From Preparedness to Response:

Managing Inter-organizational Coordination for Emergencies and Disasters

by

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ABSTRACT

Management of emergency or crisis events relies on the collaborative efforts of a wide range of organizations. How to coordinate their efforts becomes a pressing challenge for public administration. This three-essay dissertation informs understanding of public agencies' inter-organizational coordination in preparation for and response to emergencies and disasters.

The first essay provides an overview of emergency coordination research by systematically reviewing the fragmented inter-disciplinary literature on the topic for the past two decades. Through the analyses of 64 articles, the essay maps major theoretical traditions of emergency coordination research and identifies the need for further theoretical explorations. The syntheses of findings from the literature provide empirical strategies for improving response coordination effectiveness. The review reveals that current research predominantly focuses on response coordination with little understanding of coordination at other emergency management phases.

Building upon the first essay, the second essay examines coordination in the preparedness phase. By introducing the configurational approach to emergency management research, the study explores which configurations of organizational attributes – and environmental characteristics – lead to active emergency preparedness coordination. A configurational model for preparedness coordination is proposed along with three propositions. The study conducts a large-N fuzzy-set qualitative comparative analysis (QCA) to analyze U.S. public transit agencies' inter-organizational coordination in

preparation for extreme weather events. Findings demonstrate the value of configurational thinking and suggest the importance of managerial commitment.

The third essay extends the current inquiry on response coordination by reorienting the focus to the role of human agency. Drawing from institutional logic theory, the study identifies the systems of cultural elements (i.e., institutional logic) that affect inter-organizational response coordination actions. Influential managerial practices are also specified. The empirical context of this study is the local government's response to the Covid-19 pandemic in Arizona. Findings demonstrate that coordination actions are under the influence of professional and community logics. Empirical evidence also corroborates the importance of management practices for coordination.

Taken together, the dissertation contributes to emergency management research by engaging novel theoretical perspectives and diverse methodological approaches. It provides actionable strategies for public managers to improve coordination effectiveness.

DEDICATION

I dedicate my dissertation work to my parents who supported me with unconditional love. You gave me strength to face any challenges ahead and inspired me to stay curios, optimistic, and perseverant.

This dissertation is also dedicated to first responders, frontline emergency management, and public health professionals for their work and efforts in the strenuous combat with Covid-19 pandemic. Their passion for public service motivates me to keep researching the complex challenges in the emergency management world.

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CHAPTER 1

INTRODUCTION

From Covid-19 pandemic, monkeypox outbreaks, to the wildfires fueled by heatwaves around the world, hazard risks increase substantially on a global scale. Protecting citizens against the harms of various hazards is a core function of government. Dealing with increasingly transboundary hazards relies on the collaborative efforts of a wide range of organizations. How to coordinate these efforts becomes a pressing challenge for public administration. Coordination is considered as the "most studied but least understood" topic in public administration (Boin & Bynander, 2015). "Coordination failure" has been used as a buzz word to describe every unsuccessful response effort. What does (inter-organizational) coordination mean? What does it entail? How does it take place in practice? How are we able to improve coordination effectiveness when managing emergencies and disasters? This dissertation is motivated by these broad questions and aims to contribute to the conceptual, theoretical, as well as empirical understanding of inter-organizational coordination in emergency and disaster contexts.

Gaps in the Literature

Coordination is a relatively ambiguous construct because it is often used as an umbrella term to describe many different things. For instance, in the literature, information sharing, communication, decision-making, shared mental model, shared situation awareness, common operating pictures, learning, and adaptation are all related to coordination one way or another (Andreassen et al., 2020; Brown et al., 2021; Drnevich et al., 2009; House

et al., 2014). But we are lack of a systematic examination of what these relationships are and how the diverse concepts are related to coordination. Emergency management research focuses discussion of emergency coordination on the structural approach. Researchers analyze coordination network structural patterns (Kapucu, 2005; Kapucu et al., 2010) and the structural debate about the best way to structure emergency coordination – via formal centralized mechanism or informal decentralized mechanism (Buck et al., 2006; Groenendaal et al., 2013; Waugh, 2009). Public administration scholars often treat coordination as a descriptor of collaboration (Boin & Bynander, 2015). The scholarship of collaborative public management (Hicklin et al., 2009; McGuire, 2006; Nohrstedt et al., 2018) and network management (Agranoff & McGuire, 2001, 2003; Brooks et al., 2013), shed light on identifying the incentives that bring about collaborative efforts to address the challenges of extreme events. Emergency coordination is considered as an outcome of organizational, environmental, and institutional factors. Coordination is a research subject for multiple disciplines. The horizon of emergency coordination should be broader than what has been captured by emergency management and public administration literature. Without a comprehensive understanding of inter-organizational coordination, "we risk developing a partial solution to a broad conceptual problem"(Castañer & Oliveira, 2020, p.967). There is an urgent need to engage the interdisciplinary research on the topic and develop a roadmap to guide the fragmented research enterprise.

Theoretically, due to its practice focus, research on emergency management in general fall shorts of engaging diverse theoretical perspectives. Emergency coordination research primarily builds on network theory, organizational design theory and system

theory while neglecting others. Theories are important as they color our lens of inquiry toward a phenomenon. Organizational design theory guides scholars examining the roles of modalities and structures in achieving coordination (Lawrence & Lorsch, 1967; Thompson, 1967). Network theory, on the one hand, illustrates the importance of inter-personal relationships to facilitate coordination (Ancona & Caldwell, 1992; Hansen, 1999; Kale et al., 2000); on the other hand, together with system theory allows scholars to assess coordination at a macro network level (Abbasi & Kapucu, 2016; Abbassinia et al., 2021; Yeo & K. Comfort, 2017). Influenced by the theoretical thinking, strategies are devised to improve coordination via reducing structural inefficiencies and addressing the mismatches between the planned and actual operation networks (Azhar et al., 2019; Yeo et al., 2021). However, coordination is not only about structures. What are the roles of human agency? How does coordination, especially emergent coordination, takes place? These are questions left for further investigation.

Public administration is both a discipline of academic research as well as a field of practice. Aside from extending the human knowledge, scientific inquiry in public administration also aims to inform the practice. Nevertheless, there is a gap between emergency management research and the practice. Current research is unable to articulate mechanisms underlying the "effective" solution or strategy in the field. For instance, pre-incident relationship building, and joint trainings and exercises have long been identified as crucial strategies for improving coordination in the field, and also supported by research (Kristiansen et al., 2019; McNulty et al., 2018). However, through what mechanisms these strategies are efficacious is lack of scholarly attention. Without a clear understanding of

mechanisms, we are unable to make distinctions among all sorts of relationships as well as explain the variations in trainings and exercises' effects, let alone to provide further insights to aid the design of these strategies. Besides, each emergency incident unfolds differently and is context dependent. It requires emergency management research taking the complex and dynamic nature of emergencies into theoretical considerations, which are hardly met by current research. How to further push the emergency coordination research in the direction of generating novel insights for practice is another issue worthy of exploration.

Overview of the Dissertation

The goal of this dissertation is three-fold. First, it aims to develop a comprehensive understanding about emergency coordination by examining related research in diverse scholarly disciplines. The dissertation seeks to providing a structure to systematically organize current knowledge on coordination based on topic themes as well as theoretical traditions. The resulted road map is able to not only sort out various concepts' (e.g., information sharing, decision-making, shared mental model, adaptation, etc.) relationships with coordination, but also identify areas for future research. Second, the dissertation wishes to fill the theoretical void in the current literature and generate new insights for the under researched area. To meet the objective, it introduces novel theoretical perspectives to account for the role of human agency in response coordination and explore the configurations of organizational and environmental factors for active preparedness coordination to occur. Third, the dissertation further bridges the gap between research and

practice by synthesizing the improvement strategies suggested from the interdisciplinary research as well as articulating the core mechanisms for these strategies to be effective.

Specifically, the dissertation starts from a systematic literature review (chapter 2) of the interdisciplinary research on inter-organizational coordination in emergency and disaster contexts. Aside from emergency management and public administration, the review also includes research from information system and decision making, management and organizational studies, psychology and behavioral science, communication, and public health. Through the analyses of 64 articles, the essay identifies major themes of emergency coordination research, uncovers the underlying theoretical traditions, as well as summarizes empirical strategies for public managers to make further improvements. Areas for future research are also discussed.

Two findings of the literature review inform the rest of the dissertation. First, current research, across all disciplines, predominantly focuses on emergency response and left coordination at other phases of emergency management unattended. Second, a significant portion of studies do not use theory to underpin their empirical investigations. Lack of theory points to a cursory investigation of coordination, operating at the broad conceptual level rather than explicating theoretical mechanisms underneath. As Quarantelli noted, "we need more theory and abstract thinking and less mucking around in practical matters and concrete details. The heart of any scientific activity is basic knowledge and curiosity driven, and is not concerned with immediate outcomes or products" (Perry & Quarantelli, 2006).

The second essay (chapter 3) fills the void in research on preparedness coordination by exploring why some public organizations actively coordinate with others in preparation for future crises while others do not. The related collaboration research treats collaboration as an outcome of the joint influences of organizational and environmental factors (Krueathep et al., 2010; McGuire & Silvia, 2010). The use of correlation-based approaches generates inconclusive findings, which suggests a need for further theory elaboration. Inspired by the configurational theory (Fiss, 2011; Ragin, 2000), the study argues that preparedness coordination does not depend on *individual* organizational attributes, but on the alignment (i.e., configuration) of organizational attributes and environmental characteristics. A large-N fuzzy-set QCA is conducted to examine U.S. public transit agencies' inter-organizational coordination in preparation for the extreme weather events. Findings demonstrate the value of configurational thinking and reveals that both top-down and bottom-up mechanisms can achieve active coordination. Managerial commitment is identified as a critical contingency factor for preparedness coordination.

The third essay (chapter 4) extends the current inquiry on response coordination by reorienting the focus to the role of human agency. Drawing on practice theory, the study no longer treats coordination as an outcome, but conceptualizes it as a contextually situated process manifested in individual and organizational actions. The introduction of institutional logics theory allows the study to identify the systems of cultural elements (e.g., cultures, values, beliefs) that influence individuals or organizations' action-taking during response. Results show incompatible professional logics contributing to the frictions in public health and emergency management agencies' collaborative efforts. The sense of

community and emotional attachments create the flexibility needed in coping with emergency incidents. The study also provides empirical evidence for the importance of management practices for facilitating response coordination.

CHAPTER 2

PUBLIC ORGANIZATIONS' COORDINATION IN THE DISASTER CONTEXT: INSIGHTS AND RECOMMENDATIONS FROM A SYSTEMATIC REVIEW

Abstract

Nowadays governments are expected to develop a stronger competency in dealing with increasingly frequent extreme events. Coordinating diverse actors in collective emergency and disaster management effort is at the core of that competency. Current knowledge of inter-organizational coordination in managing emergencies and disasters is fragmented due to the interdisciplinary nature of the field. By systematically analyzing and narratively synthesizing 64 articles within last two decades, this review aims to map the structure of the knowledge and advances the scholarship by identifying major themes of research, exploring the underlying theoretical traditions, as well as summarizing empirical strategies for public managers to make further improvements. The review finds previous research predominantly focuses on response coordination and identifies four theoretical traditions underlying emergency coordination – structural, behavioral, cognitive, and contextually-situated. The identified empirical strategies to aid response coordination center around four cornerstones of emergency coordination, shared understanding of goals and situations, clear role and responsibilities, shared knowledge base, as well as the trusted and collaborative relationship. The study also identifies areas for future research.

Key words: Inter-organizational Coordination, Disaster Management, Emergency Coordination, Systematic Review

Introduction

The need for coordination is undisputed in disaster management. When disaster occurs, it is impossible for a single organization to have all the needed resources, information, and skills to cope with unexpected events (Beck & Plowman, 2014; Ginter et al., 2006; Yeo & K. Comfort, 2017). Managing the dependencies of multiple organizations' activities and integrating them into synchronized efforts becomes an important task as well as a challenge for disaster management. Effective coordination increases operation efficiency by reducing duplicated efforts of engaged agencies (Nolte et al., 2012), minimizing potential conflicts, and producing collective synergies for joint actions (Peters, 2018). On the contrary, lack of inter-organizational coordination often leads to the misallocation of resources, inappropriate ordering of sequential process, and the escalation of crises (Bharosa et al., 2010). Developing a comprehensive view of inter-organizational coordination is beneficial for both the research and practice of emergency management

Diverse streams of research contribute to our knowledge of inter-organizational coordination in emergency and disaster management. Organizational design theory suggests the importance of pre-arranged plans, rules, and standard operating pictures for coordination under time constraints (Lawrence & Lorsch, 1967; Thompson, 1967). While practice-based approach emphasizes the need for improvisation and adaptability in coordinating actions and tasks in dynamic environments (Beck & Plowman, 2014; Faraj & Xiao, 2006; Wolbers et al., 2018) . Public administration literature, such as the research on collaborative public management (Hicklin et al., 2009; McGuire, 2006; Nohrstedt et al., 2018) and network management (Agranoff & McGuire, 2001, 2003; Brooks et al., 2013), shed light on the incentive for coordination and strategies to coordinate the disaster

management network. Besides, research on information system and organizational psychology delve deeper into the mechanisms of information sharing (Andreassen et al., 2020; Bharosa et al., 2010), situation awareness distribution (Power, 2018; Wilkinson et al., 2019), and swift trust building (Beck & Plowman, 2014; Curnin, Owen, Paton, Trist, et al., 2015) during emergencies, which are all important components of coordination process.

As a result of diverse research streams, the current knowledge of inter-organizational coordination in emergency management context is fragmented. Without a broader overview and systematic analysis of the previous literature, "we risk a partial, incomplete view of the literature and thus risk developing a partial solution to a broad conceptual problem"(Castañer & Oliveira, 2020, p.967). Table 1 summarizes previous reviews related to inter-organizational coordination in emergency management context, which denotes a need for a systematic review on coordination for the following three reasons.

Table 1

Prior Reviews of Inter-organizational Relationships in Emergency and Disaster Management Context

Authors & Year	Major construct	Adoption of SLR methodology	Number of articles	Article type	Contextual boundary	Data Source	Time period	Key search terms	Classification variables	Findings
Drabek, T. E., & McEntire, D. A. (2002).	Coordination	No	NA	NA	Phase: Response period	Sociological Abstracts & Hazlit Databases	1984-1999	Disaster Emergent Phenomena (e.g., behavior, norms, structure, organizations), Response coordination	NA	Summarize the definitions of coordination, explicate its importance in disaster context; identify strategies to improve it. Empirical implications for public managers are also provided.
Kapucu et al. (2010)	Collaborative Emergency Management	No	NA	NA	NA	Academic Search Premier, Academic OneFile, Info Track OneFile	NA	CEM, collaborative and emergency and management, collaborative networks, emergency networks, emergency network, interorganizational networks, Interorganizational and networks, intergovernmental and networks, and National Emergency Management Network (NEMN).	NA	Identify major themes in collaborative emergency management research, including leadership, decision making, intergovernmental and interorganizational relations, technology applications.

Steigenberger (2016)	Multi-agency coordination of response operations	Yes	76	Empirical	Phase: Response period Methodological lens: case studies	Google scholar database, Ebsco Academic Search Complete, Sociological Abstracts	NA	"Disaster management", "disaster response", "emergency management" and "emergency response".	Disaster type Socio-economic setting Organizational level in focus Data sources	Pinpoint important factors and contextual contingencies that shape response actions and develops a framework showing how ex-ante and operational condition intertwined to influence cognition, communication, and coordination of emergency response.
Moshtari M., Gonçalves P. (2017)	Collaboration among humanitarian organizations	Yes	28	Empirical & Conceptual	Phase: Disaster relief Organizational type: humanitarian organizations	ABI/INFORM ProQuest, Web of Science, Journal of Humanitarian Logistics and Supply Chain Management.	Before 2015	1. Title, Abstract, Keyword: 'coordinate*', 'collaborate*', 'cooperate*' or 'partnership*' combined with 'humanitarian' or 'relief'. 2. Abstract: challenge*, factor*, inhibit*, determi-nant*, imped*, constrain*, dilemma*, encourage*, problem*, barrier*, hamper*, complexit*, failure*, or success*.	NA	Identify drivers and inhibitors (contextual factors, inter-organizational factors, intraorganizational factors) that influence collaboration among humanitarian organizations.

Nohrstedt et al. (2018)	Inter-organizational collaboration	Yes	74	Empirical & Conceptual	Theoretical lens: Collaborative Public Management	9 High-ranking Public Management Journals & 1 Leading Crisis Management Journal	1990-April 2016	"Collaborative" -> manually decide whether the article brings in collaborative public management theory	Geographic area Level of analysis Hazard type Aspect of collaboration Crisis management phase Collaboration incentive Research design Data collection	Outline major themes in collaborative crisis management literature; synthesize the factors that enable and constrain effective cross-boundary work in relation to extreme events; illustrate how collaborative public management and crisis management literature can cross-fertilize our understanding about collaborative crisis management.
Hu et al. (2022)	Emergency Management Network	Yes	58	Empirical	Methodological lens: Network analysis	44 Public Administration and Emergency Management Journals	1997-2018	NA (Identify network articles about emergency management)	Publication Year Type of emergencies Major themes: Network formation & development Network properties Network performance	Summarize factors driving network formation and development; describe the structural characteristics of EM network; report the performance measures that have been used to evaluate network performance.

First, as Table 1 shows, out of 6 literature reviews that study inter-organizational relationships in the context of emergency management, only one 20-year old review (Drabek & McEntire, 2002) particularly examines coordination. The remainder of the reviews focuses either on collaborative behaviors or on network characteristics, formation, and development. Though there are great overlap between coordination, collaboration and network studies, these reviews cannot draw conclusions about coordination research by design. A review explicitly addressing coordination and summarizing its recent development is needed.

Second, Table 1 shows that two most recent reviews (Hu et al., 2022; Nohrstedt et al., 2018) primarily synthesize findings about inter-organizational relationship in disaster context from public administration and emergency management journals. For the interdisciplinary nature of the topic, understanding of coordination could be further enriched by studies from management, psychology, information system, and other related fields. How these studies further our knowledge of inter-organizational disaster coordination is worthy of investigation.

Third, current reviews are either driven by a particular methodological approach (such as case studies and network analysis), a theoretical framework (e.g., collaborative public management), or restricted to a specific phase of emergency management (e.g., disaster relief, disaster response). These focused reviews offer us valuable insights on coordination but is unable to provide a full picture on the issue. Besides, most reviews (5 out of 6) concentrate on examining influential factors that shape inter-organizational relationships in emergency management context. A systematic review on theories applied

is needed as theories enable us to go beyond the identified factors and reveal the patterns or underlying mechanisms that can better direct future intervention actions (Ward, 2019).

The purpose of this review is three-fold: systematically organizing fragmented knowledge of inter-organizational emergency coordination; informing theoretical understanding about emergency coordination by outlining major theoretical traditions; and synthesizing empirical strategies suggested in the literature to further improve coordination effectiveness. Specifically, the study reviews the research within last two decades and addresses the following research questions:

- What is the current state of research about public organizations' coordination with other actors (both within or outside the public sector) in managing emergencies, crises, or disasters?
- What theory or theories drive our current understanding of coordination on issues related to emergency and disaster management?
- Which strategies have been identified or recommended to improve inter-organizational coordination in disaster management?
- What are the implications for future research suggested by the findings produced from this research initiative?

Method

I conducted a systematic review of the literature following PRISMA statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) to identify the body of knowledge on disaster inter-organizational coordination in the last two decades. The choice

of a systematic review is because it can help to reduce the subjectivity in data collection and analysis found in the traditional literature review (Cacciotti and Hayton 2015; Tatli and Özbilgin 2012) and present the knowledge in a transparent and reproducible manner (Moher et al. 2009).

2.1 Eligibility Criteria

The period reviewed includes studies published from 2002 to 2021. The year 2002 is chosen as the starting point for two reasons. First, September 11 Terrorist Attack is the striking event that draws emergency management scholars to examine response coordination (Comfort & Kapucu, 2006; Schweinberger et al., 2014); Second, "Emergent Phenomena and Multiorganizational Coordination in Disasters: Lessons from the Research Literature"(Drabek & McEntire, 2002) -- the first study synthesizing the previous work on inter-agency coordination and influencing the conceptualization of coordination in the disaster research (Comfort, 2007; Martin et al., 2016; Raju & Becker, 2013) -- is published in 2002.

To ensure the highest quality and scholarly standards, I considered only peer-reviewed articles published in well-known journals (impact factor greater than 1). Work that appears in books, book chapters, and conference papers were excluded. As mass rigorous scholarly publications are likely to appear first in peer-reviews journals, excluding books and book chapters can help to reduce double counting. Articles that went through peer-review process in good-quality journals could be regarded as credible and enhance the quality of a systematic literature review (Hilligoss and Rieh 2008; Newbert 2007). However, I do recognize by limiting the focus to peer-reviewed articles might have led to

a small handful of potentially seminal work being excluded. Besides, the review includes both empirical and conceptual studies written in English. Empirical papers must include public sector organizations as part of the study subjects. Appendix S1 shows the detailed eligibility criteria.

2.2 Conceptual Boundary

Before delving into the literature search there is a need to establish the conceptual boundary for the review. With the interests of examining research on public agencies' coordination in management of emergencies, studies included in the review only focus on inter-organizational working relationships involving public sector organizations. Research that concentrates on intra-organizational coordination, the coordination among humanitarian and private sector organizations (Martin et al., 2016), or coordination in the policy or governance context (Brattberg, 2012; Kettl, 2003; Morris et al., 2007) are beyond the scope of the review.

Besides, emergencies here refer to occasions or instances that warrant action to save lives and to protect public health and safety (FEMA, NA). They include routine emergencies (such as house fires, traffic accidents) as well as crisis incidents or high-profile hazards, including hurricanes, earthquake or any other natural or man-made catastrophes (Leonard & Howitt, 2007). Using this definition, studies that focus on personal safety issues (e.g., domestic violence and mental health crises) as well as wars, refugee crisis, food security, are excluded.

Drawing conceptual boundary for coordination is challenging for two reasons. First, coordination is a process that brings organizational actions into synchronized efforts. It

entails an array of distinct actions, such as information sharing, resource sharing, collective decision-making, building shared mental models, etc., all of which are standalone research topics. Studies examining the behaviors or sub-processes of coordination will only be included in the review when authors explicitly discuss the findings' implications for disaster coordination.

