

# Contextual Inquiry of Affordances for Collaboration in Crisis: Lessons from the Finnish Context

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## ABSTRACT

The COVID-19 pandemic followed by the energy crisis in Europe demonstrates how complex crises can be. Being embedded in a digital media environment and global interdependencies, complex crises elude straightforward interpretations and explanations. Nonetheless, crises require fast and coordinated response from multiple public authorities. In recent years, advances in computational methods and information technology have influenced the field of crisis and disaster management, and diverse technical approaches have been developed to enhance authorities' response to crises. Drawing on a relational approach to crises, we investigate the socio-technical affordances emerging in Finland to facilitate multi-actor collaboration in crises. Based on our analysis, we argue that contemporary practices and technologies do not match with the complexity of recent crises. Taken together, we consider the role of digital technologies and socio-technical practices to better support multi-actor sensemaking and collaboration in future crises.

## Keywords

Crisis response, ICT's, collaborative sensemaking, multi-actor, digital tools

## INTRODUCTION

Crises are increasingly frequent and complex as they are embedded in an unpredictable world, characterized by threats such as climate change and infectious disease outbreaks; these effects are often exacerbated by global interdependencies and a digital media environment where information and opinions are widely disseminated across diverse platforms (IFRC, 2022). In these conditions, crises are unpredictable and difficult to anticipate as they are the results of multiple inter-related socio-economic, political, and environmental causes. Complex crises produce long-lasting threats across diverse domains of societies and often elude straightforward interpretations and explanations (Boin *et al.*, 2017). The global spread of the COVID-19 virus in early 2020, followed by subsequent waves of the pandemic over the following years, demonstrates how complex crises can unfold intermittently and require extended multi-actor response. Consequently, there's a need to conduct crisis research within a relational approach to crises that – unlike the traditional strategic and pragmatic perspectives – accounts for ambiguity, and our dependence on digitally-saturated communication (Gilpin and Murphy, 2010; Frandsen and Johansen, 2010).

From the viewpoint of crisis management, complex, prolonged crises pose extraordinary challenges for coordination and collaboration. Several authors have found that societal crises are inherently multi-actor situations

(Boin *et al.*, 2017; Kapucu, 2006; Prezelj, 2014). After a crisis is detected, a typical crisis response involves multiple organizations, with diverse socio-technical ICT systems and practices. Nonetheless, it is the duty of public authorities and elected leaders to respond to a crisis according to their areas of jurisdiction and cooperate as needed. This calls for collaborative sensemaking that can be understood as “structuring the unknown” (Waterman, 1990: 41) and as a process of constructing knowledge about the situation when information about the causes and consequences remain unknowable (Boin *et al.*, 2017). However, inter-organizational collaboration and sensemaking under time-pressure has proven to be challenging (Comfort and Kapucu, 2006). Hence, this paper examines the research gap regarding how multi-stakeholder collaborative sensemaking and emerging socio-technical practices must be leveraged for adapting or designing systems in crisis contexts.

In recent years, advances in computational methods and information technology have influenced the field of crisis and disaster management (Kuchai *et al.*, 2020). For example, data mining algorithms are seen as part of the solution for coping with complex information emerging, as they can be used to analyze and visualize large amounts of data produced in a crisis (Domdouzis *et al.*, 2017). Consequently, a number of computational tools, platforms, and dashboards are developed for the purposes of crisis management (Appleby-Arnold *et al.*, 2019; Bennet, 2019). However, while digital technologies are vital for crisis response, none of the emerging technologies alone can manage a crisis. Instead, today’s crisis response takes place in the interplay between human actors and technologies that we believe conceptually leverage notions of (socio-technical) affordances. We approach affordance as a relational concept that links the social practices undertaken by public authorities responding to crises with the technologies available for sensemaking, communication and collaboration (Faraj and Azad, 2012). Originating from work by Gibson (1986), the concept of affordance can be understood as the action potential of ICT technology, capturing in part what ICT technologies allow human actors to undertake (Chatterjee *et al.*, 2020; Markus and Silver, 2008). In this paper affordance is used as a heuristic device to enable us to explore how ICT allows (or prevents) public authorities to collaborate in crises.

