# ORIGINAL ARTICLES

# Towards transformational emergency systems leadership: A holonic perspective

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## ABSTRACT

This qualitative research study explores the results and implications of a key informant study of emergency systems leadership challenges in Canada. Grounded theory methodology and thematic analysis was deployed to identify ten key properties of transformational emergency systems leadership. Of 103 emergency systems leaders of diverse professional backgrounds are presented. The response rate was 83.5 percent from 81 organizations across Canada. A theory of holonic emergency systems leadership is proposed. This study concludes with the potential theoretical and pragmatic implications of a holonic paradigm of emergency systems leadership for further healthcare research in diverse settings internationally.

**Key Words:** Emergency systems leadership, Emergency management systems, Grounded theory, Holons, Key informant study, Qualitative research

## 1. INTRODUCTION

Emergency management systems are complex adaptive systems that respond to external emergency events.[1–8] These systems self-organize in response to external environmental stimuli in the form emergency events, all requiring systems intervention to safeguard lives and mitigate injuries. These events include mass emergencies, disasters and catastrophes-all of which may be biochemical;[9] meteorological;[10] sociogenic;[11, 12] technological;[13] or topological[14] in nature. The systemic mission is to lower mortality and morbidity rates, safeguard community integrity and deliver emergency services efficiently and effectively. Emergency management systems have both horizontal and vertical dimensions. The horizontal dimension is a continuum of care that includes: prehospital care, transportation, emergency unit care, critical care units, specialized tertiary care services, recovery and rehabilitation, and aftercare services. The vertical di-

mension includes emergency organizations, care institutions, municipal and regional authorities, national governments and international organizations. In normative times, emergency management systems tend to function as independent and loosely linked silos that focus primarily on internal care processes. In mass emergencies, disasters and catastrophes, closer horizontal and vertical systemic integration becomes compelling and essential.

### 1.1 Transformational emergency systems leadership

Emergency leadership is essential in managing the systemic dynamics of care providers, resources, patients and technologies.[15, 16] The extant leadership literature focus on a range of theoretical paradigms, such as: authentic leadership models;[17, 18] transformational models;[19–21] integral models;[22, 23] and adaptive models.[24] Effective emergency leadership is crucial in all facets of emergency management

systems in the quest for greater efficiency, effectiveness and performance excellence.[25] Rodriquez and Sanchez (2015)[26] stressed that emergency leaders must engage multidisciplinary professionals across the socio-political spectrum and build cogent coalitions and relationships among diverse groups. The literature stresses the importance of leadership in inspiring and fostering mutual respect, open interprofessional communication, collaborative decision-making, all of which motivate a commitment to high quality systems of care.[27–31] Urby and McEntire (2015)[32] have underscored that transformational leaders are change agents that form the backbone of high-performing and effective systems that result in positive outcomes, such as lower mortality and morbidity rates, greater community resilience, higher quality of care.[33–38]

## 1.2 Holonic paradigms in emergency management systems

This study proposes a holonic perspective of emergency leadership in the context of complex adaptive emergency management systems. As Kostler (1967)[39] first suggested in his classic "The Ghosts in the Machine", holons are epistemological constructs and conceptual abstractions that represent complex adaptive systems in the real world. Furthermore, Wilber (2000)[23] underscored that holons evolve, and in so doing, subdivide and constantly create new holons. Lei and Yang (2013)[40] noted that holons are adaptable, integrative and structured entities that form holonic organizations with other holons to support systemic processes. Furthermore, as Edwards (2005)[41] suggests a holonic framework with its inherent adaptability and transformative capacity provides relevant conceptual constructs. In this study, emergency systems leadership is viewed as a holon that engages and interacts with its systemic horizontal and vertical components. In so doing it influences the direction, growth and evolution of emergency management systems.

## 2. METHODS

### 2.1 Theoretical framework: A triangulation approach

Qualitative research studies on transformational emergency systems leadership have been sparse.[38] This qualitative research study explores the phenomenology of transformational emergency systems leadership, using a grounded theory approach. In particular, key informant analysis is used to probe the perspectives of emergency system leaders. The literature underscores the continuing relevance of such qualitative research methodologies.[42–49] Theoretical triangulation was deployed, whereby several conceptual leadership, open complex and adaptive systems models and holonic concepts were merged to form the theoretical framework for this study.[50–52] The central study objectives were twofold: to

identify ten emerging leadership challenges, as expressed by key informants and to propose an emerging theory of holonic emergency systems leadership. In so doing, this thematic study contributes to and provides insight into the nature of emergency systems leadership in Canada with import to diverse healthcare settings internationally.

