general consensus that qualitative research is best used to answer why and how research questions, but not how much or to what extent." (Chandra & Shang, 2018, p. 3). Research question 1 for this study asks *how* certain influences affect emergency communication efforts, and research question 2 asks *how* roadblocks might affect efficacy of an alert. There are aspects of *what* questions in both research questions, but those too rely on professional insights that can be best gathered through an in-depth discussion rather than a self-reporting method such as a survey.

Quantitative research methods intuitively seemed like a poorer fit for this study, as the research questions demand a thorough examination of a particularly esoteric phenomenon that is better served with depth of data as opposed to a numerical representation of data. In order to fully understand and explain the key components of RQ1 and RQ2 as they pertain to emergency managers' professional perspectives, it was vital that the methodology be one that allowed for deeper examination of a complex topic and ideas.

As Varma (2019) notes: “Crisis situations are typically dynamic and volatile in nature often accompanied by the stress to make quick decisions. It is argued that the decision makers might have to balance competing or conflicting interests of the internal and external publics involved in the crisis” (p. 237). Al-Dabbagh (2020) argues a similar position to Varma that ultimately underscores the importance of the role of the emergency manager in a crisis:

> The influential act, amid a high degree of suspicion surrounding all options and alternatives presented, and under great psychological pressure from the possibility of deteriorating situation and the failure of the entire process, must make fateful decisions with a degree of clarity and publicity in order to reassure public opinion, and here comes the skill of the decision-maker. (2020, p. 3).

The arguments of both Varma and Al-Dabbagh played an important role in refining this study’s research question, and ultimately the methodology employed herein. As Denscombe claims, “interviews are particularly good at producing data which deals with topics in depth and detail. Subjects can be probed, issues pursued, and lines of investigation followed over a relatively lengthy period.” (Denscombe, 2014, p. 201). With emergency managers and decision-makers being identified as key informants for this study, it was logical to employ a methodology that could adequately extract data with considerable depth and detail, or an interview. Further to that point, as Al-Dabbagh described, decision-makers can find themselves in incredibly stressful and difficult situations. Key to navigating those particular situations is Denscombe’s claim that interviews are best suited for exploring phenomena that involve “opinions, feelings, emotions, and experiences.” (p. 186, 2014). Guthrie’s position is similar to Denscombe’s: “they [interviews] are often used to find out attitudes and perceptions, but they can be a source of factual information too.” (Guthrie, p. 118, 2010). These considerations point

to interviews as being a logical methodology to employ based on the research questions, theoretical framework, and purpose of this study.

Compounding the need for qualitative interviews as the methodology of choice for this study were considerations such as time, scope, budget, and as will be further explained in the instrument and setting sections in this chapter, the ongoing COVID-19 pandemic. Each of these considerations were less influential than those key points made above regarding depth of data, but nevertheless played a role in selecting a methodology for this study. Denscombe's chapter on one-to-one interviews (2014) notes four key benefits of interviews, each of which has some tie to the above considerations, and therefore had a bearing to some degree on the selected methodology:

> "1) ease of scheduling and arrangement,
>
> 2) singular data source (the interviewee),
>
> 3) straight-forward procedure with more control for the researcher, and
>
> 4) reduced workload and complexity in data analysis (transcriptions)." (p. 187).

With a qualitative one-to-one interview methodology prescribed for this study, the next steps were to further identify study participants, and the ethical and responsible recruitment of them.

Participants

Prior to beginning the formal participant recruitment process, study approval was sought and granted by the University of Alberta's Research Ethics Board (REB) via the ARISE online system (Appendix A). Specifically, ethics approval was for REB1 for minimal risk human participant studies.

As noted in the previous section, the goal of this study is to gather data based on experiences, feelings, and/or behaviours, that will help explain complex phenomena related to

decision-making and perspectives in the field of Canadian emergency alerting. As such, the inclusion criteria for this study is defined as follows; participants must be current or former emergency managers with some unique perspective and experience dealing with emergency alerting systems, specifically around alert origination. Densombe notes that researchers may gain valuable insight from key informants as interview participants (2014, p. 207). With that in mind, potential key informants were carefully considered before being approached for participation. Homburg et. al. partially confirmed their hypothesis that "the reliability of key informant responses is greater for informants with longer tenure (vs. shorter tenure)." (2012, p. 597), with the caveat that organization properties (such as size) play a role in participant reliability as well (2012, p. 601). These findings support narrowing the inclusion criteria to aim for key informants with significant tenure; ideally 5+ years in emergency management and/or alert origination. Each of the key informants utilized as participants for this study meet that threshold, with several decades of combined experience between them. The goal was also to include those in management positions, or participants who have experience in managing and issuing emergency alerts via mobile devices.

Because the goal was to acquire a robust set of data that would only be available from experts, academics, and practitioners in the field of study, a purposive sampling method was used (Denscombe, 2014). Denscombe defines purposive sampling as operating "on the principle that we can get the best information through focusing on a relatively small number of instances deliberately selected on the basis of known attributes." (2014, p. 34-35). For this study, those attributes are current or former professionals, and their relevance to emergency management and alert origination. As the research questions endeavour to answer questions regarding the perspectives of emergency managers, purposive sampling is the ideal method for selecting

participants as only those with unique first-hand experience and insight will be eligible to participate.

Participants were purposively sampled with the help of the study's supervisor and the snowballing method for their relevance and knowledge in order to obtain the "best information by selecting people most likely to have the experience or expertise to provide quality information and valuable insights on the research topic." (Denscombe, p. 41, 2014).

Because the inclusion criteria were tightly controlled via the purposive sampling method, less focus was put on the exclusion criteria. However, a few key factors were considered, especially pertaining to the participant's geographical location and work history. Foreign emergency managers (specifically overseas) with little to no experience or insight into Canadian or North American practices were not considered. To provide some breadth and depth to the data obtained, it was important for me to include participants from various levels of the field (local, regional, provincial, national), and as such, more than one participant from each level would have been excluded.

Setting

The ongoing COVID-19 global pandemic was a major factor in determining the setting for this study. A digital data collection method in the form of online interviews was required for the safety of everyone involved.

Janghorban et. al. found that "in Skype interview cases, ethical issues are considered the same as in face-to-face and online interviews. Researchers obtain informed consent by online, email, or posted forms and all participants are fully aware of audio or video recordings." (2014, p. 2), easing any concerns of obtaining consent or managing the study's ethical obligations. Following study participant agreement to meet for the one-to-one interview process, they were

offered a variety of video platform options (including Zoom, Google Meet, Microsoft Teams, and Skype), with the goal of providing the highest level of comfort in the technology, and reducing the potential for technological challenges as much as possible. Every participant agreed to a Zoom meeting.

While in-person interviews would have been preferred to allow for a richer experience for both myself and the study participants, studies have shown that video conferencing is an effective substitute (Adams & Longhurst, 2017), and data collected through the medium is at low to no risk of being deemed any less valuable or insightful: "In short, internet video calls are a valuable tool for both QLR [Qualitative Longitudinal Research] and one-off interviews and should not be viewed as second rate to the 'gold standard' of physical co-present encounters." (Weller, 2017, p. 623).

In fact, the digital setting used for this study was particularly useful in the data analysis because every participant agreed to have the video interview recorded. Throughout the transcription process, I was able to refer back to the raw video to confirm the context of a question and gather verbatim statements without an over-reliance on raw audio. There were no issues of audio quality in any interviews, but had there been, reasonable assumptions on missing words could have been made by supporting video. The video medium used was also preferable to collecting written statements or a phone setting that could have (perhaps more easily) been utilized to adjust for COVID-19 restrictions. Gestures and non-verbal queues and acknowledgments from both myself and the participants were valuable in helping to develop context, add an element of familiarity, and further explore and probe ideas with follow-ups.

Instrument

This study utilized a semi-structured interview data collection method with several open-ended prompt questions (interview guide, Appendix B) designed to promote a conversational flow rather than a more rigid or binary form of data collection. This methodology allowed me to follow up on important or key conversation points, prompt further elaboration, and tie thoughts together in a cohesive manner.

Al-Dabbagh's study on decision-making in emergencies and crises (2020) identified five factors of decision-making, as described below, which were utilized in the creation of the interview guide (Al-Dabbagh, p. 5, 2020).:

1. *Lack of professional competence for decision-makers.*
2. *Fear of the consequences of decision-making at a time of crisis.*
3. *Lack of decision-making skills.*
4. *Lack of others confidence about the decisions made.*
5. *Lack of information*

In order to operationalize the data collected in the study or move the abstract to a more empirical level for analysis (SAGE, 2004), the research questions, the theoretical framework, and the data collection tool were charted to demonstrate their relationships to one another. The operationalization table below (Table 2) demonstrates how the research questions (concepts being studied), Al-Dabbagh's framework (the variables influencing the concepts), and the prepared interview questions (indicators of presence or extent of variable) influence one another in the context of this study.

Study Research Questions (Concepts)	Al-Dabbagh Five Factors of Decision-making (Variables)	Interview Questions (Indicators)
What are the factors, decisions, and considerations that influence emergency managers' decision-making in a crisis? How do those influences affect the emergency communication efforts that are a product of those decisions?	Lack of decision-making skills	How much does the Canadian Profile of the Common Alerting Protocol factor into issuing an alert from your perspective
		Explain how adhering to the CAP helps or hinders your effectiveness in your role.
		Who decides to "pull the trigger" on the alert? *Follow-up:* What does that decision look like (what factors are considered)?
		What decisions are left to you when putting together an alert?
		What, if any, role do your personal emotions play in the decision-making process?
		How does your personal background affect your decision-making
		Explain how any given alert may influence the next situation you may face
	Lack of confidence in decisions	How do you weigh the potential of a negative outcome stemming from an alert? Does it weight into your decision-making?
		How does your personal and professional background affect your decision-making
		Explain what happens post-alert (i.e., is there a de-brief or analysis of an alert)? *Follow-up:* What is considered successful a successful alert from your perspective?
	Lack of information	At what stage in the process is a go/no-go decision made on an alert? What role do you play in making that call? *Follow-up:* How does timing of alert issuing or standardized procedure affect your ability to vet information to a level your comfortable with?
What gaps or procedural		Describe any formalized or on-the-job training did you received for this role?

roadblocks exist in Canadian practices, and how might they affect the efficacy of an alert message in a crisis?	Lack [or level] of professional competence	Tell me about the materials you have on hand to help you in your role (style guide, best practices, manual, etc.)
		If you can, explain what role your education & training plays in the process, vs. the role of intuition and experience
	Lack of information	Describe how you get the information you use in an alert
		How do you decide what information to include, and what to exclude?
		How much vetting do you do of material or information issued in an alert?
	Fear of consequences	Describe the team or setting you work with or support structure in place to help you in your role.
		How do you decide what information to include, and what to exclude?
		Explain how any given alert may influence the next situation you may face
		Describe your level of freedom or oversight in going through the process of sending an alert. Is it largely left up to you, or do you utilize a more rigid, structured pre-determined format
		How do you weigh the potential of a negative outcome stemming from an alert? Does it factor into your decision-making?

