Enhancing Situation and Information Management for Crisis Response: Insights from a Scoping Review

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ABSTRACT

Purpose: Crisis management teams (CMT) play a central role in managing crises and disasters. With steadily increasing volumes of information, the demands on their work are rising, while recurring deficits are becoming apparent in practice. In particular, information management and decision-making are core processes of targeted crisis and disaster management. **Method**: To identify success factors in information and situation management, a scoping review was conducted in two academic databases, and relevant publications were analyzed based on defined criteria. **Results**: The analysis reveals three central areas of tension: the relationship between autonomous action and hierarchical decision-making structures, between comprehensive access to information and selective, audience-appropriate distribution, and between standardization and adaptability. These tensions are not opposites, but continua that must be balanced depending on the situation. **Conclusion and Outlook**: Effective information and situation management operates between these poles and must be adapted to organizational and situational conditions.

Keywords

disaster management, crisis management teams, information management, decision-making

INTRODUCTION

Crisis management teams (CMT) play a central role in dealing with crises and disasters as a form of task-oriented organization. In view of the increasing intensity and frequency of crisis and disaster events and the considerable damage associated with them, their effectiveness is coming under growing scrutiny. Crises and disasters exhibit specific characteristics that require a coordinated, structured and information-based response. Situation and information management, as well as decision-making within CMT, play a pivotal role in this context (Drews & Fiedrich, 2024; Gißler, 2019). At the same time, significant challenges become apparent in practical application, which are further exacerbated by an increasing flood of information, particularly as digitalization advances (Garrecht et al., 2012; Gißler, 2021, 2024; Herbe, 2024). Based on this problem, our aim was to identify success factors for situation and information management in CMT. To this end, we conducted a systematic literature review in the form of a scoping review, examining two academic databases.The contribution of this paper a structured synthesis that reveals recurring fields of tension by conceptualizing them as continua rather than dichotomies. Based on this synthesis, we propose a compact framework of three central tensions and discuss ways to balance them in practice, thereby unifying fragmented findings and providing actionable implications for CMT design and operation. Notably, these fields of tension emerged as a secondary outcome of the analysis conducted to address our primary research aim. In our analysis, we identified three recurring areas of tension in the academic literature: (1) autonomous

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execution of actions and hierarchical decision-making, (2) information transparency and information selectivity, and (3) standardization and adaptivity. Following an introductory presentation of the importance of information management and decision-making, as well as a description of the practical challenges, the methodological approach is first explained. This is followed by a systematic presentation of the identified areas of tension, before these are discussed in a comparative manner and the methodological limitations of the present study are outlined. Finally, the conclusion provides a summary and an outlook on further implications for research.

