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Opening the Black Box of Macro- and Micro-Level Work Practices in German Virtual Operations Support Teams: development and initial validation of a functional process model

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Abstract

The growing use of social media during crises and disasters, together with an increasing volume of user- and AI-generated content, confronts public authorities with large amounts of potentially decision-relevant but unstructured information. For local authorities operating under turbulent governance conditions and limited resources, processing these data is particularly challenging. Virtual Operations Support Teams (VOST), volunteer teams that monitor, analyze, and prepare social media data for decision-makers during crisis management, are increasingly deployed to address this challenge. Despite their growing use, VOST's procedural approach and working methods remain a "black box." This paper systematically reconstructs the general VOST process at both team (macro) and individual-member (micro) level and identifies current practices for creating a psychosocial situational picture of the digital space from social media. Data were collected from all six active German VOST, which operate at municipal, state, and federal level, through operational observations, working groups, and World Café sessions. Using a qualitative process-modelling approach adapted from process mining, process models were developed and refined through qualitative content analysis. The resulting models detail the teams' deactivated and activated operating states, their hierarchical structure, and members' data-detection and evaluation procedures. They show that existing monitoring practices already closely resemble, though do not yet formally constitute, the dedicated psychosocial situational picture required for psychosocial crisis management. Despite growing digitalization, this work remains largely manual, underscoring the continued centrality of human judgment. The findings provide a transparent basis for establishing, supporting, and further developing VOST and their working methods, and show requesting authorities what such volunteer-based capacity can, and cannot yet, contribute.

1 Introduction

Governance at the subnational level increasingly unfolds under conditions of persistent turbulence, driven by overlapping crises, disruptive technologies, and increasingly mediatized public communication, creating "turbulent problems" that call for robust rather than merely efficient governance responses (Ansell et al. 2021; Kuhlmann et al. 2024; Blamire and Rees 2025). Within this environment, the ongoing digital transformation of society is leading to an exponential increase in available data, further intensified by the proliferation of digital communication technologies (Zeller 2016; Haug et al. 2024). For local authorities operating with limited resources yet facing growing demands for robust risk and crisis management capacity, this generates a pressing need for efficient methods to filter, analyze, and thematically structure mass data generated on social media (SM). This challenge is intensified by local authorities' complex dual role: they may themselves be affected by a crisis, for instance as operators or components of critical infrastructure, while simultaneously being responsible for coordinating public communication, situational awareness, and community support during that same crisis. In hazardous situations, publicly available data often exists in the form of eyewitness reports comprising texts, images, or videos, which require the know-how to extract relevant information and synthesize it into a coherent situational picture (Kaufhold et al. 2020). For local administrations, which typically lack the in-house resources, specialized personnel, or established

procedures to conduct this kind of systematic digital monitoring, this constitutes a considerable governance challenge, further complicated by the diversity of data formats and structures involved (Fosso Wamba et al. 2015; Kuhlmann and Heuberger 2023).

In response to this challenge, an increasing number of local, regional, and national authorities activate Virtual Operations Support Teams (VOST) as an external or complementary organizational resource. VOST function as an interface between the digital flood of information and the operational units of crisis management: they extract, analyse, and prepare relevant digital data for decision-makers (Fathi and Fiedrich 2022) and, based on the derived information, can act as advisors during the decision-making process itself (Lülf and Fathi 2023). Automated sentiment analyses in particular have been shown to produce inconsistent results (Kejriwal et al. 2021), underscoring the continued necessity of this kind of complementary manual evaluation and human supervision. For local authorities with limited resources, VOST thus offer a scalable way to build capacity for situation assessment without having to maintain their own permanent, resource-intensive structures, thereby directly addressing the resource constraints under which most subnational risk and crisis management structures operate (Plotnick and Hiltz 2016; Roth and Prior 2019; Fathi et al. 2020).

Despite the increasing use of VOST for the analyzing of the digital space by authorities across different administrative levels (Fathi and Fiedrich 2022), a research gap exists regarding the systematic and procedural description of their modus operandi, which thus remains a "black box". It is often unclear what specific steps a VOST goes through (the macro perspective as the team's overall approach) and how individual analysts extract data and create information products (the micro perspective as the working methods of VOST members). This opacity constitutes a challenge in its own right: without a transparent process description, the quality of VOST work can hardly be assured, good practices can hardly be transferred between teams, and targeted support, such as training, tools, or methodological guidance, cannot be developed systematically. Process descriptions of the VOST approach and working method can therefore form a central basis for quality assurance, research, and development, both for existing teams seeking to consolidate and scale their work and for organizations wishing to build comparable structures. In the longer term, such a basis can also support the better integration of digital situation analysis into public crisis management structures.

Given this gap, and its relevance to how digital situational awareness can be practically operationalized and further developed, the paper addresses the following research questions:

- **RQ1:** How do German Virtual Operations Support Teams conduct their operations at the macro level?
- **RQ2:** How do members of German Virtual Operations Support Teams perform their operational tasks at the micro level?
- **RQ3:** How do German Virtual Operations Support Teams contribute to the development of a psychosocial situational picture of the digital space?

2 Current state of research

This section reviews the state of research in four steps. Section 2.1 outlines the psychosocial situational picture as a decision-relevant instrument for local authorities. Section 2.2 examines how the population's SM use during crisis and disaster situations generates the data underlying such a picture. Section 2.3

introduces VOST as one organizational mechanism through which authorities can transform these data into actionable insights, and Section 2.4 derives the resulting research gap.

2.1 The psychosocial situational picture and its digital extension

An accurate situational picture is central to crisis and disaster response, particularly in the initial phase, as it substantially shapes situational awareness, the course of operations, and ultimately operational success (Drews et al. 2022). Situational assessment is embedded in the overarching decision-making process, which is understood as an iterative cycle of reflection and action in which decisions are prepared and implemented (Ryan 2013). In emergency management, this process is commonly structured into situation assessment, planning, issuing of orders, and control (Ausschuss Feuerwehrangelegenheiten, Katastrophenschutz und zivile Verteidigung 1999; Hofinger and Heimann 2022). Its complexity increases with the scope of the crisis and the number of actors involved (van de Walle et al. 2016), while time pressure limits the opportunity to gather disaster-relevant data. Consequently, action-relevant information must be identified, evaluated, and forwarded in a timely manner, covering both immediate response and longer-term preparedness or reconstruction needs (Zade et al. 2018; Mostafiz et al. 2022).

These organizational demands are typically addressed through temporary command staffs that support decision-makers by establishing defined roles, structures, and information flows (Ryan 2013). Following emergency-services terminology, this paper uses the term Führungsstab [command staff] accordingly (Hofinger and Heimann 2022). Decision-making within such structures relies fundamentally on shared situational awareness: the capacity to perceive, comprehend, and anticipate a dynamic environment (Endsley 1988; Zade et al. 2018; Detera et al. 2021). To build this shared understanding, reduce complexity, and identify coordination requirements, command staffs compile a dynamic, interdisciplinary situational picture (Hofinger and Heimann 2022) containing information on damage, available resources, and operational planning (Queck and Gonner 2022).