Table 2: Operationalization table demonstrating the relationship between research questions, the five factors of decision-making, or the theoretical framework (Al-Dabbagh, 2020), and the study's interview questions.

Research Question 1 investigates the decision-maker's views on the role of decision-making of mobile alerting practices and the influences factoring into those decisions, and Research Question 2 of this study seeks to identify procedural roadblocks or existing gaps that may affect alert efficacy. As Table 2 demonstrates, the relationship(s) between factors such as professional competence, decision-making skills, fear of consequences of action (or inaction), and

information accessibility are instrumental to answering the Research Questions, and therefore, considerations of those factors were integrated into the open-ended questions and follow-up prompts.

Procedures

After ethics approval was granted, participants were approached and informed of the purpose and goals of the study, and provided with relevant background information and investigator information, including contact details. As the lead investigator, I then described the potential benefits of the study, and carefully explained any and all risks to potential participants. After describing that no payment or compensation was offered, and information would be stored confidentially on a password-protected external hard drive, prospective participants were formally invited to voluntarily participate in the study, but with the caveat that they were free to withdraw at any time, for any reason. Following verbal or written agreement to those terms, as laid out, participants were provided with a standard consent form for the study (Appendix C), which they signed and were provided with a copy of for their own records.

After consent was granted and participants were successfully recruited, the data collection process took place systematically. Email correspondence was utilized to find agreeable time slots in each participant's schedule, and a decision was made by the participant as to the video conferencing software or platform that was most comfortable and accessible to them (Zoom in all cases).

The interviews began during the agreed-upon time slots with a brief review of the project, consent, their right to terminate their consent and the interview at any time, and finally a brief overview the instrument and agenda, including verbal permission to record the session. As the interviews were conducted via video conferencing or calling, participants were reminded that

they could relocate to a private area of their home or office for the duration of the interview, and were given adequate time to do so if desired.

As the interviewer, I made every effort to remove myself from any setting that could be deemed distracting. I opted for a plain white background, and utilized headphones and a microphone for the best sound quality possible for both participants. Throughout the interview, I maintained a professional demeanor, and kept the conversation on topic and focused by referring back to the interview guide and predetermined open-ended questions and follow-up prompts.

Analysis

The data analysis method was an adaptation of Chandra & Shang's process of inductive coding (2016, p. 91). I began by transcribing the text utilizing the transcription software *transcribe* by Wreally. After I had converted my data to a text format, I reviewed the videos along with the text, adjusting and correcting the software's results as necessary. Following the transcription process, I read through each document a single time, highlighting and annotating key points that were deemed to be explicitly relevant to the research questions. At this point, I had engaged in the initial interviews, re-watched recordings, and read through the text transcriptions twice, so I was able to identify obvious trends and patterns across the interviews. I further analyzed the data specifically looking for quotes or remarks that supported or contrasted the initial trends and patterns identified, and how those quotes fit into Al-Dabbagh's (2020) five factor framework, annotating the raw transcript as I proceeded.

Further reference to literature examining decision-making theories and frameworks was necessary throughout the initial analysis to help ground the data in a theoretical framework and help explain the trends prevalent in each decision-maker's various answers to the open-ended

questions and follow-up prompts. Key quotes and excerpts were identified and set aside in a separate document with annotations for analysis, findings, and discussion chapters.

Reliability and Validity.

To ensure the study is deemed as credible and the data collected and analyzed is an accurate representation of the discipline and the phenomenon being examined, this study took measures to ensure reliability and validity. Denscombe's approach to reliability is "whether a research instrument in neutral in its effect and consistent across multiple occasions of use." (2014, p. 298). He refers to validity as the "the accuracy and precision of the data." (2014., p. 298). For both reliability and validity, Denscombe suggests that there are important questions a researcher may ask themselves in order to ascertain the credibility of their study. For reliability, Denscombe suggests that the question to ask is "would the instrument produce the same results on different occasions (all things being equal)?" (2014, p. 298); and for validity, "are the data the right kind for investigating the topic and have they been measured correctly?" (2014, p. 298).

Reliability and validity of the data are of particular concern in an interview setting, such as the one used for this study. As Denscombe claims:

> "The data from interviews are based on what people say rather than what they do. The two may not tally. What people say they do, what they say they prefer and what they say they think cannot be automatically assumed to reflect the truth." (Denscombe, 2014, p. 202).

Specifically, the question of reliability is a difficult one to answer for qualitative research, and especially so for interviews. The setting, timing, and role of the researcher/interviewer may all play a role in the data collected, and a different researcher using the same tool may not collect the same data. However, Denscombe claims that a study's dependability -and reliability - can be

measured by a researcher demonstrating that the decisions made and tools used for a study "constitute reputable procedures and reasonable decisions." (2014, p. 300). This chapter is written in an effort to provide explanations and rationale behind the study design to achieve that goal of demonstrating those procedures and decisions.

However, despite the use of an interview guide to help ensure data reliability, and every effort being made to guide natural discussion and prompt organic answers rather than influence or lead participants to a conclusion, it is still possible that the data collected through the interview method may face some questions of reliability or validity based on the nature of the instrument. Because the participants are individuals with their own unique backgrounds, experiences, and opinions, findings may not be applicable to the field of study as a whole. Similarly, another researcher may not collect the same data or come to the same conclusions as this study, even if the process used for this study was replicated as closely as possible. However, as each participant is an expert in the field, and explicit efforts were made to ensure reliability, it is reasonable to assume that data collected has a basis in reality, and trends and themes identified from the data can likely be reasonably assumed to be reliable.

Similarly, questions of validity may arise from qualitative research, especially when the instrument is an interview process. However, as Denscombe notes, validity is somewhat easier to ascertain than reliability through methods such as respondent validation, which was used for this study and is discussed further in Chapter 4. Despite taking these steps to ensure reliability, no guarantees can be made, but through those steps data can be assumed to be reasonably likely to be accurate (2014, p. 299).

Limitations and Challenges.

The study's data collection went largely as planned. Thanks to careful scheduling, email reminders to participants, and test runs with the interview technology, few issues occurred. During one interview, there were challenges with connectivity that resulted in a momentary disconnection, but the interview resumed without affecting the data. Transcription proved more challenging than anticipated, with the AI Software being utilized producing a number of errors that had to be rectified by hand transcription, delaying the analysis by over a week.

Despite these challenges, the instrument proved to be incredibly valuable, as the interviews conducted with the key participants were long and detailed. In fact, it was challenging to keep the interviews to the scheduled 1 hour, but the use of the interview guide kept things on track.

Summary

This study utilizes qualitative data collected via semi-structured interviews, guided by open-ended questions and interview prompts. The instrument for data collection is rooted in theories and frameworks about decision-making in emergencies, and as such, participants were ethically recruited via purposive sampling because of their current position or history working with Canadian emergency alert systems in roles that require some level of decision-making themselves. The goal of this study is to collect and analyze data offered via interviews with experts and practitioners in the field of emergency communications and emergency alerting. That data, once analyzed and discussed in the next chapter, aims to answer this study's two research questions regarding the factors influencing decision-making (RQ1) and the gaps and roadblocks that may affect a massage's efficacy (RQ2).

Chapter 4: Results and Discussion

Introduction

Decision-making in a crisis is by its very nature a difficult and stressful task. For emergency managers, who are often the practitioners tasked with identifying a crisis and disseminating critical, sometimes life-saving information, the weight of that task can be incredibly intense. Existing literature on emergency alerting fails to adequately examine the role of the decision maker and their thought processes and challenges in disseminating alerts. The purpose of this study is to shine light on this instrumental step in alerting, and uncover the factors that influence those decisions, and what, if any, roadblocks exist in the procedures for Canadian emergency managers.

The focus of this chapter is primarily to present the data collected via the methodology and approach discussed in the previous chapter, and to analyze and discuss the findings, and the significance of those findings as it pertains to the research questions. As has been discussed previously, this goal of this study is to answer two interrelated research questions:

RQ1: What are the factors, decisions, and considerations that influence emergency managers' decision-making in a crisis? How do those influences affect the emergency communication efforts that are a product of those decisions?

RQ2: What gaps or procedural roadblocks exist in Canadian practices, and how might they affect the efficacy of an alert message in a crisis?

To answer these questions, a thorough literature review was conducted in an effort to explain the phenomenon of emergency alerting and its components. In doing so, I identified a significant gap in literature relating to the discipline of alerting. Although the topic is supported by an extensive body of literature, scholars generally focus on one of four broad themes: technology,

behavioural response, policy, and/or content and practices. Beyond identifying a gap in the total literature with a Canadian focus, it also became apparent that a second significant gap was present among the four major themes: a focus on the alert originator or emergency manager. The procedures and policies are often cited in literature, but there is little focus on the human decision-making process at the origin of any given alert. Given that emergency alerting is an incredibly powerful tool with the capacity to save lives, the entire process from beginning to end must be examined closely in order to understand and hope to improve moving forward.