THEORETICAL BACKGROUND

Information Management and Decision-Making in Crisis Management Teams

The increasing frequency of climate-related extreme events, such as droughts and floods, as well as the growing occurrence of global and regional pandemics, exemplify the urgency of substantially strengthening disaster preparedness (United Nations Office for Disaster Risk Reduction & Centre for Research on the Epidemiology of Disasters, 2020). In addition to the preventive avoidance or reduction of the impacts of such events, crisis management teams (CMT) play a central role in managing critical and complex situations in order to maximize the performance of the respective command-and-control system. CMT can be characterized as organizational units operating on a division-of-labor basis, in which leadership tasks are carried out, problems are systematically processed, and decisions are prepared or taken (Gißler, 2019). In 2022, Heimann and Hofinger defined a CMT as an advisory and support body that assists the person who makes decisions in a critical situation (Heimann & Hofinger, 2022). On the basis of this observation, decision-making and the preparation of decisions can be defined as the central core process (Drews & Fiedrich, 2024; Gißler, 2019; Heimann & Hofinger, 2022). The effectiveness of decision-making is influenced by a wide range of factors, in particular uncertainty, cognitive biases, and personality traits of the employees involved. The quality of a decision is highly dependent on the availability and validity of relevant information. To generate effective decisions, a pronounced level of situational awareness is required (Pleban et al., 2002). In the scholarly literature, the concept of situational awareness is defined heterogeneously (Müller, 2025). Endsley (1988) conceptualizes situational awareness as the ability of individuals to accurately perceive situations, understand the information obtained, and to derive robust projections of potential future developments (Endsley, 1988). Reilly et al. (2007) understand situational awareness as a process of integrating all available information into a coherent mental model that serves to cope with complex, dynamic situations. This cumulatively generated knowledge is of central relevance for crisis and disaster management, as its systematic analysis forms the basis for identifying and deriving appropriate options for decision-making and action (Abbas & Miller, 2025; Abbas et al., 2018). In the context of decision-making processes, information forms the fundamental basis for the formulation of rationally justified and empirically grounded decisions (Krcmar, 2015). With ongoing digitalization and media transformation, both the volume of available information and the speed of information dissemination are increasing, while at the same time the relative share of fact-based content is declining (Gißler, 2021). The absolute amount of available information is thus steadily growing, which increases the need to focus attention and cognitive resources on essential content. This extensive supply of information is accompanied by the disadvantage that a continuously rising volume of information can only be processed cognitively to a limited extent. The perception and processing heuristics that are then inevitably employed can lead to misjudgments as well as to the reception and dissemination of misinformation (Oehler, 2021).

Challenges in Practical Implementation

There are various approaches for supporting the underlying processes. These include, among others, methods of knowledge visualization as cognitive support tools (for example in the form of images, maps, or diagrams) that aim to prepare data and information in a representation that is easily accessible and interpretable for decision-makers (Vesperi et al., 2021). In practice, this challenge is frequently addressed through the use of common operational pictures (COP), which are intended to collect, organize, and present information in order to enable a shared situational assessment across different areas of expertise. Nevertheless, despite these shared situational pictures, the same information continues to be interpreted differently. This makes it clear that COP alone are not sufficient (Wolbers & Boersma, 2013). In addition, process support includes the use of organizational norms for standardizing the exchange of information as well as the deployment of specific technologies for inter-organizational information exchange (Bharosa et al., 2010). Despite the presentation of the relevance of information management and the underlying decision-making processes, as well as the increasingly complex challenges that have been outlined, significant shortcomings become apparent in practical implementation. As early as 2012, a study was able to show that inadequate information forwarding, deficient information management in paper-based procedures, poor information management during situation briefings, and inadequate information presentations on the situation map

are among the most significant disruptive factors within staff work (Garrecht et al., 2012). Hansen et al. 2023 also identify in their review, in particular, communication breakdowns, problems in inter-agency communication, signs of overload, and incompatibilities between the communication systems used as key challenges. Gißler (2019) classifies lack of knowledge and uncertain information situations as a distinct problem category in the context of leadership performance and operational outcomes. In this context, establishing the manageability of the operation as a central leadership task expected of the command staff (Gißler, 2019). The inadequate assessment and consolidation of the available information had a decisive impact on the course of operations during the flood disaster in the Ahr Valley, as it was not possible to reduce the volume of information at hand to a level that was cognitively and organizationally manageable (Gißler, 2024; Herbe, 2024). In their contribution, Bharosa et al. (2010) systematize the challenges of information management. At the individual level, particular emphasis is placed on information overload, uncertainty regarding the selection of information to be shared, insufficient information quality, and the potential misinterpretation of information. At the coordination level of the agency, the focus is primarily on dependence on predefined protocols and on issues of assigning responsibilities. At the community level, by contrast, horizontal information exchange, standardization, interoperability, and the presence of heterogeneous technical systems move into focus.