Such a situational picture of population behavior (Lagebild Bevölkerungsverhalten, LBevV) captures the cognitive, emotional, motivational, and social dimensions of behavior across population groups, dimensions that vary considerably given population diversity (Gouweloos et al. 2014; Schopp et al. 2022). Affected populations respond not only cognitively but also emotionally, predominantly with grief, anger, and fear (Jin et al. 2012). These emotions shape attitudes, decision-making, and behavior (Turner 2007; Zhu 2022), and may spread through emotional contagion between individuals (Barsade 2002). Understanding these emotional dynamics can provide decision-makers with indicators for anticipating public behavior and developing response strategies (Jin et al. 2012), particularly because indirect and long-term health consequences, such as stress-related illness, may constitute one of the greatest overall challenges (Hyams et al. 2002).

Within the LBevV, the psychosocial situational picture focuses specifically on the potential and actual behavior of directly and indirectly affected people, their psychosocial needs, support requirements, resources, and self-help capacity (Hufschmidt et al. 2017; Tutt 2023). Whereas the broader LBevV adopts a government-wide perspective primarily at federal and state level, the psychosocial situational picture is especially relevant at the operational-tactical municipal level (Schopp et al. 2022). It supports situation assessment for decision-making, quality assurance, needs assessment, identification of affected individuals, and targeted deployment of psychosocial emergency care (psychosoziale Notfallversorgung, PSNV) resources (Schopp et al. 2022; Sterl 2024). PSNV is the German counterpart of what is internationally referred to as mental health and psychosocial support (MHPSS) (Inter-Agency Standing Committee 2007), although it focuses more narrowly on acute psychosocial care in the immediate

aftermath of an event. Combining the frameworks of Mähler et al. (Mähler 2023) and Schopp et al. (2022), the psychosocial situational picture typically covers:

- characteristics and locations of affected groups and their needs;
- available technical, material, and personnel resources;
- expected social structure and demographics of the affected area;
- mood and its development;
- state of information and risk perception among those affected;
- self-help capacity of the population;
- resulting operational and tactical PSNV measures.

Given the population's increasing use of SM, digital-space phenomena and behavioral patterns increasingly complement surveys, responder feedback, and media analysis as inputs to such psychosocial situational pictures (Palen and Liu 2007; Kleinberg 2008). A "space" in this context is not a fixed physical location but a relational construct produced through social interaction and group affiliation (Schubert 2000; Döring 2008). Digital spaces are therefore constituted through digital interaction and communication and remain in continuous flux depending on the user groups involved (Wunder 2021). Since emotions can spread within these spaces and prompt further action (Lee et al. 2016), psychosocial SM monitoring can support the creation of a psychosocial situational picture by collecting and processing information relevant to emotion management, situational awareness, and decision-making (Verma et al. 2011; Schulz 2013; Lee et al. 2016).

2.2 Use of social media in crisis and disaster situations

SM can be defined as web-based digital platforms that connect individuals within defined networks (Acquisti and Gross 2006) and enable the collection, creation, evaluation, and sharing of user-generated content (Boyd and Ellison 2007) across formats such as text, images, and video (Joinson 2008). They are characterized by scalable audiences (Miller et al. 2016), functions such as information provision, communication, community-building, and collaboration (Fuchs 2017; Rhee et al. 2021), as well as privacy settings, personal profiles, and network ties (Boyd and Ellison 2007). Common types include microblogs, social networking sites, blogs and forums, collaborative platforms, social news sites, and media-sharing platforms (Sloan and Quan-Haase 2016). Owing to their velocity, volume, value, variety, and veracity, SM are commonly considered "big data" (Laney 2001; Lukoianova and Rubin 2014) or, in crisis contexts, "big crisis data" (Castillo 2016), with all five dimensions shaped by usage patterns that differ from everyday use during crisis and disaster situations (Müller et al. 2023).

During crisis and disaster situations, SM can function as psychosocial resources by enabling information seeking, social support, communication, shared experience, and collective sense-making (Qu et al. 2023). This resource-oriented use manifests primarily in information seeking and in comparing one's own perception of reality with that of others (Simon et al. 2014; Gardiner et al. 2023). Information exchange is the primary use, while secondary functions vary by disaster type (Ogie et al. 2022). In a representative German online panel (N = 476), 65.1% of respondents reported at least occasionally using Facebook, Twitter, or Instagram to obtain crisis information; at the same time, information is more often sought than shared: 28.7% seek eyewitness content, but only 16.8% share it, and only 35.3% share crisis-related content publicly (Müller et al. 2025), consistent with earlier European survey data in which 43% of users primarily sought and 27% primarily shared information (Reuter and Spielhofer 2017). Beyond factual information, SM foster social connectedness and can have a calming, supportive effect for vulnerable groups (Taylor 2012). Affected individuals exchange information on road, weather, and traffic conditions

as well as their own mental state and location (Reuter and Kaufhold 2018), and an estimated 20–30% of crisis-related SM content expresses emotions such as grief, anger, or humor (Zhang et al. 2019).

This articulation of opinions and fears can function as a channel for stress coping and emotional support (Brummette and Fussell Sisco 2015). Some scholars describe a buffering effect through which social support may mitigate the negative psychological consequences of stress and trauma (Cohen and Wills 1985; Kummervold et al. 2002). Relatedly, crisis narratives on SM can connect individuals with similar cognitions, emotions, or experiences, thereby generating psychological support (Zaretska 2023). Emotionally charged content may also increase audience engagement, as such posts are shared more often and more quickly (Stieglitz and Dang-Xuan 2013).

SM use in crisis and disaster situations extends beyond information exchange. It can include escapism from potentially traumatizing experiences while connecting with like-minded others (Kaufhold and Reuter 2014), self-organized volunteering and fundraising that counteract abrupt resource loss (Hughes et al. 2008; Bird et al. 2012), and the coordination of aid needs and offers alongside official crisis management, historically concentrated on Twitter/X, Facebook, and Google Maps (Kaufhold and Reuter 2016). Such use intensifies with the continued proliferation of internet and SM technologies (Choudhury et al. 2014), and SM can serve as alternative communication channels when conventional systems are overloaded (Simon et al. 2015). While crisis scale affects the intensity of SM use, it does not fundamentally alter its structure (Ogie et al. 2022), which can be grouped into four dimensions: information acquisition, information sharing, collaborative problem-solving, and event processing (Jurgens and Helsloot 2018). Source choice is shaped by disaster type, message characteristics, and the traits of the information seeker (Ryan 2018).

However, SM use in crisis and disaster situations also entails risks. Media engagement with disasters can directly affect mental health (Otto et al. 2007; Busso et al. 2014), low-threshold accessibility can facilitate rumor spread (Gu et al. 2022), and SM-based information seeking during COVID-19 correlated positively with adherence to conspiracy theories, thereby undermining health-protective behavior (Allington et al. 2021). At the same time, populations may show some capacity for self-correction of misinformation (Simon et al. 2014). Coping-related use also differs across social groups: women more often seek social and emotional support, whereas men more frequently favor solution-focused strategies and distraction (Tamres et al. 2002; Matud 2004). Socioeconomic status and place of residence further shape platform choice and perceived reliability, with lower-income and minority households showing distinct usage patterns and lower trust in SM as an information source (Dargin et al. 2021). Overall, roughly 44% of the population uses SM during crisis and disaster situations, with women and older adults sharing emotional content more frequently (Reuter et al. 2017). Intensive use has also been linked to worsening mental health, mediated by negative emotion, particularly among already high-stress individuals (Zhao and Zhou 2020).

In sum, SM serve three core functions in crisis management (Zhang et al. 2019; Gardiner et al. 2023):

1. efficient acquisition of information on the disaster situation;
2. insight into the affected population's mood for emergency services;
3. open communication between the population and emergency services.