Due to the fact that decision-making is often a highly-subjective practice done by humans, who are fallible by nature, it was imperative for this study to produce data with a high degree of depth, detail, and insight. The data collection process was a series of semi-structured interviews with individuals highly experienced and knowledgeable in emergency alerting. Specifically, the data collected was sourced from individuals who have themselves been decision-makers in emergency alerting situations. Interview participant number #1 is an Emergency Manager/Team Lead at a Canadian post-secondary institution. Interview participant #2 is a former Emergency Alert Team Lead who has worked extensively with provincial alerting agency in Canada. Interview participant #3 is a climate and weather expert working with a Canadian federal agency, with direct influence on issuing weather-related alerts. Interview participant #4 has been involved in international standards-setting for the discipline of emergency alerting throughout their distinguished career. Each participant currently works, or has significant experience working at different levels of government and/or private institutions heavily involved in alerting and has direct experience with issuing alerts and the decision-making process behind alerting.

These four individuals collectively make up this study's primary data source. Each interview was transcribed to provide a written record of the interviews, a key step in the inductive coding

approach taken for this study's data analysis. The data analysis approach taken for this study was chosen for two main reasons: the type of data collected and the topic itself, which required thorough in-depth examination. That process, inductive coding, as described by Chandra and Shang (2018), lends itself to research looking to establish thematic relationships between data sets:

> As its name suggests, the inductive coding approach generally relies on inductive reasoning, in which important themes, topics or models emerge from the raw data through repeated examination and comparison. It begins with organizing the raw data, which might come from news articles, interview transcripts, marketing reports, academic articles or other material through a process known as first-order coding or open coding. Through first-order coding, a researcher closely reviews the data, makes notes, combines the data into broader themes and theoretical dimensions. (2018, p. 91).

The process of inductive coding for the interview data enabled a logical flow for the data analysis and presentation. This chapter will present the data in the following section, organized in themes that align with an adapted version Al-Dabbagh's (2020) framework for crisis-decision making, and the five factors affecting the crisis decision-making process:

1. Lack [or level] of professional competence
2. Fear of consequences
3. Lack of decision-making skills
4. Lack of confidence in decisions
5. Lack of information

Following the presentation of data, I present a brief review of the analytical method used for the study, with a focus on the reliability and validity of the analysis. A more thorough discussion

of the results and their significance in relation to this study's research questions will follow in the penultimate section of this chapter, which will conclude with a brief summary.

Data Presentation

This study utilized a similar methodology to Al-Dabbagh's (2020) study on decision-making in a crisis. The results of that study provided a framework indicating factors affecting decisions in which to evaluate this study's data; and importantly, that study's results offer a strong definition of decision to apply to the research conducted herein. Al-Dabbagh's defines decision-making in a crisis as a thinking skill and process that considers the various factors of a situation "… based on his [the decision-maker's] experience, the situation, and the nature of the event." In more practical terms, Al-Dabbagh's research finds that those in a position to make decisions in a crisis are in essence making a choice from the available - or perceived to be available – alternatives. Whichever choice made by a decision maker should then be proportional to the situation (Al-Dabbagh, 2020).

This study's findings follow a similar pattern, and the five factors presented in the Al-Dabbagh study are consistent with the findings herein.

Lack [or level] of professional competence.

Using the interview guide created for the semi-structured interviews that were the primary source of data collection for this study (Appendix B), interview participants were asked a series of background questions to get a better understanding of the educational and professional backgrounds of emergency managers and alert originators operating in various roles. The responses from each of the participants indicated a common theme for professional progression within the discipline; experience is the most typical career progression metric, over formal education. Participants indicated there is a gap between the required competencies for emergency

management and the formal education currently available. Participant #1 went as far as to state "Emergency Management in Canada is not a profession. There is no accepted standard of training." When the same question regarding formalized or on-the-job training was asked of Participant #2, the response was almost identical "The answer is zero. There's not really a [education] stream on alerting." When followed up for elaboration, Participant #2 told me "I tell people alerting is about simplicity. Being complete, comprehensive, and understandable, and these are the things you don't learn in school. These are the things that are quite frankly taught by experience, some of it hard-earned." The theme of relying on experience over education was especially prevalent in Interview #2. The participant further noted that "Bad experiences – like Fort McMurray [2016 wildfire[2]] do teach, but there's really not a university course you can take for this."

Participant #4 traced their career path back to broadcasting, which evolved into a specialization in emergency management and emergency communications. The commonality between these three participants is noteworthy in that those who are tasked with managing the flow of potentially life-saving information in a crisis are largely left to make decisions based on intuition, grandfathered best practices, and experience without the luxury of a formalized education path to rely on or refer back to. The lone outlier of this theme was Participant #3; however, that participant's position is not as an emergency manager in the same regard as the others, they are a subject matter expert on weather, specifically convective weather systems. In that role, the participant does have the tools and abilities to originate alerts specific to their area of expertise. The difference in role has some bearing on the education and training available, but

[2] The Fort McMurray wildfire was a 2016 forest fire in Northern Alberta that destroyed several thousand buildings and burnt over 5,000 square kilometres of land from early May until it was finally extinguished in early August. The proximity to Alberta communities and the out-of-control nature of the fire prompted tens of thousands of emergency evacuations. (The Canadian Press, 2016)

it is worth noting that the "ability to issue tornado alerts" is in fact part of the formalized training.

The disparity in formalized training among the participants for this study speaks to an overall trend identified in the data regarding inadequate support, be it budget, resources, or a capable workforce, for the effective management of crisis information dissemination in Canada. In fact, Participant #1 attests that "Other formal training I ever needed? I had to write myself. So I will write a course on how to activate our crisis management team or how to activate our emergency Operation Center. And then I will take the course so that, that way, I can say, yes, I have officially taken this course when I started." That same participant notes that current events, in tandem with ongoing and future crises will further compound the issue of a general lack of professional competencies. "Covid has made emergency managers of us all. The effects of climate change are going to surpass the effects of Covid insomuch as Covid made emergency managers of all of us – all climate change is going to do that more." The implications of that claim will be discussed in more detail later in this chapter, but at a high level, the call for a standardized educational curriculum and/or emergency management training was heavily alluded to - and at some points explicitly called for – by the majority of participants in this study. Participant #4 noted that the act of alerting has historically been thought of as a "risky activity to undertake" and that despite the changes in the discipline over the years, that risk has yet to be subdued "I think that a lot of that perception of risk has to do with the unknown nature of the task. Folks in emergency management and public safety are untrained in how and when to do warning. It's literally not defined as part of their job in most cases." The lack of professional competencies is further exacerbated by the second theme drawn from this data, the fear associated with decision-making in a crisis.

Stress and fear of consequences.

In a crisis or emergency situation, stress and fear levels are highly elevated for decision makers. Returning to the literature review, Varma (2019) notes: "Crisis situations are typically dynamic and volatile in nature often accompanied by the stress to make quick decisions. It is argued that the decision makers might have to balance competing or conflicting interests of the internal and external publics involved in the crisis." Participant #4 aptly summarized the affect that stress can have on a decision-maker "Stress makes you stupid. We do exercises in a short-sleeve environment, we do the real thing surrounded by smoke."

Each of the themes extracted from this study's data has some overlap with another, but the concept of fear recurred often throughout each of the four interviews conducted. Participant #3 spoke to how stress, anxiety, and fear often stems not from a lack of professional competency as Participant #4 indicated, but rather from a lack of information. "I think the more challenging situations are where you don't have a lot of confidence, you're thinking, yeah this doesn't look quite right [the weather patterns that could indicate severe weather events]." According to the interview participants, it can be challenging to reach a particular threshold of certainty that would help ease some of those stressors, with Participant #3 adding "There's no magic number. I mean it's really hard as a forecaster to quantify that confidence in these types of situations."

By their very nature, the emergencies and crises warranting an alert broadcast are significantly urgent. Participant #2 used some form of the phrase "alerting is about speed" on five separate occasions in the 1-hour interview. Participant #4 noted that "typically, if you're going to be using warning technology at all, that implies the timelines are constrained." Those constraints regarding speed often elevate an alert originator's stress and fear levels because the need to disseminate information can come at the cost of certainty of the outcome or the accuracy

of information. Participant #2 admits that "If alerting is about saving people quickly, speed being the issue, then vetting [the information on hand] is counter-intuitive in some situations, not always, but sometimes." This claim is supported by Participant #3 who adds "You're trying to gather as much information as you can, but at a certain point in time, you can't keep waiting, right? At a certain point in time, you have to make that decision." When probed for elaboration, Participant #3 indicated the delicate balance required by alert originators "Once you've got to a point in time where your confidence is there, you put it out [the alert]. So you're always under this pressure to make sure that you're doing the best you can to balance." Participant #4 supported that claim, "decision-making is, you know, you weigh the risk of the phenomenon, you consider side effects – frequently that's used as an excuse for inaction." The question posed about whether or not to alert based on the potential for fallout seems as though it is a common consideration for all the participants to some degree.

Participants #2 and #3 offered anecdotes about when the decision to alert (or not alert) had a negative outcome that resonated with them moving forward, influencing their perspective on decision-making. Participant #2 spoke to the latter: "Paradise fire, California, 2019, if we tell people, they might panic and clog the roads, so we won't tell you – 36 people died." Participant #3 spoke about how the potential for a negative impact influenced a decision that didn't necessarily go well with the public.

> We had a storm that passed just to the north of Calgary, and the group decided that the storm may touch parts of Northeast Calgary. The forecasters on the desk at that time decided that - and their thinking - was to be preventative, right? To ensure that people had the information they could use to take action. So I would say that we're a little bit precautionary - and there was there was fallout from that. There was a whole bunch of

> questions from people in Calgary, you know, they're getting out of their house, Calgary's a big city. And people anywhere from downtown to the South, barely even saw a storm. It was just on the horizon they're asking themselves. Why is my phone and my TV blaring?

This is perhaps a surprising revelation when considering that humans instinctively vie for survival, but as Participant #4 noted, "there's all manners of ways that you can get criticized for issuing a warning."