Implications for Research

Increasing challenges and problems in practical implementation make it clear that information management and decision-making processes in crisis management teams need to be improved. This leads to the central question of which factors have a positive influence on these areas. As part of a research project, a mixed-methods approach is used to identify those factors that can improve decision-making and information management in crisis management teams. The results presented in this paper are based on partial findings of the research approach, namely the conduct of a scoping review. Although existing related work offers comprehensive insights into identifying key performance indicators, it focuses mainly on the exercise context (Drews & Fiedrich, 2024) and remains vague for practitioners and for information management and decision-making. Other studies address, for example, the effectiveness of the system (H. H. Chang, 2017; Jensen & Thompson, 2016) and at the same time highlight the need for further research in order to do justice to the complex conditions of such systems. The research approach pursued here is intended to serve as a basis for deriving practice-oriented recommendations for action. In the course of identifying the relevant influencing factors, several central areas of tension were identified in the relevant literature, which form the conceptual core of this paper and will be systematically presented and discussed below.

METHOD

The partial results presented in this paper were obtained through a scoping review, which we chose in order to make the available findings and concepts more tangible. Scoping reviews are particularly suitable for gaining and mapping a general overview of heterogeneous research literature, while identifying key concepts, theories, and research gaps (Arksey & O'Malley, 2005; Peters et al., 2021; Von Elm et al., 2019). This approach proved effective for our purposes, as it allowed us to maintain a certain exploratory openness toward the evidence found, despite using a systematic procedure. We selected Web of Science (WoS) and Scopus as our primary literature databases for this research, owing to their interdisciplinary coverage, extensive scope, and in-depth subject indexing. Other bibliographic databases were excluded from the primary data collection due to insufficient technical support for search strings or an unsuitable thematic focus. Methodologically, we base the conduct of our literature review on the PRISMA Extension for Scoping Reviews (PRISMA-ScR). To identify the study corpus, we chose an approach that employs a search string with Boolean operators (Table 1). The search string consists of different search components, which were derived from breaking down the initial research question according to the PCC framework (Population, Concept, Context) recommended for scoping reviews (Peters et al., 2021; Von Elm et al., 2019).

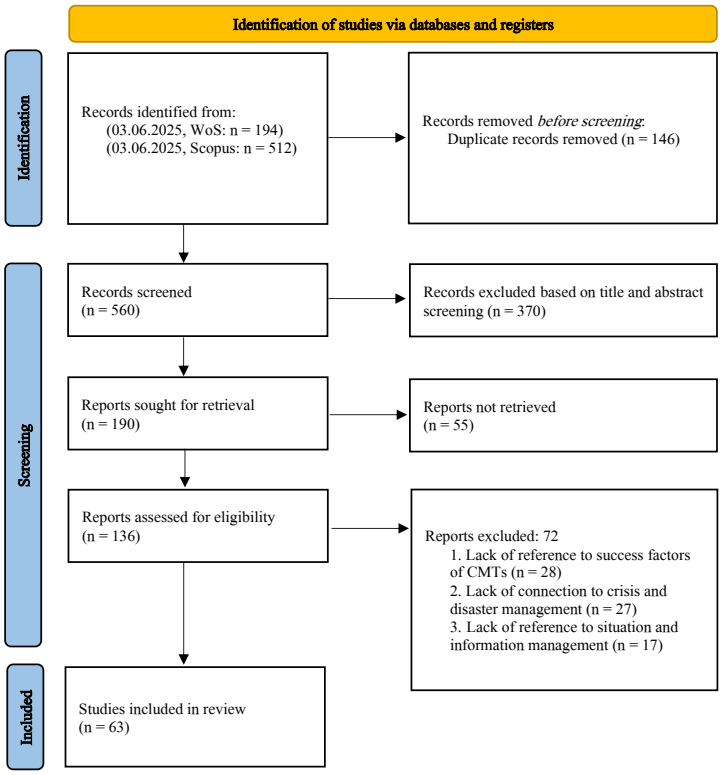

Figure 1. PRISMA flowchart illustrating the study identification, screening, and inclusion process