In addition, self-organized peer-to-peer support may strengthen community resilience (Watkins et al. 2023). Rapid analysis of SM data can thus deliver timely, disaster-relevant information that expands situational awareness, supports decision-making, and facilitates communication (Reuter et al. 2018; Reuter and Kaufhold 2018).

2.3 Virtual Operations Support Teams

To manage the complexity of digital crisis information, digital volunteers have emerged who monitor SM and aggregate information on a non-professional basis (Eismann et al. 2016). Like spontaneous helpers, digital volunteers participate in emergency response spontaneously and without formal organization (Daddoust et al. 2021), but they are distinguished by specialized IT skills (Fathi et al. 2019). Within this group, "trusted digital volunteers" or "trusted agents" have emerged, enabling informal information flows with disaster-protection authorities through positive interactions in previous deployments, without being formally integrated into crisis management structures (Lise Ann St. Denis and Amanda Lee Hughes and Leysia Palen). Digital volunteers may also organize into Volunteer and Technical Communities (V&TCs), which pool technical expertise to support humanitarian disaster relief in a coordinated and geographically dislocated manner (Vidolov 2015; Park and Johnston 2017). Sha et al. (2025) distinguish four types of digital volunteer services, bridging, supporting, complementary, and collaborative, based on their orientation toward victims or emergency forces and their alignment with official organizations' tasks.

To institutionalize and professionalize digital-volunteer capabilities within German civil protection, the Federal Agency for Technical Relief (Technisches Hilfswerk, THW) initiated a VOST THW pilot project in 2016 (Fathi and Hugenbusch 2021). Comparable initiatives subsequently emerged at state and municipal level, including VOSTbw in Baden-Württemberg, VOSThh at the Hamburg Fire Department, and the VOST Media Team of the Bad Kreuznach district (Fathi and Hugenbusch 2021).

VOST differ from other digital volunteers and V&TCs through their hierarchical structure and formal connection to official agencies, which lends them a high degree of trust and credibility (Lise Ann St. Denis and Amanda Lee Hughes and Leysia Palen). In the classification by Sha et al. (2025), they therefore constitute collaborative teams. Acting as intermediaries, VOST make large volumes of digital crisis data operationally accessible by filtering, processing, contextualizing, and translating them into a form usable for crisis management. Their primary aim is to expand decision-makers' situational awareness through additional resources, expertise, and tools (Martini 2015; Roth and Prior 2019). In doing so, they address key challenges of digital-volunteer deployment, including insufficient training, liability, and motivation or expectation management (Daddoust et al. 2021; Ruohonen and Backholm 2023). Unlike spontaneous helpers, VOST members must meet specific requirements and complete an admission process that demonstrates analytical and communication skills as well as prior operational experience (Lise Ann St. Denis and Amanda Lee Hughes and Leysia Palen; Roth and Prior 2019; Fathi et al. 2020).

VOST are institutionally connected to official agencies at federal, state, or municipal level. Internationally, they are networked through umbrella organizations: the Virtual Operations Support Group supports team development globally, complemented by VOST Europe, VOST Oceania, and VOST America, which have been established over the past decade (Susaeta 2017). Of 71 VOST recorded worldwide in 2024, nine are based in Germany, six of which remain active (own compilation extending the data of Silver et al. (2024)); VOST THW holds a distinct position as the only German VOST deployable nationwide.

VOST's core areas of responsibility comprise:

1. **Digital situation analysis**: SM analysis and digital data collection, processing, and visualization based on open-source intelligence; classification of disaster-related information;

and verification or falsification of rumors and misinformation (Lülf and Fathi 2023; Silver et al. 2024).

2. **Crisis mapping**: digital crisis maps and dashboards, geolocation of SM data, and spatial analysis using geographic information systems (Lülf and Fathi 2023; Silver et al. 2024).
3. **Coordination and collaboration**: cooperation with national and international volunteer disaster-protection actors through technical and collaborative exchange platforms (Fathi et al. 2019).
4. **Advisory decision support**: advice on risk and crisis communication, including target-group alignment and the interpretation of SM-derived insights for actionable recommendations (Lülf and Fathi 2023).
5. **Active crisis communication**: in some teams, direct communication with the population via SM, including targeted requests for information, correction of misinformation, and responses to population needs (Silver et al. 2024).

To collaborate efficiently with decision-makers, VOST adopt a hierarchical structure that varies with objectives and team size. They are typically led by a team or operational leadership that functions as the interface between the requesting institution, the affiliated operational organization or state authority, and other digital networks or VOST (Fathi et al. 2020). Within this structure, "connectors" act as on-site mediators between the VOST and decision-makers (Hughes and Tapia 2015). Empirical evidence links team size to work efficiency, with groups of four to nine members achieving optimal results (Lise Ann St. Denis and Amanda Lee Hughes and Leysia Palen). Larger units may therefore benefit from segmentation into function-specific subgroups, for example by separating digital situation monitoring from digital situation mapping (Fathi et al. 2020). While specific structures vary by team, the roles of team or operational leader, connector, and VOST member appear, in some form, across all teams (see Table 1 for detailed role descriptions).

Table 1: Roles in a VOST (adapted from Müller et al. (2024), summarizing (Fathi et al. 2020; Fathi and Fiedrich 2022; Silver et al. 2024)).

Role	Main task	Inter-organizational tasks	Intra-organizational tasks
Team or operational leadership	Leading the deployment	Passing actionable information to and advising decision-makers; collaboration with other digital networks and VOST	Prioritizing information; establishing the team structure: coordinating workflows, defining information products, assigning tasks, roles, and responsibilities
Connector (technical advisor)	Link between the digital team and the requesting entity	Defining the procedure with the requesting entity (task prioritization, information needs, information processing and transmission); on-site expert advice; distributing external documentation; reconciling SM information with information from conventional methods (e.g., field response)	Reporting current developments in chronological order at regular intervals and in situation briefings
VOST members	SM monitoring, social listening, and mapping	–	Dislocated, independent work; coordination with the leadership; large-scale extraction, aggregation, and filtering of information from various publicly available digital sources

2.4 Resulting Research Gap

Sections 2.1–2.3 together outline what is needed, where relevant data may be found, and who is organizationally positioned to process it. The psychosocial situational picture is a decision-relevant instrument for local authorities (Section 2.1); the population's use of SM during crises can generate information relevant to such a picture (Section 2.2); and VOST have emerged as organizational actors capable of translating digital crisis information into operationally usable insights (Section 2.3). However, the procedural connection between these three elements, and in particular the systematic integration of psychosocial indicators from SM into municipal-level psychosocial situational pictures and VOST workflows, remains insufficiently specified. This is particularly relevant because operational decision-making requires not only data collection but also valid interpretation, prioritization, and translation into actionable psychosocial support measures.

Existing literature documents VOST's institutional role, organizational positioning, and general areas of responsibility, but provides limited insight into their concrete working methods for generating (psychosocial) situational information from SM. This applies both to the macro level of team-based workflows, roles, and coordination structures, and to the micro level of individual members' search, assessment, interpretation, and documentation practices. As a result, the process by which VOST transform SM data into inputs for a (psychosocial) situational picture remains a "black box."