Despite a common trend among interview participants, Participant #1 had a somewhat differing view on managing fear and uncertainty in disseminating an alert. That participant believes that the fear of a negative outcome is less about causing panic than it is about conveying the proper information.

> "People will do the right thing if you tell them what it is. So when you give people an action, they will do it most of the time. If you do not give people an action, some of the time, they will figure it out and they will do the reasonable thing. And when you do not give them an action and they cannot take the reasonable action that occurs to them, that is when things get really bad."

Each of the participants indicated that fear and uncertainty are undoubtedly factors in decision—making; however, none of the participants claimed that it should be reason enough to avoid the practice of alerting. Participant #2 understands warning and alerting as not an option, but a requirement of those capable "You have a duty to warn. Fundamentally the most important thing a government does is protect its citizens. Failure to fulfil that mandate means people get hurt." Participant #4 shared a similar strong feeling "to my mind, it [alerting] becomes an ethical

obligation. And to discover that that has somehow become controversial is really grievous to me."

Lack of decision-making skills.

Al-Dabbagh's third factor in his decision-making framework revolves around a lack of decision-making skills. Using Al-Dabbagh as a reference point, the key (decision-making) skills indicated by crisis managers in his 2020 study (p. 8) are:

1. The skill of collecting information about the crisis.
2. The skill of developing alternatives and possible solutions to the crisis.
3. The skill of comparison and choosing among the available alternatives to face the crisis.
4. The skill of predicting the consequences of possible solutions and alternatives.
5. The skill of analysis, correlation, and conclusion.
6. Evaluation skill for the results of solutions taken to face the crisis.
7. Diagnostic skill for the current situation.
8. Effective communication skills with the parties to the crisis.
9. The skill of solving problems using traditional and creative methods.
10. Critical thinking skills.

The data collected in this study suggests that there is a direct correlation between professional competencies discussed earlier and the decision-making skills found in Al-Dabbagh. Participant #4 noted a common theme that emerged during their time as an emergency manager.

> "The first question is whose job is it? And that is frequently left somewhat ambiguous. So the warning task falls easily between the chairs. Frequently, the people in the field have no idea what warning capabilities they have, or how they can best use them, it's just not part of the curriculum."

The issue of roles and responsibilities came up often during the interviews, with each participant having experience in a different model or situation. Participant #3 for example, shared a type of hierarchy where "the supervisor will give the yes [to issue an alert], but the convective weather expert will be the one the presents the case." Conversely, Participant #1 described their situation which is essentially one person on the emergency management team shouldering responsibility for a campus with the population of a small city. These discrepancies in training and resources speak to the availability of emergency managers who possess the required skills to effectively handle alerting procedures. Crowd-sourced or field-based information is often relied on by emergency managers, and in the case of some smaller jurisdictions, as noted by Participants #1 and #2, it is in fact first responders who often originate an alert. As noted by Participant #4, in many cases, these ground-level officials may not even be aware of their alerting capabilities, let alone possess the decision-making skills indicated by Al-Dabbagh's study as being critical to crisis communications.

The discussion section of this chapter will provide insight and recommendations based on the data collected to potentially alleviate some of these uncertainties in an effort to build those decision-making skills for alert originators across Canada.

Lack of confidence in decisions.

As demonstrated through the data presented in the preceding themes discussed thus far in this chapter, many of the challenges faced by emergency managers and alert originators stem from uncertainty. All four participants agreed that alerting is a necessary discipline, but the level of certainty and the calculations required to make a decision in alerting is "really complicated and demanding, and really subjective," as Participant #4 put it. Participant #2 summarized the issue of confidence, claiming "using a very powerful, intrusive tool comes with a lot of responsibility.

If people believe you and trust you, then they will follow your direction." The participant posited that although "it's about veracity, trust, and credibility" there is a delicate balance between crying wolf and being wrong or doing nothing when life or livelihood is at stake "if you have to say hey, I'm sorry, you didn't have to run, but at least you're alive – I'll take that heat every day of the week, because now I'm talking to people who aren't injured."

With speed and efficiency playing such a large role in alerting, participants unanimously agreed that waiting for a 100% level of confidence in a decision is virtually never an option. Participant #1 claimed that uncertainty is simply a part of alerting, equating it to a fire alarm. "The thing that makes people comfortable with the uncertainty of our messaging is the fire alarm – when the fire alarm goes off, it does not tell you what is happening." Uncertainty in the decision has a direct relationship with lack of information, the final theme identified in this study's data.

Lack of information.

Emergency events are by their very nature, uncertain. Often, an alert originator has limited or incomplete information, which can weigh heavily in the decision-making process. Participant #2 offered an anecdote to conceptualize the problem of incomplete information.

> So one thing you could say, alright, there's an active shooter, there's a police incident, stay in your homes, shelter in place. More information will be available – you leave the details out. Just get people to shelter in place. That's one option. The other option is to say nothing, a police event is ongoing, we're not going to risk it. The one thing you cannot do is take the middle ground. That is, issue a tweet. In other words, you issue an alert on one channel, but not all channels. It's serious enough that you took action, but not serious enough that you triggered the entire system.

That question of issuing an alert or not is the key point in the decision-making process. Each participant noted that every emergency is unique in that there is no accepted standard for a threat threshold, it is entirely subjective, and the potential impact is a key piece of that consideration. Without complete information, it becomes more difficult for an emergency manager to define their threshold and make a decision on the next action. Participant #1 provided a hypothetical situation where an active shooter is reported on a campus.

> We get one person calling to report someone with a gun. We send someone out to scope out the area. If we get two calls reporting a person with a gun, at that point, we're like it's going to be police, SWAT team, full response, because one person can make that mistake, right? Two people making that mistake is much less likely and the consequences of deciding that they are wrong are huge.

Similarly, Participant #3 is always searching for more information to inform the decisions they are required to make. Their team utilizes social media and eyewitness accounts to confirm severe weather events such as tornados when the information they have on hand is insufficient to comfortably make a decision. The need for more (or better) information to help make a decision was among the most common points discussed during the data collection period. Despite this, there are situations where waiting is not an option, and emergency managers must take action. In these scenarios, all four participants indicated that the ability to update and/or cancel an alert immediately was of the utmost importance. The case of the Hawaii missile alert (Nagourney, Sanger, & Bar, 2018) was specifically mentioned by Participants #1 and #2 as being an example of how a 38-minute delay before issuing a cancel message or correction can cause panic and in fact do harm. Participant #2 says of the event and its impact:

> The result was that they took them too long to cancel the message, and the harm was done in that intermittent, that gap. So it's really important that you understand, that alerting is about speed. There will be errors, there will be mistakes, it is not perfect, because the people not perfect, the information is not perfect.

Incomplete or incorrect information is a reality of the discipline, and something that decision-makers must overcome to effectively manage their jobs. The data collected for this study indicates that the factors influencing decision-making are far-reaching and varied, and the subjectivity of the discipline lends itself to additional uncertainty.

The following section will provide a brief overview of the data analysis method, and speak to the validity of the data itself.

Data Analysis

Data collected for this study came in the form of recorded video interviews, which were then transcribed by Wreally's AI software platform, *Transcribe*, and then reviewed in a traditional transcription fashion to ensure quality and correct errors that were present in the AI's initial written product. The written data was then analyzed using an inductive coding method where the passages were marked with a code in line with Chandra and Shang's (2018, p. 92-93) approach. Using Al-Dabbagh's (2020) framework for the factors affecting decision-making in a crisis, five themes were apparent from the initial transcription, and each assigned a colour. The coding was a straightforward, yet effective method wherein the key data points were highlighted in various colours to denote the theme a given segment of text most closely aligned with. Key statements were bolded for added emphasis. The first-level coded transcript was then coded a second time with a simple binary support/refute code to indicate whether the text segment supported the

framework's findings or refuted or contrasted it. A sample of a coded transcript is included as Appendix D.

Reliability and Validity.

As discussed in Chapter 3, both reliability and validity are of concern in conducting qualitative research. Reliability is difficult to ensure in these types of studies, particularly when interviews are the primary or sole method of data collection. Denscombe claims that "the impact of the interviewer and of the context means that consistency and objectivity are hard to achieve. The data collected are, to an extent, unique owing to the specific context and the specific individuals involved. This has an adverse effect on reliability." (Denscombe, 2014, p. 208). To counter this, interviews were conducted in a consistent manner, using the same tools for meeting, recording, transcribing, and coding. Interviews were also done in the same manner in terms of questions asked, follow-ups used, and time allotted. As such, the data produced was generally consistent across all interviews, The discussion surrounding the study structure, setting, instrument, etc. in Chapter 3 is an important aspect to this, as it explains the decisions made in constructing this study and the rationale for them, which is intended to make the study highly replicable to achieve a higher degree of reliability.

A higher degree of validity, on the other hand, can be more easily achieved. As Denscombe claims, "When the interview is concerned with gathering information of a factual nature, the researcher can make some checks to see if the information is broadly corroborated by other people and other sources. When the interview concerns matters such as the emotions, feelings and experiences of the interviewee, it is a lot more difficult to make such checks." (2014, p. 203). While fact checks were done on some of the data collected (where possible), the process of member-checking was also used to increase the degree of this study's reliability. Specifically,

synthesized member checking (SMC) was used. Brit et al. suggest that "SMC provides a rigorous approach which facilitates participant's engagement beyond existing member check procedures, thereby going some way toward alleviating concerns that member checking has little use as a validation tool (Morse, 2015)." (2016, p. 1810). The act of member checking was done in accordance to Brit et. al.'s model, where "both interview data and interpreted data are returned to participants. SMC also enables participants to add comments which are then searched for confirmation or disconfirming resonance with the analyzed study data, enhancing the credibility of results." (2016, p. 1806). Participants were provided with select quotes and interpretations of those quotes via email, and asked to provide comments and feedback, or to point out inconsistencies, discrepancies, or conflict with their own experience and how the researcher interpreted it.