Building on this background context, in this paper we empirically investigate the affordances of ICT for multi-actor collaboration in crises within the context of Finland. In this regard, we examine 1) the nature of digital tools and platforms employed and examine what kind of activities related to collaborative crisis response were afforded. Moreover, we explore 2) emerging ICT tools and work practices that can enable better collaboration among public authorities in future crises.

For this interpretive case study of crisis communication and sensemaking, we conduct contextual inquiry and participatory design (Leinonen *et al.*, 2010). Contextual inquiry, which is grounded in design research methodology, can be defined as a form of qualitative field study that entails interviews, workshops, and in-depth observations to gain a nuanced understanding of work practices, behaviors, and social processes (Leinonen, 2010: 59–61). Our goal in using contextual inquiry is to understand communication experts who use digital tools and platforms in the context of crises. For us, this involved critically understanding their needs, behavior, and requirements within the context of multi-actor crisis response in Finland. We aim to identify potential computational tools and digital services, while examining meaningful ways for people to interact with them. Our contextual inquiry aims not only to offer potential improvements in existing designs, products or services but provide directions for devising new socio-technical concepts and practices for crisis communication and sensemaking.

In the following sections, we first introduce how multi-actor crisis response has occurred in the context of Finland. Next, we present a theoretical discussion on collaboration and sensemaking in complex crises and provide an overview of recent technological solutions discussed in the related literature that aim to support collaborative crisis response. We then present our research approach including data collection and analysis, before introducing our emerging findings. Based on our analysis, we argue that contemporary approaches do not match with the complexity of recent crises. Building on this Finnish perspective and findings from our contextual inquiry, we discuss a vision of how novel ICT platforms and practices could better support multi-actor sensemaking and collaboration in future crises.

### **Multi-actor Crisis Response in Finland**

Finland is a parliamentary democracy with a political system whereby power is divided among governmental branches; this means that the executive, legislative and judicial branches are independent of each other and have their own distinct roles and responsibilities. This political framework is designed to ensure that none of these governmental branches wields too much power and decisions are made in the best interests of all citizens. In addition, Finland as a Nordic welfare state has a comprehensive social welfare system, universal access to education and healthcare (Greve, 2007), high levels of trust (Delhey and Newton, 2005) and digitalization (The Digital Economy and Society Index, 2022).

Nordic countries share a common approach to crisis management, which revolves around key principles such as

responsibility, similarity, proximity, and cooperation (Rapeli *et al.*, 2017). While these principles of crisis management remain similar across the Nordic countries, the specific organization and implementation of these systems vary across different countries. The Finnish Government's National Emergency Supply Agency (NESA) is responsible for maintaining strategic reserves and preparedness and as such also gathers together expertise and resources from civil society and the business community alike. In Finland, resilience – often considered the capacity to withstand crises – is broadly discussed and followed in national policy-making. Public authorities along with other organizations of civil society regularly participate in formal training and simulation exercises, to practice ways of responding to different kinds of crises, ranging from nuclear accidents to environmental disasters such as oil spills in the Baltic Sea.

Organizational collaboration was crucially important during COVID-19 pandemic. In Finland, the structure of expert organizations is a highly centralized multi-level system with a strong emphasis on evidence-based decision-making and collaboration between national and regional authorities. This approach has been credited with helping Finland to effectively control the spread of the COVID-19 virus and keep its infection and death rates relatively low compared to other countries (Tiirinki *et al.*, 2023). There are many key organizations involved in this system with national and regional authorities involved. The Ministry of Social Affairs and Health (STM) has the responsibility of setting national policies, guidelines, and regulations related to the pandemic. The Finnish Institute for Health and Welfare (THL) is the government's main expert organization for COVID-19, with responsibility for monitoring the situation, providing scientific evidence, and issuing guidelines and recommendations for controlling the spread of the virus. Regional State Administrative Agencies (AVIs) are responsible for implementing the policies and guidelines developed by national authorities at the regional level, while local municipalities are responsible for implementing the policies and guidelines developed by the national (the ministry and THL) and regional (AVIs) levels. The situation is further complicated by the ongoing reform (and restructuring) of social welfare and rescue services, which is particularly affecting how regional level organizations respond to crises.