Second, there is no common understanding about the distinctions between coordination and other forms of inter-organizational relationships, such as collaboration and cooperation (Boin & Bynander, 2015; Nolte et al., 2012; Okhuysen & Bechky, 2009). One view considers coordination, collaboration, and cooperation describing the same phenomena -- bringing organizations together to carry out tasks. In this view, these three terms can be used interchangeably (Valecha, 2020), coordination is a descriptor of collaboration (Boin & Bynander, 2015). Another view perceives collaboration as an umbrella term for coordination and cooperation (Gulati et al., 2012, p. 201). Cooperation, coordination, and collaboration lie on a continuum with an increasing level of embeddedness and density of interactions among organizations (Keast et al., 2007; Martin et al., 2016; McNamara, 2012). Coordination points to the strategic actions in terms of aligning, organizing and differentiating different actors' activities to achieve a shared goal, but does not contain high level of mutual dependence as collaboration does (Nolte et al., 2012). Furthermore, some conceptualizes collaboration as a mechanism to achieve the coordination of policy and governance (Peters, 2018). Multi-level coordination actions in the governance context also include joint measures and co-management, which are behaviors of collaboration (Hovik & Hanssen, 2015; Klijn et al., 2010).

To delineate a boundary for the review, I follow Drabek & McEntire (2002) and Comfort (2007), and conceptualize coordination as the alignment of inter-organizational actions to achieve a shared goal. The alignment here particularly refers to the enactment of behavioral, cognitive, and structural mechanisms that enable organizations to sequence, synchronize and integrate their efforts (Power, 2018). This emphasis on the alignment of actions makes coordination distinct from other concepts.

2.3 Search Strategy & Record Selection

As disaster inter-organizational coordination is an interdisciplinary research field, I undertook article searches using several electronic databases, including Web of Science, Scopus, ProQuest's Social Science Premium Collection, and Business Premium Collection[1]. Aside from the electronic databases, I also identified a list of Public Administration and Emergency Management journals, which would be used to supplement the database search.

The search starts from compiling a list of key search terms. As the review focuses on papers studying "inter-organizational" and "coordination" in "disaster" scenarios, I gathered an initial list of keywords by identifying synonyms of these three words. Then, I consulted five emergency management experts in US, Europe, and Asia about the initial search terms as well as the preliminary list of journals. I further included other variants of

[1] ProQuest's Social Science Premium Collection and Business Premium Collection contain a comprehensive list of databases in politics, sociology, education, and business management respectively, including PAIS Index, Social Science database, Policy File Index, ABI/INFORM Collection, Asian & European Business Collection etc.

the keywords as well as related concepts in the search based upon the experts' feedback. For example, one expert mentions coordination often has been used interchangeably with collaboration, so I added "collaboration", "cooperation", and "communication" in the search to ensure the comprehensiveness of the search. Appendix S2 shows the final key words and search strings. As different databases index research differently, I performed the key terms search in Scopus and Web of Science, while combining the use of key terms and subject headings in the searches within ProQuest Business Premium Collection and Social Science Collection.

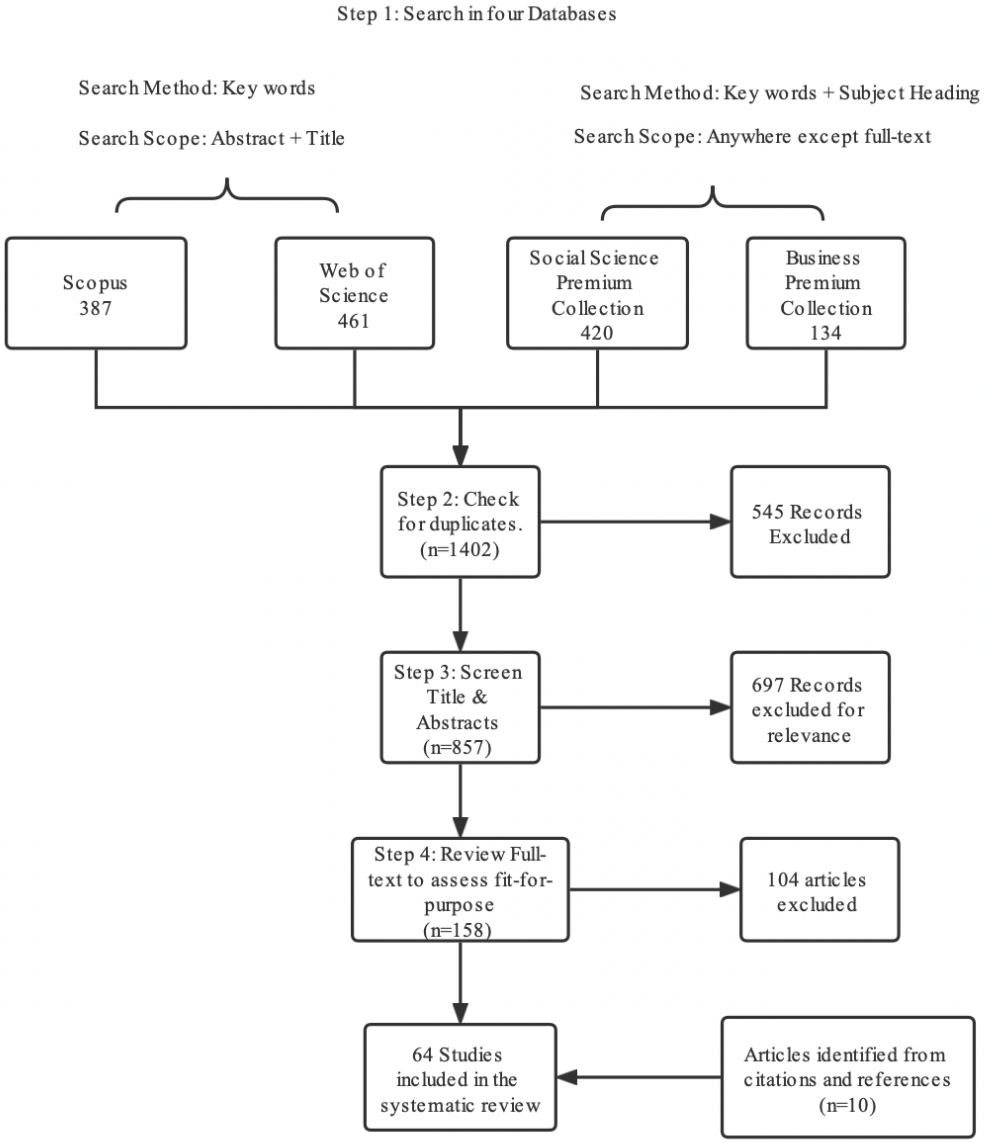
The initial search conducted in these four databases identified 1402 articles as potentially relevant for analysis. The identified articles were imported to reference management software Mendeley for duplication check. By using Check for Duplicates Command in Mendeley, I reduced the initial 1402 studies to 857. Next, I reviewed the abstracts and titles of these 857 studies to assess against criteria of quality and relevance. Papers published in journals with impact factors less than one were excluded. Relevance is assessed upon four criteria: (1) whether the study involved emergency or disaster context; (2) whether the subjects of empirical study contain public agencies; (3) whether the study is at the organizational level; (4) whether the study examines inter-organizational relationship, such as coordination, collaboration, network, etc. This process reduced the number to 160 articles for the selection stage of the review.

Finally, I scrutinized the full-text of 158 articles for the fit-for-purpose criteria (see Appendix S3 for details). Fit-for-purpose criteria provide a manual about how to operationalize the conceptual boundary of coordination. While reading through the full-texts and conducting the analysis, 10 relevant articles identified in the references were

further added to the sample to ensure the comprehensiveness of the sample. Figure 1 shows the whole process of search and screening. The final sample contains 64 articles. As the results of database search covered all the pre-identified public administration and emergency management journals, no journal-based search is further needed.

Figure 1.

Preferred Reporting Items of Systematic Reviews and Meta-Analysis (PRISMA) flowchart for the Article Search Process



2.4 Analysis

To address the research questions, I combine the deductive coding with inductive coding to analyze the data. Deductive coding is primarily used to extract key information about each study's context, research design, and theory. Context information includes year

of publication, journal name, field of the journal, incident type, emergency management phases, country of study. Research design section records papers' research design (quantitative, qualitative, mixed-method research), research type (empirical, conceptual, review), paper classification (exploratory or confirmatory research), data collection method, and data analysis method. Theory section denotes whether this study uses theory, which theory or theories it engaged, and core constructs under examination. All these information is recorded in a worksheet, which I have checked carefully for potential errors.

For inductive coding, I write memos to summarize the core ideas and arguments of each paper and do in-depth line-by-line coding for both memos and papers through Nvivo 12. The coding focuses on identifying and categorizing the concepts used in the study, the connection between the concepts, theories engaged to build arguments, as well as the empirical strategies relevant to improve coordination effectiveness. A narrative synthesis is conducted to interweave and present findings about themes, theories, and strategies, which allows researchers to bring coherence to the data and identify story underpinning a disparate and fragmented body of research (Bailey et al., 2017; Zahoor et al., 2020).

Results

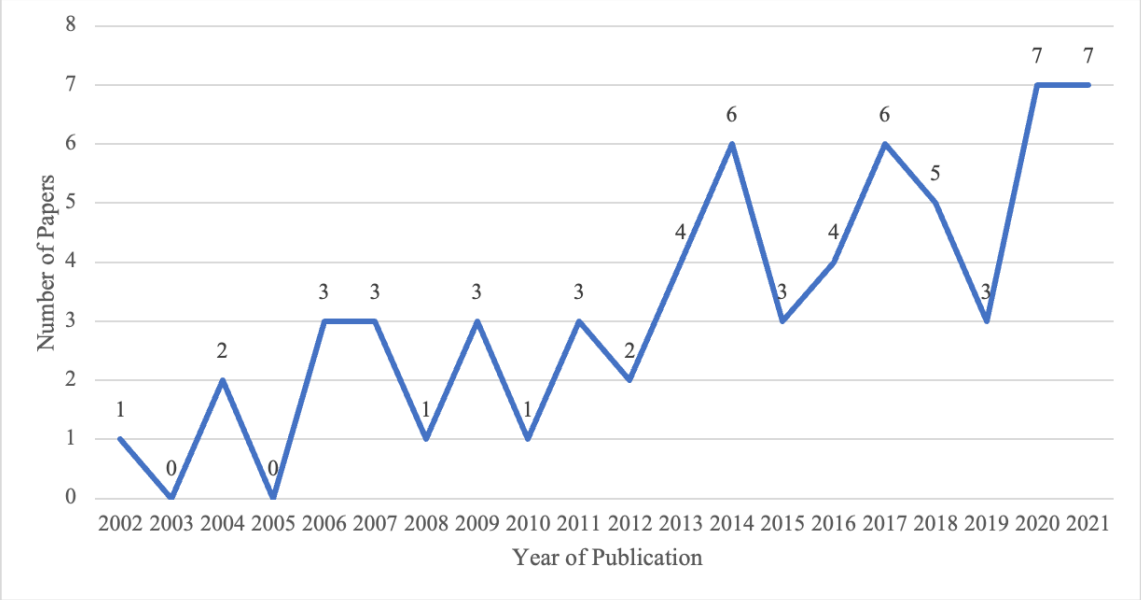
3.1 Current State of Research

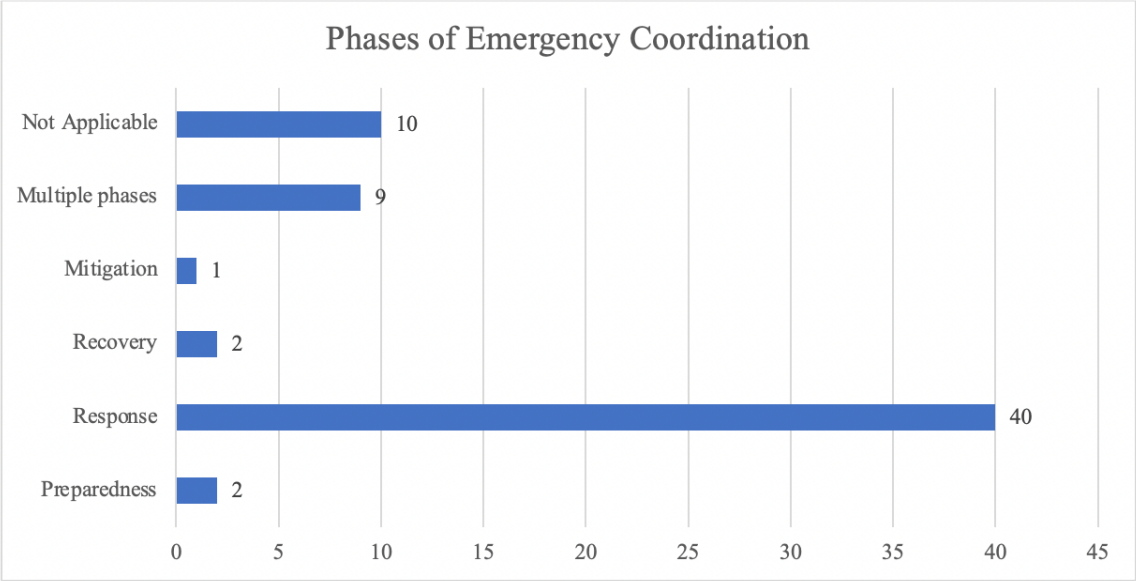
The distribution of articles on inter-organizational disaster coordination in 38 journals is shown in Appendix S4. The fields of published journals mainly include disaster and emergency management, management and organizational study, public administration, human factors and ergonomics, and information system. As 2002 is chosen as the starting

year, the number of articles has increased (see Figure 2). Almost three quarters of the articles (73.4%) in the review sample were published in the last decade. A recent upsurge is also noted, as 44% of articles were published between 2017 and 2021.

Figure 2

Distribution of Publications by Years and Emergency Management Phases (2002-2021)





In terms of the methodological orientation, most of the selected studies are empirical (n=57/64), while review paper (n=4/64) and conceptual paper (n=3/64) take part around 6% and 5% of the total sample. More qualitative (n=29) than quantitative (n=14) and mixed-method studies (n=14) were presented. Single (n= 14) and multiple-case designs (n= 6) have been widely adopted in the research. The qualitative designs employed primarily include exploratory single-case study (n=12), multiple-case study (n=5), and grounded theory (n=4). Quantitative studies are primarily driven by social network analysis (n=8) and regression analysis (n=4). Among all the papers in the sample, social network analysis (n=17) is the most popular method used to analyze inter-organizational coordination.

The review sample shows moderate heterogeneity in geographic regions. Empirical studies in the review sample cover 16 countries in five different regions, as shown in Appendix S5. And all the papers conducted research in one country, which indicates a lack of cross-country comparative perspective in understanding inter-organizational

coordination in the management of disasters and emergencies. A significant amount of research has focused on US (n=25), followed by UK (n=7), Australia (n=5), and Netherland (n=4), limited focus remained on developing countries (n=14). With respect to the phases of emergency management, as shown in Figure 2, the focus is predominantly on response coordination as 49 studies in the sample examines inter-organizational coordination in response periods. In comparison, research completely dedicated to preparedness (n=2), recovery (2), and mitigation (n=1) are minimal. With respect to incident types, a large portion of studies (16/44) gather data through examining exercises and simulations, followed by studies focused on natural hazard (n=14) and man-made disasters (n=12). Lastly, for data collection, half of the research (n=32) use multiple methods to collect data, such as interview (n=36), document/archive (n=19), field observation (n=15) and survey(n=14), etc.

3.2 Thematic Mapping of Coordination Research

In addition to the trends discussed above, the analysis provides insights into the thematic topics covered in emergency coordination research. Current research could be categorized into three major themes, coordination assessment, coordination activities and practices, and influential factors for inter-organizational coordination.

Coordination Assessment. The first stream of research (N=15) primarily takes a network perspective to assess inter-organizational coordination (N=11), particularly response coordination (N=8). These studies focus on identifying central actors and analyzing structural characteristics of the emergency operation network, which might point

to problems or gaps in coordination. Through analyses, scholars consistently find governmental actors as the central actors in coordinating information and resources (Azhar et al., 2019; Chen et al., 2020). Nonprofit organizations sometimes serve as boundary spanners, but mostly reside in the peripheral side of the structure (Azhar et al., 2019; Li et al., 2020; Yeo & K. Comfort, 2017). Therefore, scholars argue one of the gaps in current coordination practice is the lack of engagement of NPOs in planning and response processes. Besides, they also find the actors designated with legal responsibility and authority to organize emergency operations might not be the ones taking the lead in practice (Azhar et al., 2019). The discrepancies between the plan enactment and implementation create confusion for response and challenge coordination.

As for the examination of structural characteristics, though varying on the choices of network metrices, the level of fragmentation and centralization are two primary interests of network analyses. Emergency operation networks are often highly fragmented and become decentralized over time (Abbasi & Kapucu, 2016; Lu et al., 2021; Yeo & K. Comfort, 2017). Scholars argue that the high-level fragmentation, indicated by the large number of isolates and components, low network density, and the core-peripheral structure, point to the problems of underutilization of resources (Abbasi & Kapucu, 2016; Yeo & K. Comfort, 2017), information discontinuity, as well as the lack of cohesion across involved actors. Scholars make these normative assessments primarily based on theoretical interpretations of network measures with no substantive knowledge of response efforts engaged (except for Opdyke et al., 2017).

Coordination Activities and Practices. The second stream of research investigates specific activities or practices that are integral part of or contributing to inter-organizational

coordination, such as information sharing, joint decision-making, and boundary spanning activities. These studies entirely focus on coordination at the response stage. Information sharing, as a coordination activity, receives a lot of attention in the coordination research. Lack of timely information (Anthony et al., 2014), information underload or overload (Beck & Plowman, 2014), and the information gap across different operational units all make it challenging to mobilize a coordinated response (Comfort, Dunn, et al., 2004). To address these challenges, scholars comprehensively examined the influential factors for information sharing during emergency response. Technological factors (Aros & Gibbons, 2018; Beck & Plowman, 2014; Militello et al., 2007), organizational differences in cultures, roles, and procedures (Steigenberger, 2016), institutionalized incentive mechanisms and supporting environments (Bharosa et al., 2010), as well as familiarity and trust (Bdeir et al., 2013) are all found impactful for information sharing.

Joint decision-making is a cognitive process to coordinate efforts in a multi-agency setting, which later contributes to synchronized actions. Several studies examined the difficulties or barriers for effective joint decision-making (Drnevich et al., 2009; Power & Alison, 2017; Waring et al., 2020). For instance, individuals have the tendency not to make decisions based upon situational cues but on their organizational affiliation at the early-stage response (Drnevich et al., 2009). Redundant deliberation delays decision-making (Waring et al., 2020). Similar to information sharing, trust and familiarity, and organizational culture also shape decision-making. Moreover, clarity of goals affects decision-making quality through directing human or organizational behaviors, and thus influencing inter-organizational coordination effectiveness.

Boundary spanning refers to activities reaching across organizational boundaries and bringing together available resources and capacities to align actions and jointly solve problems (Ansell et al., 2010; Kalkman, 2020). Research on boundary spanning primarily concentrates on articulating boundary spanners' (i.e., liaison officers) activities during response (Kalkman, 2020; Sisco et al., 2019), skills needed to accomplish these tasks (Kalkman, 2020; Sisco et al., 2019), as well as influential factors (Curnin et al., 2014; Curnin, Owen, Paton, & Brooks, 2015).

Aside from these routine coordination activities, this stream of research also investigates the emergent coordination practices (N=6). By observing what gets practiced in the real-world operations, these studies try to identify practices contributing to smooth coordination (Andersson et al., 2014; Brooks et al., 2013; Kristiansen et al., 2019) as well as delineate processes of how emergent coordination unfolds (Beck & Plowman, 2014; Wolbers et al., 2018).

Influential Factors for Coordination. Unlike research tackling into micro-level activities or macro-level structural patterns of coordination, this stream of research (N=16) is at the meso-level, and explores factors that impede or facilitate inter-organizational coordination in emergency management context (Bahadori et al., 2017; Drabek & McEntire, 2002; Steigenberger, 2016).

Several studies look into the correlates of agencies' coordination activities at preparedness stage and find managerial perceptions of risk (Lee & Mossberger, 2009), organizations' relational characteristics (e.g., number of connections, strength of relationships) (Hossain et al., 2011), as well as funding and designated coordinator (Kano & Bourque, 2008) as influential factors. Besides, research also examines cross-sector coordination at response

and recovery stages. The wide acknowledgement of the need for coordination as well as the pre-existing working relationships motivate coordination and collaboration across sectors (Kapucu et al., 2021; Nolte et al., 2012; Raju & Becker, 2013). Lastly, the role of leadership, particularly leadership styles and strategies, in shaping coordination has also been loosely discussed in the literature (Uhr, 2017; Wukich & Robinson, 2013).

As current research predominantly concentrates on inter-organizational coordination at response stage. Only five studies in the sample assessing coordination in emergency management phases in exclusion to response coordination. With little knowledge about inter-organizational coordination in other phases, the following analyses of theoretical foundations and identification of the empirical strategies in this review are restricted to response coordination. Second, it is also important to note that *coordination activities and practices* and *influential factors for coordination* are not mutually exclusive themes. Research in coordination activities and practices also contain analyses of influential factors for specific coordination activities. Current research primarily addresses questions of what factors matter. Why these factors matter requires a deeper theoretical understanding about the nature of coordination.

3.3 Theoretical Traditions of Emergency Coordination Research

"It is the theory which decides what we can observe"

Albert Einstein, Physics and Reality

Theories color our lens of scientific inquiry. Table 2 maps the landscape of theories applied in emergency response coordination research. Among 49 response coordination research, almost a third of them (N=14) do not include any theories. From the rest of research, four primary theoretical traditions emerge -- structural perspective, complex adaptive system theory, cognitive perspective, and practice approach. They each capture a specific characteristics of response coordination and address the question how coordination takes place differently. In each section, the discussion will start from a brief review of the core idea of the theoretical approach, its recent application in emergency coordination research, and how it contributes to the understanding about inter-organizational response coordination.