### 2.2 Research ethics and instruments

An institutional research ethics committee on human subjects reviewed the proposed research study goals, design and instruments. It endorsed the study proposal, as meeting all confidentiality, privacy and ethical requirements. The research instrument consisted of a semi-structured questionnaire of six parts with 26 open-ended questions that focused on perceptions key informants of the challenges facing emergency systems leadership in Canada. The use of open-ended questionnaires is a well-recognized potent tool in the repertory of qualitative research instruments.[46] In this study, it was deployed as the key research instrument to capture the diverse perspectives of a large number of key multidisciplinary informants across Canada. Respondents could elect to complete the confidential research instrument tool online, or opt for a telephone interview, using the same identical questions of the online version. Thus, mixed methods triangulation was deployed in this study. All respondents were given the option to respond either in English or French, both the official languages of Canada. On a consensual basis, respondents then accessed a secured and private database with a reputable and trusted online research firm. Qualified key informants, who accessed the database, first read and then signed a confidential statement of consent in the official language of their choice. Only then were the key informants allowed to have full access to the online questionnaire.

### 2.3 Sampling design and procedures

The responses to the open-ended questionnaires were triangulated on the basis of the sample design.[53,54] A chain referral technique was the sampling procedure of choice in this study. Several professional bodies were approached and agreed to be points of entry. The participating professional bodies included: the Canadian Association of Fire Chiefs, the Canadian Association of Social Workers, the Canadian College of Health Leaders and the Canadian Information Processing Society. Each issued a general invitation to their membership to directly contact the researcher within a six-week inclusion period, if they wished to participate. The recruitment of key informants was voluntary and confidential. To assure reliability and internal validity, the sample design only included members of these professional bodies. These professional organizations focused on leadership development and professional growth and required adherence to a professional code

of ethics. The study only included key informants, who were professional leaders with ten or more years of experience in emergency management and who were willing to share their leadership perspectives. The sample saturation point occurred when the inclusion criteria yielded a representative sample of select key informants who responded within stated time deadline.

### 2.4 Study participants

Purposive sample size was determined by the six-week response time limit and the defined study objectives. Of the 103 open-ended questionnaires received within the study period, 17 were disregarded as they were not fully completed. In addition, seven key informants opted for a telephone interview. Given a total of 86 key informants from 76 organizations across Canada, the response rate was 83.5 percent. This included: 28 leaders in health care facilities and hospitals; 25 Government leaders in emergency management on either a municipal, regional, provincial or Federal (including defence) level; 14 leaders in fire and rescue officers and paramedics; 15 clinical leaders in emergency medicine, nursing and social work; and four leaders in private technology consulting firms. The construct validity of the study was underscored by the high response rate received and concordance on a diverse range of questions that the emergency system leaders could understand and relate to.

### 2.5 Grounded theory methodology

Grounded theory is a qualitative research approach that deploys inductive methodology for generating new theory from data.[55–59] It is a realist and constructivist approach, whereby collected data is subjected to detailed systematic thematic analysis to generate new theory. In this key informant study, responses produced results that shed light on emergency systems leadership. Open-ended questionnaires and interviews evoked detailed responses with relevant descriptions of experiences and perceptions of emergency leaders. The data responses were subject to iterative processes of coding, memoing and integration. Jonsen and Jehn (2009)[53] maintain that grounded theory require an "epistemological verstehen", or interpreted understanding that is at the heart of the conceptualization and analytical phases of the coding process. During coding, qualitative data was noted and categorized into themes that related to the core concept of emergency systems leadership. This iterative theoretical coding process essentially formed cognitive maps that reflected respondent perspectives of emergency systems leadership. Through memoing, thoughts and ideas were recorded, as they evolved and developed. The validity of this approach was underscored by the high degree to which evoked concepts fit with the textual data and were deemed relevant in that they reflected the real perspectives expressed by the key informants, who were leaders themselves. The evolving themes, based on iterative coding, served to reinforce the content validity, interpretive validation and the theoretical validity of the study. Repeating concepts were merged into substantive codes and formed the basis of new theory. The emerging concept of transformational emergency systems leadership was workable in that it showed how systemic problems are resolved and was adaptable in that new data could lead to changes to the open complex adaptive systems model. In the integrative process, ten emerging themes of transformational emergency systems leadership were identified. New theory emerged that lend insight into emergency systems leadership as complex adaptive holons.