Minor adjustments were made to select quotes through the member checking process, but all four of the interview participants stated that the context and analysis presented was consistent with their thoughts and experiences. This approach, though not definitive, provides an additional layer validity to the study's data. The SMC method utilized, along with the high degree of professionalism of the participants and no apparent motivation for providing incorrect or misleading data support the claim that the data can be considered highly valid.

Discussion

This study asks two essential research questions, both pertaining to how alerting as a practice is managed and perceived by practitioners in the field or discipline, and how their decision-making affects the emergency alerts they issue. As such, it was imperative that data be sourced from individuals with direct experience in emergency alerting. The results of the data

collection and subsequent analysis yielded a wealth of valuable data that was broken down into five main inter-connected or overlapping themes.

Notably, each of the four participants interviewed had very little standardized formal education in common with one another, which when considered holistically, speaks to a systematic detriment in the decision-making process, which is a lack of consistency in training and available resources for emergency managers and alert originators. As Participant #1 indicated, "specific on-the-job training that I have received has almost all been during real emergencies, where we are adapting, learning, implementing." The caveat with this finding is that emergency managers are proficient in the technical aspects of alert issuance (i.e., what buttons to click, where to fill in information, etc.), and those hard skills may be easily taught without the need for formal education as different organizations may utilize different tools. However, as Al-Dabbagh (2020) notes, there are five critical factors affecting the decision making process:

1. Lack [or level] of professional competence
2. Fear of consequences
3. Lack of decision-making skills
4. Lack of confidence in decisions
5. Lack of information

A lack of formalized or standardized training to assist emergency managers in making decisions can be seen as a significant detriment to the process as laid out by Al-Dabbagh, specifically lack of professional competence, lack of confidence, and lack of information. While formal education may not be the stand-alone solution for improving crisis decision making, improving (and standardizing) what constitutes an acceptable level of professional competence is

certainly an attainable goal that would have a significant impact on the discipline. Further to that, learning opportunities that do not come 'on the job' could prove to be advantageous in not only improving the confidence of decision-makers as there is less on the line in a workshop environment or classroom, but will also help ease the issue of lack of information by familiarizing emergency managers with what information is required, where it can be found, and how to best utilize it.

The findings surrounding education and training must be considered in the context of RQ 1: What are the factors, decisions, and considerations that influence emergency managers' decision-making in a crisis? How do those influences affect the emergency communication efforts that are a product of those decisions? Decision makers are highly influenced by past professional experiences, with little to no formalized or standardized procedure and education to fall back on. It can be assumed through the findings of this study that this missing piece of emergency management has the potential to produce a negative outcome or have a negative effect on the emergency communications that are issued at any given time.

This breakdown in standardization also speaks to RQ2: What gaps or procedural roadblocks exist in Canadian practices, and how might they affect the efficacy of an alert message in a crisis? A lack of consistency in education and training is both a procedural roadblock, as well as a potential detriment to the efficacy of the emergency managers' work product.

To partially rectify this perceived issue, the data shows that emergency managers would be in support of public training or additional exposure to the discipline of alerting. This may run in tandem with formalized training for the decision makers themselves, but the concept of public knowledge and training was prevalent in the data, and in the existing literature. Participant #1 suggests that alerting as a discipline would be improved by such a systemic overhaul: "what we

need to say is emergency managers is here is the basic information that every functioning adult, and even moderately-functioning adult, will need over the next hundred years at some point." The data also finds that some emergency managers believe that centralized alerting, often performed by government agencies, is not necessarily the future of alerting:

> And then when you stop to think about it, we don't really need these authority figures in the decision chain at all. Are there other ways we can detect, infuse, and interpret information to the public interest, particularly because we've got a lot of people think that the government shouldn't be doing that [handling alerting].

The data shows that there is not necessarily an explicit call for the restructuring of the alerting model as we know it, but rather for a supplemental infusion of information sourced from outside the traditional inputs. The concept of providing access to public information on hazards, emergencies, and alerts is by no means new. Scholars such as Vitek and Berta called for a similar program in 1982 "Because the interaction between people and natural events cannot be eliminated, we need effective educational programs that will inform residents of natural hazards in their area and how to respond to emergencies in order to minimize losses." (Vitek and Berta, 1982, p. 228).

This proposition, or some form of it, could in fact directly improve or help emergency manager's decision-making in crises. In the context of RQ2, improving public knowledge is a removal of a perceived roadblock. Al-Dabbagh's framework posits that fear of consequences and a lack of information can hinder the decision making process, and as such, it is conceivable that a well-informed public would potentially be more responsive to alerts, reducing the fear of negative outcomes (consequences). Further to this point, the data shows – in line with Al-Dabbagh's framework – that a lack of information is in fact detrimental to the decision-

making process. Emergency managers sourcing additional real-time information from a well-informed public would logically go a long way to easing that factor of a lack of information.

Despite these potential improvements to the Canadian approach of alerting, the data shows that uncertainty in the potential outcomes can have a detrimental effect on the decision-making process, which due to the very nature of alert-worthy events, in a constant concern. Alert-worthy events are rarely predictable. However, with a broader understanding of emergency procedures and response within the general public, emergency managers may be more easily able to confidently predict the target audience's reactions and response.

When taken as a whole in the context of this study's research questions, the data collected for this study indicates that overall alert effectiveness and the effectiveness of emergency managers and alert originators is significantly influenced by the decision-making process, and Al-Dabbagh's five factors influencing decision making were clearly aligned with the data collected from key informants within the discipline. The gaps and procedural roadblocks, such as a lack of qualified emergency managers or standardized training only serve to further exacerbate the issue.

Limitations.

As mentioned in the validity and reliability section earlier in this chapter, the findings of this study are based on the insights, experiences, and opinions of four individuals. Although those individuals are all highly regarded among their peers and in the field of study, and uniquely qualified within their own right, it is difficult to assume the experiences of four individuals can be extrapolated to the discipline as a whole, or even the discipline within Canada alone. This study was done with little or no initial bias or supposition, but the framing, analysis, and

conclusions of this researcher may not be the same as another. Further, this study is limited by the resources and timelines of the researcher, and the wealth of data provided by the participants could be easily utilized in other, similar studies with different research questions, potentially specific to policy, technology, etc.

Future Studies.

One conclusion of the data collected for this study is that Canadian alerting practices as a whole, and more specifically, the role of the emergency manager, are under-studied, and would be well-served by future research. The development of a formal educational framework or curriculum to help existing and future emergency managers is clearly a necessity in Canada and warrants further academic examination.

Summary

This study found that emergency managers and alert originators are tasked with offering an essential service to Canadians but are not necessarily given the tools and resources necessary to effectively do so. The high-pressure situations in which emergency managers must make timely decisions is both highly subjective and heavily reliant on experience and intuition, with little support in the way of a formal code of practice, governance, or systematic approach to the discipline. Decision-making is influenced and affected by a number of internal and external factors that are often beyond the control of the alert originator, yet they are left to shoulder the responsibility.

With regards to RQ1: how is alert effectiveness measured and evaluated by Canadian practitioners and decision makers following a crisis or emergency?, it can be concluded that Canadian practitioners are left to make difficult decisions based on a multitude of factors in an effort to simply try to provide the best information as quickly as possible with the hope that it

minimizes losses for the Canadians affected. It stands to reason then, that those alerts are considered most effective when the decisions made by practitioners result in the conveying of adequate information in time for protective measures to be undertaken. RQ2; What gaps or procedural roadblocks exist in Canadian practices, and how might they affect the efficacy of an alert message in a crisis? Is a more difficult question to answer. The roadblocks to decision-making can be procedural, but they may also be the result of external factors outside of anyone's control. However, the data would suggest that practitioners would generally feel more comfortable in their decision-making if there were fewer uncertainties and fewer barriers to success such as a clear policy framework.

The next chapter in this study is the conclusion, summarizing the entirety of the study and offering next steps for the research based on the findings of this study.

Chapter 5: Conclusion

Introduction

As seen in numerous examples throughout pop culture, most often in disaster films, a warning often starts with a group or individual pressing a button, pulling an alarm, or setting off a chain of events intended to get word out quickly. Alerting is not an unfamiliar concept to many in Canada, especially with the evolution of our society's technical capabilities. Despite this, the focus in academia tends to be on the message, or the technology for disseminating the message, and/or the outcome of that message. Little attention is given to the alert originator, or 'the person pushing the button. This study initially set out to answer two questions related to the gap identified in the literature. The initial questions pertained to efficacy; specifically, how practitioners in the discipline self-evaluated the efficacy of any given alert, and what (if any) roadblocks existed in current practices that could negatively affected that efficacy.

Through the literature review and the data collection and analysis steps of this paper, the first of those questions evolved to primarily focus on that individual from where alerts originate, rather than efficacy. Research question 1 became an evaluation of the role of the decision-maker in a crisis, and the various factors that influenced both the decisions made, and the end product.

This concluding chapter is intended to summarize the findings of the study and place them in context of those above-stated research questions. The following two sections will endeavour to do so, followed by a brief commentary on future direction for study on the discipline and a brief concluding section.

Summary of Findings

By collecting data from key informants in positions enabling them to provide unique insight and commentary on their experiences, I was able to identify three major findings stemming from

the data: 1) formalized and/or standardized training is not typically available, and certainly not widely adopted for Canadian emergency managers, 2) the discipline of alerting in Canada suffers at times from a lack of confidence and certainty in the information available, the sources of the information, and the potential outcomes and responses from the target public, and 3) political, financial, and procedural roadblocks do indeed exist that can be detrimental to the decision-making process.

The theoretical framework adapted for this study, originating in Al-Dabbagh's 2020 study, indicates that there are five critical factors affecting decision making in a crisis:

1. Lack [or level] of professional competence
2. Fear of consequences
3. Lack of decision-making skills
4. Lack of confidence in decisions
5. Lack of information

The influence of each of these factors was seen in the data collected for this study, to varying degrees. The most notable influence noted by the interviewees was the lack or inadequate level of professional competence that experienced emergency managers commonly recognize within the discipline. The subsequent effect of competence is seen in the lack of confidence in decisions and lack of decision-making skills, largely attributed to finding 1 noted above. Additionally, findings 2 and 3 are rooted across all five of Al-Dabbagh's stated factors, and contribute to one another. The existing roadblocks, which exist as financial constraints, political pressure or influence, and lack of resources exacerbate the pressures and stresses placed on emergency managers and alert originators, potentially having negative influences on the decision-making process, and thereby negatively impacting the quality of alerts that can be issued.