Table 2

Mapping the Landscape of Theories

Theoretical Tradition	Main constructs or topics	How the theoretical approach informs understanding about coordination	Selected examples
Structural Perspective (N=8)	Incident Command System Structure of response network Structure of disaster management system Trust & control	Coordination is about addressing task interdependencies, which relies on careful design and arrangement of roles, modalities, structures, as well as their contingent relationships with environment.	(Buck et al., 2006; Celik & Corbacioglu, 2016; Gil-Garcia et al., 2016)
Complex Adaptive System (N=8)	Socio-technological system Information sharing Auto-adaptation	Coordination occurs in the process of self-organization. Empowering self-organization processes as well as identifying inefficiencies of whole	(Bdeir et al., 2013; Chen et al., 2020; Comfort, Ko,

	Network evolution	response network could aid response coordination.	et al., 2004; Comfort & Kapucu, 2006)
Cognitive Perspective (N=5)	Decision-making Shared mental model Goal-setting	Coordination could be achieved through a cognitive mechanism, through agreeing on a shared goal for the operation, developing a shared mental model to obtain situation awareness, as well as making decisions in a collective effort.	(Drnevich et al., 2009; Power & Alison, 2017; Waring et al., 2018, 2020)
Practice Approach (N=5)	Leadership behavior Collaboration practice Articulation practice Self-organization action	Coordination refers to contextually situated and temporally unfolding work processes, which varies across individuals' engagement with routines or structures.	(Andersson et al., 2014; Beck & Plowman, 2014; Brooks et al., 2013; Wolbers et al., 2018)
Miscellaneous Theories (N=9)	Boundary spanning Leadership ideals Coordination challenges Communication ecology	NA	(Bharosa et al., 2010; Brown et al., 2021; Curnin & Owen, 2014; Uhr, 2017)

Note. 14 response coordination studies do not use any theory.

3.3.1 Structural Perspectives

From a structural perspective, inter-organizational coordination takes place through a careful organizational design (Lawrence & Lorsch, 1967; Thompson, 1967). Though initially developed to address the task interdependencies in stable environments, structural perspective argues after characterizing various contingencies and carefully designing structures, protocols, routines, and plans, organizations are capable of dealing with external turbulences (Malone et al., 1999; Malone & Crowston, 1994). Informed by this perspective, a command-and-control managerial model, relying on the formal and structural

mechanisms (e.g., pre-defined objectives, tasks, and authority structures) to achieve coordination, has been widely adopted by emergency management community of practice. However, this design-centric perspective has been challenged for the feasibility to prescribe structures coping with dynamic, unpredictable, and complex disaster incidents. Compared to the "rigid", centralized "command and control" approach, disaster scholars prefer a network-based approach to coordination. They argue that flexible network structures together with informal coordination mechanisms (including improvisation, adaptation, and mutual adjustment) make network-based model more capable of adapting to the needs of emergencies and crises (Dynes, 1994).

The debate of these two opposing theoretical models of coordination has informed coordination research in last two decades. By assessing their real-world applications, scholars find neither a command-and-control structure (e.g., incident command system in the US) nor a network-based coordination approach (e.g., crisis management system in Norway) is sufficient for effective coordination (Buck et al., 2006; Wimelius & Engberg, 2015). Instead, integrating the two is a critical success factor in emergency response.

Command-and-control and network-based coordination models are seemingly contradictory, as they require different organizational structures (i.e., hierarchy versus network), coordination mechanisms (i.e., formal versus informal), and motivational incentives (i.e., obligatory command versus voluntary participation). But empirical evidence suggests they are compatible with each other. For instance, Beck and Plowman find (2014) the real-world response operations are organized in a hybrid form of hierarchy and network, where network structure is embedded within bureaucratic hierarchy. ICS is not as rigid as some scholars imagined because incident commanders can constantly

change the structures of the operations and re-specify the roles, positions, and relationships. This helps ICS capitalize on the efficiency and control benefit of bureaucratic structure while reducing the inertia (Bigley & Roberts, 2001).

Besides, formal coordination mechanisms (e.g., plans, rules, and SOPs) are not in antithetical to informal coordination acts (e.g., improvisation and mutual adjustment). Because they serve complementary functions --- former specifies the roles, goals, and standards of operations, while the latter are about strategies to implement them (Andreassen et al., 2020). One example is that pre-disaster planning provides organizations with knowledge about their partners' roles, responsibilities, and capabilities, and these knowledge are critical to develop feasible improvisation strategies (Raju & Becker, 2013). With respect to motivational incentives, Kalkman and de Waard (2017) find control measures are able to reinforce rather than harm the trust. Even when initial relationship is mandated, and not built upon voluntary basis, trust begins to develop and conducive to create synergic efforts after its establishment.

By focusing on the roles of modalities and structures and their contingent relationships with environment, structural perspective provides a structural mechanism to address response coordination. Though falling short of adapting to the needs of unpredictable and dynamic environments, pre-specified plans, roles, and routines are able to reduce cognitive processing, facilitate rapid action-taking and increase the response efficiency. Structural perspective provides a general guide for emergency response efforts by informing the design of disaster management systems and the assessment of managerial approach. The integration of command-and-control and network-based coordination models has been suggested as a critical success factor. However, how to integrate the two

models needs further research, particularly a closer examination on the role of human agency.

3.3.2 Complex Adaptive System Theory

One of the most frequently applied theoretical framework in current emergency coordination research is complex adaptive system (CAS), a theory derived from complexity science. Complex adaptive systems operate on the edge of chaos and consist of interdependent agents, who work in parallel with each other while collectively shape the operation and status of the system (Beck & Plowman, 2014; Holland, 2006). Every response network is a complex adaptive system. And inter-organizational coordination takes place in the process of self-organization, which is a defining feature of CAS.

Self-organization denotes a process for organizations to continuously learn, make adaptations, and align their functions in response to unfolding crisis events without a higher-level coordinator (Kauffman, 1993). To identify viable means to improve response coordination, scholars explore what enables self-organization and what self-organization practices consist of in crisis response. Current discussion of enablers predominantly focusses on the role of information and information infrastructure (Comfort, Dunn, et al., 2004; Comfort, Ko, et al., 2004; Comfort & Kapucu, 2006), as they are key to build learning and adaptive capacity for self-organization. Comfort and colleagues examined the appropriate design principles for socio-technical system (e.g., decision-support system) to address major difficulties in response operations (Comfort, Dunn, et al., 2004). They also investigated information sharing practices that might aid the self-organization and increase response efficiency (Comfort, Ko, et al., 2004). Though these studies greatly extend our

knowledge about emergent coordination, we still know little about what other non-information related factors might empower self-organization. As for self-organization practices, co-location, experimentation, deployment of portions of a portable structure, and the creation of superordinate goal have been identified by Beck and Plowman (2014) after investigation of a successful response to the Columbia Space Shuttle incident. This is the only study on this topic. More studies are needed to be grounded in empirical observations to identify self-organization practices and understand how the process unfolds in practice.

As CAS also suggests agent-level adaptation and interactions determine the system behaviors, examining emergent and dynamic network interactions is considered an effective way to garner insights about overall response coordination (Bdeir et al., 2013, Celik & Corbacioglu, 2016, Chen et al., 2020). Another stream of emergency coordination research combines CAS with network theory to assess the effectiveness of response coordination. Theoretically speaking, a comprehensive investigation of network interactions might involve the assessment of network structures, emergence of new behavioral forms, frequency of the interactions, successful or failed interaction attempts, etc. Current research, informed by the theory of centrality (Freeman, 1978), centralization (Bavelas, 1950), weak ties (Granovetter, 1983) and many others, primarily focuses on identifying central actors (Opdyke et al., 2017), comparing planned and response network (Azhar et al., 2019), as well as describing the network structural characteristics (Abbassinia et al., 2021; Li et al., 2020). The multidimensional "interaction" has been operationalized as the presence of network ties in a static structure. The rich content of CAS theory, particularly its emphasis on dynamism, has not been fully explored in current empirical research

Unlike structural perspective leveraging structural arrangement to achieve coordination, CAS theory acknowledges that coordination takes place in constant interactions among internal agents, systems, and external environments. Organizations' self-organization will guide the system toward a status of order. CAS shifts focus from static structures to dynamic interactions. However, current empirical research hasn't revealed how self-organization takes place and fail to capture the dynamism of interactions.

3.3.3 Cognitive Perspective

Cognitive theories have long been applied to study emergency management operations, such as nationalistic decision-making theory (G. Klein, 2008; G. A. Klein et al., 1989), sensemaking theory (Weick, 1995). From a cognitive perspective, inter-organizational coordination takes place in the process of joint decision-making and requires the formation of a shared mental model. Within last two decades, cognitive theories extend coordination research by (1) uncovering how behavioral tendencies and cognitive factors shape crisis decision-making (Drnevich et al., 2009; Waring et al., 2020); and (2) exploring how shared mental model influences coordination activities and commitment (Waring et al., 2018).

By examining decision-making behaviors of agency representatives at joint operations center, Drnevich and colleagues (2009) find, due to professional training and the reliance on routine to deal with uncertainties, representatives from various agencies tend to make decisions based upon their organizational affiliation rather than situational cues at the early-stage response. This behavioral tendency could easily lead to flawed decision-making at the start of crises. Besides, Waring and colleagues (2020) find

multiagency group has a tendency to revert back to information sharing rather than forming an action plan. The decision-making inertia can easily delay coordinated response actions. Moreover, some operational goals shared by responding agencies, such as “save life”, are found problematic for decision-making, because they are too vague to direct behaviors toward synergic efforts (Power & Alison, 2017).

Compatible mental models are critical to team behaviors, such as coordination (Salmon et al., 2011). People rely on their mental models to interpret the information, conceptualize problems, and make sense of the unfolding events (Comfort, 2007). Drawing from relevant cognitive theories, such as data/frame theory (G. Klein et al., 2006a, 2006b) or representational gap (Kozlowski & Ilgen, 2006), the shared mental model among the response teams facilitates coordination through creating a common interpretation scheme of which information is relevant for each other’s work and deserve sharing (Waring et al., 2018).

Cognitive perspective reveals that coordination is not only a structural or behavioral process, but also a cognitive process. Aside from structural mechanisms, coordination could also be achieved through designating a shared goal, formulating common information interpretation scheme, and developing compatible mental model. With shared situation awareness, agreed task priorities, and clear roles and responsibilities, actions each agency takes to pursue the common goal are intrinsically integrative. Compared to structural and system approaches, cognitive perspective acknowledges the importance of human agency and team processing in shaping coordination effectiveness. And its findings can be directly used to improve public organizations’ training and exercise programs. However, the examination of coordination from cognitive perspectives are relatively

sporadic. More cognitive theories could be further applied to examine emergency coordination.

3.3.4 Practice Approach

Practice approach acknowledges the centrality of people's actions in producing organizational reality and is against the view of overemphasizing the role of rules and structures in explaining working activities (Feldman & Orlikowski, 2011). From a practice perspective, coordination takes place through contextually situated and temporally unfolding work processes (Faraj & Xiao, 2006). "Coordinated actions are enacted within a specific context, among a specific set of actors, and following a history of previous actions and interactions that necessarily constrain future action" (Faraj & Xiao, 2006, p.1157). Coordination varies each time because organizational rules and routines unfold differently when interacting with different individuals, specified in a different context, or succeeding different actions. Practice approach highlights the temporally unfolding and contextually situated nature of coordination.

As grounded in the observation of practice, practice approach is powerful in identifying emergent practices contributing to coordination. For instance, through examining how state-level emergency managers operate during crises, Brooks and colleagues (Brooks et al., 2013) find their situated articulation practices help to reconfigure an area's networks and capacities, and coordinate work across governmental levels, as well as various coordination domains. Moreover, McNulty and colleagues (McNulty et al., 2018) identified leadership behaviors that might facilitate inter-organizational coordination, such as showing high level of respect and deference to others' expertise and authority, not taking

any blame-avoidance or ego-driven behaviors, and sparing no efforts in assisting other partners' work. All these newly identified practices have implications for the design of exercises and trainings.

Moreover, practice-based approach is capable of articulating the contextualized mechanism underlying emergent coordination, which might challenge conventional wisdom of coordination. For instance, pre-existing working relationships are long considered as a critical factor for successful coordination (Kristiansen et al., 2019; McNulty et al., 2018), because it is difficult to build trust on site. However, in the response to Columbia Space Shuttle disaster, strangers who have never worked with each other before, quickly work across organizational boundaries and achieve successful collaboration and coordination. Scholars find the urgence of the scenario, especially individual actor's vulnerability during the time, will generate situation-based swift trust based upon each organizations' responsibility. Facilitated by the self-organizing actions, such as co-location, experimentation, deployment of portions of a portable structure, and the creation of superordinate goal, situation-based swift trust is possible to be transformed into relationship based conventional trust, which furthers our understanding about trust building during crisis response.

Practice-based approach, to some extent, is a reaction to the earlier emphasis on structural features in explaining coordination while neglecting the agentic capacity of individuals. With a focus on organizational practice and trajectories, it is a good complement for macro theories, like complex adaptive system and structural approach. However, with the emphasis on contextuality of coordination, to what extent the identified practices could be applicable elsewhere needs further examination.

To summarize, these four theoretical traditions highlight different characteristics of coordination and provide insightful yet different answers to a core question – how does inter-organizational coordination takes place during emergencies? Structural perspective of coordination focuses on the roles of modalities and structures, and their contingent relationships with environment, in addressing task interdependences. Complex adaptive system approach stresses the dynamic and emergent nature of coordination. From a CAS perspective, coordination occurs in the process of self-organization. It can be further improved by empowering self-organization processes as well as identifying inefficiencies of whole response network. Cognitive perspective and practice approach acknowledge the importance of human agency in shaping coordination. Coordination could be achieved through a cognitive mechanism, through agreeing on a shared goal for the operation, developing a shared mental model to obtain situation awareness, as well as making decisions in a collective effort. Lastly, practice approach conceptualizes coordination as contextually situated and temporally unfolding work processes. It is path dependent and varies across individuals' engagement with routines or structures.

Empirical Strategies for Improving Response Coordination

Apart from outlining different theoretical mechanisms to achieve response coordination, another interest of this paper is to synthesize strategies suggested from previous research on improving the effectiveness of coordination. These strategies fall into four domains: institutional design and role structure, information sharing and information

technology, training and exercise, as well as leadership behaviors. The discussion not only includes which action items or principles are suggested, but also articulates the underlying mechanisms for them to take effects. And these underlying mechanisms further points to four antecedents of response coordination.

4.1 Institutional Design and Role Structure

As a series of emergency coordination research is informed by structural perspective, scholars identify two empirical strategies to improve coordination via creating institutional mechanisms and designing role structures.

Use institutional mechanism to create incentive for coordination, sustain common knowledge, and specify roles and responsibilities. Emergency or disaster incidents can easily become politicized. The fear of being disadvantaged in the "blame game" might discourage coordination. Research finds providing institutional support, such as a law, regulation or a higher authority obliging cross-agency information sharing, is critical to incentivize cross-agency coordination (Bharosa et al., 2010). Besides, building an institutional repository to store the common knowledge about roles, tasks acquired from each response, is beneficial for long-term learning as well as addressing the coordination problems due to personnel turnover (Raju & Becker, 2013). Lastly, having a designated plan is a must for emergency operations. The plan is responsible for specifying roles and responsibilities of each participating organization. Scholars advise that future planning processes are encouraged to involve more nonprofit and private organizations (Li et al., 2020)and integrate "what if" thinking to specify contingencies as detailed as possible (Brooks et al., 2013).

Designate boundary spanners. A particular role structure design that has been strongly recommended by scholars is to designate boundary spanners (i.e., liaison officers). Boundary spanners are individuals who are trained to relay information and coordinate actions across organizational boundaries during emergency response (Curnin et al., 2014; Gil-Garcia et al., 2016; Power, 2018). Designating boundary spanners could aid response coordination by reducing communication barriers, building common operating pictures (McMaster, Baber & Houghton, 2007; Power, 2018), and strengthening trust and confidence across organizations (Alvinius et al., 2010; Kalkman et al., 2018). Having a boundary spanner could also improve the quality of decision-making by reducing cognitive loads on central commanders (Brown et al., 2021). Competent boundary spanners share the following characteristics: open-minded, sensitive to partners' concerns, politically sophisticated to navigate complex environment, as well as have enough power and authority to represent their own organizations in a multiagency setting (Brown et al., 2021; Curnin et al., 2014; Kalkman, 2020). Managers are encouraged to provide those competent boundary spanners with long-term deployment to make their work successful (Kalkman, 2020).

4.2 Information Sharing and Information Technology

Information functions (search, exchange, and feedback) are core to the success of response coordination. The capacity of self-organization depends on communication channels and feedback patterns. Therefore, research on sociotechnical system, information system, as well as organizational psychology delves into the design of technological system, the use of information artifacts, as well as information sharing practices to devise strategies.

The proposed information-related strategies aim to improve coordination primarily through increasing shared situation awareness across organizations.

Adapt the design of technological system to accommodate the fluctuating and unpredictable circumstances as well as meet the needs of real-time information sharing across command and jurisdictions levels. Emergencies or disasters often disrupt information infrastructures. Thus, the technological system needs first to be built upon a resilient infrastructure. For instance, internet is a more resilient choice than landlines when establishing a communication system. Besides, the fast-evolving situations and the urgency of tasks require speedy information sharing across organizations. Incorporating the pre-existing knowledge about roles, tasks, and responsibilities into the design of technological system is a partial solution (Power, 2018). Responders can easily identify the right point of contact through the technological system without remembering or recalling contact information under stress. Any updates will be shared across the whole network immediately.

Moreover, to maintain a shared situation awareness, the technological system needs to incorporate the information and tasks at each command level as well as each jurisdiction level (Brooks et al., 2013; Waring et al., 2018). For instance, when operational-level staff are in the process of delivering or distributing resources, their geolocation information shall be imposed on a map for their tactical-level team members to track where they are and what their current task is (Brooks et al., 2013; Waring et al., 2018). Moreover, the system should be able to track all the resources associated with local, state, and federal authorities, outline which resources are available from and provided by which organizations, and where they are directed to.

Use information artifacts to ensure every agency's equal access to core operational and situational information. Unlike the adoption of a new technological system, information artifacts, such as notebooks, white boards, telephone books, are able to help public managers maintain awareness of what is going on without a steep learning curve. Without these artifacts, situation awareness of the whole situation is distributed across team members (Salmon et al., 2009). The use of these artifacts help to present the required information in the "real world", rather than in the actors' heads (Salmon et al., 2011). Though limited in volume of data these artifacts could hold, they are able to track and share the core information and make sure other agencies have same access to this information. Using information artifacts not only contributes to the shared situation awareness, but also builds another layer of redundancy to the overall response efforts. This redundancy is crucial for the operation continuity when power or internet gets disrupted during the response (Militello et al., 2007).

Adopt appropriate information sharing practices to allow agencies having access to the right information, in the right format, at the right time. Previous research recommends three practices. First, provide rationales whenever requesting or sharing information (Waring et al., 2018). This practice could expedite the information access and draw other's attention to the relevant information in the following operations. Second, proactively offer information about ones' own agency's roles and responsibilities. It is an act to ensure one's role, responsibility, and capability is clear to other partners, helping them assess which information needs to be shared with the agency. Third, only share information relevant to other agencies' functions and responsibilities and deliver it in a concise manner (Salmon et al., 2011; Waring et al., 2018). This practice requires basic

knowledge of other partner's roles. The lengthy or irrelevant information sharing would prolong the meeting and hurt the efficiency of the overall response. These information sharing practices jointly contribute to a shared understanding about roles and responsibilities, which help to establish a common frame for problem identification and information interpretation.

4.3 Training and Exercise

Training and exercise have long been identified as critical factors for coordination performance. Repetitious trainings and exercises facilitate the routinization of effective response processes and identification of best qualified individuals for specific tasks (Brooks et al., 2013). Following are three recommendations on the organization and design of trainings and exercises, which wish to aid coordination by boosting inter-organizational trust and familiarity, as well as improve core capabilities needed in response to emergencies.

Organize trainings and exercises periodically, with a wide range of partners, and for a long period of time. Long time training and exercise serve as a foundation for trusted relationships and increase public organizations' familiarity with each other (Abdeen et al., 2021). For the wide range of organizations participated in the response efforts, the lack of overlapping areas hinders the development of common routines, and the staff turnover can further deteriorate the foundation for coordination. Periodic trainings and exercises decrease the drifting from the collaborative principles and enhance the informal relationships among the participated actors (Kristiansen et al., 2019). Besides, the increased trust and familiarity facilitate the resolution of the political, personal, or inter-

organizational conflicts during crises (Drabek & McEntire, 2002). Moreover, the training induced familiarity can reduce individuals' sole reliance on organizational affiliation in exclusion to situational cues for decision-making in early-stage response and avoid the flawed decision-making (Drnevich et al., 2009).

Design training and exercise programs for participants to quickly understand and clarify each other's roles and responsibilities. Though the establishment of relationship before emergencies is always preferrable, it is not uncommon for public managers to work with novel actors during response due to turnover or other contingencies. Without prior knowledge, responders can easily be confused over who is doing what, who knows what, and where to obtain needed information (Salmon et al., 2011). How to quickly clarify each other's roles and responsibility under the time constraints becomes a core capability that exercises and trainings need to help develop. Specific actions might include bringing novel actors to the table or rotating representatives from each agency in exercises and trainings. During the training, it is important to ensure the understanding is developed around a specific "role" rather than a specific person. Role clarification generates swift trust based upon someone's specialized knowledge in filling a particular role (Curnin et al., 2015; Power & Alison, 2017b), which is able to facilitate coordination when relationship-based affective trust is absent.

Design trainings and exercises for participants to practice generic skills related to information sharing and collaboration. The generic skills might include listening and delegation, providing rationales for information shared and requested (Waring et al., 2018), the use of common language (Kristiansen et al., 2019), and etc. Individuals need training and exercise to internalize good information sharing practices. Besides, it is also important

to acknowledge that collaboration exercises do not necessarily improve collaboration or practice collaborative skills if not designed carefully (Andersson et al., 2014). A careful planning needs to incorporate triggers for collaboration (e.g., such as boundary object) to the exercises. Moreover, if participants often need to respond in extreme operating environments (such as Arctic), scholars also recommend to train them on undertaking different roles or operating with limited equipment (Andreassen et al., 2020).

4.4 Leadership Behaviors

"No amount of planning can overcome poor management, but effective leadership may make up for the lack of measures taken for preparedness". Leadership behaviors during crises are critical for the smooth response operations. A few studies directly address the topic of leadership (McNulty et al., 2018; Uhr, 2017; Wukich & Robinson, 2013) and suggests following leadership actions.

Unite the response efforts by articulating the goal and mission of the response (McNulty et al., 2018). Goals are motivational markers that direct human behaviors. Establishing a clear shared goal upfront is able to synchronize the diverse response efforts. Besides, though it's primarily each agency's responsibility, leaders in charge of operations are encouraged to provide agency members with critical information of others' skills and responsibilities. As leaders think through the operations at a macro strategic level, their illustrations about how each agencies' functions are connected and dependent on others' could better unite the operations (Solansky & Beck, 2009).