### 2.6 Study limitations

In the initial stages of the chain sampling technique, three additional invitations were also sent to other professional bodies. These included the Canadian Association of Chiefs of Police, the Paramedic Chiefs of Canada and the Canadian Nurses Association. None had responded by the required deadline of four weeks. However, the membership in the Canadian College of Health Leaders provided access to diverse public safety and emergency professionals across a vast spectrum of emergency leaders across Canada.

## 3. STUDY RESULTS

The qualitative research study results from the thematic analysis and a grounded theory approach are presented below.

### 3.1 Thematic analysis results

From this key informant study, ten key properties of emergency systems leadership emerged. None of these properties are mutually exclusive, distinct nor separate.

**Authenticity**. The key informants underscored the importance of authentic leadership attributes, such as accessibility, adaptability, astuteness and emotional intelligence. These promote open communication, professional respect and mutual trust, upon which effective collaborative networks are built. Highly-developed social competencies were deemed very important, as were accountability, discipline, personal integrity and professional ethics. Key informants also felt that credibility and trustworthiness were also critical in working with all levels of governing authorities.

**Caring and compassion**. The key informants emphasized that caring values and compassion must be integral to the behaviours and decisions of emergency leaders. Leaders with compassion and humility, they believed, also inspire others to act ethically. Honesty and integrity were deemed of paramount importance. Mutual respect and trust were

deemed important to solid collaboration.

**Courage and equanimity**. The key informants emphasized that leaders must demonstrate courage and equanimity, as they exercise their leadership duties and responsibilities in the "heat of the battle". They felt that such attributes inspire others to effectively face the challenges of emergency events. They believed that spirited resolve and determination ultimately improves survivability, mitigates morbidity and reinforces organizational resilience.

**Emergency preparedness**. The key informants stressed the importance of emergency preparedness as a professional and social responsibility. They underscored the obligation of leaders to assess risks and analyze threats. Environmental perception, perspicacity, situational awareness and strategic analysis of a range options are all integral to the praxis of emergency preparedness. Emergency response planning, disaster planning and recovery planning and testing and simulations were deemed essential.

**Experiential knowledge**. The key informants underscored the importance of cogent knowledge and frontline experience with proven expertise in emergency management systems. Operational and strategic management expertise, sound knowledge of emergency resource logistics and cogent experience in emergency personnel deployment and management were vital. The key informants noted the growing need for knowledge in emergency informatics and systems engineering to the performance of emergency management systems.

**Strategic collaboration**. The key informants stressed that effective emergency systems leaders must build and solidify collaborative networks of diverse emergency organizations and professionals. They felt that effective collaboration enables information sharing and critical deployment of personnel, resources and supplies.

**Strategic communications**. The key informants unanimously agreed that the ability of emergency leaders to communicate effectively is a crucial leadership skill. Clarity in all communications facilitates positive interactions and prevented conflicts and misunderstandings. Moreover, they identified systems interoperability as one of the pressing challenges to effective communications across technological networks. They acknowledged that non-compliance with common telecommunication standards have roots in larger sociopolitical and jurisdictional issues. Systems interoperability, according to the key informants, poses one of the most intractable challenges to effective emergency management systems.

**Strategic decisiveness**. The key informants stressed that decisiveness is of importance for emergency systems leaders,

even in the face of incomplete, or imperfect, information. They felt that leaders must make balanced and rational decisions from diverse sources, even in the face of overwhelming time pressures and information overload. They maintained that decisiveness was key in helping to save lives and reduce injuries.

**Strategic foresight**. The key informants stressed that strategic foresight and a compelling vision are the hallmarks of emergency system leaders. The cognitive ability to think and conceptualize beyond the organizational bounds was deemed important for emergency leaders. The ability to predict emergency events and construct effective collaborative networks before their actual occurrence were critical emergency systems leadership.