The diverse range of public actors and the urgency of crises demands more effective collaboration between these organizations. The authorities must have a timely, informed, and shared understanding of the situation to devise the most effective response and regulations. This poses challenges in communication among organizations and to citizens, which also affects the general public's understanding of the situation. Few citizens were well aware of how the chain of command between the national government and health authorities worked (Sandberg, 2023). For example, if the insights and tacit knowledge of the situation is not transferred to relevant authorities or if key experts are not fully informed, it may appear to citizens that the response is inefficient, ultimately affecting the public trust in institutions and general resilience of society.

During the pandemic, public institutions maintained communications presence online via their websites, social media platforms, and press statements. However, many people found the pandemic-related instructions, regulations, and information disseminated unclear and contradictory. Often many government authorities across different divisions and public health experts publicly disagreed on the legality of each other's decisions (which was not uncommon in many other countries during the pandemic), however a unified national response emerged and the effects of the pandemic remained more manageable in Finland in comparison with many other Nordic countries.

In the broader Nordic context, there is a strong emphasis on digitalization and technological advancement. The COVID-19 pandemic has further highlighted the importance of digitalization, as public institutions have had to rely heavily on digital communication to manage crises (Moisio, 2020). Despite the region's significant progress in digitalization, there are still challenges to be addressed in terms of clear and consistent communication and decision-making during times of crisis.

## **COLLABORATIVE RESPONSE TO CRISES**

### **Collaborative Sensemaking, Decision Making and Communication in Crisis**

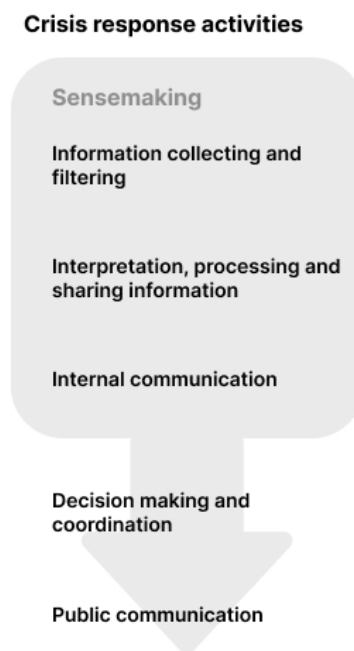
The field of crisis communication has long been dominated by strategic and pragmatic perspectives that emphasize precise prediction and exact control of crises, which in turn urges organizations to pre-emptively prepare during times of non-crisis in a comprehensive manner (e.g., Coombs, 2007; Ulmer, *et al.*, 2010). Recently, a new relational approach is emerging that accounts for the complex socio-cultural contexts of crises as well as the role of communication technologies and interaction between stakeholders in crises (Gilpin and Murphy, 2008; Frandsen and Johansen, 2010). Drawing on complexity-based thinking, Gilpin and Murphy note that whereas “[m]ainstream crisis communication procedures often favor quantifiable measures for environmental scanning and post-crisis evaluation, [...] a complexity perspective tolerates ambiguity and encourages adaptive learning and sensemaking as a crisis evolves” (2010: 648). Thus, by accepting the ambiguous and unexpected features of crises,

the relational approach to crises highlights the importance of adaptation, multi-agency collaboration, and sensemaking. These aspects will be briefly explored in the following.

Societal crises require multi-agency coordination and collaboration for effective response, involving both pre-existing and newly emerging organizations (Kapucu, 2006). Multiple public authorities and institutions are expected to respond to crises and disasters according to their expertise and areas of jurisdiction, to help restore the order that may have been disrupted by the crisis (Boin *et al.*, 2017). However, the complexity emerging from unpredictable and dynamic changes in the unfolding situation creates challenging conditions for such a multi-actor response. As a crisis evolves, the positions between the actors shift and new public authorities come into play. Consequently, public authorities may fail to recognize their own roles and responsibilities.

Given these challenges, crisis communication that aims to build relationships between different organizational actors involved, is crucial in these situations. The key feature of communication between organizations is to enable sensemaking, a term introduced by organizational theorist Karl Weick (1995). Sensemaking is about asking questions such as what is going on, what it means to organizations, and how stakeholders should proceed. Collaborative sensemaking is a process that encompasses three interconnected loops of activities: 1) collecting and filtering information, 2) processing, sharing, and interpreting information to gain more knowledge, and 3) communicating and explaining the unknown to others (Ancona, 2011; Pirolli and Card, 2005). Consequently, it enables actors from different organizations to identify their roles and responsibilities in the context of situational crisis response.