Context of Findings

The findings of this study speak to a systemic issue of emergency preparedness throughout Canada where uncertainty in the face of a crisis breeds additional complications. Despite this, the overall state of Canada's emergency alerting system is by no means critical, though not without issue. The findings show that the addition of more resources in the form of finance and manpower for both alerting agencies and public awareness would be well-received by emergency managers and would stand to improve Canada's overall approach. The framework used to guide the analysis of this study's data suggests that fear of consequences and a lack of information can hinder the decision-making process (Al-Dabbagh, 2020). Based on this claim, and the data collected from practitioners with unique insight into the field, it is conceivable that a well-informed public would potentially be more responsive to alerts. This type of emergency preparedness program could potentially alleviate several issues found in Canadian alerting by this study; namely a lack of confidence in decisions made by emergency managers and a lack of information. A well-informed, or potentially trained, audience would likely be more predictable (as is the case with fire alarms), leaving less guesswork to emergency managers in how their alerts may be responded to. Additionally, as some of the study particpants indicated, the public can indeed serve as an excellent source of supplemental information in the event of an emergency. Providing a more thorough public education could help improve Canadian alerting by information publics of what may be expected and what may be needed by emergency managers in terms of ground-level information.

This study also finds that emergency managers bear a substantial responsibility for which they are not always adequately trained. Future generations of emergency managers would benefit from a standardized training and or education program that promotes additional inter-agency

operations, builds decision-making skills, and prepares alert issuers for a career in a discipline bereft of an educational support structure to rely on and refer to. The data suggests that nationally standardized training would potentially be of the most value, as Canada operates, at most levels, on the AlertReady platform. However, as is seen in the data, regional and provincial jurisdictions can have unique or modified procedures and policies, suggesting that provincial and/or regionally-standard training would also provide significant value toward making systemic improvements.

Additionally, this study offers some advancement to the literature in the field of study with a Canadian-specific focus, an area that the literature review chapter herein identifies as severely lacking in recent years, and provides a foundation for future research into the role of the crisis decision maker.

Future Direction

Significantly more research is required to supplement existing literature in the field of emergency alerting. This is especially true for Canada, but it is a gap that widens across every jurisdiction with every advancement of technology, and society's capabilities to disseminate messages. As the discipline is tied directly to technology in many ways, the literature in the field cannot be allowed to stagnate. This is especially true when considering the absence of formalized training, as emergency managers and alert originators rely on existing studies and grandfathered knowledge passing to prepare for their roles.

The scope of this study is limited in that the primary focus is on identifying factors influencing decision-making and the roadblocks to effective alerting. As noted in previous chapters, research in the field of study often falls inside one or more common themes, including technology, behavioural response to alerts, policy, and content and practices. This study, while

touching on these themes, is not explicitly focused on any of these recurring themes, though the collected data at times provided insights into each that are worth exploration in future studies. Future studies that examine the Canadian approach to emergency alerting would be well-suited to not only investigate the phenomenon holistically, but as identified in the literature review section, the commonly recurring themes of technology, message content, behavioural response, and policy and procedure are lacking investigation where a Canadian context is the primary focus. A significant amount of literature exists on these themes with American focus, but in order to aptly describe and understand the Canadian approach, highly focused research into those areas specific to Canada is warranted (i.e., the technology of AlertReady, the role of CAP-CP, remote emergency alerting, etc.), and would provide valuable insight into the nuances of Canada's approach to alerting that could not be established due to the primary focus and constraints and limitations of this study.

Perhaps the most prevalent limitation of this study is the role of politics and political pressures in both National and Regional alerting practices. However, much of the data collected that spoke to this topic falls outside the scope of this study. It can be argued that the role of outside influences such as political pressures is a significant factor in alerting, however, it largely falls outside the decision-making framework and factors considered herein, and does not directly provide insights into the research questions posed for this study. A specific study on the influence of politics on key decision-makers in emergency alerting is a logical next step to this study, as politics were a major factor mentioned during data collection, but were only reported on in a very limited manner within this study due to the focus being on decision-making as whole. In fact, it could be argued that each of the five factors of decision-making presented by

the Al-Dabbagh study warrant a unique and focused study in order to gain an even deeper understanding of the role of the decision-maker without the limitation of reporting holistically.

The data collected provided a wealth of insight and information into the role of politics, resources, information sources, and public response to alerts, each of which would benefit from future research.

Conclusions

This study initially set out to answer questions of alert efficacy in Canada. Through the evolution of the study design, literature review, and data collection, it became apparent to me that questions regarding the role of the emergency manager as a decision maker in the process of alerting were an essential factor in the overall question of efficacy. As this issue is not well-researched in a Canadian context as of yet, and as such, this study posed the questions of what factors influence decision making, and what roadblocks exist that limit the efficacy of alerting as a practice. The findings spoke extensively about the need for more public awareness, and additional resources for emergency managers, especially in the form of formalized and/or standardized education and training. As noted above, there exists several opportunities to continue research on the topic of decision-making in a crisis. This study is among the first to examine the topic with specific regard to emergency alerting, providing a framework and baseline to continue advancing research in the field of study.

Perhaps most importantly, this study identified several key shortcomings in the Canadian approach to emergency alerting. While it is important to note where those shortcomings exist, additional research and tangible action is required to make any suggestions or recommendations stemming from this study more than a theoretical supposition.

While many would agree that some alert is better than none, this discipline will continue to evolve with technology and society, and stands to substantially benefit from future research, engagement, and resource dedication.

References

Adams, H. G., & Longhurst, R. (2017). “At least in person there would have been a cup of tea”: interviewing via Skype. *Area, 49*(2), 148–155.

Al-Dabbagh, Z.S. (2020). The Role of Decision-maker in Crisis Management: A qualitative Study Using Grounded Theory (COVID-19 Pandemic Crisis as A Model*). Journal of Public Affairs (14723891), 20*(4), 1–11.

Austin, L., Fisher Liu, B., & Jin, Y. (2012). How Audiences Seek Out Crisis Information: Exploring the Social-Mediated Crisis Communication Model. *Journal of Applied Communication Research, 40*(2), 188–207.

Bean, H. (2019). *Mobile technology and the transformation of public alert and warning (1st ed.)*. Praeger Security International.

Bean, H., Sutton, J., Liu, B. F., Madden, S., Wood, M. M., & Mileti, D. S. (2015). The Study of Mobile Public Warning Messages: A Research Review and Agenda. *Review of Communication, 15*(1), 60–80.

Bennett, D., LaForce, S., Touzet, C., & Chiodo, K. (2018). American Sign Language & Emergency Alerts: The Relationship between Language, Disability, and Accessible Emergency Messaging. *International Journal of Mass Emergencies & Disasters, 36*(1), 71–87.

Botterell, A., and Addams-Moring, R. (2007). Public warning in the networked age: Open standards to the rescue?: Emerging trends and technologies. *Communications of the ACM. 2007;50*(3):59-60. Accessed October 31, 2020.

Birt, L., Walter, F., Scott, S., Cavers, D., & Campbell, C. (4). (2016). Member Checking: A Tool to Enhance Trustworthiness or Merely a Nod to Validation? *Qualitative Health Research, 26*(13), 1802–1811.

Câmara, D., Bonnet, C., and Filali, F. (2010) Propagation of Public Safety Warning Messages: A Delay Tolerant Network Approach. *2010 IEEE Wireless Communication and Networking Conference.* Sydney, 2010, pp. 1-6.

Campbell, J. L., Quincy, C., Osserman, J., & Pedersen, O. K. (2013). Coding In-depth Semistructured Interviews: Problems of Unitization and Intercoder Reliability and Agreement. *Sociological Methods & Research*, *42*(3), 294–320.

Casteel, M. A., & Downing, J. R. (2016). Assessing Risk Following a Wireless Emergency Alert: Are 90 Characters Enough? *Journal of Homeland Security & Emergency Management, 13*(1), 95–112.

Chandra, Y. & Shang, L. (2018). *Qualitative Research Using R: A Systematic Approach*. Springer Singapore.

Cheek, J. (2004). Reworking the Emergency Alert System to Meet the Needs of Homeland Security: Overcoming Obstacles to Establish an Effective Public Warning System. *CommLaw Conspectus: Journal of Communications Law and Policy, 13*(2), 435–470.

Denscombe, M. (2014). *The Good Research Guide: For Small-scale Research Projects: Vol. Fifth edition*. McGraw-Hill Education.

Dijl, D. E. M., Zebel, S., & Gutteling, J. M. (2019). Integrating social media features into a cell phone alert system for emergency situations. *Journal of Contingencies & Crisis Management, 27*(3), 214–223.

Federal Emergency Management Agency. (2021). *Common Alerting Protocol*. FEMA.gov. https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system/technology-developers/common-alerting-protocol#:~:text=The%20Common%20Alerting%20Protocol%20(CAP,to%20develop%20the%20IPAWS%20standard.

Friel, B. & Singer, P. (2005). "Gaps in government natural disaster strategy cited."In *Fire Engineering, 158*(12), 44. Penn Well Publishing Co.

Gow, G. A. (2007). Public Alerting in Canada: Renewing the Emergency Broadcasting System. *Canadian Journal of Communication, 32*(2), 277–293.

Gow, G. A., McGee, T., Townsend, D., Anderson, P., & Varnhagen, S. (2009). Communication Technology, Emergency Alerts, and Campus Safety. *IEEE Technology & Society Magazine, 28*(2), 34–41.

Gutteling, J. M., Terpstra, T., & Kerstholt, J. H. (2018). Citizens' adaptive or avoiding behavioral response to an emergency message on their mobile phone. *Journal of Risk Research, 21*(12), 1579–1591.