**Transformative skills**. The key informants recognized the importance of transformative skills, such as change management, conflict resolution, creative thinking and negotiation. They asserted that emergency systems leaders need to challenge the status quo and introduce positive changes. Over 95 percent of the key informants underscored the importance of building partnerships with the private technology sector in order to benefit from innovative technologies. At the same time, they acknowledged that inter-sectorial differences of perspectives, priorities and values would make such partnerships challenging. Only leaders with high-order transformative skills could overcome these challenges.

## 3.2 Towards the theory of holonic emergency systems leadership

On the basis of a grounded theory approach in this study, new theory emerged that shed light into emergency management systems as complex adaptive holonic networks. This is the theory of holonic emergency systems leadership. The theoretical premise is that emergency systems leadership is a holonic construct with the ten properties identified through the thematic analysis above. Moreover, the emergency systems leadership is divided into two sub-components: a "socio-leadership" holon and "techno-leadership" holon. The "socio-leadership" holon has inherently social leadership properties, such as authenticity, caring and compassion, courage and equanimity, strategic foresight and transformative skills. The "techno-leadership" holon includes properties that are leveraged and supported through innovative technologies. Such properties include emergency preparedness, experiential knowledge, strategic communications, collaboration and decisiveness- all of which are potentially enhanced through the use of innovative technologies. This paradigm underscores the symbiotic and synergetic relationship of humans and technology within the holonic construct of emergency systems leadership. Although effective emergency

systems leadership is increasingly dependent on innovative technologies, the social properties of such leadership still remains paramount.
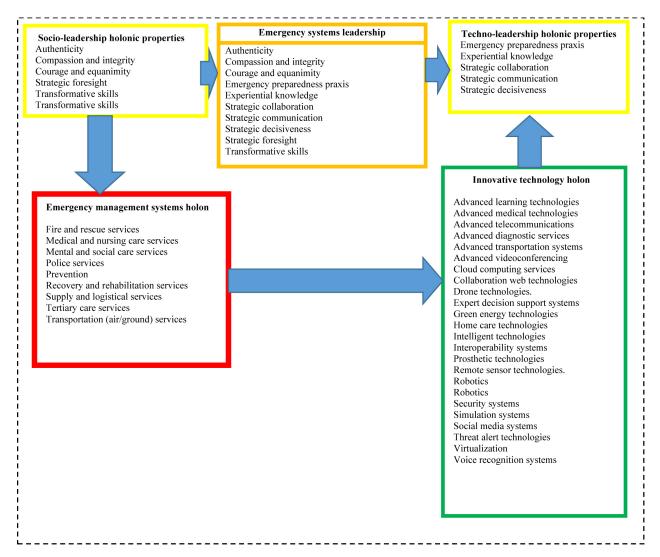


**Figure 1.** Holonic paradigm: Transformational emergency systems leadership in the context of emergency management systems

# 4. DISCUSSION

Emergency management systems are essential in response to what Malraux called "la condition humaine", that is the human fate.[60] Emergency systems leadership plays a central role in the integrity, resilience and sustainability of organizations and communities. It is instrumental in preventing deaths and injuries and assuring recovery from mass emergencies, disasters and catastrophic events.

## 4.1 Towards transformational emergency systems leadership holons

The theory of holonic emergency systems leadership points to the continued evolution of a larger holonic construct of emergency management systems. This includes comprehensive emergency services, including: fire and rescue services, prehospital care, transportation, emergency and critical care, rehabilitation, disaster recovery and aftercare. Emergency system leaders essentially orchestrate the high-order choreography of the plethora of emergency professionals within these settings. Such professionals includes fire and rescue personnel, paramedics, police, emergency physicians, critical care nurses, physiotherapists, social workers, mental health specialists, disaster relief workers and coroners. Figure 1 proposes suggests a holonic framework that depicts the synergistic interactions between the emergency leadership holon, the emergency systems holon and technological holons.

In the model presented, the emergency systems leadership

holon is dichotomized into "socio-leadership" and "techno-leadership" holons respectively. Innovative technologies have great potential in leveraging these leadership properties. Technologies, such as "big-data" storage, cloud computing, nanotechnologies, neural networks, sensor technologies and virtualization facilitate the integration of critical environmental and emergency information sharing. Strategic and operational emergency decision-making are enhanced through autonomic systems, data analytics, expert decision support systems and intelligent systems. Advanced telecommunication systems, collaboration technologies and social media facilitate the building and coalescing critical emergency infrastructures. Novel technologies, such as advanced learning technologies, robotics and simulation systems enhance and facilitate shared learning regionally, nationally and internationally. All these holons are interdependent and influence each other, as they evolve and transform. What results is a highly dynamic family of constantly changing holons that influence the evolution of emergency management systems. In this paradigm, emergency systems leadership is the quintessential holon that seeks to orchestrates and harmonizes these dynamic interactions in the quest to save lives and mitigate the deleterious effects of emergency events.