Furthermore, Ancona (2011: 2) defines collaborative sensemaking as a process of “how we structure the unknown so as to be able to act in it”. Thereby, it serves as a foundation for the subsequent phases of crisis response, including decision-making and coordination, and public communication (Boin *et al.*, 2017). Without collaborative sensemaking decision-makers lack a shared and accurate understanding of the situation, which hinders their ability to make informed decisions, coordinate activities effectively with other actors or communicate these decisions in the public sphere (Boin and Renaud, 2013). An overview of crisis response activities is presented in Figure 1.



**Figure 1. A brief overview of the crisis response activities that are undertaken during collaborative sensemaking, decision-making, and communication.**

Despite its importance, collaborative sensemaking is a demanding process that often fails. Previous studies suggest that this is due to the psycho-social factors such as stress and uncertainty, and dysfunctions of group dynamics (e.g., trust, dislike) as well as organizational factors such as fragmentation of normal communication flows and organizational chains, and barriers within and between organizations (Boin and Renaud, 2013; Kahneman, 2011).

Recently, emerging information and communication technologies have been seeking to offer potential solutions to some of these challenges.

### **Collaboration through Communication Technology**

Information and Communication Technologies (ICTs) are being utilized to help government officials and organizations to respond quickly and effectively to emergencies and allow a multitude of ways to collaborate. Such platforms can provide various features, including annotation and commenting, visualizing and interaction with social media data, and crisis mapping applications (Pipek *et al.*, 2014).

ICT systems play an integral role in collaboration and coordination to support the efforts of different agencies involved in crisis management. Using digital communication tools such as instant messaging and video conferencing, crisis management teams can quickly exchange information and collaborate on response strategies. Integrated platforms such as the Dutch Crisis Management System LCMS (Groenendaal *et al.*, 2021), and quick-messaging platforms such as Microsoft Teams support communication, disintermediation (i.e., reducing the need for intermediaries), and sharing of timely information to facilitate direct communication between stakeholders (Pipek *et al.*, 2014).

ICT's are also used to increase public awareness and to provide critical information and guidance. This includes the use of social media, mobile apps, and websites to disseminate information about evacuation plans, emergency services, and other critical resources (Habig *et al.*, 2021). The organizational use of social media has also seen an increase in usage and in people's willingness to incorporate such platforms in their work practices (Reuter, 2022). However, responders often prioritize the use of trustworthy data, which can lead to underutilization of data from outside sources such as social media (Tapia and Moore, 2014).

Crises often generate large amounts of data that must be analyzed, including information on affected populations, damage assessment, resource needs, and response efforts (Mohan and Mittan, 2020; Pipek *et al.*, 2014). By leveraging data analytics, crisis responders can quickly identify trends, assess needs, and make informed decisions. Challenges arise due to both the enormous amount of data and the difficulty in classifying which information is reliable (Reuter, 2022). Similarly, there is a gap between rhetorical and actual use of social media. For example, social media is often used by organizations to share information, rather than receive messages (Reuter, 2022).

Computational systems using big data and machine learning methods, often characterized as Artificial Intelligence (AI) systems, could help crisis responders gather and classify information. Social media and other sources of data mining powered by AI systems can help to fill the information gap, decrease information overload, and assist emergency responders in their various ad hoc practices (Sawhney, 2019). Many researchers have been developing computational techniques to automatically process high-volume social media streams, identify relevant information, and prioritize credible alerts to disseminate in real-time using machine learning (Imran *et al.*, 2013). However, many of these systems have not been incorporated into the daily work practices of crisis responders as they don't sufficiently handle the context and complexity of unfolding crises (Sawhney, 2019). Likewise, robust systems using machine learning, which are still in their early stage of development, can often negatively influence the trustworthiness of data and methods among crisis responders (often due to the incompleteness of data and the "black box effect"), and introduce ethical concerns related to misinformation, algorithmic bias, and limited representativeness (Kraft and Usbeck, 2022). Hence, a great deal of effort, testing and validation must be conducted on machine learning platforms before widespread adoption to avoid these pitfalls.