Take actions to promote team members' collaborative attitudes and enhance their willingness to coordinate. By examining the response to Boston Marathon bombings

and observing exercises, scholars (McNulty et al., 2018) identified four leadership behaviors that might improve responding agencies' willingness to coordinate, and thus aid response coordination. First, for agency leaders, rallying diverse actors to assist one another in coping with resource insufficiencies and other obstacles are able to increase solidarity, laying a foundation to mitigate further inter-organizational challenges (Millikin et al., 2010; Nicolaides et al., 2014). Second, by understanding and respecting other agencies' expertise and capabilities while staying in their own lanes, leaders provide good examples for their staff members on how to cooperate and coordinate with partners. Third, leaders abandoning the ego-driven or blame-casting behaviors are able to reinforce the in-group mindset for the whole response network. Last but not the least, for incident commanders, publicly identifying, crediting and appreciating agencies' attentive actions to others' needs and requests could serve as emotional awards and encourage further altruistic behaviors (Bharosa et al., 2010; Solansky & Beck, 2009).

Aside from behaviors suggested above, leaders are also encouraged to (1) exert strong leadership in multiagency meeting to keep discussion focused on the agenda and avoid decision inertia (Waring et al., 2020); (2) equip themselves with skills to deal with political intrusion (Gil-Garcia et al., 2016).

4.5 Antecedents for Response Coordination

Table 3 lists the empirical strategies suggested from literature and the underlying mechanisms for them to aid response coordination. The mechanisms point to four antecedents for inter-organizational response coordination: (1) trust, familiarity, and collaborative attitude; (2) shared understanding of goals and situations (i.e., shared

situation awareness, and shared mental model); (3) clear role and responsibility; and (4) knowledge repertoire (of tasks, key personnel, operational procedures, etc.).

Table 3

Empirical Strategies and Effective Mechanisms

	Trust, familiarity, collaborative attitude	Shared understanding about goal and situation	Clear role and responsibility	Knowledge repertoire
Institutional Design and Role Structure				
Use institutional mechanism to create incentive for coordination, sustain common knowledge, and specify roles and responsibilities.	X		X	X
Designate boundary spanners.	X		X	
Information Sharing and Information Technology				
Adapt the design of technological system to accommodate the fluctuating and unpredictable circumstances as well as meet the needs of real-time information sharing across command and jurisdictions levels.		X		X
Use information artifacts to ensure every agency's equal access to core operational and situational information.		X		
Adopt appropriate information sharing practices to allow agencies having access to the right information, in the right format, at the right time.		X	X	
Training and Exercise				
Organize trainings and exercises periodically, with a wide range of partners, and for a long period of time.	X			
Design training and exercise programs to help participants quickly understand and clarify each other's roles and responsibilities.	X		X	
Focus trainings and exercises on practicing generic skills related to information sharing and collaboration.		X		
Leadership Behaviors				
Unite the response efforts by articulating the goal and mission of the response		X	X	
Take actions to promote team members' collaborative attitudes and enhance their willingness to coordinate.	X			

In essence, coordination is manifested in the process of sequencing, meshing, synchronization, and integration to complete a task (Okhuysen & Bechky, 2009). The alignment of actions requires participating organizations reach consensus on (1) what to do, (2) who does what, and (2) how to do it. **Shared understanding of goals and situations** address the question of "what to do" during response. It establishes a shared perspective on collective operational goal, situation awareness, major tasks and priorities, as well as how each organizations' work fits within the whole. **Clear role and responsibility** points to the question of "who does what" and identify responsible party for each aspect of work. Clear task division and responsibility contributes to the integration of work into a joint effort as well as helps to hold each other accountable for their share of task. **Shared knowledge repertoire** speaks the question of "how to do it". The repertoire contains task knowledge as well as knowledge about operational procedures, contacts of other agencies relevant for a specific task, etc. It provides guides for individuals about how to complete the tasks and when to take actions. Last but not the least, though desired, coordination and collaboration do not occur automatically during the response (Andersson et al., 2014). Collaborative attitude and trusting relationship are essential for the occurrences of inter-organizational coordinating actions in the first place. **Trust, familiarity, and collaborative attitude** serve as motivational incentive and can also aid conflict resolution for response coordination.

Discussion and Implications for Future Research

The original overarching purpose of this review is to systematically analyze and synthesize empirical and conceptual research that focuses on inter-organizational coordination in all phases of emergency and disaster management. In fulfilling this goal, I mapped the field over the past two decades and identified three major themes of current research. Further analyses for the underlying theoretical traditions as well as recommended empirical strategies are limited to response coordination due to the field's unbalanced focus on response phase. This section discusses implications of findings and identifies gaps and avenues for future research.

5.1 Implications for Theory Utilization and Development

The review revealed that one third of (response coordination) studies do not use theory to underpin their empirical investigations and enhance the credibility of the field. Lack of theory points to a cursory investigation of coordination, operating at the broad conceptual level rather than explicating theoretical mechanisms underneath. Several theories– mainly structural perspective, complex adaptive system theory, cognitive perspective, practice theory – have informed our understanding of (response) coordination, but sometimes they are discussed loosely and not engaging the concrete theoretical notions. For instance, some studies only use complex adaptive system theory as a justification for a network analysis to analyze response operations. There is no in-depth discussion of how this theory informs the research inquiry.

Besides, very few studies promote theoretical syntheses as well as significantly develop or challenge aforementioned theories. Unlike juxtaposition of theories or presenting several theories in one paper, theoretical synthesis explains how two theories are complementary to each other and can further our theoretical understanding. Future research can consider synthesizing theories on macro structures or systems (e.g., CAS, structural perspective) with the ones on micro-processes and activities (e.g., cognitive perspective, practice theory). For example, syntheses of CAS theory and practice approach could further untangle the micro-processes and contextual factors that enable the self-organization. Moreover, recent developments on structural perspectives suggest, the integration of command-and-control and network-based model is beneficial for coordination. By adopting a practice approach, future studies can further investigate successful coordination operations to see if they have features of both models and what factors enable them to capitalize on the strengths of the two.

In addition, many other theories could benefit our understanding of inter-organizational coordination. Current discussion of response coordination is often apolitical and only focuses on the operations of organizations. However, how the framing of operational goal, the interpretation of problems and situations, as well as task delegation are shaped by power dynamics and political consideration need further examination. Besides, the role of leadership has very limited discussion in the emergency coordination literature. Leadership is found crucial to the process of self-organization in management studies (Schneider & Somers, 2006). “Leaders” in crisis conditions might not necessarily be the ones associated with positions. How operational leaders cope with political intrusion as well as influence the self-organization and emergence in emergency or crisis contexts

remains for investigation. Moreover, institutional logics provide a behavioral orientation for agencies with respect to which problems they address, why it is important, and how they evaluate situations (Hustedt & Danken, 2017). While managing emergencies requires the engagement of diverse public agencies, institutional logics could offer a lens on how they interact and coordinate with others not only in response, but also in other phases of emergency management.

5.2 Implications for Content Development

In preceding sections, I have outlined the key themes and trends in the relevant literature, which serves as a valuable knowledge base for inter-organizational coordination, as well as suggests gaps and opportunities for future inquiry. First, as previous research predominantly focuses on response coordination, future research is encouraged to delve into coordination activities, processes, challenges, and influential factors at other phases to extend our understanding about inter-organizational coordination in emergency and disaster management. Specific questions might include: What are the primary coordinating activities and tasks at other phases? How is coordination at response stage different from coordination at other phases? How do factors shape inter-organizational coordination at other phases differently than response?

Second, current coordination assessment is primarily driven by analysis of network structures. Structural efficiency becomes the only criterion in evaluating coordination efforts. To further extend evaluation criteria, future research could start from identifying the real-world manifestation of the four antecedents summarized by the review and think about how to assess the coordination along these four dimensions. Third, current

examination of coordination activities primarily focuses on information sharing, decision-making and boundary spanning. What problems and challenges are for other coordination activities, such as learning and adaptation, knowledge coordination, resource allocation, also need further scholarly attention.

Lastly, the existing body of research is deficient in terms of countries covered, with limited studies in developing countries, particularly those in Africa. Also, all the studies focus on single-country setting. Multinational comparative studies are needed to further explore how institutional characteristics shapes inter-organizational coordination in emergency and disaster management similarly or differently.

5.3 Implications for Methodology Utilization and Development

As for the methodology, current use of network analyses in the literature suffers from two limitations. First, some studies rely on newspapers as the only data source. News reports primarily focus on significant actions and pay closer attention to the actions of governmental actors for accountability consideration. Therefore, the constructed network often fails to capture the full operations, as it might leave out routine operations as well as non-governmental actors' efforts. Arguing for the need higher-level involvement of nonprofit organizations (Celik & Corbacioglu, 2016) or enhancing cross-sector collaboration in the response. With this limitation in data collection, studies arguing for a need to further enhance cross-sector coordination and collaboration (Celik & Corbacioglu, 2016; Yeo & K. Comfort, 2017), might not reach the conclusion via a valid reasoning process. Second, scholars often make normative assessments solely based upon the calculated network measures with no justification for the underlying assumptions. For

example, scholars recommend involving more NPOs in the resilience planning process when 75% of organizations in the core components of the network structure are governmental agencies (Li et al., 2020). The taken-for-granted assumption of this recommendation – a 50-50 split between governmental and nongovernmental actors is preferrable – is debatable. Because governmental agencies have the legal authority as well as responsibility for leading the emergency management operations. Third, current network analyses primarily focus on analyzing the static network structure, only a few tries to analyze the dynamic network changes.

Future network research on coordination is encouraged to use multiple data collection methods to reduce the data collection bias. For instance, scholars can consider surveying the response organizations identified in the newspapers, asking them to list other partners, and gathering information about interaction (such as strength, frequency, satisfaction, etc.). The collected data is less biased and could enrich the analyses of interactions. Besides, when combining the social network analysis with in-depth interview, scholars are able to form an in-depth understanding about the network measures, as well as their implications for coordination. In addition, more longitudinal analyses of networks are needed to capture the dynamism of coordination.

Similar to network analyses, other quantitative studies also rely heavily on cross-sectional data and rarely use longitudinal data, which has the potential to reveal the causal linkages. The regression analyses seldom analyze mediating or moderating factors, which implies little interest in uncovering the underlying mechanism for coordination.

Conclusion

Like all the other research, this study has several limitations that need to be acknowledged. First, this review only focuses on peer-reviewed articles to ensure the quality of the review. Books, conference papers, as well as book chapters have been excluded, which might also provide useful insights. Second, the search -- requiring the presence of both *inter-organizational* and *coordination* in the abstract might leave out some studies which examine inter-organizational coordination in content but failing to make it clear in abstract. Third, though planned for a comprehensive understanding of coordination in all phases of emergency management, examination of theoretical traditions and empirical strategies is only restricted to response coordination due to few studies in other phases.

Despite the limitations, this review also makes several contributions to emergency coordination research. The review enriches our theoretical understanding about coordination by identifying major theoretical lens from inter-disciplinary research. On the one hand, coordination in emergency and disaster management relies on the pre-planning to structure roles, standards of operations, and operating procedures. On the other hand, it also emerges from the process of improvisation and adaptation informed by the dynamic context and real-time cognitive processing. Besides, the review summarizes empirical strategies for practitioners to improve coordination effectiveness, all of which point to the importance of building trust and collaborative relationships; developing shared understanding of goals and situations; clarifying roles and responsibilities; and having a shared knowledge repertoire in place. Lastly, the review identifies avenues for future

research, such as expanding the focus from response to coordination in other phases, synthesizing multiple theoretical streams, as well as engaging longitudinal data collection.

CHAPTER 3

A CONFIGURATIONAL APPROACH TO UNDERSTAND PUBLIC ORGANIZATIONS' EMERGENCY PREPAREDNESS COORDINATION

Abstract

As the environmental turbulence becomes the "new normal", coordinating public agencies addressing emerging threats becomes a pressing challenge for public administration. Despite its importance, little empirical research explores why some public organizations actively coordinate with others in preparation for future crises while others do not. The related collaboration research relies on correlation-based approaches and generates inconclusive findings. To further extend current inquiry, this study takes a configurational approach and examines which configurations of organizational attributes – and environmental characteristics – lead to emergency preparedness coordination. A configurational model for emergency preparedness coordination is proposed along with three propositions. A large-N fuzzy-set QCA is conducted to examine U.S. public transit agencies' inter-organizational coordination in preparation for the extreme weather events. Findings demonstrate that it is the configurations rather than individual attributes essential for active preparedness coordination. Both top-down and bottom-up mechanisms can achieve active coordination and identify managerial commitment as critical contingency factor.

Keywords: Inter-organizational coordination, Emergency preparedness, Emergency management, Emergency coordination, QCA

Introduction

We are entering a new historic stage when living with hazard risks, normal accidents, and environmental turbulence becomes the "new normal" (Roberts 2020; Ansell, Sørensen, and Torfing 2020). Governments' capabilities in addressing the future crises are tightly linked to their legitimacy and performance (Eckhard et al. 2021). As the extreme events increase in uncertainty, complexity, and expand in geographic boundary, coordinating a diverse set of public organizations within one or multiple jurisdictions for an effective response becomes a pressing challenge for public administration.

The key to effective emergency coordination lies not in the response stage itself, but its preceding preparedness stage (Scholtens 2008). Preparedness coordination actions include intensive pre-planning, joint exercises, the development of mutual aid agreement, etc. These coordinating activities help to clarify the agencies' role expectations, reduce their competition of control over shared responsibilities and increase their familiarity with each other's operating procedures (Eyerman and Strom 2008), all of which help to minimize the barriers for response coordination. Despite the importance of preparedness coordination, the existing scholarship of inter-organizational coordination in emergency and disaster management has a dominating focus on response coordination. Little empirical research has examined coordination at the preparedness stage so far. This study aims to fill the void and explain why some public organizations actively coordinate with others in preparation for future crises while others do not.

Drawing from collaborations research, a list of organizational attributes (e.g., organizational capacity, agency structure, managerial capability) and environmental factors (e.g., physical and political environment) are found critical for the formation of

inter-organizational relations (Weiss, 1987; Krueathep et al., 2008; Friend, 2006; McGuire & Silvia, 2010). However, the dominance of correlation-based approaches in this stream of research – with the assumption of linear, additive, and independent causality – generates inconclusive findings and constrains the studies' capability to account for the complexity of organizational phenomena (Misangyi et al. 2017). For instance, organizational size is anticipated to both foster and constrain the collaboration depending on the theories engaged (Graddy 2006; Krueathep, Riccucci, and Suwanmala 2010). The contradicting effects violates the assumption of linear causality and demonstrates a need for theory elaboration.

To extend the previous research and account for the causal complexity, the study takes a configurational approach (Ragin 2000, 2008; Fiss, Peer 2011) to examine the impacts of organizational attributes and environmental factors. The study posits that preparedness coordination does not depend on *individual* organizational attributes, but on specific *configurations* of attributes. Taking the influence of environmental factors into account, emergency preparedness coordination is informed by the extent to which the bundle of interconnected organizational attributes fits the environmental characteristics. Therefore, the research question is, **which configurations of organizational attributes – and environmental characteristics – lead to emergency preparedness coordination?**

To address the research question, I proposed a holistic framework and further investigate it in the context of public transit agencies' external coordination actions to prepare for extreme weather events. This study conducts a large-N fuzzy-set qualitative comparative analysis (fs-QCA) (Ragin, 2000), a set-membership technique which is suitable for configuration analyses and new to emergency management research. The results show complex trade-off effects of organizational attributes, substitutive effects of

environmental characteristics, and reveal both bottom-up and top-down mechanisms leading to active preparedness coordination.

Conceptualization of Coordination

Following Comfort's (2007) and Drabek and McEntire's (2002) conceptualization, in this paper, coordination is defined as a "collaborative process in which organizations align their actions with the actions of other organizations "(Martin, Nolte, and Vitolo 2016) in order to achieve a common purpose. This definition reveals three features of inter-organizational coordination in the context of emergency preparedness. First, the purpose of the coordination is to achieve a common objective – making preparation for future threats – rather than an organizational goal (Gulati, Wohlgezogen, and Zhelyazkov 2012). This feature helps to distinguishes coordination from cooperation, as the latter focuses more on achieving individual goals (Keast, Brown, and Mandell 2007).

Second, coordination serves an instrumental function and focuses on the deliberative mechanistic process of aligning actions or bringing every participant's efforts together (Gulati, Wohlgezogen, and Zhelyazkov 2012). Coordination's instrumentality is that participants do not need to establish a shared understanding or commitment toward the pre-set collective goal (Keast, Brown, and Mandell 2007). They just need to work together toward it by carrying out their functions through structured mechanisms or formal linkages (Ödlund 2010; McNamara 2012).

Third, this definition conceptualizes coordination as a collaborative process and avoids an arbitrary separation between coordination and collaboration. Scholars have long discussed the differences between coordination and collaboration (Ödlund 2010; Keast,

Brown, and Mandell 2007; Gulati, Wohlgezogen, and Zhelyazkov 2012). Compared to coordination, collaboration is considered to have a higher level of embeddedness and commitment in the interactions (Bryson, Crosby, and Stone 2006; Keast, Brown, and Mandell 2007; McNamara 2012). It is often difficult to entirely separate coordination from collaboration, especially in the context of emergency management, where emergency preparedness efforts are not mandated. Public agencies have large discretion to decide how they would like to coordinate in preparation for future crises and to what extent. Inter-organizational preparedness coordination originates from public agencies' collaborative spirits to deal with extreme events.

Drivers of Inter-organizational Preparedness Coordination: A Holistic View

"Following Mintzberg (1993), organizational attributes do not occur in isolation" (Andrews, Beynon, and McDermott 2016, 243). Rather, they tend to coalesce around configurations that serve a particular purpose. Four major theoretical streams point to four key determinants in understanding public agencies preparedness coordination efforts respectively. First, as resource dependency shapes organizations' willingness to give in part of its autonomy in exchange for needed resources (Agranoff and McGuire 2003; Bardach 1998; Schermerhorn 1975), *organizational size* is related to the incentive for external preparedness coordination. Second, organizational design theory emphasizes the effectiveness of certain organizational forms in achieving organizational outcomes (Miles et al. 1978; Thompson 1967), which brings our attention to *centralization* – a core structural feature. Third, complex organizational decisions are often considered largely an

outcome of behavioral actors, (Cyert and March 1963; March and Simon 1958), suggesting the importance of *managerial attitude and commitment*. Last but not the least, invoking insights from resource-based theories (Barney 1991), marshalling human resources and obtaining *employee support* are also crucial for public agencies to pursue better performance (Andrews, Beynon, and McDermott 2016).

In the following sections, I would illustrate the potential influence of each attribute and show how their effects on preparedness coordination can be ambiguous or subject to other factors' influences.

3.1 Organizational Attributes

Organizational size. Organizational size is one of the most important attributes in studying organizational behavior and performance (Hall, Johnson, and Haas 1967; Kimberly 1976; Misangyi et al. 2006). Previous studies suggest two theoretical logics to consider the relationship between organizational size and inter-organizational coordination behaviors – "economies of scale" (Blau, 1972) and "resource dependency" (Pfeffer and Salancik 1978). From the perspective of "economies of scale", large organizations presumably have greater financial and human resources. They are more capable of absorbing high transaction costs associated with networking and coordinating activities in terms of time, money and energy (Graddy 2006). Meanwhile, resource dependency theory suggests that actors lacking resources are motivated to seek out and establish linkages with others to obtain needed resources (Pfeffer and Salancik 1978). For public agencies, crises and emergencies are wicked problems, which are difficult to handle by themselves and need to coordinate and collaborate with other partners (Bogason and Toonen 1998;

O'Toole and Meier 1999, 2004; Van Bueren, Klijn, and Koppenjan 2003). Hence, in theory, **organizational size** may have either a positive or a negative relationship with interorganizational coordination of public organizations—or no relationship as the costs and benefits of coordination cancel each other out.

Organizational centralization. Structuring the organizations to promote the organizational effectiveness has been an enduring concern for public administration scholars (Andrews et al. 2009). **Centralization**, as a core component of organizational structure, refers to the extent to which decision-making authority resides at the upper levels of the organization (Andrews et al. 2009). Centralization's impact on organizational performance is ambiguous, because the effect is contingent upon other organizational characteristics (Andrews et al. 2009). When examining preparedness coordination actions, the impact of centralization is also ambiguous. In a decentralized organization where the decision-making authority is at the hands of front-line staff, they can establish connections with other agencies more freely (Andrews et al. 2011), which in turn create more opportunities for inter-organizational coordination. However, a centralized structure, together with strong managerial support, also has its strengths in accelerating the decision-making process and facilitating internal conflict resolution for organizations (e.g., Goodsell 1985; Ouchi 1980). With higher efficiency and less concern for internal operation, these organizations also likely to have more capacity and resources for external coordination activities. Like organizational size, centralization's association with preparedness coordination efforts – either positive or negative – is not pre-determined, but dependent upon other organizational attributes.

Managerial commitment. Organizational decision-making and action-taking greatly relies on how managers interpret the problem and make sense of the environment (Bundy, Shropshire, and Buchholtz 2013; Kaplan 2011). The importance of managerial attitude to organizational adoption of strategic action and innovation is well documented in the literature. With a strong commitment, managers likely create a favorable organizational climate to support the implementation and allocate resources for specific actions and tasks (Damanpour 1991; Dewar and Dutton 1986; Mumford 2000). The collaborative emergency management study also finds that collaboration [coordination] is less a function of stable relationships or organizational structure, but "more a product of the individual-level decisions of the manager" (Hicklin et al. 2009, 112). However, the implementation of the strategic managerial decisions still relies on employees as well as organizational resources. Managerial commitment alone may not be sufficient to affect the organization's coordination actions.

Employee support. Adapting from Huang and Rousseau's (2007) definition, employee support here refers to employees' positive affect toward managers' decisions as well as their willingness to support the initiatives. Marshalling employee support to achieve organizational goals is an important task for human resources management. The shared values and visions between employees and organizational leaders can boost employees' commitment to the agency (Vancouver and Schmitt 1991) and increase their involvement in the development, communication, dissemination, and implementation of the organizational goals (Wang and Rafiq 2009). Besides, the level of autonomy also shapes employees' attitudes and motivation toward the work (Hornung and Rousseau 2007; Hackman and Oldham 1975). Thus, employee support is in conjunction of other

organizational attributes to exert effects on inter-organizational preparedness coordination actions.

3.2 Environmental Characteristics

As "an organization …… must always bow to the constraints imposed on it by the nature of its relationship with the environment" (Saddler and Barry 1970, 58), public agencies' emergency preparedness coordination actions are also shaped by their surrounding environment. The environmental constraints can either originate from physical environment – severe hazards threatening the organization's survival and operation (Lindell, Prater, and Perry 2006), or from political environment – constituencies' political orientations shaping their support for governmental actions.