Using this procedure, 560 articles were identified in the first step. In order to further reduce the volume of text and to identify articles that can genuinely provide insights into success factors for information and situational management within governmental crisis management structures, an expanded set of criteria was developed. The criteria were created collaboratively by the reviewers and tested iteratively on the available data set. For the literature review, both academic studies and grey literature were included that explicitly address success factors, key factors, conditions, performance indicators, or evaluative findings from which inferences can be drawn regarding effective situation and information management. The review focused on literature on CMT work structures within the broader context of crisis and disaster management. A deliberately broad conceptualization of "staff" underpinned the selection process, encompassing not only governmental entities but also military organizations and staff-like structures within the private sector. The corpus was restricted to German- and English-language academic publications and grey literature. Excluded from the review were studies with an exclusively technical orientation that did not incorporate an explicit user perspective, as well as work situated primarily in the domains of risk management and disaster prevention. Furthermore, studies focusing predominantly on exercises or exercise evaluations were omitted, except where they provided substantive work- or process-oriented insights into situation and information management undertaken by CMTs. Once the set of inclusion criteria had been established, the identified articles were first filtered through a title and abstract screening and then through a full-text screening. Figure 1 illustrates the process of identification, screening, and inclusion. To ensure the reliability of the screening process, it was conducted by three reviewers. Two of the reviewers have a background in engineering, and one reviewer comes from the field of sociology. All reviewers documented their decisions based on the developed criteria. In cases of divergent assessments, the case was first discussed within the group of authors using a consensus procedure, and an agreement was reached. Since this article reports on an ongoing research project, the complete corpus of material under investigation has not yet been reviewed by at least two reviewers. In order to ensure the reliability of the study, we therefore decided to have ten percent of the texts identified reviewed twice. The remaining material under investigation has so far been assessed by only one reviewer. Through the procedure described, 63 scholarly and grey literature articles were identified that could be used for the final synthesis of the results. The articles selected via the two-stage screening process were then carefully recorded in a standardized excerpt table. This procedure follows the charting approach proposed by Arksey and O'Malley (2005) and provides a broader method for capturing different types of evidence than is the case with traditional meta-analyses (Arksey & O'Malley, 2005). In line with the charting approach described by Arksey and O'Malley, a standardized excerpt table was created for all included studies. It captured the study's objectives or research questions, guiding questions or hypotheses, data basis, methodology, period of investigation, study area, as well as the reported empirical findings. This structured documentation served to make the studies comparable along a uniform analytical framework. Based on the extracted findings, success factors for situation and information management were inductively derived across studies in a subsequent analytical step. The focus of this article is on presenting those areas of tension that have emerged in the analysis so far as particularly striking and recurring patterns, rather than on presenting an already completed synthesis of the success factors.

Table 1. Key terms used in the conducted scoping review (example WoS)

Web of Science (03.06.2025)
TS=(("Success*" OR "key factor*" OR "requirement*" OR "condition*" OR "evaluation*" OR "performance*") AND ("operational team*" OR "tactical team*" OR "operational staff" OR "tactical unit*" OR "administrative staff" OR "organizational unit*" OR "emergency operation center" OR "incident command system" OR "Command Post*" OR "commanding unit" or "crisis staff" or "crisis team*") AND ("Crisis*" OR "disaster*" OR "Situation display" OR "operational picture" OR „emergency manage*“))

RESEARCH FINDINGS

The analysis of the included literature made it possible to identify conflicting requirements that authors formulated regarding the information and situation management of CMT. In this article, these contradictions are presented as three recurring areas of tension that shape situation and information management within staff structures. These areas of tension, which are visualized in Figure 2, do not describe “either-or” decisions, but rather structural goal conflicts: measures that improve one dimension often increase the burden or the risk in another dimension. The results are presented as areas of tension that organizations must balance through situational adjustments to their CMT. The identified areas of tension can be titled (1) autonomous action and hierarchical decision-making, (2) information transparency and information selectivity, and (3) standardization and adaptability.