This gap has practical and conceptual relevance. In practical terms, limited knowledge about VOST procedures hampers quality assurance, the transfer of good practices, and the targeted development of VOST, and thus, in the longer term, their integration into crisis management structures. For research, it leaves open how technology-supported and manual procedures interact in the production of psychosocial situational awareness from digital data. Accordingly, this paper addresses this gap through the three research questions formulated in Section 1 (RQ1–RQ3).

3 Method

The study combines two complementary methodological strands. First, the general VOST process was reconstructed using a process-modelling approach adapted from process mining (Scheer 2023) : an initial process model was derived from the literature and subsequently validated and refined through qualitative methods (operational observations, working groups, and World Café sessions). Second, insights from VOST members on creating a psychosocial situational picture were gained exclusively through qualitative methods. was used to reconstruct. Since no machine-readable event logs of VOST deployments were available, the process models were not discovered algorithmically but elicited from observations, working groups, and World Café discussions and subsequently formalized. The empirical material stems from a doctoral research project (Müller 2025); preliminary results were presented in German by Müller et al. (2024). The present article extends these analyses by relating the reconstructed processes to the perspective of requesting local authorities.

To identify and analyze the intra-organizational collaborative processes of German VOST, a combination of qualitative methods formed the data basis, enabling development of detailed Business Process Model and Notation (BPMN) 2.0 collaboration process models mapping VOST workflows. In a first step, an initial process model was developed based on an unstructured literature review and operational observations. In a second step, this model was empirically validated and refined: during a workshop with members of several German VOST, it was discussed, revised, and split into sub-processes (see Fig. 1). The workshop also included open discussions on VOST working methods across several World Café rounds. Findings from the qualitative content analysis were aggregated with the working-group input, adapted to the standardized BPMN 2.0 notation (Bollen 2016), and finalized through iterative bilateral consultations before being visualized and described.

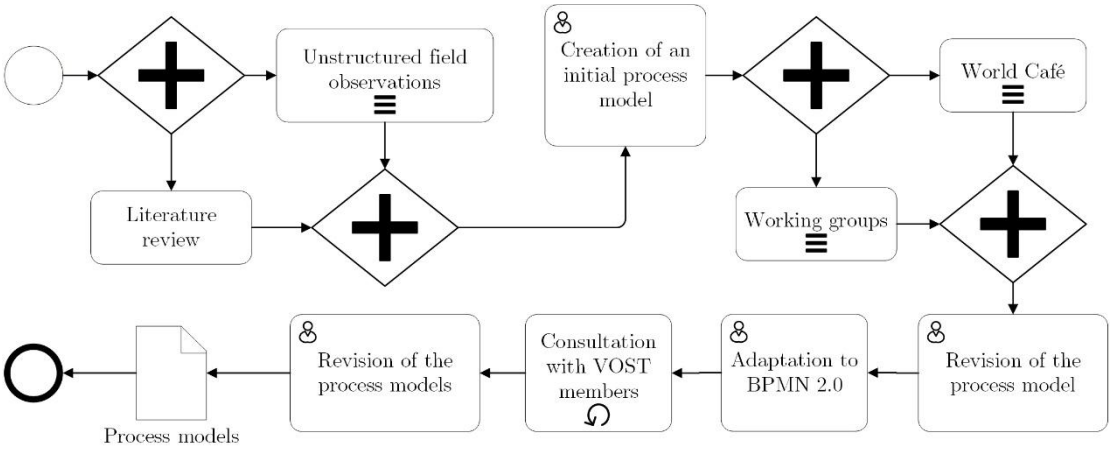

Figure 1: Process model of the methodological approach used to visualize VOST working methods and procedures.

3.1 Data collection: observations, working groups, and World Café

Over the years 2020-2024, unstructured observations of VOST deployments were conducted, both from a team-member perspective (>10 observations) and as external scientific observation within the crisis staff (two observations), to gain deeper insight into a VOST's (VOST THW) operational procedures, members' individual working methods, and the coordinating unit's decision-making. These findings, compiled with insights from the state of research, formed an initial process model at both the macro (team) and micro (individual member) level, serving as the starting point for the working groups.

The working groups and World Café rounds were conducted during a two-day workshop in December 2023 in Wuppertal with six different German VOST, three World Café rounds and two working-group sessions per day. Day one focused on general data generation and working methods; day two on data generation and evaluation in the psychosocial context. In addition, short poster surveys were conducted during the workshop, in which participants indicated, for example, how they predominantly search SM, which share of their work is carried out manually, and how they would rate the relevance of twelve example posts. The sample comprised 23 participants, of whom 93% reported substantial crisis-management expertise and 69% reported high competence in SM assessment and monitoring.

In the working groups, groups of five to seven participants each received a "Definition of Done" (DoD), a task question, target outcome, format, and description, and worked self-organized for 90 minutes without methodological guidance or moderation; discussions were transcribed and outputs recorded per the DoD.

The World Café method complements established qualitative approaches by capturing discourse on diverse topics across alternating group configurations in a simulated café atmosphere (Löhr et al. 2020). Participants rotate between discussion stations at fixed intervals, building cumulatively on the previous group's findings, before a final collective discussion of results (Weidner 2013). Moderators guided discussion while note-takers documented content in writing and participants noted key themes on prepared tablecloths; all moderators were briefed in advance using specific guidelines and topic-relevant sub-questions.

Sessions were documented using a semi-structured scheme capturing general remarks, thematic focal points, and points of controversy; note-takers recorded recurring themes with timestamps to identify cross-group focal points. Given the limited number of participants per VOST, no personally identifiable data were collected, ensuring anonymity during data processing.

3.2 Data analysis: qualitative analysis procedures

Notes, working-group outputs, and annotated tablecloths were transcribed and coded deductively-inductively using content-structuring qualitative content analysis (Schreier 2014), aiming to identify and conceptualize categories that capture the macro-level approach (team perspective) and micro-level working methods (member perspective); the coding scheme is available upon request (see Data availability).

Following a modified procedure of qualitative content analysis according to Mayring (Mayring 2022), as described by Steigleder (Steigleder 2008), main and subcategories were generated through combined deductive-inductive coding: main categories derived thematically, subcategories extracted as in-vivo codes.

In total, n = 530 statements were categorized, with multiple category assignments permitted:

- A – Working method: n = 185
- B – Procedure: n = 101
- C – Psychosocial factors in VOST: n = 51

- D – Monitoring of psychosocial factors: n = 155
- E – Practical insights from deployments: n = 38

This categorization enabled deeper analysis of the content dimensions and formed the basis for refining the process models and deriving VOST members' insights on monitoring psychosocial factors.

BPMN 2.0 was used to integrate and visualize the initial process diagram with the qualitative findings, chosen for its standardized visualization of communication flows, execution semantics, event-based flow control, and comprehensive, unambiguous symbol set (Völzer 2010; Bollen 2016), as well as its ability to create collaboration diagrams visualizing interaction, sequencing, and communication flow between process participants.

Combining the content-analysis findings with the initial process diagram in a macro-level collaboration diagram precisely represents the interfaces and communication flows between a VOST's organizational units (see Fig. 3); micro-level process models (see Figs. 4 and 5) are represented within the overall process as condensed sub-processes.

4 Results

4.1 Analysis of the iterative discussion process

The analysis of the iterative discussion process reveals key insights into the functioning and characteristics of VOST. A key distinction between VOST and digital volunteers active on a voluntary basis with organizations such as the Digital Humanitarian Network is VOST's (intended) embedding within a statutory hazard-prevention authority (Fathi et al. 2019). This requires several conditions to enable formal cooperation between the authority and the volunteer organization, such as a selection process with an aptitude assessment during member integration. VOST also comprise established, persistent structures, so that teams exist, depending on the event, in either an activated or a deactivated state, as illustrated in Fig. 2.