Hazard severity. Hazard experience shapes public agencies' preparation (Xiang 2021) and adaptation (Zhang, Welch, and Miao 2018) for future crises. The greater intensity and magnitude of the hazardous events can translate into a stronger incentive for public organizations to cope with the disruptions and guarantee the continuity of operations (Andrews et al. 2011). Also, more severe the problems, more likely public agencies recognize a need to build up capacity by collaborating and coordinating with others (Hicklin et al. 2009; McGuire and Silvia 2010). Meanwhile, severe hazards might also compromise organizations' capacity to prepare for future disaster risks, and lower the task priority of preparedness coordination actions (Xiang, Gerber, and Zhang 2021).

Communities' political ideology. Directors of public agencies, many of whom are either elected or politically appointed beholden to the elected officials (Taylor and Morris 2015), are pressured to take on actions not only in response to stakeholders' needs, but also

in compliance with external constituencies' political ideologies (Miao et al. 2018). The influence of political orientation on public support for governmental actions and policies is well noted (McCright, Dunlap, and Xiao 2013; Drews and van den Bergh 2016; Park and Vedlitz 2013). Individuals with left-leaning orientation or liberal ideologies are more aware of risks (Wildavsky and Dake 1990; McCright and Dunlap 2011) and have higher expectations for policy actions addressing the climatic risks and hazards (Leiserowitz 2006; McCright, Dunlap, and Xiao 2013). To maintain their legitimacy and gain political support, public agencies with larger proportion of liberal-oriented constituencies are thus more likely to coordinate with others in preparation for extreme events.

3.3 A Configuration Model of Inter-organizational Preparedness Coordination

Ideas of configurational theory shed light on understanding the anticipated contradicting effects of organizational and environmental attributes as well as how the interplay among them shapes preparedness coordination actions collectively. From a configurational perspective, the same organizational attribute can lead to different outcomes depending on how it is aligned or arranged with others (Miller 1996; Ordanini, Parasuraman, and Rubera 2014). It is the arrangements of characteristics (including dimensions of environments, strategies, practices, people etc.) rather than individual attributes, that drive the organizational outcomes (Fiss 2007), including the agencies' preparedness coordination actions.

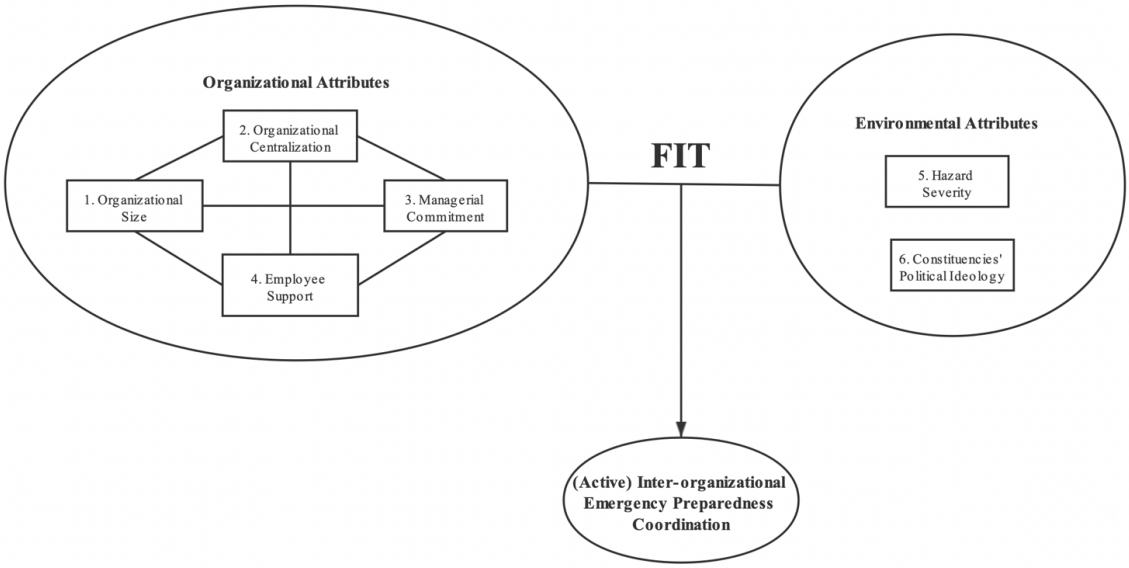
Besides, configurational theory also assumes equifinality (Ragin, 2000), meaning different combinations of causal factors can lead to the same outcome. There is no one best

way of arranging organizational and environmental attributes for active preparedness coordination.

Following Ordanini et al. (2014), I propose a configurational model to understand inter-organizational emergency preparedness coordination, as shown in Figure 3. The overall conceptual framework posits that while emergency preparedness coordination efforts depend on the four primary organizational attributes (size, centralization, managerial attitude, employee support), only when the meaningful configurations of these attributes fit with environmental characteristics, either hazard severity or constituencies' political ideology, is active preparedness coordination likely to occur. The fit logic in the figure implies that different elements in a given context are not important intrinsically. As these elements are interconnected, their role depends on how they are aligned with each other (Venkatraman 1989).

Figure 3.

A Configuration Framework of Public Agencies' Emergency Preparedness Coordination



Note: this figure is adapted from Ordanini et al. (2014) explaining companies' new service adoptions.

The general propositions implied in the configurational framework are as follows:

Proposition 1: The same organizational attribute can either foster or inhibit inter-organizational emergency preparedness coordination, depending on how it is configured with other attributes.

Proposition 2: Disparate configurations of organizational and environmental attributes are equifinal in leading to active emergency preparedness coordination.

Proposition 3: For active preparedness coordination to occur, a configuration of organizational attributes must be compatible with environmental characteristics, either with hazard severity or constituencies' political orientation.

Empirical Setting, Data and Sample

To test the propositions, the study particularly examines public transit agencies' inter-organizational coordinating actions in preparation for extreme weather events. Extreme weather events are selected as the emergency scenario for examination because they are more frequently encountered by public organizations in daily operations compared to other hazards. The study focuses on public transit agencies because their preparedness efforts directly relate to people's evacuation and delivery of vital services and goods during emergency situations. They are "second circle responders" (Hambridge, Howitt, and Giles 2017), who are not emergency response entities but play important roles in response operation. The analysis of public transit agencies has potential application beyond the substantive context and speaks to broader range of public organizations, who share similar characteristics as "second circle responders". Besides, the study further narrows the focus to transit agencies located in large metropolitan areas for two reasons. First, only in the metropolitan areas with high level of population density is there a good chance for transit agencies to actively undertake emergency management functions. Second, empirical configurational analysis requires a QCA technique, the validity of which is predicated upon the comparable cases. Focusing on transit agencies in large metropolitan areas helps to generate a more comparable population.

The data of this study comes from four sources: (1) a 2019 national survey of public transit agencies conducted by the Center for Science, Technology, and Environmental Policy Studies at Arizona State University; (2) National Transit Database (NTD); (3) Spatial Hazard Events and Losses Database for the United States (SHELDUS); and (4) MIT election lab.

The 2019 national survey targets all major fixed-route transit agencies operating bus or rail transit services across the United States with annual fare revenue of at least one million dollars. The overall sample frame includes transit agencies located both inside and outside of large metropolitan areas, the latter of which is not within this study's scope. The discussion of segmentation is in the following paragraph. The survey gathers information about transit agencies' preparedness and coordination activities, managerial attitudes, and perceptions toward extreme weather events. The research team started from gathering an entire list of public transit agencies from NTD report and collecting managers' names and contacts from publicly available online listings or through phone calls. Managers are the lead managers of (up to) five major departments in transit agencies including operations, maintenance, service planning, strategic planning, and engineering. Invitations to participate in an online survey were mailed to managers. Follow-up emails were also sent to non-respondents. The survey's final sample frame contained 853 top managers across the 292 largest fixed-route public transit agencies. A total of 313 responses were returned from 194 transit agencies. The response rate is 36.7% at individual level and 66.4% at organizational level.

As the study focuses on public transit agencies in large metropolitan areas, I use CDC's urban-rural classification scheme to filter out agencies not located in *large metropolitan counties*. According to CDC, large metropolitan counties refer to counties in metropolitan statistical area (MSA) of 1 million or more population. Therefore, the target population of this study is 172 U.S. large transit agencies located in large metropolitan counties. After removing 37 agencies that were either not reachable or unwilling to participate, 135 agencies were left in the sample frame[1]. Among the returned national

survey responses, 147 responses from 89 agencies meet the selection criteria. Therefore, the final sample covers 51.7% of the target population (N=172). And the response rate is 66% at the organizational level.

Nonresponse bias tests were conducted to compare the responding agencies with the final sample frame as well as the target population. The results find no difference in terms of geographic region, organizational size, and capacity. But organizations which are independent agencies are more likely to respond to our surveys compared to others affiliated with city or county governments or not have independent authorities.

Aside from the survey, the NTD data contains information about transit agencies' profiles and characteristics; SHELDUS collects the county-level hazard loss data; and 2016 presidential election results are stored in MIT election lab. These three sources of data were paired with the survey to capture organizational and environmental factors that might affect the public agencies' emergency preparedness coordination.

Method

5.1 Qualitative Comparative Analysis

As the choice of method shall be guided by the theoretical expectations of causal relations (Schneider and Wagemann 2012), this study conducts a large-N (N>50) fuzzy-set Qualitative Comparative Analysis (fsQCA). QCA views cases as configurations of causal attributes and assumes causal relations as complex and conjunctive, which align with the underlying assumptions of configurational theory (Greckhamer et al., 2013; Ragin, 1987). Though initially developed for relative small-N samples, recently, QCA has developed

well-suited to analyze large-N samples (Greckhamer, Misangyi, and Fiss 2013). Large-N QCA can be employed for deductive reasoning and is well-suited for theory elaboration, which meets the goal of this paper.

QCA conceptualizes the causal relations among the explanatory and outcome conditions as set relations. A case's membership in each condition or outcome set is determined through the calibration process. Fuzzy set allows a more nuanced way to capture the partial membership by using an interval scale (from 0 to 1) to capture the extent to which a condition is present or absent. All the causal set relations are summarized in terms of necessity and sufficiency. A condition is *sufficient* for an outcome when itself can produce the outcome; while *necessity* denotes whenever an outcome happens, the condition is present. QCA further uses Boolean Algebra to identify the parsimonious necessary and sufficient conditions for the outcome of interest.

The analysis procedures of QCA include (1) defining and operationalizing outcome and explanatory conditions; (2) calibrating the raw numeric data into set membership scores; (3) using calibrated data to construct a truth table, which lays out all the possible logical configurations of explanatory conditions; and (4) conducting the analysis of necessity and sufficiency and using Boolean minimization to obtain parsimonious results. The rest of the sections will proceed following this procedure to present the implementation of QCA.

5.2 Operationalization of Conditions

Outcome Condition. This study captures one distinct dimension of inter-organizational preparedness coordination – **operational coordination**, which primarily

emphasizes streamlining the response action procedures and arranging personnel as well as resources for incident management. Managers are asked about to what extent their agencies coordinate with other agencies with respect to (1) *operational authority and command structure*, (2) *personnel roles and assignments*, (3) *emergency communication procedures*, (4) *equipment and supplies for extreme weather events*. All the responses are in a 5-point Likert-type scale (1 = Not at all, 2 = Very little, 3 = Somewhat, 4 = To a moderate extent, and 5 = To a large extent). I use the weighted sums of the items to measure operational coordination (Cronbach's alpha = 0.94). The weights are the standard factor loadings of a confirmatory factor analysis (CFA), which will be discussed below.

Organizational Attributes. **Organizational size** is operationalized as the total number of vehicles operated to meet the annual maximum service requirement. Previous studies often use the total number of employees (Sadiq and Graham 2016; Damanpour 1992; Andrews, Beynon, and McDermott 2016) and organizational financial capacity (Zhang, Welch, and Miao 2018) as indicators for organizational size. Damanpour (1992) noted that different aspects of organizational size were related to different organizational problems, thus different measures of organizational size were appropriate for different types of organizations. For public transit agencies, whose primary missions are providing safe and convenient public transportation to the general public, it is reasonable to use the maximum number of vehicles available for operation to capture their organizational size. **Centralization** describes the extent to which the decision-making power resides at the upper levels of organizational hierarchies (Andrews et al. 2009). It is measured by a 3-item Likert scale from (1) "strongly disagree" to (5) "strongly agree" (Cronbach's alpha = 0.72).

All the three items are reverse coded, so higher the value, more decentralized the organizational structure will be. Table 1 lists the three items used to measure centralization.

Table 4

Items Associated with Outcome and Explanatory Conditions

Latent Factors	Concepts and Items	N	Standard loading	Response
Operational Coordination (alpha = 0.94)	*To what extent agencies coordinate with other agencies about .....?*			1= Not at all 2= Very little 3= Somewhat 4= To a moderate extent 5= To a great extent
	operational authority and command structure	137	0.877	
	personnel roles and assignments	136	0.936	
	emergency communication procedures	137	0.882	
	equipment and supplies	137	0.852	
Centralization (alpha=0.72)	Even small matters have to be referred to someone higher up for a final answer	143	0.702	
	Managers in this agency have a lot of decision-making autonomy	143	0.585	
	There can be little action taken here until a supervisor approves a decision	143	0.75	
Managerial Commitment (alpha=0.88)	Valence (alpha=0.93)		0.755	1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree
	There is a pressing need for my agency to incorporate extreme weather considerations in its operations and long-term plans	134	0.821	
	It is important for my agency to become more proactive in addressing extreme weather events	133	0.937	
	My agency should do more to plan strategically for future extreme weather events	133	0.891	
	My organization needs to change its routines and practices to address extreme weather	133	0.819	
	Efficacy (alpha= 0.87)		0.478	
	By adopting proactive strategies to deal with weather-related challenges, my agency will significantly reduce the harm from future weather events.	143	0.834	

	If we are proactive, my agency will be more able to effectively respond to extreme weather events in the future.	143	0.916	
	Organizational risk perception (alpha= 0.87)		0.726	
	My agency is increasingly concerned about the impact of extreme weather events on our transit infrastructure.	138	0.816	
	Most people in my agency recognize that extreme weather events are becoming more frequent	138	0.726	
	My agency is increasingly concerned about the impact of extreme weather events on our transit operations	137	0.948	
Employee support (alpha= 0.76)	People in my agency usually support the decision I make	136	0.652	
	People in my agency usually share my vision about the necessary action	135	0.718	
	People in my agency usually help me advocate for changes I propose.	135	0.782	
	I usually encounter resistance to the changes I propose.	135	0.574	

Note: *N* indicates the total number of individual responses to each item.

Managerial commitment in this study is a second-order factor based upon the following three factors – *salience* (Xiang 2021) (i.e., from manager's perspectives, how important it is for their agencies addressing the challenges of extreme weather events), *efficacy* (Zhang and Welch 2021) (i.e., how confident managers are toward their agencies' capabilities to deal with extreme weather events), and *organizational risk perception* (Zhang, Welch, and Miao 2018) (i.e., from manager's perspectives, to what extent their agencies are concerned about extreme weather events). Table 1 shows all the items used to capture each factor. Because the number of conditions included in QCA is often limited, constructing a higher-level construct is an effective way to maintain the useful information to a largest extent. The final latent factor ranges from 1.75 to 4.89, with higher value indicating stronger the commitment to address extreme weather events. **Employee support**

captures the extent to which staff members share the vision with their managers and support managers' initiatives. This measure originates from a 5-point Likert scale consisting of four items (Cronbach's alpha = 0.76), details of which is listed in Table 1.

Environmental Characteristics. As organizational preparedness actions are shaped by their past hazard experience (Sadiq and Tyler 2016; Tyler, Sadiq, and Chikoto-Schultz 2020). A 5-year average (2014-2018) of county's property damage per capita is used to capture **hazard severity**. Due to the large variations in the monetary value of property loss, this measure is further transformed to a logged form. **Political ideology** is usually classified according to a liberal-conservative dimension (Jost, Nosek, and Gosling 2008). The liberal ideology, in favor of actions and policies minimizing risks and combating climate changes, is operationalized as the county's proportion of votes in support of Hilary Clinton in 2016 presidential election.

Table 4 shows all the specific items used to construct the latent factors for outcome and explanatory conditions. With 147 individual-level responses, a confirmatory factor analysis (CFA) is conducted in R testing a measurement model with all the latent factors. The values for latent factors are sums of each item weighted by the standardized factor loadings. Once the latent factors are constructed, the study further uses the mean values within each agency to approximate the agency-level characteristics. Table 5 shows the descriptive statistics for the agency-level uncalibrated measures.

Though the sample size (N=147) is smaller than 200 – the suggested sample size for structural equation modeling (Kline 2016), no warnings were issued in the analysis process. Hu and Bentler (1999) suggests for small sample sizes, a combination of SRMR < 0.08 and CFI > 0.95 results in a low probability for the occurrence of Type I and Type II

errors. The CFA result passes the threshold and shows good model fit (RMESA = 0.053, CFI = 0.955, TLI = 0.947, SRMR=0.069). The convergent validity of latent factors is demonstrated in the high factor loadings (apart from efficacy, all the loadings >0.5, p <0.02). Further, a heterotrait-monotrait (HTMT) technique is used to check the discriminant validity (Henseler, Ringle, and Sarstedt 2015). All the values are below the cut-off value 0.85, which supports the discriminant validity of all the latent factors.

Table 5.

Descriptive Statistics

	Uncalibrated Variables	N	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Outcome Measure												
(1)	Inter-organizational Preparedness Coordination	87	3.16	1.08	1								
	Organizational Attributes												
(2)	Size	89	533.1	680.8	0.33*	1							
(3)	Centralization	88	2.66	0.65	-0.02	0.16	1						
(4)	Valence	85	3.24	0.79	0.17	0.25*	0.3*	1					
(5)	Efficacy	89	3.93	0.71	0.18	0.13	0.06	0.36*	1				
(6)	Organizational Risk Perception	87	3.45	0.74	0.33*	0.33*	0.23*	0.65*	0.27*	1			
(7)	Employee support	85	3.69	0.42	0.23*	0.02	-0.35*	-0.05	-0.04	0.08	1		
	Environmental Factors												
(8)	Hazard Severity (log)	87	2.63	2	-0.09	0.03	-0.05	0.05	-0.1	0.01	-0.04	1	
(9)	Political Ideology	89	0.62	0.14	0.07	0.27*	0.11	0.06	-0.08	-0.02	-0.14	-0.27*	1

Note: N represents the number of agency responses. Valence, Efficacy, and Organizational Risk Perception are first-order factors for Managerial commitment.

5.3 Calibration and Thresholds

Calibration is a process to transform the original raw numeric data into set membership scores. Ragin (2008) considers the fuzzy-set measures superior to uncalibrated measures in that it not only provides information about the difference-in-degree (i.e., the quantitative differences among cases), but also the difference-in-kind (i.e., the quantitative differences among cases). Following Ragin (2008), the direct method is applied for calibration, which requires defining three qualitative anchor points – the full membership (set-membership score of 1), the full non-membership (set-membership score of 0), and the cross-over point (set-membership score of 0.5).

The selection of qualitative anchors needs both theoretical knowledge and empirical evidence (Schneider and Wagemann 2012). In small-N studies, scholars primarily rely on intimate case knowledge. As the number of cases increase, researchers' familiarity with cases fade (Greckhamer, Misangyi, and Fiss 2013).Thus, researchers sometimes directly draw from the distribution of the measures included in the study to calibrate the data in large-N QCA studies (Rubinson, Rutten, and Greckhamer 2019). Following Arellano et al. (2020), in this study, three criteria are considered in sequence to calibrate the conditions: the availability of external knowledge, the meaning and nature of the constructs and measurements, and the skewness of the distribution in the sample.

For the latent factors constructed using survey response items, no external anchor is available. It is also not clear to what extent the Likert-scale points can represent the meaning of an aggregate scale (Arellano, Meuer, and Netland 2020). Thus, the sample distribution is used to identify the cut-off points for latent factors. More specifically, for key constructs – inter-organizational preparedness coordination, decentralization,

managerial commitment, and employee support, 75th and 25th percentile is the anchor for full membership and full non-membership, while the median serves as the cross-over point. The sets are named reflecting the calibration approach.

The selection of qualitative anchors for other conditions is based upon external knowledge. For all transit agencies located in large metropolitan area, their median value of maximum number of operating vehicles is set as the cross-over point for organizational size. 25^{th} and 75^{th} percentile are the anchors for full non-membership and membership for the set of large transit agencies (in large metropolitan areas). To calibrate the environmental characteristics, hazard loss records as well as election voting statistics of all large metropolitan counties were examined. Transit agencies located in areas that exceeds 75^{th} percentile of large urban counties' property loss per capita is considered having a full membership in the set of hazard-prone (large metropolitan) area. Similarly, median is the crossover point and 25^{th} percentile denotes the full non-membership. Because the large metropolitan areas are highly liberal, I take the skewness of data into consideration when calibrating the political ideology. The qualitative anchors are set at 60^{th}, 75^{th}, and 90^{th} percentile for full non-membership, cross-over point, and full membership of being in a set of highly liberal constituencies (in large metropolitan area).

5.4 Analysis Procedures

Following calibration, the next step in QCA is to construct a truth table, listing all the logically possible configurations of explanatory conditions. Not every logical possible configuration has an empirical representation (i.e., limited diversity), but all the cases in the sample are associated with a truth table row. QCA further uses Boolean algorithm to

minimize truth table rows and identifies more parsimonious combinations that are consistently related to the outcome in terms of necessity or sufficiency.

Set-theoretic measures of consistency and coverage aide the analysis and assessment of the relations of sufficiency and necessity (Ragin, 2008; Schneider & Wagemann, 2012). Consistency score denotes to what extent cases with the same causal configurations is associated with the outcome of interest (Ragin, 2006). It supports model's validity and is a precondition for coverage score calculation (Greckhamer and Gur 2021). Coverage score describes to what extent a configuration accounts for the outcome, and points to the explanatory power of the final solution.

Starting with necessity analysis, a consistency benchmark of 0.9 (Schneider and Wagemann 2012) is used to find necessary conditions for the active preparedness coordination. I then proceeded with sufficiency analyses with Ragin's (2008) truth table algorithm and identified configurations consistently linked to the active preparedness coordination. Followed is an analysis of the absence of the active coordination. In the analysis process, following Ragin (2008), I used a consistency threshold of 0.8 together with a PRI (proportional reduction in inconsistency) score of 0.65 (Greckhamer, 2006). Frequency threshold is set at two, which means at least two cases must be observed for each configuration to be considered relevant for necessity and sufficiency analysis (Greckhamer, Misangyi, and Fiss 2013). All the analyses were conducted in R software.