Guthrie, G. (2010). *Basic Research Methods: An Entry to Social Science Research.* Sage Publications Pvt. Ltd.

Heath, R. L., Lee, J., & Lemon, L. L. (2019). Narratives of risk communication: Nudging community residents to shelter-in-place. *Public Relations Review, 45*(1), 128–137.

Homburg, C., Klarmann, M., Reimann, M., & Schilke, O. (2012). What Drives Key Informant Accuracy? *Journal of Marketing Research (JMR), 49*(4), 594–608.

Janghorban, R. Roudsari, R., & Taghipour, A. (2014). Skype interviewing: The new generation of online synchronous interview in qualitative research. *International Journal of Qualitative Studies on Health and Well-being, 9*(1). DOI: 10.3402/qhw.v9.24152

Kim, G., Martel, A., Eisenman, D., Prelip, M., Arevian, A., Johnson, K. L., & Glik, D. (2019). Wireless Emergency Alert messages: Influences on protective action behaviour. *Journal of Contingencies & Crisis Management*, *27*(4), 374–386.

Kuligowski, E. D., & Kimball, A. (2008). Alerting under Imminent Threat: Guidance on alerts issued by outdoor siren and short message alerting systems. National Institute of Standards and Technology. *NIST Technical Note 2008*.

Leiva, M. (2014). Leveraging Emergency Notification Alerts. *Homeland Security Affairs*, 10, 1–6.

McGee, T. and Gow, G. (2012). Potential responses by on-campus university students to a university emergency alert. *Journal of Risk Research*, 6, 693.

Mileti, D. S. and Beck, E. M. (1975). "Communication in Crisis: Explaining evacuation symbolically." *Communication Research 2*(1): 24-49.

Nagourney, A., Sanger, D. E., & Bar, J. (2018). Hawaii Panics After Alert About Incoming Missile Is Sent in Error. *The New York Times.* https://www.nytimes.com/2018/01/13/us/hawaii-missile.html.

National Science and Technology Council Committee on Environment and Natural Resources. (2000). "Effective Disaster Warnings". Washington, DC. Retrieved from https://web.archive.org/web/20060513144112/http://www.sdr.gov/NDIS_rev_Oct27.pdf

National Academies of Sciences. (2018). "Emergency Alert and Warning Systems: Current Knowledge and Future Research Directions." National Academies Press.

Pelmorex Corp. (2020). Alert Ready Emergency Alert System. Retrieved December 03, 2020, from https://www.alertready.ca/

Public Safety Canada. (2020). *Alert Timeline*. National Public Alerting System. https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/mrgnc-prprdnss/ntnl-pblc-lrtng-sstm-en.aspx.

SAGE. (2004).*The SAGE Encyclopedia of Social Science Research Methods*. 3.

Sicafuse, L. L., & Miller, M. K. (2012). The Effects of Information Processing and Message Quality on Attitudes toward the Amber Alert System. *Applied Psychology in Criminal Justice*, *8*(2), 69–86.

Sheldon, P. (2018). Emergency Alert Communications on College Campuses: Understanding Students' Perceptions of the Severity of a Crisis and Their Intentions to Share the Alert With Parents and Friends. *Western Journal of Communication, 82*(1), 100–116.

Statista. (2020). *Smartphone users in Canada 2018-2024*. Retrieved December 12, 2020.

Statistics Canada. (2020). *Population estimates, quarterly*. Government of Canada. Retrieved December 12, 2020. DOI: https://doi.org/10.25318/1710000901-eng

Sutton, J.N., & Kaufmann, R. (2018). Designing imminent threat messages for an unfamiliar hazard. *Communication Teacher, 32*(4), 215-219.

Sutton, J., Spiro, E. S., Johnson, B., Fitzhugh, S., Gibson, B., and Butts, C. T. (2014). Warning tweets: Serial transmission of messages during the warning phase of a disaster event. Information. *Communication & Society, 17*(6). 765-787.

Traynor, P. (2012). Characterizing the Security Implications of Third-Party Emergency Alert Systems over Cellular Text Messaging Services. *IEEE Transactions on Mobile Computing, 11*(6), 983-994.

The Canadian Press. (2016). A timeline of the Fort McMurray wildfire, Canada's news story of 2016. *City News Toronto*. https://toronto.citynews.ca/2016/12/20/a-timeline-of-the-fort-mcmurray-wildfire-canadas-news-story-of-2016/

United States Government Accountability Office. (2007). Emergency preparedness: current Emergency Alert System has limitations, and development of a new integrated system will be challenging: report to congressional committees. Electronic Resource. Washington, D.C.

Varma, T. (2019). Understanding Decision Making During a Crisis: An Axiomatic Model of Cognitive Decision Choices. *International Journal of Business Communication*, *56*(2), 233–248.

Violino, B. (2008). Alert!: In Emergencies, Schools Use Technology to Get the Message out Quickly. *Community College Journal*, *78*(5), 16–18.

Vitek, J. D., and Berta, S. M. (1982). Improving Perception of and Response to Natural Hazards: The need for local education. *Journal of Geography, 81*(6), 225-228.

Weller, S. (2017). Using internet video calls in qualitative (longitudinal) interviews: some implications for rapport. *International Journal of Social Research Methodology*, *20*(6), 613–625.

Woody, C., and Ellison, R. (2014). Maximizing trust in the wireless emergency alerts (WEA) service. Software Engineering Institute.

Woszczynski, A., Green, A., Dodson, K., & Easton, P. (2020). Zombies, Sirens, and Lady Gaga – Oh My! Developing a Framework for Coordinated Vulnerability Disclosure for U.S. Emergency Alert Systems. *Government Information Quarterly*, *37*(1).

Yuksel, M., Guvenc, I., Saad, W., & Kapucu, N. (2016). Pervasive spectrum sharing for public safety communications. *IEEE Communications Magazine, 54*(3), 22–29.

Appendix A: University of Alberta Research Ethics Board Approval

Notification of Approval

Date:	April 7, 2021
Study ID:	Pro00107991
Principal Investigator:	Matthew Inglis
Study Supervisor:	Gordon Gow
Study Title:	Managing Information Distribution in a Crisis: Characterizing Decision Making in Mobile Alerting as Part of Canada's Emergency Alert System
Approval Expiry Date:	April 6, 2022

Thank you for submitting the above study to the Research Ethics Board 1. Your application has been reviewed and approved on behalf of the committee.

Approved Documents:

Letter of Initial Contact

Letter of Initial Contact

Consent Forms

Study Information & Consent Form

Questionnaires, Cover Letters, Surveys, Tests, Interview Scripts, etc.

Interview Guide

Any proposed changes to the study must be submitted to the REB for approval prior to implementation. A renewal report must be submitted next year prior to the expiry of this approval if your study still requires ethics approval. If you do not renew on or before the renewal expiry date, you will have to re-submit an ethics application.

Approval by the Research Ethics Board does not encompass authorization to recruit and/or interact with human participants at this time. Researchers still require operational approval as applicable (e.g. AHS, Covenant Health, ECSD etc.) and where in-person interactions are proposed, institutional and operational requirements outlined in the Resumption of Human Participant Research - June 24, 2020 must be met.

Sincerely,

Anne Malena, PhD.
Chair, Research Ethics Board 1

Note: This correspondence includes an electronic signature (validation and approval via an online system).

Appendix B: Interview Guide

Data Collection Interview Guide

Study Title: Managing Information Distribution in a Crisis: Characterizing Decision Making in Mobile Alerting as Part of Canada's Emergency Alert System

Consent Review

- Verbal agreement to Proceed and record

1. **Study Introduction**
   - *Goals of the interview:* To characterize how emergency managers handle the alerting process in a Canadian setting. I'd like to explore some of the influences and factors that go into decision-making, and how the alert that comes across a user's phone landed there as it is.
2. **Preamble/Introductions:**
   - Name:
   - Organization:
   - Position:
   - Professional Experience in Field:
   - Educational Background:
3. **Overview of Participant:**
   - Invite participant to tell me about themselves and their role.
     - *Follow-up:* Describe any formalized or on-the-job training did you received for this role?
     - *Follow-up:* Tell me about the materials you have on hand to help you in your role (style guide, best practices, manual, etc.)

- *Follow-up:* Describe the team or setting you work with or support structure in place to help you in your role.

4. Alerting:

- Walk me through the process or procedure of sending an alert (from participant's perspective)
  - *Follow-up:* What resources do you refer to when going through this process?
  - *Follow-up:* If you can, explain what role your education & training plays in the process, vs. the role of intuition and experience
- Describe your level of freedom or oversight in going through the process of sending an alert. Is it largely left up to you, or do you utilize a more rigid, structured pre-determined format?
  - *Follow-up:* Is this the standard expectation of your organization, or a preference?
- How much does the Canadian Profile of the Common Alerting Protocol factor into issuing an alert from your perspective?
  - *Follow-up:* Explain how adhering to the CAP helps or hinders your effectiveness in your role.

5. Decision-Making:

- What decisions are left to you when putting together an alert?
  - *Follow-up:* Who decides to "pull the trigger" on the alert?
  - *Follow-up:* What does that decision look like (what factors are considered)?
- At what stage in the process is a go/no-go decision made on an alert? What role do you play in making that call?

- How do you weigh the potential of a negative outcome stemming from an alert? Does it weight into your decision-making?
    - *Follow-up:* What, if any, role do your personal emotions play in the decision-making process?
- Describe how you get the information you use in an alert
    - *Follow-up:* How do you decide what information to include, and what to exclude?
    - *Follow-up:* How much vetting do you do of material or information issued in an alert?
    - *Follow-up* (if answer above is none or little): Do you find this is because you trust the material as you get it, or because it's a procedural/timing issue vetting?
    - *Follow-up* (if answer above is somewhat or significant): How does timing of alert issuing or standardized procedure affect your ability to vet information to a level your comfortable with?
- How does your personal background affect your decision-making?