## **EMERGING PRACTICES FROM CONTEXTUAL INQUIRY**

### **Research Data and Method**

To investigate the use of ICTs in crises response and to understand what kind of activities they allow users to undertake, we collected three sets of qualitative data from semi-structured interviews, participatory design workshops, and fieldwork conducted in the context of crisis communication and management of Finnish public authorities affected by COVID-19 pandemic. Specifically, we conducted 18 semi-structured interviews with regional health communication experts and organized four participatory design workshops with 16 participants. The workshop participants were public servants (primarily health communication experts) from regional administrative and state health agencies that were directly involved in responding to the COVID-19 pandemic. The workshops also engaged other stakeholders in public sensemaking processes such as journalists and media professionals. Moreover, we conducted in-depth fieldwork of two crisis communication exercises led by Finnish public authorities that allowed us to observe first-hand how these actors engaged with different ICT's. All three sets of qualitative data were collected between June 2021– December 2022 and examined using thematic analysis,

which involves identifying recurring patterns, themes, or topics. The data was segmented into separate fragments and then aggregated by themes. The analysis allowed us to organize, summarize, and interpret the data to address our key research questions, including the nature of digital tools and platforms employed and the types of activities related to collaborative crisis response.

### **Emerging Affordances and Barriers for the ICT-enabled Collaborative Crisis Response**

Our qualitative research from interviews, workshops, and fieldwork allowed us to draw a more comprehensive understanding of different affordances of ICT and social practices during crisis management in public sector organizations. To begin with, we noted today's crisis response practices rely on diverse information and communication technologies and platforms. In an age of remote work, it is impossible to imagine effective multi-actor crisis response without the use of networked communication technologies. In addition, we found that security and familiarity were the two most important characteristics of the technologies utilized. As several different national and regional organizations were involved, secure channels for communication and sharing data was crucial. This affected which information and communication systems public authorities were encouraged and allowed to use, as the official guidelines requested a formal audit of digital tools and platforms in accordance with governmental privacy and security guidelines. Furthermore, we noted that Finnish public authorities often simply employed existing, pre-crisis tools due to a lack of sufficient time or resources for adopting novel technologies.

Drawing on the analysis of our empirical material and reflecting on crisis response literature presented above, we found that different digital tools, platforms, and applications that Finnish public authorities have been using enabled several crisis response activities related to sensemaking, decision-making, and public communication within organizations. However, we also noted certain obstacles and pitfalls that especially hinder the capability of public authorities to collaborate between organizations and adapt to the situational requirements of a crisis. This is to say, that while ICTs support several internal crisis response activities within organizations, they can be seen to create barriers for effective multi-agency crisis response. Here, we first present three activities enabled by digital tools emerging from our analysis. In conclusion, we discuss the three main barriers and pitfalls relating to the contribution of ICT on collaborative crisis response. These findings are summarized in Figure 2.

#### *1) Digital tools contribute to internal sensemaking*

Most public authorities used Microsoft Teams as their primary platform for processing and interpreting information, and articulating what is known about the situation within their organizations, since the platform has been certified and audited for secure usage according to government guidelines in Finland. Microsoft Teams enabled actors to operate using the shared platform and to make sense of the emerging situation through video calls, chat discussions, and document sharing. The constant flow of information led some actors to maintain a log where situational information, decisions, and activities were recorded. While Microsoft Teams doesn't offer a tool specifically for this purpose, it was also used for archiving documentation and information. However, traditional organizational silos often obstructed effective collaborative sensemaking between organizations as was seen materialized in their interactions (or lack of them) using Microsoft Teams.

#### *2) Digital tools contribute to decision-making and coordination within and between organizations*

Microsoft Teams was the key platform for internal decision-making and coordination within organizations. Video calls enabled decision-making, whereas coordination of tasks began within pre-existing sub-groups in Teams. However, as the crisis evolved new groups were created in response to situational requirements. Due to the technical nature of the Teams platform, which doesn't afford fluent connections between different public organizations, email was used to coordinate crisis response activities between public authorities. In a long-lasting crisis it was not feasible for people to constantly monitor the overwhelming influx of emails related to the crisis. Hence, mobile communication applications such as WhatsApp were utilized to coordinate and alert actors as well as to inform them on acute matters. However, WhatsApp is not considered a certified and audited tool and hence not recommended by Finnish authorities for use with classified information due to security concerns. Nonetheless, the fact that WhatsApp enables the creation of groups across organizational boundaries was considered highly beneficial by stakeholders within the organizations. Some organizations also used SecApp, a platform designed specifically for use in emergencies. SecApp affords similar functionalities to WhatsApp, however it is currently being used only by a limited number of Finnish public sector organizations.