QCA's logical minimization process relies on the assumptions about the *logical remainders* (i.e., logically possible combination of conditions for which no empirically observed cases are available), and the directional expectations for each condition. In this study, I assumed agencies whose employees highly support the manager's general

decisions and managers are not committed to address the problem were unlikely to have active preparedness coordination. The conjunction of lacking managerial commitment and organizational members support the managerial decision is considered as an untenable assumption and excluded from the logical minimization process. As for the directional expectations, only managerial commitment and political constituencies' liberal ideology are considered having positive effects, while the other conditions' influences on active preparedness coordination can be both positive and negative.

Like all the other empirical research, a fsQCA analysis involves several decisions. Apart from transparently reporting these decisions, I also assessed the robustness of the findings. In the QCA context, a finding is robust "if slightly different decisions lead to results that are similar in terms of necessary and sufficient subset relations as well as in consistency and coverage measures of fit so they do not warrant substantively different interpretations" (Greckhamer & Gur, 2021, p.8). I conducted a comprehensive set of robustness tests to assess how sensitive the results were toward the changes to the calibration thresholds and model parameters. First, I ran two more conservative models with higher consistency value (0.85) and PRI score (0.70). Second, I varied the case frequency thresholds for sufficiency analysis to 1 and 3 cases. Third, the cut-off points for all the other conditions' full membership and for full non-membership have been checked at 70^{th}, 80^{th}, and 85^{th} percentiles, and the 30^{th}, 20^{th}, and 15^{th} percentiles. For community political ideology, the cut-off points varied from 60^{th} to the 65^{th} and 55^{th}, and the 90^{th} to the 95^{th}, 85^{th} percentiles. Fourth, I used alternative threshold for crossover points as well and further tested the model by setting the crossover point at 45^{th} and 55^{th} percentiles

respectively. For the summary of the robustness tests, please see appendix A. Overall, the robustness tests suggest the results remain substantively unchanged.

Results

6.1 Configurations for Active Coordination

The necessity analysis finds no single organizational attribute or environmental factor is necessary for the active preparedness coordination to occur, whereas the sufficiency analysis points out five distinct configurations consistently linked to the outcome, as shown in Table 6. The overall solution consistency 0.802 is above the suggested threshold of 0.8. The overall solution coverage is 0.568, which means the configurations explain large portion of the cases.

Table 6.

Configurations for Active Emergency Preparedness Coordination

	Bottom-up Initiative			Top-down Approach	
	1	2	3	4	5
Organizational attributes					
Large agency	●	●	●	●	⊗
Above-average decentralized agency	●	●		⊗	●
Above-average managerial commitment			●	●	●
Above-average employee support	⊗	⊗		●	●
Environmental factors					
Hazard-prone area	●		⊗		⊗
Highly liberal constituencies		●	●	●	⊗
Number of cases	5	5	10	9	2
Model coefficients					
Consistency	0.779	0.821	0.79	0.889	0.911
Raw Coverage	0.19	0.239	0.257	0.23	0.056
Unique Coverage	0.05	0.04	0.075	0.1	0.042
Overall solution consistency	0.802				
Overall solution coverage	0.568				

Note: ● represents the presence of a condition; ⊗ indicates an absence of a condition; the blank spaces represent the presence or absence of a condition is irrelevant to the outcome.

6.1.1 Can Individual Attribute Foster or Hamper the Active Preparedness Coordination?

Table 6 shows that among the five sufficient configurations for active preparedness coordination, all the attributes appear in at least three of the five paths, indicating the theoretically derived conditions are empirically relevant to the outcome of interest. The presence and absence of large organizational size are present in all the sufficient configurations. This finding is aligned with previous studies emphasizing the contingent fashion of organizational size's impacts.

Corroborated with previous research uncovering ambivalent effects of structural characteristics on organizational performance, active preparedness coordination can occur when a decentralized structure is present (Configuration 1, 2 and 5), absent (Configuration4) or irrelevant (Configuration 3). The role of structural features in facilitating organizational actions is less straightforward and dependent upon the combinations of other attributes.

The presence of employee support is critical for the Configuration 4 and 5 in Table 3, but active preparedness coordination can occur even in the absence of strong employee support (Configuration 1 and 2), as well as where employee support is irrelevant (Configuration 3). Different from other organizational attributes, the absence of managerial commitment to address the threat of extreme weather events is not a part of the sufficient configurations for active preparedness coordination. This finding means that if active preparedness coordination to occur, managerial commitment can be present or at most irrelevant.

The presence of one of the environmental factors, hazard severity or political ideology, is required to elicit active preparedness coordination in the first four configurations in Table 6. In other cases, active preparedness coordination can occur

irrespective of hazard severity or liberal ideology, or even when both are absent, as shown in configuration 5. This pattern of findings suggests that hazard severity is probably a less important precondition of emergency preparedness for transit agencies located in large metropolitan areas than traditionally believed, since its presence only comes into play for one specific path to active preparedness coordination.

Overall, the five sufficient configurations collectively illustrate that a single organizational or environmental attribute is neither sufficient nor necessary for the outcome of interest to occur. The presence and absence of organizational size is relevant to transit agencies' inter-organizational preparedness coordination. Managerial commitment can be either present or irrelevant contingent on the combination of others. And all the other conditions are found being either present, absence or irrelevant for active preparedness coordination. These findings support Proposition 1 – The same attribute can either foster or inhibit inter-organizational emergency preparedness coordination, depending on how it is configured with other attributes.

6.1.2 Are There Multiple Pathways to Active Preparedness Coordination?

Table 3 shows five equifinal pathways to active coordination in preparation for extreme weather events. These pathways reflect the different *reasons, motivations,* or *mechanisms* for active preparedness coordination based on holistic configuration of organizational and environmental factors. Because QCA findings are case-oriented rather than variable-based, they allow for categorizing the solutions into segments, which are labeled as *bottom-up initiatives* and *top-down approach* to coordination in this paper.

The first two configurations appeal to transit agencies relying on their employees' *bottom-up initiatives* to achieve active inter-organizational coordination. These configurations reveal that when environmental stimulus for governmental actions exists (either the hazardous threats or constituencies' support for climate-related policies), large, decentralized transit agencies, whose employees are not always in line with managerial perceptions or decisions (i.e., lack of above-average employee support), are likely to actively coordinate with others in preparation for extreme weather events. In this type of agency, employees enjoy greater autonomy and larger discretion in terms of carrying out daily work and have more opportunities to directly interact with external environments. When the autonomy and authority are translated into advantageous access to information, employees more often make their own judgements and try to inform the managerial decision later, rather than merely follow the managerial preferences. Under this circumstance, employees' increased awareness of the potential hazardous threats or the constituencies' demands for governmental actions to combat the climate change will likely change their actions and internalize the needs for greater efforts against extreme weather events, regardless of managerial attitude.

Configurations 3 to 5 describe the routes to active preparedness coordination through a *top-down approach*, driven by managerial commitment in addressing the challenges of extreme weather events. The third configuration notes that even with the absence of hazard severity, active preparedness coordination is still likely to occur when there are great number of constituencies who might favor policies or actions against the climate threats. The finding here corroborates with previous studies in that hazard exposure or severity is not enough for public agencies to take responsive or adaptive actions.

Resource sufficiency, managerial determination, and political feasibility can complement the absence of hazard experience and account for transit agencies' active preparedness coordination.

The fourth configuration reveals that large, centralized transit agencies whose managers are committed to cope with climate threats and have strong support from employees, are likely to actively coordinate with others when there is also strong public support for related policy actions. This configuration, compared to others, has the highest level of unique coverage (0.1), meaning it is more frequently linked to active preparedness coordination than other solutions. The high level of centralization is considered having negative impact on organizational performance as it boosts the procedural rigidity, reduces the organization's responsiveness to the environment and hurts its effectiveness (Andrews et al., 2009). This configuration implies that if managers can obtain a high-level of support from their employees, either through human resources management practices or through their own charisma, the negative effects of centralization could be mitigated.

The last configuration illustrates, without hazard severity and a large base of constituencies who might support climate-related policies, strong managerial commitment together with employee support for implementation also enables the active preparedness coordination actions to occur within relatively small and decentralized transit agencies. This pattern should not be interpreted as the organizational configuration in solution 5 is only sufficient for the outcome when environmental incentives are absent, as there is limited diversity in the sample regarding its combination with other environmental conditions. Configurations 4 and 5 jointly indicate strong managerial commitment together

with employee support can navigate different organizational and environmental settings and facilitate the preparedness coordination.

In summary, the QCA findings support the proposition 2 because five configurations of organizational attributes and environmental characteristics are equifinal in producing active preparedness coordination actions.

6.1.3 Is the Fit Between Organizational Attribute Configurations and Environmental Incentives Critical for Active Preparedness Coordination?

According to Table 3, environmental attributes (either presence or absence) are an integral component to achieve active preparedness coordination, as they show up in every sufficient configuration. This finding demonstrates the configurations of organizational attributes alone are not sufficient, they must be compatible with environmental conditions to derive the outcome of interest. The compatibility could be achieved in three ways.

First, the same organizational configuration can be complemented by different environmental conditions to elicit active preparedness coordination. Comparing configuration 1 and 2 indicates a substitutive effect between hazard severity and constituencies' political ideology in shaping transit agencies' preparedness coordination. For large, decentralized transit agencies where employees are proactive and thinking independently, any environmental stimulus would be effective.

Second, the same environmental condition can align with multiple organizational configurations, as shown in configuration 2 and 4. Majority constituencies' support for climate-related policies could facilitate inter-organizational coordination not only through directly influencing employees' voluntary adoptions of actions in a decentralized agency

(i.e., bottom-up mechanism), but also through raising managerial awareness of the salience of the extreme weather events and initiating actions in a top-down approach.

Third, comparing three top-down approach configurations (i.e., configuration 3, 4 and 5) also shows complex trade-off effects between organizational attributes and environmental characteristics influence the preparedness coordination actions. In relatively small and decentralized agencies, managerial determination together with effective implementation could drive the actions in absence of environmental demands. In comparison, this "managerial-implementation" package needs to be complemented with constituencies' support for large and relatively centralized agencies to take active actions.

Overall, the proposition 3 is supported by the QCA findings, as environmental attributes are on all the routes to active preparedness coordination. The configurations also show substitutive effects between environmental attributes and complex trade-off effects among organizational configuration and environmental attributes.

6.2 Configurations for the Absence of Active Preparedness Coordination

As a good practice in QCA studies, an analysis of the negation of the outcome is often recommended because it can "help to grasp the causal logic driving the positive cases and/or generate substantively interesting insights in their own right" (Schneider & Wagemann, 2010, p.13). Thus, I proceeded with an analysis for the *absence* of active preparedness coordination, though the primary interest is in the presence of the outcome. Like results on active preparedness coordination, no single condition is necessary for the *absence* of active preparedness coordination. Table 7 identifies four equifinal configurations sufficient for the absence of active coordination. The overall solution has

high consistency score – 0.858 and explains around half of the cases (solution coverage: 0.498). The discussion of the results primarily focuses on how it supplements or contradicts with our understandings of active preparedness coordination.

Among the four configurations, configurations 1, 3, and 4 collectively show the lack of a top-down initiative explaining the absence of active preparedness coordination. With the highest unique coverage score (0.257), the configuration 1 reveals that most of the transit agencies not actively engaged in preparedness coordination are the ones with relatively centralized structures and whose managers do not pay attention to extreme weather events, even though their employees might not support the managerial decision on the issue. Configurations 3 and 4 share a core component of decentralized organizational structure, lack of managerial commitment, together with a high-level employee support for the managerial decision. Under this circumstance, the managerial attitude will be passed on to and implemented by employees. These three configurations reveal that lacking managerial commitment as a driving factor for the insufficient preparedness coordination actions.

According to Table 7, the presence, absence, and even irrelevance of all the other conditions, except for managerial commitment, contribute to the absence of active preparedness coordination. It suggests the proposition 1 still holds for the negative outcome (i.e., absence of the active coordination). Besides, the four equifinal configurations also provide support for proposition 2. What is different is that proposition 3 is not supported when trying to understand the absence of active preparedness coordination. Table 4 shows the configuration of organizational attributes alone is sufficient for the negative outcome regardless of environmental conditions.

Table 7.

Configurations for Absence of Active Emergency Preparedness Coordination

	1	2	3	4
Organizational attributes				
Large agency		●	⊗	●
Above-average decentralized agency	⊗	⊗	●	●
Above-average managerial commitment	⊗		⊗	⊗
Above-average employee support	⊗	⊗	●	●
Environmental factors				
Hazard-prone area		⊗	⊗	●
Highly liberal constituencies		⊗		⊗
Number of cases	15	2	2	3
Model coefficients				
Consistency	0.87	0.84	0.816	0.851
Coverage	0.357	0.107	0.093	0.091
Coverage U	0.257	0.028	0.06	0.055
Overall solution consistency	0.846			
Overall solution coverage	0.506			

Note: ● represents the presence of a condition; ⊗ indicates an absence of a condition; and the blank spaces represent the presence or absence of a condition is irrelevant to the outcome.

Discussion

7.1 Theoretical Implications

Theoretically, the study introduces the configurational theory to emergency management research and aims to account for the causal complexity in public agencies' strategic action-taking. Previous research on preconditions for collaboration and coordination primarily focuses on the net effects of "individual ingredients", either organizational or environmental attributes, but rarely looks into the "recipes" that make the collaboration or coordination possible. As no single condition is found sufficient for the outcome, the study empirically demonstrates that no attribute has a definitive effect on preparedness coordination on its own. It is the "recipes" – the alignment of organizational and environmental factors – that matters for public agencies' active preparedness coordination actions.

The results also consolidate the past gains of the literature, synthesize broad patterns of the fragmented factors, and shed light on the contextual boundaries for the application of diverse theories in explicating the public sector organization's collaboration or coordination (Meyer, Tsui, & Hinings 1993). For instance, the finding is more in line with "economies of scale" perspective than with resource-dependency theory, as relatively small organizational size only appears on one of five paths to active preparedness coordination. Besides, though the findings corroborate with studies emphasizing importance of managerial cognition for organizational action-taking (Bundy, Shropshire, and Buchholtz 2013), they also point out circumstances where managerial commitment is not an integral part of the configuration and does not affect outcome. Aligned with organizational design theory, the results show there is no one "best" organizational form.

Both centralized and decentralized structures can fit in different organizational configurations for active coordination.

Comparing the configurations for the presence and absence of active preparedness coordination in Table 3 and 4 further generates two insights. First, active preparedness coordination can be achieved through both bottom-up and top-down mechanisms, but it is the top-down approach driving the low level of preparedness coordination actions. Managerial commitment-led organizational actions account for larger proportion of cases in our sample and is more common for transit agencies in large metropolitan areas. Its absence exists in three of four routes to the inactive coordination. These findings suggest, though managerial commitment is not a sufficient condition itself, it is a vital ingredient for the recipe for active coordination actions. Though theoretically possible, empirically it is relatively rare to find an organization whose managers are attending to extreme weather events, but itself not taking active coordinating actions. The finding corroborates with previous studies emphasizing managerial perceptions and attitudes' functional utilities for emergency management tasks completion (Xiang 2021; Hicklin et al. 2009).

Second, the configurations provide asymmetric explanation for public agencies' active preparedness coordination – the arrangement of factors that prompt agencies to actively coordinate with others might be different from those that discourage them. In the study, organizational attributes need to be aligned with environmental conditions for active preparedness coordination to occur, but the organizational attributes alone can account for low level of preparedness coordination. Specifically, for the most cases in our sample, environmental incentives are needed to prompt active coordination. But once public managers in centralized agencies have little interests in addressing extreme weather events,

the environmental incentives can no longer be translated into actions. Methodologically, this finding further demonstrates the advantage of using set-theoretic methods to study the coordination compared to the traditional regression analysis.

7.2 Implications for Practice

In terms of the implications for the practice, public managers who seek to improve their agencies' capabilities dealing with the changing environments must be aware of the different possible means to achieve active inter-organizational emergency preparedness coordination. A "single best strategy" for active preparedness coordination does not exist. The study points out profiles to look for when public managers would like to increase their agencies' external coordination either through a top-down and bottom-up approach.

First, public agencies solicit active preparedness coordination when the organizations have sufficient resources, and their employees have large autonomy and discretion in making decisions about their daily operations. These employees face political or environmental pressures with respect to the increasingly severe extreme weather events and in turn might take coordinative actions to address the concerns regardless of managerial interest toward the issue. The key tactic to activate this bottom-up approach is to form an organizational climate and culture that encourage innovation and the use of discretion. Organizational leaders should seek to ensure that staff feel their own thoughts valued and encourage them to share different opinions. This strategy is especially beneficial for public managers who are overwhelmed by their agencies' primary missions and are lack of capacity to commit to emergency preparedness work. If the employees have resources,

autonomy, as well as exposure to the external pressure, organizations' active interactions with others in preparation for future climate disasters would likely to emerge gradually.

Second, agencies adopting the top-down approach require strong managerial determination to address extreme weather events together with employee support. They can have centralized or decentralized structures and often face political pressure regarding the climate-related issues. For some other agencies, the top-down mechanism is still possible when the agencies face no severe threats from physical environments, but have strong political incentive, managerial commitment, together with sufficient resources. The key to activate the top-down approach is to strengthen managerial commitment, which could be done through raising managers' awareness toward the potential hazards and increasing their confidence in dealing with those threats. Effective tactics include encouraging them to conduct a comprehensive risk assessment for their agencies, showing them how trainings and exercises could help to increase their agencies' capabilities in dealing with challenges, or identifying modeling practices for them to follow.

Conclusion

As is common to all research, this study has several limitations that need to be noted. One set of limitations concerns the sample and design. The data is collected through surveys, which limits the capabilities to fully assess the depth and breadth of agencies' preparedness coordination. Besides, the study particularly examines transit agencies located in large metropolitan areas. Care should be taken when generalizing the results of this study to other public agencies or other empirical settings. Even though the choice of conditions is driven by theory and not by characteristics specifically linked to transit agencies, future research

shall assess whether the findings are applicable to other public agencies. A separate investigation is also needed to uncover the underlying mechanisms for medium and small agencies' active preparedness coordination, which might be quite different from the ones in large metropolitan areas.

Another set of limitations is related to the use of fsQCA. Even though the selection of conditions is based on a comprehensive review of the literature and guided by the major theoretical streams, there may be other factors shaping the preparedness coordination actions than the ones focused here. Future studies should try to include other important factors, such as leadership, organizational autonomy (McGuire and Silvia 2010), and formalization (Esteve et al. 2013). As QCA has constraints on the number of conditions included in the analysis, how to merge all the relevant conditions into meaningful higher order factors and strike a balance between the theoretical comprehensiveness and methodological plausibility is a challenge for scholars to tackle. Besides, set-theoretic methods are based on membership measures calibrated using substantive and theoretical knowledge. Several factors in the study are measured based on survey items, and the external anchors for calibration are unavailable.

As for the contribution, this study is the first to introduce configurational thinking into the emergency coordination research and use QCA to investigate how the alignment of organizational attributes and environmental characteristics influence preparedness coordination. It not only fills the gap of understanding public agencies' strategic preparedness actions, but also does it in a manner that acknowledges and embraces the real-world complexity. It is one of this study's contribution to emergency management and public administration literature.

Besides, the set-theoretic approach and QCA employed herein offer three critical insights not likely to emerge from conventional approaches for studying emergency coordination. First, coordination depends on the collective influence of the attribute *configuration*, not on a simple aggregation of each attribute's effect. Second, both top-down and bottom-up mechanisms might lead to active coordination as several alternative attribute configurations are identified in the study. There is no one best way to organize. Third, the specific configurations identified could provide useful guidance in developing the strategy fit best to a public agency's own characteristics for increasing its emergency preparedness coordination.

Notes:

1. Despite the theoretical reason, methodologically, only focusing on large metropolitan counties generates a homogenous and comparable sample, which have clear scope conditions and can benefit the generalizability of the findings.
2. There are limits on the number of causal conditions included in QCA. Because adding an additional condition doubles the logically possible configurations.

CHAPTER 4

LOCAL GOVERNMENT'S INTER-ORGANIZATIONAL COORDINATION IN RESPONSE TO COVID-19 PANDEMIC: THE ROLE OF INSTITUTIONAL LOGICS AND MANAGERIAL PRACTICES

Abstract

Covid-19 pandemic brought an unprecedented challenge to inter-organizational coordination. Previous research primarily focuses on structural, cognitive, and technological factors that shape response coordination and paid limited attention to the role of cultures, values, as well as managerial actions. This study reorients the focus of response coordination research from structural analysis of response network to the role of human agency. By introducing an institutional logic theory, this study explores institutional logics and managerial practices that shape inter-organizational coordination in response to Covid-19 at local governments. The empirical context of this study is the local government's Covid response in Arizona. Findings show that coordination actions are under the influence of professional and community logics. Incompatible professional logics contribute to the frictions in public health and emergency management agencies' collaborative efforts. The sense of community and emotional attachments create the flexibility needed in coping with emergency incidents. The study also provides empirical evidence for the importance of management practices for facilitating response coordination.

Key words:

Emergency Response, Inter-organizational Coordination, Response Coordination, Local government, Covid-19

Introduction

Covid-19 pandemic brought an unprecedented challenge to the "old puzzle" of coordination (Kapucu & Hu, 2022). Its global scale requires coordinated efforts across jurisdictional boundaries. The infectious nature of virus limits the in-person information sharing and compromises the functioning of emergency operation centers. Moreover, the long duration and politicization of the incident further challenges stakeholders' capacity as well as willingness to cooperate. Current research on Covid response examines policy coordination across nations (Comfort et al., 2020; Pacces & Weimer, 2020), the utility of federalism in coping with response challenges (Rozell & Wilcox, 2020), as well as the federal governments' coordination problems (Kapucu & Hu, 2022). We are left wondering how coordination takes place at local level and what affects local governments' coordination in response to Covid-19 pandemic.

Previous research focuses on structural, cognitive, and technological factors that shape response coordination. For instance, studies examine how effective structural design of emergency response system meets the demand of coordination (Gil-Garcia et al., 2016; Lu & Xu, 2014); how trust, familiarity, as well as the development of shared mental model influences joint decision-making (Drnevich et al., 2009; Waring et al., 2020); and how the design of sociotechnical systems shapes information sharing across organizations (Agarwal et al., 2016; Comfort, Dunn, et al., 2004). Examination of these influential factors are certainly relevant to our understanding of coordination, but it draws attention away from the critical role of human agency. With the overwhelming focus on factors beyond individual control, coordination agent "disappears" from the discussion of response coordination.

Coordination takes place through series of actions that individuals or organizations choose to take at historical moments given specific circumstances. Then, why do people or organizations take actions in a manner facilitating or impeding response coordination? Cultures and values provide a valuable lens to further shed light on this important yet unaddressed question. This study fills the literature gap by engaging a meta-theory of institutional logics to highlight the roles of cultures and values in shaping response coordination. Institutional logics refer to a set of belief systems (values, beliefs, and normative expectations) that provide frames of references directing, justifying, or regulating people and organizations' actions (Haveman & Gualtieri, 2017; Reay & Hinings, 2009). One goal of this study is to investigate how institutional logics affect interactions among response organizations during emergencies.