### 4.2 Towards inter-sectorial collaboration

The study points to the potential of inter-sectorial collaboration between the public emergency sector and private technological sectors respectively. Such collaboration fosters crucial access to dependable resource and supply chain networks and promotes emergency preparedness praxis as social community responsibility. Such collaborative networks call for dynamic, stable and mutually beneficial strategic relationships that promulgate mutual learning, growth and innovation in the public interest. This underscores the need for emergency system leaders with cogent collaborative, communication and transformative skill sets. Emergency systems leaders must encourage and engage in continuous and productive dialogues among all parties to make effective collaboration a reality. In essence, transformative emergency system leaders think strategically and embrace complex change and uncertainty positively and proactively for the public good.

### 4.3 Towards continuous learnability

Learnability is the systemic ability to derive knowledge and pragmatic lessons from emergency events. Continuous systemic learning, improvement and adaptability are hallmarks of high performing emergency management systems. It is central in the quest for higher orders of systemic effectiveness, efficiency and performance. Learnability depends on informational exchanges, interoperable and reliable telecommunications systems, effective knowledge diffusion and

transfers. Continuous learning for emergency system leaders as change agents underscore the need for strategic thinking and transformative skill sets. Creative and effective educational approaches that reinforce leadership process skills, such as change management, collaborative network building, conflict resolution and negotiation, are important. Prior emergency training and experience reinforced by simulation exercises are also instrumental in reinforcing emergency system leadership skills. Sound knowledge of systems engineering techniques, such as activity-based costing, benchmarking, lean design and root causal analysis is also relevant. Given the increasing deployment of innovative technologies, emergency system leaders require a cogent knowledge base in emergency informatics and systems management. This prepares them to judiciously deploy and leverage a wide spectrum of innovative technologies, from drones to robotic systems, to improve emergency management systems.

### 4.4 Towards future research in healthcare systems

The holonic paradigm of emergency systems leadership holds promise for further research in other healthcare settings internationally. Potential research into system leadership dynamics in the battle against cholera, dysentery, malaria, pancreatic cancer, posttraumatic stress disorder, and suicidality are only a few potential examples. Qualitative research using a grounded theory approach and thematic analysis also hold promise for other investigations into a myriad of healthcare organizations. Key informant studies that engage healthcare professionals and leaders hold promising insights in diverse settings, such as: air ambulance services, coroner services, dialysis units, field hospitals, home care and refugee medical clinics. Continued healthcare systems research on inter-sectorial collaboration with governments and private sector organizations is also of importance. Finally, more studies into emergency informatics, innovative technologies and systems engineering promise to revolutionize healthcare and represent another titanic area of future investigation.

### 5. CONCLUSION

Transformational emergency systems leadership is essential in reducing the scourges of emergency events, including mass emergencies, disasters and catastrophes. This qualitative study underscores emergency systems leadership challenges in Canada. The complementary role of innovative technology promises to become more important in the drive for systemic effectiveness and sustainability. The proposed holonic paradigm for emergency systems leadership holds potential as theoretical base for systemic research in other diverse healthcare settings internationally. The proactive identification of community threats, emergency preparedness and systemic collaboration underscore the premise that emer-

gency leaders must ever be at the ready. As Caro (2015)[38] maintains, emergencies only truly end when victims, communities and care professionals have fully recovered from the ordeals experienced. Mass emergencies, disasters and catastrophes will undoubtedly continue under the shadows of burgeoning global population growths, massive poverty, socio-political anarchy and increased exposure to climatic and other environmental threats. Cogent emergency systems leadership is essential for the positive transformation of emergency management systems through the deployment of innovative technologies. Caring and ethical emergency systems leadership that seeks to harmonize effective policies and strategies in the international domain holds great promise for humanity in the decades to come.

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## CONFLICTS OF INTEREST DISCLOSURE

There is no conflict of interest in this paper.

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