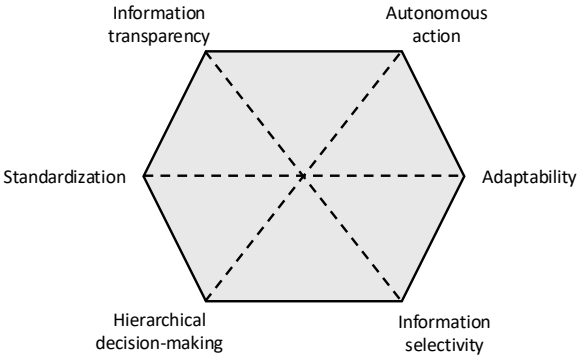

Figure 2. Visualization of key tension fields identified

Autonomous Action and Hierarchical Decision-Making

A recurring area of tension concerns the relationship between the necessity for autonomous action by individual groups or persons and fixed, hierarchical decision-making structures. Especially in emergency services that assume leadership of CMT structures in many crisis scenarios, strictly hierarchical leadership structures constitute the (proven) status quo. These clear, predefined leadership structures prevent conflicting responsibilities, instructions, and decision-making authorities. For aspects of information management, fixed reporting interfaces and channels are also provided (Nazari et al., 2024; Shane, 2005; Wurmb et al., 2018). In addition, clear allocations of roles and tasks within staff structures foster the coherence and coordination of the overall structure, provided that information flows along the chain of command are reliable (Andreassen et al., 2020).

By contrast, the literature examined emphasizes the advantages of autonomous, action-capable CMT members and systems. This is particularly necessary when crisis or disaster situations exceed a certain level of complexity (Nowell & Steelman, 2019). Autonomous ad hoc solutions are also required when communication channels no longer function or the CMT leadership is no longer able to make rapid, well-informed decisions (Akitomi et al., 2019; Andreassen et al., 2020; Fattoum, 2024). Thus, when classic hierarchical command structures fail, it is necessary to be able to reorganize themselves on a task- and situation-oriented basis in order to respond to dynamic situations (Noori et al., 2016; Nowell & Steelman, 2019). On the basis of these considerations, Nowell and Steelman (2018) propose that CMT structures and the information management should be deliberately designed in a way that, while there is a clearly defined leadership core, many coordination processes take place within functional subnetworks characterized by high interconnectedness and strong subject-matter expertise. In this way, not every coordination task has to run through the CMT leadership, and decisions are made where the relevant expertise is located. However, autonomy does not occur automatically: in order for individuals and subsystems to be capable of acting in an emergency, authority must be transferred at an early stage and (autonomous) CMT work must be trained (Akitomi et al., 2019; Nowell & Steelman, 2019). Likewise, formal delegation of responsibilities alone is not sufficient; social and systemic factors in the collaboration between different agencies must also be taken into account (Fattoum, 2024; King et al., 2010). In addition, autonomous action is associated with a significantly higher need for information. These factors can be addressed, among other things, through the establishment and legitimization of liaison positions and a shared mission objective (Curnin et al., 2014; King et al., 2010).

Information Transparency and Information Selectivity

The second area of tension identified concerned the handling of information during a crisis or disaster situation and the question of whether all information should be passed on to all parties involved. Sharing information with everyone involved through large-group formats promotes a common orientation and ensures a collective understanding of the situation (Ryan, 2013; Son et al., 2020). At the same time, this inevitably increases the information load on individual CMT members, which can lead to information overload and a higher perceived level of complexity (Engelbrecht et al., 2011; Son et al., 2020). In contrast, the idea is to reduce the information load on individuals and groups through information filtering and limited communication channels, and to ensure that information only reaches the places where it is actually needed (Engelbrecht et al., 2011; Rowan, 2021; Turoff et al., 2013). However, this approach involves the risk that information asymmetries and deficits in situational awareness may arise. Therefore, (information-) management systems and governance structures must be adapted to asymmetric information flows (Moynihan, 2009b; Nekooie, 2021). This can be achieved through role- and task-appropriate information filtering in information management tools (Engelbrecht et al., 2011) as well as through exchange formats in specialized small groups (Akitomi et al., 2019; Moran et al., 2024). However, it must also be taken into account that information needs can differ greatly depending on the situation and the CMT unit (Nekooie, 2021), which must be addressed by appropriate support tools.