Aside from cultures and values, managerial actions are also of importance to the effectiveness of response but rarely investigated empirically. Previous studies draw the attention to the roles of managerial perceptions (Lee & Mossberger, 2009), network management strategies (Wukich & Robinson, 2013), and leadership styles (Uhr, 2017) in response coordination. Few studies examine what managerial actions or practices facilitate or impede response coordination (except for Brooks et al., 2013; McNulty et al., 2018).

To fill the void in the literature, the article intends to inform our understanding about local governments' coordination in response to emergencies and disasters by asking two important questions: (1) How do institutional logics shape inter-organizational coordination actions in response to Covid-19 at local level? (2) What gets practiced by managers to influence inter-organizational coordination? To answer these questions, I conducted a multiple-case study and examined local governments' inter-organizational

coordination in response to Covid-19 pandemic in Arizona. Data were collected through in-depth semi-structured interviews as well as internal governmental documents.

This study contributes to emergency management literatures in three ways. First, it reorients the focus of response coordination research from analyzing structural features of response network to the role of human agency. Second, the study adds to the emerging scholarship by introducing institutional logics theory and explicating how cultures and values shape response actions. The study revealed that incompatible professional logics contributed to the inter-departmental frictions. The strong commitment as well as emotional attachment to local communities (i.e., community logic) facilitates coordination by resolving conflicts and enable flexible task delegation. Third, findings unveil new insights about how public managers can facilitate response coordination and address the crucial roles of their personality characteristics (e.g., humility, ego) in leading emergency response.

Literature Review

Conceptualization of Coordination: A Practice Approach

Multiple theoretical perspectives inform our understanding of inter-organizational coordination during emergency response. From a structural perspective, the core of coordination is to address task interdependencies through careful design and arrangement of roles, modalities, structures, as well as their contingent relationships with environment (Malone et al., 1999; Malone & Crowston, 1994). Emergency management scholars look into whether a bureaucratic structure with features of standardization and formalization

(e.g., pre-defined objectives, tasks, and authority structures), or a network structure with informal mechanisms (including improvisation, adaptation, and mutual adjustment), is more conducive to response coordination in practice (Buck et al., 2006; Jensen & Waugh, 2014; Kilby, 2008; Waugh, 2009).

Drawing from the theory of complex adaptive system, idealistic response coordination occurs in a manner when organizations continuously learn, make adaptations, and align their functions in response to unfolding crisis events without a higher-level coordinator (Kauffman, 1993). Scholars explore the prerequisites that enable response entities' self-organization, including information sharing practices (Comfort, Ko, et al., 2004), design principles of socio-technical system (Comfort, Dunn, et al., 2004), and the role of information infrastructures (Comfort, Dunn, et al., 2004; Comfort, Ko, et al., 2004; Comfort & Kapucu, 2006). From a cognitive perspective, inter-organizational coordination takes place in the process of joint decision-making and requires the formation of a shared mental model. This stream of research focuses on how behavioral tendencies and cognitive factors shape crisis decision-making (Drnevich et al., 2009; Waring et al., 2020) as well as how shared mental model influences coordination activities and commitment (Waring et al., 2018).

In summary, these three theoretical traditions largely conceptualize coordination as an *outcome* of structural, cognitive, or self-organization activities. They fail to recognize that coordination is an ongoing *process* constantly shaped by individual's or organization's action-taking. The importance of human actions has been overlooked.

Practice theory is a response to the neglect of the agentic capacity of human actions in organizational studies (Feldman & Orlikowski, 2011). It acknowledges the centrality of

people's actions in producing organizational reality, and believes that "social life is an ongoing production and emerges through *people's recurrent actions*" (Feldman & Orlikowski, 2011, p.1240). Following the practice approach, coordination in this article is defined as "a temporal unfolding and contextualized process of input regulation and interaction articulation to realize a collective performance" (Faraj & Xiao, 2006, p.1157). This definition suggests that coordination is an unfolding process manifested in the series of individual or organizational actions instead, which offers implications for furthering research agenda on response coordination.

First, the practice-oriented conceptualization of coordination highlights the emergent and context dependent nature of coordination. Different from much of the correlation and regression research focusing on identifying influential factors, this conceptualization emphasizes that response coordination shall be studied within its context. "Coordinated actions are enacted within a specific context, among a specific set of actors, and following a history of previous actions and interactions that necessarily constrain future action" (Faraj & Xiao, 2006, p.1157). Coordination is no longer an outcome of predesigned rules, structures, and activities because they unfold differently when interacting with different individuals or specified in a different context.

Second, this conceptualization calls for reorienting the focus of response coordination research to the role of human actions and practices, an empirically important yet underresearched topic. Though might not explicitly draw on practice theory, previous studies started outlining leadership behaviors (McNulty et al., 2018), pinpointing self-organization actions (Beck & Plowman, 2014), and identifying situated articulation practices (Brooks et al., 2013), that contributes to effective response coordination. In line

with this growing attention to the role of human agency, the practice approach to conceptualize coordination further encourages specification of emergent practices as well as articulation of the contextualized mechanism underlying response coordination. This conceptualization makes institutional logics theory, a theoretical framework explaining human actions, a good fit to study response coordination,

Institutional Logics

The understanding of individual or organizational actions needs to be situated in institutional context. Friedland and Alford (1991) argue that each institutional order has a central logic which constitute its organizing principles. These logics "provide guidelines, prescriptions, and practical horizons that shape cognition, behavior, and emotion" (Lounsbury et al., 2021). Thus, institutional logics refer to "the set of material practices and symbolic systems including assumptions, values, and beliefs by which individuals and organizations provide meaning to their daily activity, organize time and space, and reproduce their lives and experiences" (P. H. Thornton et al., 2012). They provide frames of references for individuals and organizations to make sense of actions, direct attention, as well as regulate behaviors.

At the societal level, seven institutional logics guide the organization and individual's action-taking, including market, community, profession, state, family, religion, and corporation (Friedland & Alford, 1991; P. Thornton, 2004; P. H. Thornton et al., 2012). Actions driven by market logic emphasize cost efficiency, transactions, accumulation of capital (Venkataraman et al., 2016). Community logic is often associated with group membership, belief in trust and reciprocity, commitment to community values, and

emotional attachment (M. Lee & Lounsbury, 2015; McMillan, 1996). And professional logic is characterized by professional expertise, technical quality of service provision and personal reputation (Kitchener, 2002). Previous research finds organizations are often confronted with multiple institutional logics (Besharov & Smith, 2014; van den Broek et al., 2014; Zhang & Welch, 2022). For instance, health care organizations are driven by both professional logics and market logics. The former requires health organizations to prioritize the quality of care in service provision, while the latter leans toward cost-effective treatments (Reay & Hinings, 2009). Multiple institutional logics might be compatible with each other reinforcing organizational actions, or compete with each other for resources and power (Besharov & Smith, 2014).

Institutional logics approach is useful in emergency management research because it frames the conflicts or dilemmas that emergency management operations face. Take professional logic as an example. Multiple professional groups are often involved in response to emergencies, such as fire, police, emergency medicine and others. Members of each profession prefers to stress the legitimacy of their knowledge base to maintain jurisdictional control (Besharov & Smith, 2014; Dunn & Jones, 2010), which partially explains the on-scene turf battles or inter-group frictions (Wolbers et al., 2018). Besides, aside from societal-level logic, at meso-level (i.e., organizational level), response organizations always need to resolve the competition between the efficiency logic and flexibility logic. Both logics provide different prescriptions and guidelines for further action-taking. Institutional logics provide a frame to understand heterogeneous operational preferences and actions during emergency response.

Method

Case Selection

Because little is known about the role of institutional logics in influencing response coordination actions, an explorative and inductive research strategy was chosen (Eisenhardt, 1989; Glaser & Strauss, 2017). Case study is an empirical method examining contemporary phenomenon in-depth and within its real-world context (Yin, 2018). It is the most appropriate research methodology to address the inquiry for three reasons: the absence of previous empirical research, the nature of the research questions, and the hard-to-measure concepts of theoretical interests (i.e., institutional logics, coordination) (Agranoff et al., 2014; Marshall & Rossman, 2014). This article adopts a multiple-case study design to examine local governments' actions in response to Covid-19 pandemic. The multiple-case approach helps to decrease the possibility that findings are tied to a unique aspect of a single case (Moynihan, 2009). Besides, the study takes a postpositivist stance. The researcher serves as an external observer and remains a value-free stance toward the objects of the study (Ospina et al., 2018).

For qualitative research, cases are not selected at random, but to serve theoretical purposes (Eisenhardt & Graebner, 2007; Ospina et al., 2018; Stewart, 2012). The goal of the study is not to explain the ultimate success or failure of response to Covid-19 pandemic, but to understand how coordination takes place in different local government settings, informing an emerging theory about how institutional logics affect response coordination. Thus, cases are not selected based upon the response performance. The primary case selection criterion is the diversity of local government settings. As emergency management is largely the function and responsibility of county-level governments, county-level Covid

response taskforce is the primary object of study. Thus, I focus on Covid response taskforce in both large metropolitan counties and small rural counties to diversify the institutional arrangements. All the counties are selected from a single state because the design and implementation of Covid policies are highly politicized and vary across states. Selecting from a single state can control for the impacts of political climate on response coordination. Another important criterion for case selection is the access to key informants and adequate archival documents. Cases were selected based upon the previous working relationships as well as the possibility to gather rich information about Covid response operations. Pre-established relationships are likely to facilitate the data collection and potentially improve the data quality.

In the end, the study particularly focuses on Covid response taskforces in three counties in Arizona, including one large central metropolitan county, one large fringe metropolitan county, and one micropolitan county according to CDC Urban-rural classification scheme.

Data Collection and Analysis

Primary data collection relies on semi-structured in-depth interviews with practitioners directly involved in the Covid-19 response. To identify eligible and knowledgeable interviewees, I started from talking with emergency management professionals in a large metropolitan county through personal connections and used a snowballing method to identify other subject experts. Data collection contains three phases. Phase one was from December 2021 to January 2022. I conducted five pilot interviews with local officials through personal connections to collect background information (e.g.,

task division, milestone events) and understand the structures and responsibilities of major public agencies in covid response. Based upon these pilot interviews, I decided to narrow the focus of inter-organizational coordination primarily to the interactions between public health and emergency management agencies. Because they were the leading agencies of the response operations. The frequent interactions between these two agencies generate rich materials about coordination challenges and practices. Interview guides were also revised based upon professionals' feedback.

I started the second phase of data collection in March 2022. Interviews were conducted to collect information about respondents' job responsibilities, professional background, their agencies' structure, operation details of the response efforts (e.g., major tasks) and challenges encountered during response (e.g., role ambiguity, miscommunication, low morale). Interviews also remained flexible to include follow-up questions based upon respondents' responses. Following each interview, I wrote memos about observations and reflections, and modified subsequent interview questions based upon the field notes. Through the initial thematic coding of the transcripts, concepts of theoretical interests, such as "cultural differences between emergency management and public health", "contrasting views of operations", "small-town mentality" emerged. Going back and forth between codes and literature pointed to the theory of institutional logics as the primary theoretical framework for the study. Phase 3 data collection was from June to July in 2022. Interview questions were further refined to capture the theoretical constructs and enhance construct validity. This round of data collection ensures sufficient data were gathered for each case.

Phase 2 and 3 data collection led to 21 interviews in total with emergency management (4 county-level directors, 2 city-level directors, 3 county-level staff), public health (2 county-level directors, 2 division managers), and community partners (3) in Arizona. All these interviews were conducted via Zoom and range from 48 minutes to 2 hours. They were recorded and professionally transcribed. As interviews suffer from the bias of impression management and retrospective sensemaking, I tried to include multiple informants from different agency as well as at different hierarchical rank to gain diverse perspectives on the response coordination practices (Eisenhardt & Graebner, 2007). Besides, government internal documents, such as incident action plans and annual reports, were also gathered to assist triangulating the information collected from interviews. These documents provide details about each organization's responsibilities and operational requirements during Covid-19 response. They could help to mitigate the concern for recall bias.

As aforementioned, the data analysis started from an open coding process, which revealed themes around coordination challenges, their causes, as well as managerial strategies to cope with response problems. Through subsequent axial coding, I identified sub-themes and interdependencies between the themes. Emerging from this analysis was opposite opinions between emergency management and public health professionals toward certain operations, different coordination experiences in small counties and large counties, as well as managerial strategic actions to cope with response challenges. These discussions guide the exploration towards the role of institutional logics as well as managerial practices.

Findings

Different Professional Logics between Public Health and Emergency Management

Profession as an institution has standards for operations, distinct normative system of rules about how things should be done, as well as their own cognitive framework to make sense of the reality (Hughes & Hughes, 2013). With large variations in values, norms, and cultures, response actions guided by the professional logics have caused frictions in emergency management and public health's joint response efforts. In this section, I would first explain the values, beliefs, that are embedded in each logic, and then articulate how it facilitates or impede the inter-organizational coordination in response to Covid-19 pandemic.

Emergency management agencies are primarily responsible for coordinating field response group, local and state jurisdictions to get situation awareness, relay information, and direct resources during the response. Dealing with emergencies require rapid action-taking in unpredictable and dynamic environments. Efficiency is a core value directing their behaviors. Emergency management professionals adopt a top-down management approach to expedite decision-making. They are comfortable of making decisions under uncertainties and value the importance of acting, solving problems via trial-and-error experimentations.

In contrast, a lot of public health work focuses on health equity and diversity, which builds a more equitable and inclusive culture within the profession. As the domain of public health includes a diverse set of areas, such as emergency preparedness and response, infectious diseases epidemiology surveillance, environmental health, medical forensics, etc. Their decision-making is more decentralized, leaning more towards discussion-based

decision-making style, wishing to integrate every actor's expertise. As a public health respondent mentions, "we have a variety of background from doctors to scientists, to community health workers. All that combines to make this really nice discussion-based problem solving" (Interview 12).

The differences in professional logics provide contradictory guidelines for actions as well as conflicting interpretations of others' actions. Because of the methodical tradition and discussion-based problem-solving custom, public health professionals set protocols and come up with solutions through thorough discussion, which usually takes a long time. As a public health respondent describes:

> We would just talk for two hours to come up with a solution and we get down into the weeds, because we can't just say, 'Oh, let's go ahead and set up five mega points of dispensing.' We work through everything in those meetings because we're the ones that have to set them up (Interview 12).

However, from an emergency management perspective, the prolonged meetings represent analysis paralysis and lead to insufficient action-taking.

> When we first were looking at going into unified command with public health, there was initially a lot of analysis paralysis. A lot of really long conference calls that were occurring. …… Things are really dragging out these calls that would last hours. A lot of time talking about stuff, not a lot of time spent doing (Interview 5).

Incident command system (ICS) is a good tool to improve the efficiency. It requires response team writing incident action plans (IAP), specifying operational objectives, and outlining response strategies by operational period. Though both public health and emergency management receive trainings on ICS, different professional logics lead to divergent expectations about how to operationalize ICS doctrines in the response. For example, at the beginning of the response, emergency management professionals, following FEMA training protocol, stick to the 24-hour standard operational rules to improve the efficiency of the response.

> By the end of the day, you have your agenda for the next day of what you're supposed to accomplish. That's called your battle rhythm when your incident command starts really functioning in that cycle. It does a great job towards making everything much more efficient (Interview 5).

On public health's side, every disease has a different response. The notification requirements vary from 24 hours to 7 days. They tend to set operational period at a longer time span. Emergency management's adherence to 24-hour cycle increases their workload and represents a lack of flexibility in tailoring the use of method to meet the actual response objectives.

> When emergency management and public health got together for COVID, there was a lot of friction. Because we had already been setting our incident action plans to be week, and they wanted to go 24 hours. When we did that, it caused twice as

much work for us in operations, because we were trying to come up with new objectives all the time (Interview 21).

They don't realize that they can set an incident action plan outside of 24 hours…. FEMA curriculum really is based around wildfires and wildfire changes so quick within a 24-hour period. Everybody that I've worked with for 20 years has always tried to set their objectives to meet that 24-hour cycle instead of setting their IAP to meet their objectives…. We don't work overnight, so there's no need to that. That's the first thing they teach you, flexibility (Interview 13).

In addition, data also shows that **differences in professional logics lead to the issue of lack of respect and cause adversarial atmosphere**. As a public health informant noted, "a lot of us think emergency management doesn't see us as an equal, and that can be cultural-based." Public health's working style is more collaborative and equitable. A respondent describes "the profession is all about changing the norms in a culture, and you can't do that by just telling people to get in line and follow these rules. You have to work with people" (Interview 18). In comparison, many emergency management professionals are "ex-military" and "ex-public safety", who are trained in command-and-control managerial approach and a rough and direct communication style (e.g., 'If you don't like it, get out', "do as I say"). During response, this style is problematic when working with others, because emergency management agency does not have legal authority over other governmental departments. "We are not first responders, we're a support agency. It's very

easy to cross that line. If you go to a Police Chief, a Fire Chief, or a Sheriff, and you start telling them what to do, you're going to lose their respect very quickly" (Interview 20).

During the Covid response, several public health respondents point out they encountered situations where emergency management professionals overstep and did not stay in their own lanes. Some distribute public health's medical-standard protective personnel equipment (PPE) without permission, use public health's name to request resources from state departments, and constantly question public health's operations. All these actions erode the trust and respect and create adversarial atmosphere, which undermine the joint coordinated efforts during stressful time.

> They didn't say "you need to follow your plan and tell us what we need to do". It was more of those times – "Why are we doing it this way? And why do we have to follow the plan? And why can't we just give all these PPEs to the schools?" They shouldn't tell us how to respond to our event…. [They should] make suggestions, [but] not question the information or the intent (Interview 21).

Community Logic in Small and Rural Counties

Professional logics prescribe individual's choice of actions through professional operation standards. While under the community logic, individuals' action-taking is influenced by the belief in reciprocity within the group as well as the commitment to community values (P. H. Thornton et al., 2012). The core of community logic is that local community influence explains organizational behaviors. The community could be defined based upon affiliation or geography. In the study, community logic is guiding small and

rural counties' response operations. The sense of "relying on each other" unites responders across professions (i.e., affiliation-based community) and creates a natural bond to mitigate the tensions from incompatible professional logics. Moreover, small-town mentality – the belongingness to the local (geography-based) community and the commitment to protect neighborhoods – motivates responders to step outside of their traditional roles and take on extra task to help each other out

Mitigate tensions from incompatible professional logics. As interviewees are primarily from public health and emergency management, I will illustrate how they are united to establish a sense of community across professions. In some small and rural counties, emergency management and public health are consolidated into one department. Though still two professions with distinct expertise, the consolidated structure together with periodic training creates a natural bond for the entire response group, which reconcile the tensions from incompatible professional logics. As a public health director, who is also in charge of emergency management division, describes:

> I made a concerted effort to combine my PHEP (public health emergency preparedness program) and emergency management programs and required everybody to go through the exact same training. And everybody in my health department was required to be bringing in emergency management [and] public health emergency preparedness during an event. So, I could plug them into any role in the emergency operations center that we set up, and they would be comfortable, and they would know how to do those roles (Interview 18).

As a result, the emergency manager of that county mentions:

> When I have a fire, I need to staff my EOC, I staff it with public health employees. They help us out, we're going to help them out, for sure… There is a huge, huge divide there in that work culture between emergency management and public health, opposite ends of the spectrum, but we get along great (Interview 20).

This solidarity and tight bonding are also seen in another small county public health emergency preparedness program manager's statement. "We don't really differentiate if it's a health emergency or a regular emergency. We're tied together on all of it…. We rely on each other 24/7 for all of it" (Interview 17).

Facilitate flexible task delegation. The novel challenges of Covid-19 pandemic generate extra tasks that were not specified or delegated in the pre-existing plan but need to be taken care of on top of agencies' other responsibilities. The task division and responsibility delegation during response can easily lead to inter-agency tensions. For instance, a public health specialist in a large county complains:

> There was a great divide in responsibilities. Some of us, including myself, were working 17 hours a day when they (emergency management) made sure they left at five o'clock on the dot, they were out… Where the disagreements happened was when they felt a mission should be ours and we just didn't have the staff or the time to do that mission, but they did (Interview 12).

Small and rural counties are in even more inferior positions to cope with novel challenges due to lack of operational resources, short on manpower, tasked with service delivery across the huge expansive land. The small-town mentality or the commitment to taking care of the community drives responders to be proactive and flexible in terms of undertaking extra tasks.

> Small town, you have that small town mentality of caring for your neighbor. Our medical records person who prints birth certificates was out there writing times on people's cars for the time that they got their vaccine to see when they can be released. Everybody was doing something that was way outside of their job. I had talked to a few of my friends in some of the larger counties and they said, "Oh yes, I'm not involved at all." I'm like, "Why not? You could be." I think flexibility is probably one of the biggest differences you notice between rural and larger counties (Interview 20).

Internal Management Practices

Apart from institutional logics, managerial practices, both internal management practices and external practices, also shape inter-organizational coordination in response to Covid-19 pandemic. Internal management practices primarily focus on how managers educate and manage their own staff as well as boost morale of the response group to facilitate inter-organizational coordination.

Education. Experienced emergency managers are aware of the cultural differences between emergency management and public health and tried to reduce the tension by educating employees on how to communicate with public health department.

> Sometimes there were challenges with my staff … Some of them were being a little too direct sometimes, where you got to explain that "Hey, you got to walk that back a little bit. Let's take a different approach. You can't just use the 'do as I say' approach, we've got to play nice." (Interview 5).

Match talents with roles. Aside from education, managers also talk about the importance of learning and reading about their own people, as well as putting the right person at the right role.

> There is somebody that was highly competent but wasn't the right person to have a direct interface with some of the public health leadership people. That's up to me to see that and say, "Okay, you don't belong here. You go back and work the wildfire," and put somebody else in this role that's a little bit more of the right personality to interface (Interview 5).

The inter-organizational frictions have been reduced after getting the "wrong" person out of the position.

Boost morale. Another practice that frequently stressed by managers is morale management. The long duration of Covid response leads to staff burnout. Many responders mention about receiving threatening calls from the residents, which further exacerbate their stress and frustration. To maintain morale, managers take the time to take care of their staff, listening what is going on in their lives and allowing them to vent. Besides, they also try to integrate small fun activities into operational routines. For instance, one emergency manager mentions they played a corn hole game during the long wait for resources to arrive, so that they can set up the vaccination point of dispensing site. At another county, PHEP manager says they played briefing bingo and press conference bingo at the multiagency EOC to boost morale and increase cohesion of the group.