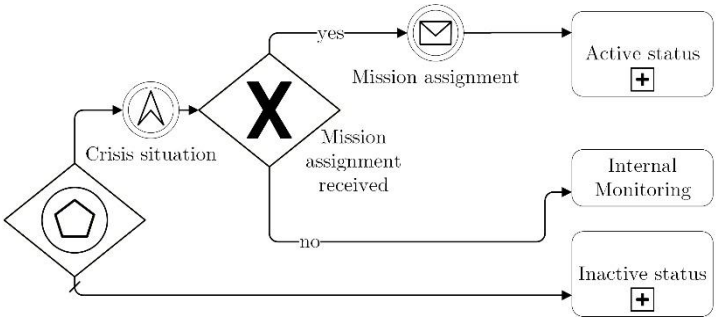

Figure 1: Process Model of Event-Triggered Status Changes in VOST Operations.

In its default state, a VOST remains deactivated, a phase shaped by recovery from prior deployments (the work is predominantly voluntary), internal coordination, and networking and competence development (Silver et al. 2024). Core activities during this phase include internal analysis projects, updating overviews, integrating current research findings, and evaluating past deployments. Teams also maintain networks, refine public communication, and identify new deployment scenarios. These activities serve not only to expand knowledge but also as practice opportunities for the team. Regular

digital meetings complement these measures and provide space for further training and exchange. This structured use of inactive time keeps VOST deployment-ready while continuously improving their capabilities and internal processes.

During the deactivated state, VOST members conduct primarily technology-based, day-to-day monitoring without intra- or inter-organizational networking. This enables the detection of unusual events and discussions in the digital space, which can trigger an internal pre-alert phase and allow the team to become active even before a deployment order is received.

When a crisis or disaster situation occurs, the team transitions, event-driven, into the activated state (Silver et al. 2024). This activation marks the beginning of the team's operational readiness and initiates specific courses of action. Internal monitoring initially consists of individual members' monitoring activities without defined intra-organizational structures or inter-organizational information-handover processes. The VOST is formally integrated into the deployment once external factors require it, normally, a request for support from a commissioning entity in the form of a deployment order. This transition is characterized by formal integration into the crisis-management structure through the deployment of the VOST's technical advisor to the crisis staff and the assumption of defined tasks within situational monitoring.

Information gathered by VOST, for example from SM, is intended to feed into decision-makers' situational picture as part of the situational picture of the digital space, for instance to broaden situational monitoring and support crisis management. The type and scope of information can be regulated by a deployment order, which may specify, for example, which indicators (e.g., monitoring the population's mood) require particular attention or which SM channels should be considered (Silver et al. 2024). These indicators can be supplemented or expanded through VOST expertise when situation-specific particularities emerge that were not foreseeable at the outset. Digital situational monitoring by VOST can identify needs or resources of the population within SM that are relevant to crisis management and help classify them. In this way, information from other sources (e.g., surveys, mapping, press) can be complemented, and indications can be derived for measures (e.g., disseminating information in regions with high uncertainty on SM) as well as their effectiveness (e.g., resonance analysis) that support situation management. The activated state of VOST is thus structured both intra- and inter-organizationally and can be described procedurally.

4.2 Approach of German Virtual Operations Support Teams: macro perspective (RQ1)

The operational team's organizational structure is divided into a coordinating unit and operative members (Müller et al. 2024). The coordinating unit comprises two key functions: the technical advisor (connector), primarily responsible for external networking, and the team/operational leadership, which focuses on internal networking and structuring. Depending on the deployment and provided enough active members are available, operative members are divided between situational monitoring (data monitoring) and situational mapping (data processing). Communication and networking pathways are designed to optimize both vertical and horizontal information flows. Vertical communication runs bidirectionally between the coordinating unit and operative members, with the team/operational leadership acting as the central interface. Horizontal communication takes place through direct interaction between the operative areas as well as within the coordinating unit. The technical advisor

serves as the link between internal processes and external stakeholders, ensuring seamless integration into the broader deployment context. This structure enables an efficient response to dynamic deployment scenarios while maintaining a clear command-and-control structure aligned with established crisis-management organizations. VOST's approach therefore comprises processes of team collaboration, networked structures, and intra- and inter-organizational information-handover processes.

This collaborative procedure is visualized in the macro-level process model (Fig. 3). The deployment sequence of an activated VOST begins with a damage event. First, the VOST's technical advisor consults with the requesting entity (represented as a black-box pool). Based on this consultation, the VOST's coordinating unit assesses its own capacity to manage the deployment, the fundamental decision on whether to activate the team. If the decision is positive, the coordinating unit initiates preparation of operational readiness. The technical advisor reviews the deployment order, while the team leadership simultaneously structures the intra-organizational conditions, including determining capacity, alerting members, and preparing communication. Team members report their available deployment times and establish their individual readiness, while the team leadership prepares the essential deployment documents and initiates the video conference.

A characteristic feature of VOST is their decentralized way of working, with team members operating from their respective locations and networked online. This structure enables flexible, rapid responses to varying deployment scenarios. In the activated state, collaborative work takes place primarily via shared deployment documents, with communication and coordination handled mainly through digital video conferencing. A VOST's internal deployment documents comprise several elements that together ensure a comprehensive, traceable record of all relevant activities and decisions during a deployment.

The **worksheet** forms the shared basis for the team's targeted activities and contains the following main sections:

- deployment overview (information on deployment start, designation, hazard/damage situation, links to relevant exchange formats),
- collection of relevant SM contributions identified as significant by monitoring members,
- meta-information on the collected contributions (location data, reference links), as well as
- assessment of contributions regarding their inclusion in external documentation products and their relevance for decision-makers.

The worksheet is continuously updated throughout the deployment and supports internal communication and coordination by providing a clearly structured overview of all relevant information and activities. In addition, an operations log (Einsatztagebuch) is maintained, in analogue or digital form, under the responsibility of the operational leadership, although this is not yet established practice in all teams.

The effectiveness of VOST's activities rests on clearly defined conditions for documentation and coordination: standardized documents, fixed communication channels, and a hierarchical division of tasks within the team. This structured approach enables VOST to respond efficiently to crisis and disaster situations and to forward relevant information to decision-makers in a timely manner.

Data detection by team members is based on a deployment briefing, which draws on the deployment order as well as already identified, deployment-relevant keywords and selected SM accounts of relevant

individuals and locations. Data detection follows the task assignment made by the team leadership. Documentation and recording of detected data is handled on a team-specific basis and includes, for example, bookmarks, lists of SM sources, and tool overviews such as the VOST Dashboard (https://start.me/p/4KeEek/VOSTdashboard). Data capture uses collaborative digital tools such as spreadsheets (e.g., Excel or Google Sheets) or Trello boards, which can be used internally or shared externally.