Standardization and Adaptability

The third area of tension concerns the role of standardization in disaster and crisis management processes. By definition, crises and disasters are unplanned events, which means that the response to crises can only be standardized to a limited extent and must allow for a certain degree of adaptability. Among other things, standardized approaches to crisis situations ensure the creation of shared frameworks and the prevalence of uniform role models and terminologies (Moynihan, 2009b). In addition, standardized situation reports in terms of format and frequency, as well as documentation, help to mitigate the problems described in the second area of tension (Moynihan, 2009b; Wurmb et al., 2018). Furthermore, a routine procedure, limited range of tasks leads to increased effectiveness of actions taken, even in more complex situations (Buck et al., 2006). Crisis situations are often characterized by the deployment of personnel and resources under stress and uncertainty, often outside their previous experience (Ryan, 2013). Consequently, standardized procedures are less effective when the situational picture is unclear, recurring patterns are absent, and reliable points of reference from past experience are lacking. Once such a point is reached, concepts such as adaptability and sensemaking become central. In order to cope with a dynamic or ambiguous situation, contradictions must be actively identified in order to construct a situational picture (Iserson, 2024). Even though clearly defined roles in CMT structures can help with orientation, in practice they may not be sufficient, as additional flexible tasks have to be taken on (Kokogawa et al., 2017). For this reason, strictly formalized structures must become more flexible to allow ad hoc solutions and improvisation (Andreassen et al., 2020; Rowan, 2021), which is particularly true for staff structures at the administrative level (Wiedemann et al., 2024).

COMPARATIVE DISCUSSION

As already described, the tensions presented here are not normative "either-or" decisions, but recurring goal conflicts that must be balanced differently by crisis management structures depending on the situation, the constellation of actors involved, and the available resources. The focus of the discussion is therefore less on resolving these tensions than on design principles that can help to mitigate the conflicts described. It should be noted, however, that the points addressed will only be effective if the underlying concepts have previously been practically trained and practiced in training and exercises, so that they do not have to be developed ad hoc in the event of an incident.

Leadership Based on Mission Objectives

The conflict between hierarchical decision-making and autonomous action can be defused above all when autonomy is not understood as "acting without leadership" but as acting in line with a "shared mission objective" (King et al., 2010). At the same time, it should be noted that autonomous actions entail a higher need for information, since all those involved must be comprehensively informed. An appropriately high-quality situational picture can help here. Jointly developed situational pictures and communicated mission objectives can also serve as a shared frame of reference for negotiating differing interpretations and logics among the organizations involved (Fattoum, 2024). For this form of framed autonomy to work in practice, the ability to delegate tasks and responsibilities effectively must be trained (King et al., 2010). In addition, liaison officers and coordination units can help ensure that individual actors are able to act autonomously across organizational boundaries. However, these roles only unfold their full benefit if they possess clear decision-making authority and receive information from both "worlds" (Curnin et al.,

2014; Nowell et al., 2018). Ultimately, it becomes apparent that formal authority alone is not sufficient, since the exercise of autonomy depends on sociocultural and systemic factors, in particular on the culture of dealing with errors (Fattoum, 2024; Turoff et al., 2013) as well as on relationships and trust established in advance (R. Chang & Trainor, 2018; Moynihan, 2009a).