#### *3) Digital tools contribute to organization-based public communication*

Organizational social media accounts on platforms such as Facebook and Twitter, together with organizational websites, enabled public authorities to inform the general public about the mitigation measures, recommendations,

guidelines, and rules pertaining to the crisis. However, when the crisis appeared to prolong, some concerns were voiced about accessibility and the requirement for targeting information towards certain demographics of people. Many organizations activated or created sites using social media platforms such as TikTok and Instagram. The intention was to inform groups that were difficult to reach through traditional media, such as young people or language- and ethnic minorities. Social media sites were mainly used for distributing information to the public and media but also as interactive platforms to participate in public discussion. A major downside of organizational presence on social media platforms was the constant dissemination of false and misleading information by online trolls and internet bots in response to the official information provided by authorities. Recently, THL decided to stop using Twitter for information dissemination due to this confounding factor (Helsinki Times, 2023)

Next, we turn to the crisis response activities that were not enabled by ICTs and identify three phases in the crisis response process that are not supported by digital tools or platforms. These lacks are summarized in Figure 2.

### *1) Lack of systems and practices for information collection and processing*

Sensemaking begins with information collection and filtering, and in complex crises there's a surge of information coming from various sources. Understanding what is happening in traditional and social media is vital for crisis professionals to create an overall picture of a complex situation. As discussed above, scholars commonly recommend collecting information from digital media to get a grip of the perceptions, claims, myths, and questions of diverse publics. However, drawing on our analysis, not too many crisis professionals striving to manage the situation have the time or resources to scan, gather, and validate information from diverse digital media sources for the purposes of crisis sensemaking. The potential of computational and machine learning techniques to automatically process high-volume social media streams for information collection remained under-utilized within and between organizations.

### *2) Lack of platforms for collaborative sensemaking*

While Microsoft Teams was a prominent tool offering multiple ways for collaboration among actors working in the same pre-existing organization, it doesn't support effortless inter-organizational cooperation or effective crisis response emerging from the situational demands of the disruption (i.e., a newly structured organization with stakeholders from other existing organizations). Actors aiming to share information across organizational boundaries by using Teams needed to establish e.g., which organization's Teams site would host the newly emerging crisis organization. Consequently, when trying to join a new sub-group outside of their home organization, some actors encountered time-consuming challenges to sign-in and get access to such platforms. Taken together, the dominant use of Microsoft Teams in Finland creates barriers for collaborative sensemaking between organizations during a crisis as it forces organizations to operate in silos. These social and technological silos may hinder the ability of public authorities to clearly recognize their roles and responsibilities, and adapt them according to the needs of the emerging crisis situations. Moreover, our analysis reveals that the lack of certified and audited collaborative tools leads to the use of 'gray area' tools, such as WhatsApp which afford collaboration at the expense of a perceived weakness in security.

### *3) Lack of platforms for joint public communication*

Our analysis shows that authorities disseminate their public communication in a multitude of organizational social media accounts and websites, leading to a fragmentation of public knowledge of the crisis and a loss of the 'big picture' among the general public. As discussed above, the public expects credible, coherent, and timely situational information and guidelines from authorities. The needs and questions of citizens, however, can be very contextual and heterogeneous. Consequently, authorities are faced with the demand to engage in recipient-based crisis communication. However, as the roles and responsibilities of public authorities are not always clear, even for themselves, it is very difficult for the citizens to identify which public authority oversees a specific area and able to offer relevant information. Establishing a mutually accessible public communication platform, summarizing the latest information and guidelines published, could mitigate the complexity of a crisis.