A central element of VOST's intra-organizational structure is the precise assignment of members to specific tasks, including assignment to specific SM platforms as monitoring sources. Source selection depends on members' qualifications and suitability. Data detection, i.e., filtering the SM data stream, is based on the requesting entity's deployment order, allowing VOST activity to be focused and thereby helping manage the growing volume of data. Monitoring initially concentrates on missing persons and time-critical events before broader situational information is considered.
Following detection, the data is assessed: action-relevant information (following Zade et al. (2018)) is evaluated first by team members, then by the team leadership, and finally by the technical advisor. If classified as critical at all three stages, the technical advisor forwards the information directly to the requesting entity. Regardless of the criticality assessment, team members continue to evaluate the data, expand the worksheet, and enable the team leadership to select information for the situational map and externally facing documentation products.

Team members **record data** in various formats (tables, charts, dashboards, text documents) and frequently use maps, as these support clear data capture and event localization. Regional references considerably ease verification and mapping, particularly when specific local characteristics within the deployment area are identified. In addition to maps, information is shared via collaborative tools such as digital pinboards. Maps and boards are continuously maintained until a change in the situation or the order occurs, or the time interval set in the deployment briefing (approximately every two hours) elapses, at which point an internal situation briefing takes place. In the event of a change in the situation or order, the cycle restarts with reviewing the deployment order and adjusting the approach accordingly.

A situation briefing takes place at intervals defined by the coordinating unit. During the briefing, the team leadership, supported by individual team members, summarizes current findings from the digital space. The technical advisor/connector relays key situational developments from the crisis staff to the VOST and describes the corresponding on-the-ground findings. The coordinating unit then prepares an overview or documentation for the next situation report, which the technical advisor forwards to the requesting entity, while team members continue data detection and evaluation.

This entire cycle, from data detection to situation reporting, continues until the coordinating unit, in consultation with the requesting entity, decides to conclude the deployment. Once concluded, the coordinating unit documents the VOST deployment's final report, and the VOST returns to its deactivated state.

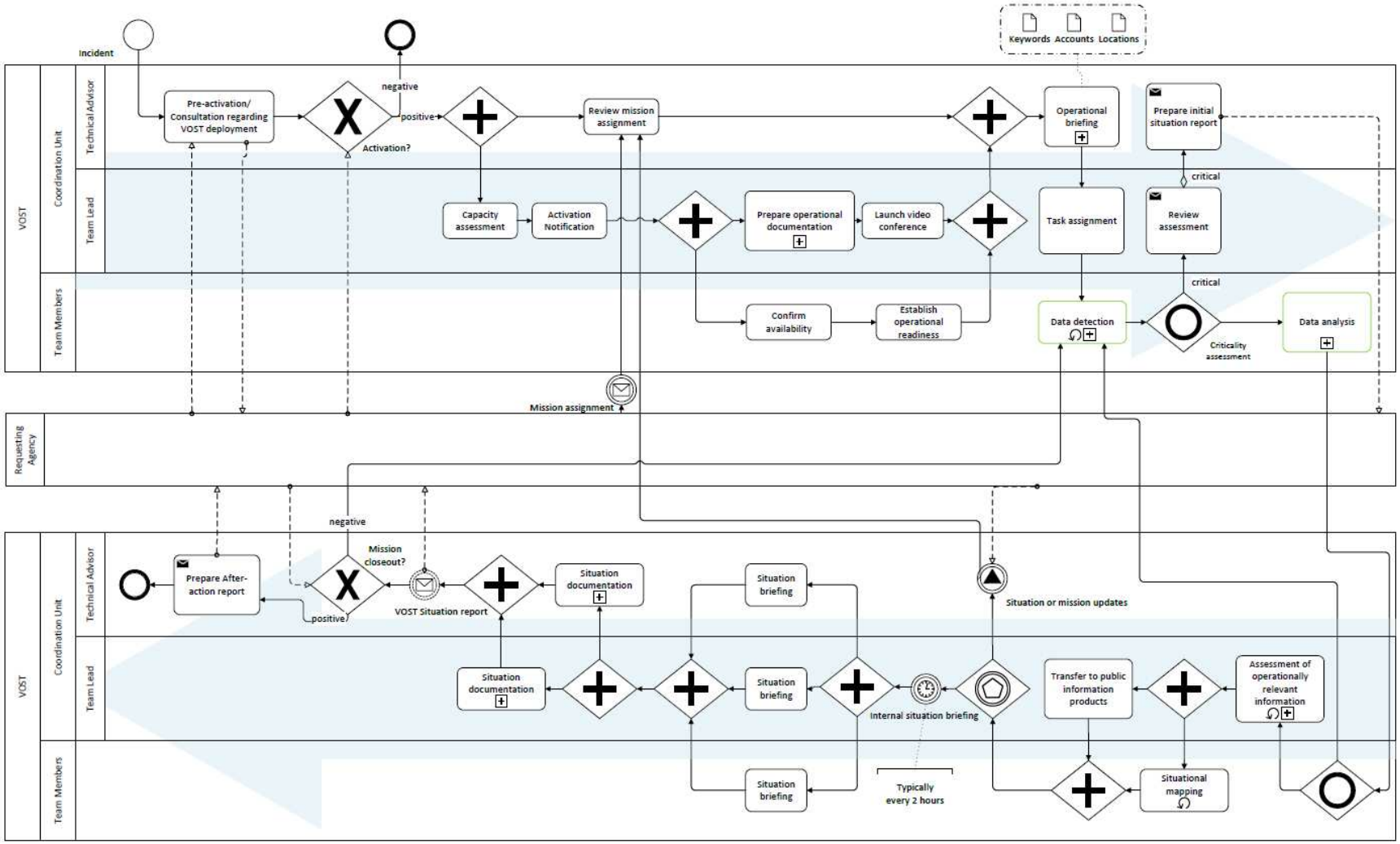

Figure 2: Macro-level BPMN 2.0 collaboration diagram of the deployment process of an activated VOST.

4.3 Working method of German VOST members: micro perspective (RQ2)

For situational monitoring, the key elements are data detection and evaluation by team members, assessment by the team leadership, and use and communication by the technical advisor. Data detection is generally situation-dependent and adaptive, distinguishing between manual and automatic approaches: Manual refers to using individual platforms' search functions and manually reviewing the results. Automatic refers to the use of tools, algorithms, or other software solutions. In the poster survey, 82% of the participating VOST members stated that they search SM predominantly manually via the search bars of the individual platforms.

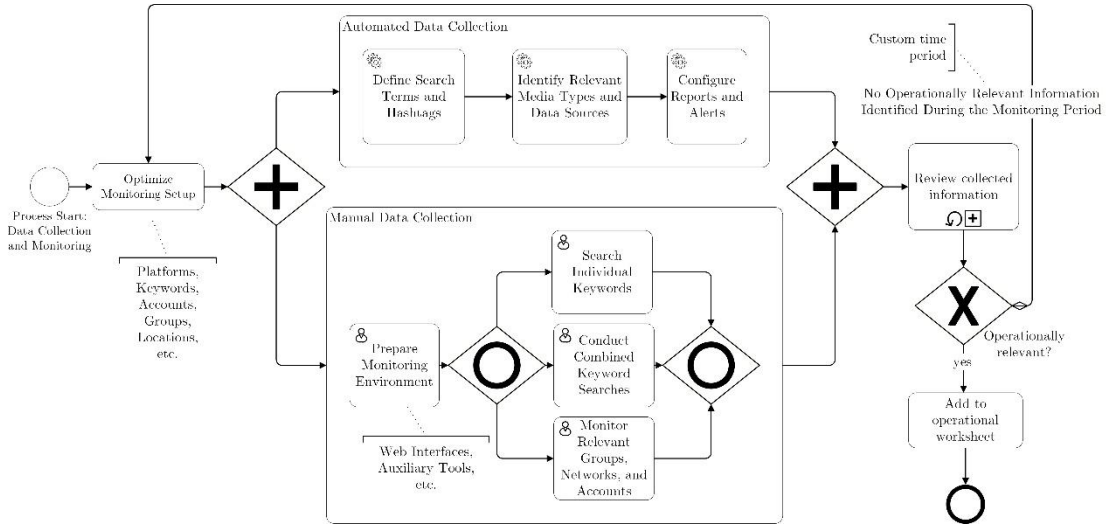

Figure 4: Micro-level process model of VOST members' data detection.