6. Post-alert

- Explain what happens post-alert (i.e., is there a de-brief or analysis of an alert)?
    - *Follow-up:* What is considered successful a successful alert from your perspective?
- Explain how any given alert may influence the next situation you may face

Appendix C: Sample Consent Form

Study Information & Participant Consent Form

Study Title: Managing Information Distribution in a Crisis: Characterizing Decision Making in Mobile Alerting as Part of Canada's Emergency Alert System

Study Number: Pro00107991

Research Investigator:

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Study Background:

This study is being conducted by research investigator Matthew Inglis as part of the University of Alberta's Master of Arts in Communications and Technology program. The study serves as the final academic requirement of the program and is under the supervision of Dr. Gordon Gow. You are being asked to participate in one (1) semi-structured digital interview with the primary researcher. The interview will primarily focus on the use of push notifications to alert and inform the general public and target audiences of an ongoing or incoming emergency that has the potential to affect them. Specifically, as a professional with experience as a decision-maker in this field, your experiences, opinions, and insights will help the researcher deconstruct and

understand the emergency alerting process, including best practices and factors influencing decision-making at different levels (small-scale local, regional, provincial, and national) in a Canadian context.

Study Purpose:

This study is intended to characterize decision-making surrounding emergency alerting in Canada. The insight gained from your responses will contribute contemporary research to the existing body of knowledge and literature in the field of crisis and emergency alerting. The study intends to fill a gap in the existing literature where Canadian practices receive disproportionately less focus than those of America or the European regions.

Study Procedures:

Four interviews will be conducted with professionals possessing unique perspective or insight into the field of emergency alerting at various levels throughout Alberta and Canada. Each interview will be conducted in a one-to-one setting with only you and the researcher investigator present. Your decision to participate in this study will not be shared with any other participants.

As interviews will be conducted digitally, you may propose any web-based video meeting or conferencing software you feel comfortable with (e.g., Skype, Google Hangouts/Meets, Microsoft Teams, and/or WebEx). If you do not have any preference, Skype will be the default meeting space. Each session will last approximately 1 hour, and will be recorded, and downloaded to the researcher's password-protected external hard drive. The recordings will be transcribed by the investigator and used as the primary data source for the study.

Benefits:

Your participation will assist in the contribution of contemporary literature with a Canadian context to the field of study. You will help emergency communication professionals, academics, and policy-makers better understand the complexities and nuances of the decision-making behind emergency alerting, and inform the evolution of best practices in the field. However, there may be no direct benefit to participating.

Risk:

There are no known risks to participating in this study.

Cost of Participation/Reimbursement:

There is no cost associated with participating in this study. Your participation is completely voluntary, and you will not be compensated for participating in the interview.

Voluntary Participation:

Your participation is completely voluntary - you are under absolutely no obligation to participate in this study. You are also not obliged to answer any specific questions during the interview, and are welcome to terminate your participation at any time during the interview for any reason. Any data collected may be withdrawn up to 5 business days after your interview is conducted by contacting the study team by phone or email.

Confidentiality & Anonymity:

No identifying information, including your name, contact information, and/or organization will be published in the study or shared outside of the research team. Any references to you, your position, or your organization within the study will be pseudonymous (a fake name) or anonymous (i.e., an emergency manager working for a provincial alerting body). All personal and identifying information collected, as well as transcripts and recordings of your interview will

be stored on an encrypted and/or password-protected external hard drive in the principal investigator's locked home office. Data will not be used for any additional study or other purpose outside of the proposed research. Collected data and any relevant documentation will be retained for a minimum of 5 years (as per University of Alberta policy), at which point it will purged from the password-protected/encrypted external hard drive.

Contact Information:

If you have questions, concerns, or complaints please contact:

Researcher: Matthew Inglis, minglis@ualberta.ca or 780.5151.0625

Supervisor: Dr. Gordon Gow, ggow@ualberta.ca or 780.710.4673

The plan for this study has been reviewed by a Research Ethics Board at the University of Alberta. If you have questions about your rights or how research should be conducted, you can call (780) 492-2615. This office is independent of the researchers.

Participant Consent:

_____

DATE

_____ _____

PARTICIPANT NAME (PRINT) PARTICIPANT SIGNATURE

_____ _____

INVESTIGATOR NAME (PRINT) INVESTIGATOR SIGNATURE

Check If consent is being provided electronically:

☐ By checking this box and typing my name and email below, I am electronically signing this consent form.

Name:

Email:

Please indicate if you would like a copy of the research report after final grades have been assigned:

☐YES ☐NO

Any personal or identifying information, along with your answers in the interview will be anonymous, however, if you wish to be recognized or acknowledged for your participation in the study, please indicate so below.

☐YES ☐NO

Appendix D: Sample Interview Coding

Code	Meaning/Theme
First-level Coding	
Red Outline	Lack of Information
Blue Outline	Lack of Confidence in Decisions
Yellow Outline	Lack of Decision Making Skills
Pink Outline	Stress and Fear of Consequences
Green Outline	Lack or Level of Professional Competence
Second-level Coding	
Bold Text	Key Statement
Blue Text	Supports Framework
Red Text	Refutes Framework
Black Outline	Redacted (Potentially Identifying Information)

Participant #4: I remember when I was coming up, it wasn't clear to me that there was any question, you know, that you did this [alerting], but there was no money for it. There was no staffing, there was no policy for it. There was just a whole body of Mythology. That warning was a very risky activity to undertake. **I think a lot of that perception of risk had to do with the unknown nature of the task. Folks in emergency management and Public Safety are untrained in how and when to do warning.** It's literally not defined as part of their job in most cases. And when there are specific regulations, the warning system for [redacted], for example, was mandated by a County ordinance, that rode a revenue stream that the state and ultimately the federal authorities had created by making the industry responsible for hazardous materials, but that was an exception. Then the idea of generalizing that for all Hazards was a really exciting exception. It's generally thought, typically we build Warning Systems around particular hazards and around your particular technologies. So if a new technology appears, reliably somebody will do warning with that technology but, deciding to go ahead and interrupt people's football games, hockey games on television, spoil or their afternoon, wake them up in the middle of the night, that looks like a whole bunch of downside, and politically, very risky. **And warning originators typically don't have any - well in Washington, they call it top cover - they have no policy, no document that they can hold up and say, hey, I did the right thing, it says so right here. So that lack of information and the lack of policy framework actually maximizes the fear in the alert originator.** And the most common response to that is to try to rationalize a way out of the problem altogether - to come up with some rationale why warning isn't necessary or appropriate. I think we make me make it

unnecessarily hard for our alert originators. There's also this question of who is the alert originator, really. We have a cold war.

Interviewer: Yeah, no that's that's excellent. You've mentioned a few times and it's a recurring theme that I've come across. That there's this sense of fear and unknown in the alert originator and that stems from a number of different things, you know, be it not having a truly defined process in place or having that top cover or whatever the case may be, but so I'd like to get your insight into the actual decision-making of those alert. Who are these alert originators?

Participant #4: There was a time when sounding the sirens or activating a working system was typically the privilege of the chief executive, the mayor, County Executive, somebody like that, it was pretty high up and it was viewed as essentially a political action - the problem with that model Is that folks back at the [redacted] really don't have access to the information that they need fast enough to make warnings useful. And so I and a few others have really pressed for the idea that we should be empowering Public Safety people in the field to use these warning tools, they're the ones on the scene. They're the ones with the immediate need for some sort of public compliance. They've got the best information and the minimum decision lag - not that they have none - but there was a lot less of it than the administrator with his or her staff all running around, trying to make sure nobody gets in trouble. So there is the first question is whose job is it - and that is frequently left, somewhat ambiguous. **So the warning task easily falls between the chairs. Frequently, the people in the field have no idea what warning capabilities they have, or how they can best use them. It's just not part of the curriculum**. So, All of these, I guess it boils down to ignorance and fear. Our warning origination processes tend toward dysfunction. And I think that's because of all the ambiguities - Should I do it? Am I the person who should do it? How do I do it? typically the people who are in a position to use these systems to good benefit have not been educated in any of those aspects, and as a result, we do, what we see tacitly to be encouraging, which is...

Interviewer: So in that event. I mean, there's there's a lot to unpack there but If we operate on the assumption that the alert originator knows that it is their Duty. Like we take that uncertainty out of the question, just speaking. Hypothetically here. You mentioned that question of how do I do it? And what do I do? That's sort of one of one of the things that I'm trying to explore is the things like does a common alerting protocol come into play there, does it help them or hinder their effectiveness? Now,

are they, are they getting the information out there or are they trying to respond in an organized predetermined matter?

Participant #4: Yeah, and I'd say that involved the larger jurisdictions, they tend to have this stuff pretty well worked out. It's frequently a bit over bureaucratized, but at least it's a plan. Smaller jurisdictions, it's typically just never, it's just not something that happens very often. As a result, there really isn't a lot of planning for it. The planning is sort of on the lower level. Well, call Margie at dispatching, she'll get George out, their internal cycles. Very informal in most places, because again, the factors, local forces, that tend to drive the emergency planning, which is a degree of coercion associated with funding for programs. Don't consider public warning to be - it's just lumped into telecommunications or else, it's lumped into public relations. PIOs, public information officers are the last people you want to have any warning. Because they are always thinking, you know, how is this going to be interpreted? What are the second, or third, or fourth, implications, which is exactly the mindset that you don't want, you know, in decision making process. **Decision making is, you know, you weigh the risk of the phenomenon, you consider side effects -** frequently that's used as an excuse for inaction, Oh, I didn't want to start a panic. Our roads aren't big enough, they'll get clogged

Interviewer: Yeah, that's it's funny that you went down that road because my follow-up to that was, how does a decision maker weigh the potential of a negative outcome versus sending it, right? It really becomes that. at what point is a decision made to quote unquote, pull the trigger

Participant #4: It's a stressful moment. More stressful than it needs to be. Which again, makes me question what our real intentions are in this regard. **Typically, if you're going to both using warning technology at all, that implies the timeframes are constrained.** You don't blow sirens to announce a hurricane because you've got three days. So there's the, you know, and ultimately, I don't mean to be cynical - its a decision of what's going to get people in the least trouble.