Quality-Oriented Information Sharing

Poorly structured or overly extensive data streams can increase the perceived complexity of the situation (Brugghemans et al., 2008). Empirical findings suggest that defusing this conflict consists less in controlling the amount of information than in managing information quality and role fit. Quality-oriented, user-defined information exchange supports mutual team awareness and can simultaneously shorten processing times without compromising technical accuracy (Grace et al., 2025). In addition, for information management it is also crucial how CMTs process information. Under low workload, serial, joint processing of information supports a shared situational awareness because everyone is working with the same information. Under high information load and time pressure, by contrast, parallel processing becomes more functional, as it increases decision speed-albeit at the expense of collective hypothesis formation (Artman, 2000). At the technical level, role-based decision and information management systems can help to mitigate this conflict (Engelbrecht et al., 2011). However, here too, someone would have to decide, based on the "single point of truth" principle, who receives which information and when, which could create another bottleneck in information management, as information may accumulate at a single point and thus become a "single point of failure". Moreover, it should be borne in mind that the introduction of additional technical systems initially increases the complexity for users rather than reducing it, which is why tools from everyday use are often preferred.

Standardization and Adaptive Problem Solving

Crisis management is shaped by the fundamental paradox that cross-organizational cooperation arises spontaneously, while at the same time there is a need to establish an orderly emergency response under conditions of stress (Moynihan, 2008). This paradox is also reflected in the third area of tension presented. Standardization works best when the situation is well known, recurring patterns are present, and reliable experience is available. In such situations, standardized procedures and roles create interoperability between actors and reduce coordination efforts. As soon as the situation becomes unclear, dynamic, or ambiguous, heavily content-prescribing standardization reaches its limits. This applies in particular to CMT structures at the administrative level, which can only effectively contribute specialist expertise to crisis management if there is sufficient flexibility for situation-specific problem-solving. In our view, an obvious solution lies in standardizing processes, interfaces, and decision-making logics, while deliberately leaving solution paths and roles within the CMT open and developing them in a situation-dependent manner.

Methodological Limitations

The approach of the scoping review presented and applied in the methods chapter has several methodological limitations (Von Elm et al., 2019). It must be noted that a publication bias exists in that relevant sources of information may have been disregarded because they were not published, are not indexed in the databases included, or were not accessible to the authors. Moreover, within the framework of scoping reviews, no systematic appraisal of the evidence is conducted, so that the results neither allow for the derivation of practice-oriented recommendations for action or for the weighting of the identified contributions in terms of the strength of their conclusions. The identification and derivation of influencing factors represent an interpretive act of transfer by the authors, which means that, despite efforts to ensure interrater reliability, potential biases in the interpretation and synthesis of the results may occur.

CONCLUSION AND OUTLOOK

The preceding discussion shows that information management and decision-making take place within complex fields of tension, which, more precisely, emerged as an ancillary outcome of our research rather than constituting its primary objective. Effective information and situation management operates between these poles and must be adapted both to the organizational framework conditions of the CMT and to the situational contextual factors. The outlined research area and the methodological limitations give rise to an expanded spectrum of research approaches, which we are partly addressing systematically in the ongoing project. The success factors identified in the scoping review are being compared, using a mixed-methods approach, with the results of guideline-based interviews with practitioners. The aim is to develop organization-specific recommendations for action and to validate the review findings. In addition, a reflection workshop with practitioners is being held, in which the success factors are critically

examined in order to reduce possible distortions arising from the interpretation and transfer efforts of the authors. Furthermore, additional research is advisable to support organizations in positioning themselves within these fields of tension in light of their specific conditions. In particular, there is a lack of empirically tested concepts for the systematic alignment of roles, information flows, and qualification measures that prevent both individual overload and the emergence of new organizational bottlenecks. Such concepts need to be tailored to the specific structural conditions, resource configurations, and distributions of responsibility of the respective CMT, and subsequently evaluated and validated within this concrete organizational context.

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