Source selection depends on the current situation, the area to be monitored, and specific requirements. Frequently mentioned sources include webcams, live video streams, railway disruption websites, Telegram, earthquake information sites, Facebook, Flightradar, community Wi-Fi networks, Instagram, flood information systems, traffic camera imagery, press portals, disruption-reporting portals, TikTok, X (formerly Twitter), transmission grid operators, traffic apps, electric vehicle charging-station websites, World Traffic Service, YouTube, and various municipal resources. Facebook and Instagram were mentioned particularly frequently. Local members (from the VOST or participating emergency services) use private or dedicated fire-service accounts to collect data, which can offer greater reach.

Data detection is structured into four steps:

1. Preparation: optimizing monitoring parameters by testing keywords, hashtags, and relevant accounts/locations
2. Detection and review: both automated (defining search terms, media types, data sources, alerts) and manual (opening the platforms to be analyzed, using tools such as SPYTOX (People Search Engine))
3. Assessment: manual review and filtering of data by team members; automatic filtering is applied where geo-referencing is available
4. Entry into the worksheet: captured, situation-relevant contributions are documented in a digital worksheet

If no situation-relevant contributions are detected over a given period, the monitoring parameters are adjusted to capture potentially relevant data. This iterative process continues until the coordinating unit declares the deployment concluded.

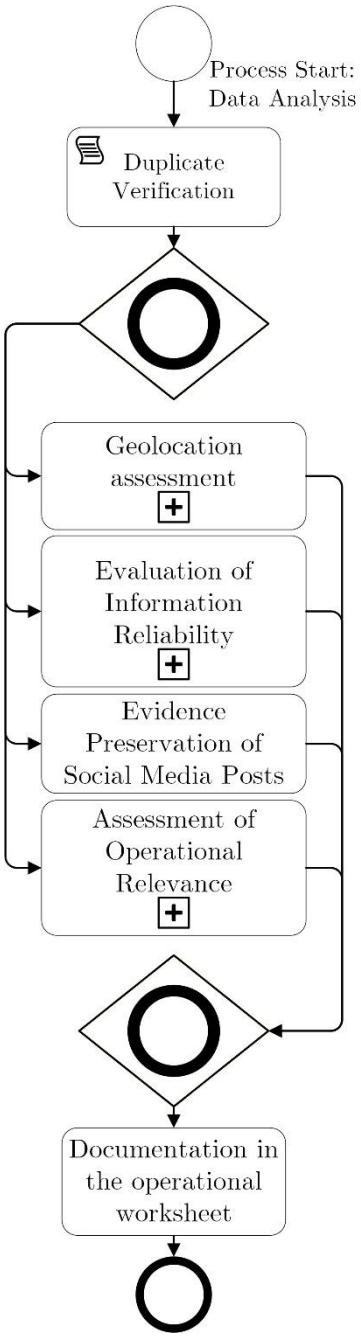

Figure 3: Micro-level process model of VOST members' data evaluation.

Various tools are used for **data evaluation**, including Snap Desktop, ArcGIS, Excel, Cave, DataMiner, EDP-Map, in-house developments, Google tools, PublicSonar, ScatterBlogs, QGIS, Start.me, TaskCards, Trello, Geo-Guessing, Overpass Turbo, and Wakelet. Google tools and ArcGIS were mentioned particularly frequently; however, participants noted that keeping pace with the frequent updates of these programs poses a challenge.

According to a poster survey conducted during the workshop and to the World Café discussions, approximately 90% of the data are searched and evaluated manually; self-programmed algorithms are not yet used. Evaluation begins with a duplicate check (e.g., via a script in an Excel spreadsheet), followed by geolocation, credibility assessment, and relevance assessment. Validation relies mainly on team members' experience and intuition as well as posting frequency; images, for instance, are verified using reverse image search. The data is additionally backed up in a shared online data store.

Relevance is assessed using categories such as "low," "medium," "high," or "relevant" and "not relevant." In acute situations, a red-green classification is often used. The assessment is subjective and strongly dependent on individual experience: in a poster survey during the workshop, only one of twelve example posts was rated equally relevant by all members, whereas the initial decision on whether to include a post in the worksheet was largely consistent. No uniform, standardized criteria exist so far.

Key assessment criteria include:

- Content aspects: relevance to the deployment, spatial/temporal/action relevance, influence on situational development, threat potential to critical infrastructure, emergency personnel, or human life, credibility, and clarity.
- Linguistic aspects: coherence, impact, emotionality, grammar, spelling.
- Metadata: context, account credibility, posting frequency, platform, reach, public visibility.

In unclear or critical cases, these points are discussed within the team via video conference.

4.4 Contribution of German VOST to the psychosocial situational picture of the digital space (RQ3)

VOST members capture not only facts but also emotions and feelings (mood), as well as discrepancies between the perceived and the actual situation. The workshop refined the monitoring assignment around "mood capture" in more detail. While there is currently no explicit assignment to create a psychosocial situational picture, similar procedures are already applied in practice.

This assignment is understood as a need to identify emotions, feelings, and discrepancies, distinguished along two dimensions: (1) type of situation (isolated incident or major-damage event) and (2) need for PSNV. Relevant keywords for mood capture include dismay, existential concern, mood, gratitude, worry, dissatisfaction, death, grief, missing persons, anger, fear, and basic needs. The well-known Big Five personality traits (openness, conscientiousness, extraversion, agreeableness, neuroticism; (Asendorpf and Neyer 2012)) were also discussed, though they are harder to infer from individual posts than acute affective expressions.

Data sources for mood capture include videos, obituaries, and information from emergency personnel, relatives, and former VOST members. Main sources are Facebook, Facebook groups, X (formerly Twitter), Tagesschau, Jodel, and comment sections of public media outlets. Monitoring is conducted manually using keywords and verified through a four-eyes principle. PSNV-relevant situations are frequently discovered incidentally during situation-specific monitoring and then discussed within the team.

Involving PSNV experts is considered particularly important for improving the assessment of content. Evaluation of detected data is multidimensional, considering frequency, reach, and potential impact on collective mood. Dynamic assessment categories are proposed, including a frequency-analysis approach (counting mentions per time unit).

A challenge is that affected individuals frequently voice their concerns directly on SM without addressing decision-makers or emergency-service representatives.

Mood is preferably represented cartographically. Through layers, color coding, and symbols, maps allow the integration of different data sets and complement situational maps. Tactical symbols for emotions and needs (e.g., red = high need, green = low need, symbols for grief, anger, etc.) were rated as useful. In addition, tabular formats with charts can be used to show the progression of case processing and the distribution of emotional states. Real-time dashboards facilitate identification of action needs and time-critical events.