External Management Practices

External management practice refers to the external-facing actions that managers take to increase shared situation awareness as well as support from community partners.

Increase shared situation awareness through co-location and daily briefings. Geographic proximity directly influences the amount of communication and interaction among organizations (Beck & Plowman, 2014; Okhuysen & Bechky, 2009). One large county intentionally finds a new place to serve as the unified command center, where public health and emergency management work side by side with each other. At another county, though not exactly in the same place, emergency management and public health are located in the same building, which facilitates the interactions between two professions. As an emergency manager notes, "because of the close proximity, we work with medical side pretty much all day every day" (Interview 7). For counties that are not able to take

advantage of the geographic proximity and run a joint operation center, either due to the concern of Covid or other constraints, they facilitate interactions by daily briefings. “We were briefing twice a day and they were remote into our command center” (Interview 16). Respondents mention these daily briefings help to keep everyone on the same page about objectives and operations.

Get buy-in from partners via transparency and humility. Establishing relationships beforehand is a principle for emergency management. However, due to the unprecedented challenges of Covid-19 pandemic, response organizations have to work with novel actors that they have rarely interacted before. How to build these relationships and gain support from novel partners become coordination challenges for public managers to cope with.

> Once that executive order came out [and] required this very quick relationship between the public health directors and all the school superintendents in the county. I'm telling you I was a little nervous at first (Interview 18).

When asked about how to build these relationships and gain support, a public health director answers “transparency [and] humility [were] the keys for me”.

Several managers talk about the importance of transparency, disseminating the information to community partners as fast as possible, to establish trust and support from partners.

> One of the things I chose at a very early stage in this pandemic was complete transparency. I didn't lie about the data. I didn't hide the data. I didn't hide anything. I always told the truth about what was going on in County and the state as far as the trends for COVID. I think the superintendents of the schools were extremely appreciative of my honesty, and my staff's transparency (Interview 18).

> As soon as we get information, we would disseminate it as quickly as possible. We would have regular meetings with our partners... Just so they were in the loop and they knew everything that we know…. [What] you don't want to do as a county [is] to withhold information. Because that will create frustration and damage relationships between us and our municipalities (Interview 20).

Besides, due to the politicized nature of Covid response, transparency also helps to combat the misinformation and serves as a strategic response when response organizations' motive and intention called into question. One public health informant says some school boards don't trust the protective measures (such as contact tracing and isolation of positive case) taken in the school aiming to protect students and teachers. What he did is to be transparent about his legal responsibility in the issue and send them a copy of state law.

> It wasn't a choice I had. Because the law clearly said if I didn't do it, I could potentially be prosecuted for a class three misdemeanor …Some of the school board members would always say I'm making things up… If I heard about it, I'd always resend the state law to the superintendents to share with the board (Interview 18).

Except for the transparency, several interviews suggest managers taking actions to show humility help to solicit support from partners, which corroborates with the idea that vulnerability helps to build swift trust (Beck & Plowman, 2014). A public health director talks about how he established rapport with novel partners by revealing his "vulnerability". "I was not an expert in COVID. I didn't know what was going to happen. I freely admitted that, and I asked for their help." A staff person from another county provides an opposite example, which shows how the headstrong managers hurt the morale of response team, prolonged the response, and affected other partners' daily work.

> Emergency manager and the public health incident commander [are] both very headstrong individuals -- the types that were "always right". That's where a lot of head butting came into… You could just see a change in morale. Like, "why am I coming in here if I just have to listen to those to argue?" It plays a significant role on the staff and how things are run...We were activated way too long. Then it started affecting other departments that were helping us, because they have their regular jobs to do… Had it not the county manager stepped in and how to sit down with these folks. It could have been disasters because the coordination efforts would not have been there (Interview 15).

Discussion

This study contributes to the emergency coordination research by reorienting the attention of response coordination research from structural features to the role of human

agency and actions. It advances the scholarship of emergency management by articulating how cultures and values cause and resolve inter-organizational tensions during response. Coordination challenges, such as lack of trust and contradictory operational actions, are well acknowledge in the literature. But the cause underlying these challenges are rarely examined. Institutional logics theory offers a vehicle of cultures and values to explain the causes of these problems. This theoretical perspective has the potential to further enrich emergency management research by explaining the variations in the adoption and implementation of disaster related policies, the level of community preparedness, local governments' commitment to disaster risk reduction, etc.

One interesting finding of this paper is that incompatible professional logics contribute to the frictions between public health and emergency management departments, which in turn undermines coordination effectiveness at the beginning of response. Cultural differences across response organizations are well noted (Kapucu & Hu, 2022; Power & Alison, 2017) but loosely discussed in the literature. What these differences are and through what mechanisms they make a difference to the response are not articulated. This study provides a theoretical frame to understand this empirical problem and extends previous inquiry by illustrating how the values, assumptions, interests, and norms embedded in professions lead to the coordination challenges.

The study also finds evidence that community logic, particularly the sense of local community and strong commitment to help community members, mitigate tensions from incompatible professional logics and generate flexibility in task delegation. This finding points to the importance of affective elements, such as emotional attachments, loyalty, commitment in dealing with unprecedented challenges. Novel crises require greater

flexibility in operations. And greater flexibility is not only dependent upon the structural design, but also predicated on the responders' willingness to support each other to tackle the challenges together. The finding to some extent echoes network-based research's emphasis on the importance of pre-incident relationship building for effective response (Kapucu et al., 2010). However, it also reveals the limitations of that stream of literature. Because the often-used network measures (e.g., attending joint conferences, participating in trainings together) are not able to capture the level of the emotional attachments or commitment, which are core in exerting effects during emergencies.

Besides, the study also identifies five managerial practices that facilitate inter-organizational coordination. The importance of manager's personal characteristics such as humility and egos have been emphasized by practitioners, but rarely catches scholarly attention. Moreover, the finding suggests that managerial actions are a great way to reconcile the competing institutional logics. For instance, managers can reduce the tension of inter-profession collaboration by teaching staff on how to communicate with partners, as well as, putting people with right skills at the right place.

Practically, the study offers several implications for the practice of emergency management. First, findings suggest the importance of reconciling competing professional logics for coordination. Hiring and socialization are two avenues suggested by institutional logics literature to increase the logics' compatibility (Besharov & Smith, 2014). Background of emergency management professionals is becoming more diverse nowadays. But with the increasing risk of biological hazards as well as cyber security, it is suggested to hire talents with diverse backgrounds, such as public health and computer science, to further build a response team that is capable of working with departments with very

different cultures and values easily. Though not included in the findings, several interviewees on emergency management related positions reveal that their public health or health related background help them as well as their agencies in the response to Covid. Second, socialization is an important practice for emergency management, as it not only reconciles the incompatible logics, but also helps to cultivate the sense of community and emotional attachment to partners.

Third, the interviews also reveal that though clear roles and responsibilities are preferable theoretically, it is hard to realize in practice. Contingencies of emergency situations generate novel tasks that are unable to be pre-specified or pre-delegated. It might be difficult to identify the functional departments that novel tasks belong to. It is also not uncommon for functional departments who own the task lacking capacity to carry them out. During Covid response, many counties need to identify temporary morgue sites, which is not a traditional public health or emergency management task. Two departments have disputes on the ownership of this task. Some counties might deem it more of public health function, but public health departments do not have capacity to take charge of the task.

Several limitations of the approach taken in this paper need to be noted. First, the small number of interviews conducted in each county risk the research findings not able to comprehensively capture the county's overall operational pictures. Though tried to mitigate the bias by intentionally ensuring the interview opportunities with department heads, future research shall delve deeper by conducting interviews with broader stakeholders within each county. Second, as Covid has lasted for more than two years, it might be difficult for participants to recall all the response operations with accurate and rich details. Third, the study points out the existence of different professional logics as well

as community logic but fails to specify the content of each institutional logic. Follow-up interviews could be used to further remedy this limitation. Fourth, the single case design compromises the findings' generalizability to local governments in other states.

Conclusion

Though catastrophic, Covid-19 pandemic put local governments' capabilities of coordinating collective response efforts to the test. It examines how capable public organizations are in terms of working with partners with opposite cultures and values, building novel relationships under stressful time, maintaining collective efforts in a long duration, and combating misinformation and distrust. Institutional logics – cultures, values, commitment embedded in institutional orders – are found having impacts on coordination through regulating individual and organizational behaviors. The crucial role of public managers in coordinating collective response efforts is also demonstrated via the managerial practices. This study is exploratory in nature. It does not aim to establish a comprehensive view of all the institutional logics exhibited in the response efforts or identify all the beneficial managerial practices. Future research is encouraged to further extend this line of inquiry and uncover other institutional logics or managerial practices to enrich our understanding about response coordination.

CHAPTER 5

CONCLUSION

This dissertation is an attempt to engage novel theoretical lens to study inter-organizational coordination in preparation for and response to emergencies and disasters. It starts from a broad overview of research on inter-organizational coordination in emergency and disaster context, moves to examine the preconditions for public agencies' active preparedness coordination, and then ends with outlining institutional logics and managerial actions that shapes response coordination to Covid-19 pandemic. Taken together, they examined how organizational attributes, environmental characteristics, cultures and values, as well as managerial perceptions and practices shape preparedness and response coordination. This chapter is dedicated to articulating how this three-essay dissertation contributes to the conceptual and theoretical understanding of coordination, as well as provides empirical strategies to improve coordination effectiveness.

Conceptual Understanding of Coordination

Coordination in emergency and disaster management context is often defined as the strategic alignment of actions to achieve a shared goal (Comfort, 2007; Drabek & McEntire, 2002). This definition is concise and insightful, but unable to provide a comprehensive descriptive account of coordination. This dissertation contributes to answering the question -- "what does coordination mean" -- by identifying two ways to organize the knowledge around emergency coordination.

Coordination has four building blocks, structures, cognitions, activities, and affections. In brief, if conceptualizing coordination as a car, structural elements are the car skeletons determining the "shape" of coordination; cognition elements are the mirrors directing the operation actions; activities are the wheels in charge of real-world functioning; and affection is like the fuel providing motivation for the operation. The systematic literature review suggests inter-organizational coordination relies on a careful integration of formal centralized coordination mechanism with informal decentralized mechanisms. Former helps to specify the roles, goals, and standards of operations, while the latter contributes to the development of strategies to implement them (Andreassen et al., 2020). Aside from structures, inter-organizational coordination could also be achieved through cognitive processing. Agreeing on a shared goal for the operation, developing a shared mental model to make sense of situation, as well as making decisions in a collective effort are critical for synchronizing organizational actions (Power & Alison, 2017; Waring et al., 2020). Activities, such as information sharing, resource allocation, and boundary spanning, are responsible for translating the structural design and cognitive processing into real world actions. The constant actions and adaptation to feedback also facilitate self-organization. Third essay further reveals the importance of affection, such as emotional attachment, commitment, collaborative attitude, to coordination. It provides incentive for coordination activities.

Coordination could be conceptualized as an action, an outcome, or a process. As an action, coordination is an umbrella term for all sorts of alignment and integration activities, such as information sharing, communication, joint decision-making, resource allocation, boundary spanning, etc. Coordination relies on these discrete activities to take place.

Though these activities have their own standalone research program, investigation of these activities in the emergency and disaster context constitutes the knowledge of emergency coordination. To develop a comprehensive understanding of response coordination requires careful examination of how these activities are carried out. This conceptualization points to a series of relevant research that does not explicitly use the term "coordination". As an outcome, coordination is influenced by series of factors. For instance, systematic literature review suggests coordination is a product of structural design or cognitive processing. It is also an outcome of strategic alignment of organizational attributes and environmental characteristics, implied by the second essay. The third essay further points to the influence of institutional logics and managerial actions. This conceptualization denotes studies that identify influential factors for coordination. As a process, coordination is manifested in the series of actions that individuals or organizations take (Faraj & Xiao, 2006). It is contextually situated and dependent on individuals' choice at a historical moment. This stream of research draws attention to the emergent nature of coordination.

Theoretical Contributions

This dissertation makes several theoretical contributions to emergency management and public administration research. The first essay enriches current theoretical understanding about response coordination by identifying four major theoretical lenses from inter-disciplinary research. Emergency coordination in public administration and emergency management literatures primarily draw from structural perspective (Lawrence & Lorsch, 1967; Thompson, 1967) and complex adaptive system theory (Dooley, 1997;

Holland, 2006). Limited attention to cognitive processing as well as coordination's unfolding processes suggest a need to reorient the research focus to the role of human agency in the future research.

To heed this call, the third essay introduces an institutional logics theory to examine coordination in response to Covid-19 pandemic. Institutional logics offer a vehicle of cultures and values to explain the response actions and outcomes and advance the understanding of why pre-established plans and protocols unfold differently in different crisis events. Coordination challenges, such as lack of trust and contradictory operational actions, are well noted in the literature. But there is lack of theoretical explanation for where these problems come from. Institutional logics theory provides an avenue to postulate the causes of these problems. Institutional logics approach is useful in emergency management research because it frames the conflicts or dilemmas that emergency management operations face. It has the potential to further enrich emergency management research by explaining variations in the adoption and implementation of disaster related policies, the level of community preparedness, as well as local governments' commitment to disaster risk reduction.

Lastly, by introducing a configurational approach, the second essay takes the complex and dynamic nature of emergencies into theoretical consideration and breaks away from the conventional assumption of linear, additive, and independent causality. It demonstrates coordination depends on the collective influence of the attribute *configuration*, not on a simple aggregation of each attribute's effect. As a meta-theory, it helps to consolidate the past gains of the literature, synthesize broad patterns of the fragmented factors, and shed light on the contextual boundaries for the application of

diverse theories in explicating the public sector organization's coordination (Meyer et al., 1993). For instance, the finding is more in line with "economies of scale" perspective than with resource-dependency theory. It also provides asymmetric explanation for public agencies' active preparedness coordination – the arrangement of factors that prompt agencies to actively coordinate with others might be different from those that discourage them. This theoretical insight is not likely to emerge from conventional approaches for studying emergency coordination.

Empirical Strategies for Improving Coordination

The three essays of this dissertation reveal that effective strategies to improve response coordination are the ones that are able to increase trust, familiarity, and collaborative attitude among the response group, promote shared understanding of goals and situations, clarify roles and responsibilities, and build the common knowledge repertoire to store the task knowledge. Specifically public managers can improve coordination effectiveness by organizing trainings and exercises, using information technology to aid information sharing, practicing favorable managerial and leadership behaviors.

Trainings and Exercises. Trainings and exercises have long been identified as crucial measures to support coordination. This dissertation finds trainings and exercises are able to aid coordination in three ways. First, trainings and exercises increase participants' knowledge of partners' tasks, capabilities, and procedures, as well as their perceptions, concerns, and thinking patterns. They facilitate coordination through a cognitive mechanism and help participants to develop a common scheme to make sense of the

situation and interpret the problems. Second, as socialization events, trainings and exercises contribute to response coordination via building attachments among participants and increasing their familiarity and mutual trust. This mechanism intends to boost participants' willingness to help each other out when facing unprecedented challenges, which is identified as an important issue in the third essay. Third, trainings and exercises could also be designed to hone generic skills related to information sharing and collaboration. These three mechanisms are guiding principles for designing effective trainings and exercises.

Information Sharing and Information Technology. As information sharing is a critical coordination activity, the first essay draws from the information system research and provides practical information related strategies to improve response coordination. Public managers are first encouraged to adopt appropriate information sharing practices. For instance, provide rationales whenever requesting or sharing information; proactively offer information about ones' own agency's roles and responsibilities; only share information relevant to other agencies' functions and responsibilities and deliver it in a concise manner (Salmon et al., 2011; Waring et al., 2018). Second, public managers can use information artifacts to ensure every agency's equal access to core operational and situational information. Third, the design of technological system shall be adapted to accommodate the fluctuating and unpredictable circumstances. Therefore, the technological system needs to be built upon a resilient infrastructure, and incorporate the pre-existing knowledge about roles, tasks, and responsibilities. Besides, the design of technological system shall also incorporate the information and tasks at each command level as well as each jurisdiction level (Brooks et al., 2013; Waring et al., 2018).

Managerial and Leadership Behaviors. The whole dissertation stresses the importance of managerial perceptions and actions for coordination. One of the main tasks for public managers during emergency response is to promote the collaborative attitude of the multiagency response group and enhance their willingness to coordinate. This can be done by teaching team members the right way to communicate, abandoning the ego-driven or blame-casting behaviors themselves, as well as publicly identifying, crediting and appreciating ones' attentive actions to others' needs and requests (Bharosa et al., 2010; Solansky & Beck, 2009). Besides, managers are also responsible for articulating the goal and mission of the response, which can help to unite the response efforts together (McNulty et al., 2018).

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APPENDIX A

ESSAY 1: LITERATURE ELIGIBILITY CRITERIA

This review selected studies if they met the following criteria:

- Type of studies and participants: Records are related to the study of organizational coordination in the public administration/sector. Studies must examine coordination actions that involve public organizations.
- Topic: Records must contain the terms shown in Appendix S2 in the titles and/or abstracts. All records were read in their title, abstract, or entirely.
- Study design: Empirical and conceptual studies are selected.
- Field of study: The review contains studies from all the relevant social science disciplines.
- Year of publication: The selected period includes the studies published from 2002 to 2021.
- Language: The study considers records written in English exclusively.
- Publication status: The review only includes peer-reviewed articles.

APPENDIX B

ESSAY1: KEYWORDS AND SEARCH STRINGS

Number	*Category*	*Search strings*
1	Group string 1*	"Coordination" OR “Cooperation” OR "Collaboration" OR "Partnership*" OR "Relation*" OR " “Network*” OR “Communication”
3	Group string 2	"Inter-agency" OR "Multi-agency" OR "Inter-organizational" OR “Cross-organizational” OR “Cross-sectoral” OR “Interagency” OR “Multiagency” OR “Inter organizational” OR “Interorganizational” OR “Cross organizational” OR “Cross sectoral”
4	Group string 3	"Emergency OR "Emergencies" OR "Disaster*" OR "Cris?s" OR "Hazards" OR “Extreme event*”
5	Related concepts	“Complex adaptive system” OR “Boundary spanner”
6	Combined string 1	("Coordination" OR “Cooperation” OR "Collaboration" OR "Partnership*" OR "Relation*" OR " “Network*” OR “Communication”) W/15 ("Inter-agency" OR "Multi-agency" OR "Inter-organizational" OR “Cross-organizational” OR “Cross-sectoral” OR “Interagency” OR “Multiagency” OR “Inter organizational” OR “Interorganizational” OR “Cross organizational” OR “Cross sectoral”) AND ("Emergency OR "Emergencies" OR "Disaster*" OR "Cris?s" OR "Hazards" OR “Extreme event*”)
7	Combined string 2	("Coordination" OR “Cooperation” OR "Collaboration" OR "Partnership*" OR "Relation*" OR " “Network*” OR “Communication”) AND “Complex adaptive system” OR “Boundary spanner”) AND ("Emergency OR "Emergencies" OR "Disaster*" OR "Cris?s" OR "Hazards" OR “Extreme event*”)

**Note: 1. We used both British and American spellings for Group String 2, like inter-organisational, interorganisational, inter organisational, cross organizational.*

2. W/15 is a proximity operator for adjacency search (in Scopus). It finds papers where “inter-organizationa”l shows within 15 words of “coordination”.

APPENDIX C

FIT-FOR-PURPOSE-CRITERIA

Following criteria are used to assess whether the inter-organizational relationship addressed in the paper fits the review's definition of coordination:

1. The paper explicitly focuses on coordination or the cognitive, behavioral, and structural mechanisms that lead to coordination, such as trust building, information sharing, communication, boundary spanning, etc. Papers that only contain a section about coordination and do not make substantial discussions about coordination are excluded.

2. Papers are excluded if they discuss coordination in a governance context and conceptualize coordination as an attempt to "optimize the coherence and consistency of political decisions as well as policy implementation" (Wollmann, 2003, p. 594).

3. Under three circumstances, collaboration or cooperation studies will be considered as coordination research and included in the review: (1) authors explicitly mention that these terms are used interchangeably; (2) authors use collaboration or cooperation as the main theoretical constructs but collect data by framing questions using the term "coordination"; (3) studies examine inter-organizational collaboration or cooperation behaviors during emergency response. Due to the urgency of response period, collaborative or cooperative response behaviors are intrinsically involved the alignment of actions to address the emergent needs, which fits the review's definition of coordination.

APPENDIX D

DISTRIBUTION OF SLR ARTICLES BY JOURNAL

Journal	Number
Journal of Contingencies and Crisis Management	7
Journal of Occupational and Organizational Psychology	4
Natural Hazards	4
Cognition Tech Work	3
International Journal of Disaster Risk Reduction	3
Safety Science	3
Administration & Society	2
American Behavioral Scientist	2
Applied Ergonomics	2
BMC Public Health	2
Disaster Prevention Management	2
International Review of Public Administration	2
Natural Hazards Review	2
Organization Studies	2
American Psychologist	1
American Review of Public Administration	1
Communication studies	1
Computational and Mathematical Organization Theory	1
Construction Management and Economics	1
Disaster Medicine and Public Health Preparedness	1
Disasters	1
European Journal of Operation Research	1
Health Security	1
Information System Frontier	1
International Journal of Emergency Management	1
International Journal of Emergency Services	1
International Journal of Mass Emergencies and Disasters	1
International Journal of Project Management	1
International Journal of Public Administration	1
Journal of Decision Systems	1
Journal of Homeland Security and Emergency Management	1
Journal of Leadership Education	1
Journal of Managerial Issues	1
Knowledge Management Research & Practice	1
Public Administration Review	1
Public Management Review	1
Sustainability	1
Transforming Government: People, Process and Policy	1

APPENDIX E

SUMMARY OF LITERATURE SEARCH RESULTS ON COUNTRIES, REGIONS, EMERGENCY MANAGEMENT PHASES, AND INCIDENT TYPES

Countries studied		Regions studied		Emergency management phases		Incident types	
				Preparedness	4	Exercise / Simulation	16
China	3	Europe	16	Response	49	Natural Hazards	21
Haiti	1	North America	25	Recovery	9	Man-made disasters	10
India	1	Oceania	5	Mitigation	3	Public health emergency	5
Iran	2	South America	1	Not applicable	10	Natural & Man-made hazards	1
Netherland	4					Not Applicable	20
Norway	2						
Pakistan	1						
Philippines	1						
Poland	1						
Sri Lanka	1						
Sweden	2						
Thailand	1						
Turkey	2						
UK	7						
US	25						

Note. The total of studies on emergency management phases exceeds 64 because there are 9 studies assessing coordination in multiple phases.