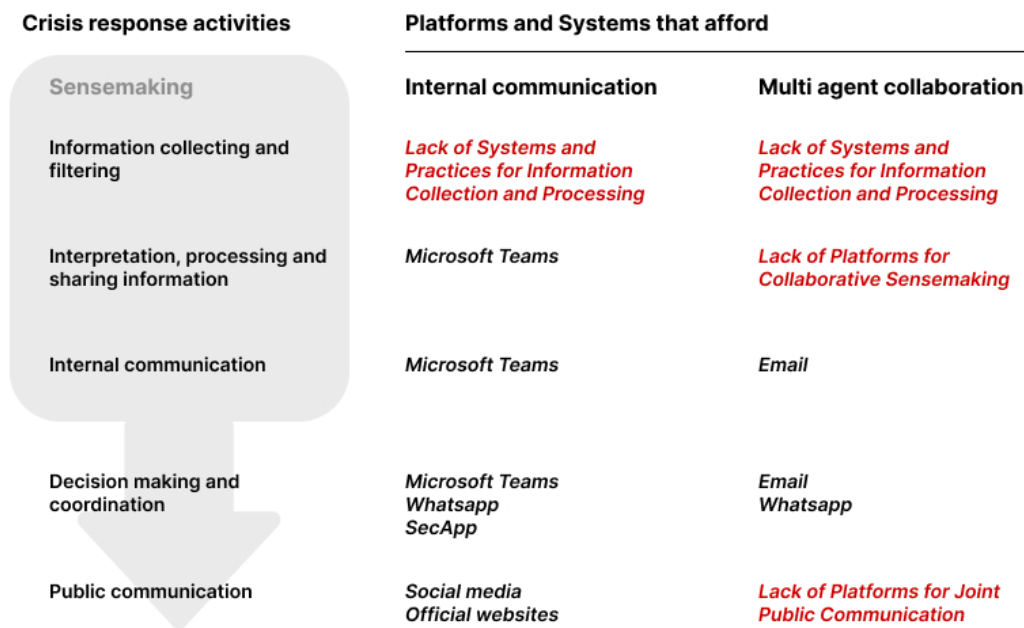


Figure 2. Illustration of the crisis response activities that currently are and are not afforded by existing digital platforms and systems.

### CONCLUSION AND FUTURE DIRECTIONS

Our research explores the challenges and opportunities for collaborative sensemaking during crisis, and how the affordances of ICTs and social practices can enable (or obstruct) multi-actor sensemaking to accommodate its multifaceted complexity. As mentioned in the literature, collaborative sensemaking is a crucial but challenging process amidst complex crises. In recent years, specialized ICT systems have been developed to assist public authorities to respond to crises. However, our research indicates that there is a gap between the ecology of ICT tools designed for crisis management and communication, and the everyday digital tools that are more widely adopted and used for crisis response by Finnish public authorities during the COVID-19 pandemic. We found that Finnish public authorities rely mainly on pre-existing digital tools and platforms that are designed to support governance and communication in times of non-crisis; this offers possibilities for organization-based crisis response but have significant shortcomings when it comes to ICTs that would afford multi-actor sensemaking and collaboration. The current tools do not adequately address the fragmentation of communication flows or the barriers between organizations. Hence, there’s a need to develop new holistic ICTs that enable public authorities to better adapt and make sense of the crisis by creating suitable socio-technical practices that are better adapted for demanding situations.

A big challenge is using global technology and data in times of crisis while taking into account the local context, situated knowledge, and socio-political challenges. While technology is helpful in crisis response, there is a risk of relying too heavily on it and de-emphasize the experiences of crisis managers and emergency responders, and the complex challenges encountered in crises. Our findings are clearly anchored in communication during crisis in the Nordic context, with its characteristics such as high trust in government and authorities, comprehensive welfare services, and high level of digitalization and use of digital services; hence, using contextual inquiry and participatory design strategies is key to provide crucial insights into more contextually relevant practices for crisis response and sensemaking.

Drawing on a relational approach to crises, we argue that using crisis communication technology as potential solutions must move from framing the need for data-driven dashboards and quantifiable measures to address crisis awareness, and decision-making to recognizing the broader need for facilitating and empowering crisis communication professionals and citizens towards collaborative sensemaking of complex crises. We believe that this empowerment can create more resilient societies, in not only short and medium-term crises such as an



earthquake or a pandemic, but even in long-term crises such as climate change.

Using contextual inquiry as a method for design research allowed us to unpack challenges in the practices and platforms used by actors beyond crisis communication experts, including journalists and citizens. Design research can be used to examine the nature of complexities emerging during crises at the intersection of technological, societal and organizational practices, offering new forms of information flow, sensemaking, and decision-making across stakeholders and organizational silos for complex emerging crises. Holistic redesign of crisis communication technology and organizational structures are necessary to improve situational awareness, facilitate participatory inter-agency practices, addressing actionable information and regular feedback mechanisms for tackling increasingly complex crises today.

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