For longer-running deployments, VOST members recommend visualizing emotional dynamics via a timeline to track fluctuations in the population's expressions over time. Table 2 relates these practices to the components of the psychosocial situational picture outlined in Section 2.1.

Table 2: Correspondence between the components of the psychosocial situational picture (Section 2.1) and current VOST practice (own synthesis of the workshop findings).

Component of the psychosocial situational picture	**Current VOST practice**	**Coverage**
Characteristics and locations of affected groups and their needs	Monitoring of missing persons, basic needs, and expressed needs; geolocation of posts; cartographic representation	Partially
Available technical, material, and personnel resources	Identification of population resources and offers of help within SM	Partially
Expected social structure and demographics of the affected area	Not systematically captured; SM data provide no reliable sociodemographic information	Not covered
Mood and its development	Core of the "mood capture" assignment: keyword-based capture of emotions, frequency counts, timelines, and maps	Covered
State of information and risk perception among those affected	Identification of discrepancies between perceived and actual situation; detection of rumors and misinformation	Partially
Self-help capacity of the population	At most indirectly, via observed self-organization and offers of help; not explicitly assessed	Indirectly
Resulting operational and tactical PSNV measures	Not derived by VOST; requires PSNV experts and decision-makers	Not covered

5 Discussion

This study examined how German VOST operate at both team (macro) and individual-member (micro) level and how their monitoring practices contribute to a psychosocial situational picture of the digital space. A direct comparison with prior studies is only possible to a limited extent, as the procedural focus and the derivation of psychosocial factors from SM by VOST have so far received little research attention. The present study, however, largely confirms the VOST roles described by Fathi et al. (2020) and Silver et al. (2024). Smaller teams, i.e., those with fewer members, (often federally organized) show functional flexibility, with individual members taking on several roles simultaneously. Larger, state- or municipally organized VOST units display a more specialized distribution of roles. These differences can be attributed to resource availability, deployment scope, and administrative conditions.

The study extends the approach of Fathi et al. (2020) by providing, for the first time, a detailed procedural breakdown of aspects previously regarded as a "black box." It also confirms the operating states described by Silver et al. (2024) and VOST's collaborative role as described by Sha et al. (2025). Through their permanent existence across both operating states and their structured integration into emergency-service structures, VOST achieve a degree of integration that digital volunteers without such embedding do not possess.

5.1 Implications for local authorities

These findings have direct implications for local authorities as they consider how to build capacity for a digital situational overview. Since VOST relies almost exclusively on volunteer work and manual processes, integrating such a team is less a one-time technical decision and more an ongoing commitment of resources that must be weighed against building the skills in the local team. In this context, local governments should view VOST-based capabilities as a resource with its own continuity requirements—including succession planning, workload limits, and redundancy among team members—rather than as a fixed, always-available service.

An authority considering this approach needs, at a minimum, clarity regarding the activation procedures (the transition from deactivated to activated status described above), regarding where its own liaison function stands in relation to the VOST's technical advisor, and, as a side note, regarding the fact that currently no established teams have operationalized the creation of a psychosocial situational assessment of the digital space. This means that a requesting agency that wants this specific result would have to explicitly state it in the operational order, rather than assuming that it is covered by standard sentiment monitoring. Furthermore, there should be greater awareness that, despite the technical advisor (VOST) serving as a supporting entity, decision-makers must possess the expertise to assess the utility and value of the digital space information extracted and transmitted by the VOST. Equally important is the requesting authority's own absorptive capacity: information transmitted by a VOST only becomes useful for decision-making if staff in the crisis or command staff are able to interpret it, including its verification status and the limited representativeness of SM data discussed in Section 5.3, and to translate it into concrete measures. Table 3 summarizes the aspects that a requesting local authority should clarify before engaging a VOST.

Table 3: Aspects to be clarified by requesting local authorities before drawing on a VOST (derived from the findings and the deployment order template of the VOST method handbook).

Aspect	**Questions to clarify in advance**
Activation and general information	Who may request the VOST, through which channel, and what triggers the transition from the deactivated to the activated state (pre-alert, deployment order)? Which deployment designation, start and expected end apply, and who bears the costs?
Situation	What is the hazard or damage situation, and to what extent is the requesting authority itself affected (e.g., as operator of critical infrastructure)?
Deployment order and monitoring focus	Which indicators (e.g., mood, needs, misinformation), platforms, keywords, local sources, and geographic area are to be monitored, and should open-source intelligence and anomaly detection be included? Which criteria define relevant and critical information, and which reporting intervals are required? Is a psychosocial situational picture explicitly requested?
Staffing and team strength	How many VOST members are required, and for which period? Which personnel requirements does the requesting authority have?
Liaison and command relationship	Where is the VOST's technical advisor integrated (crisis or command staff)? Under whose command does the VOST operate (subordination and assignment of forces)? Who is the authority's counterpart (contact details)? Which other actors (e.g., other VOST, press office) should the VOST network with?

Aspect	Questions to clarify in advance
Information input	Which information (e.g., situation reports, mission updates) does the requesting authority provide to the VOST?
Information products and handover	Which formats (situation reports, maps, dashboards) are expected, and how are critical findings forwarded immediately? How are internal documentation and the operations log handled?
Press and public communication	Is the VOST involved in press work or active crisis communication, and how is this coordinated with the authority's press office?
Absorptive capacity of the requesting authority	Does the requesting authority have staff with the competences to interpret the transmitted information? This includes understanding its verification status and the limited representativeness of SM data, and translating it into decisions and measures. Is technical advice from the VOST required for this?
PSNV integration	Are PSNV experts involved in interpreting psychosocial content and deriving measures?
Continuity	How are volunteer availability, rest periods, and redundancy ensured during prolonged or repeated crises, including when members are personally affected?
Legal framework	Have data protection, documentation, and liability questions been clarified in advance?

5.2 Relation to findings on social media use

The largely intuitive, experience-based relevance judgments described by VOST members can also be read against the quantitative SM literature summarized in Section 2.2. The emphasis VOST members place on emotional content and mood shifts aligns with evidence that a substantial share of crisis-related SM content is emotionally expressive (Zhang et al. 2019) and that such expression can itself function as a coping mechanism (Cohen and Wills 1985; Kummervold et al. 2002). At the same time, VOST's reliance on keyword- and platform-specific manual monitoring raises the question of whether it systematically captures or systematically misses certain population segments. Prior research shows that SM use during crises varies by gender, age, and socioeconomic status, with lower-income and minority groups showing distinct usage patterns and lower trust toward SM as an information source (Reuter et al. 2017; Dargin et al. 2021). Since VOST monitoring is not designed to correct for this variance, the resulting psychosocial situational picture may under-represent exactly the population groups whose needs are hardest to detect through other channels, a limitation worth making explicit to the requesting authorities who rely on this picture for decision-making.

5.3 Limitations

Several limitations qualify these findings. With 23 participants, the sample appears small at first glance. However, all six currently active German VOST were represented, so that the macro perspective covers the entire population of active teams in Germany. Moreover, the population of VOST members is itself small, the sample comprises roughly one fifth of all German VOST members. At the micro level, however, participation was voluntary, so the individual working methods described may not reflect the full range of practices within each team. Findings should also not be transferred unreflectively to teams operating under different legal and administrative systems internationally. Finally, the World Café and working-group data rely on participants' self-reported accounts of their working methods rather than

direct behavioral observation. Despite the four-eyes verification described for content monitoring, this cannot fully rule out social desirability effects in a group setting. Moreover, part of the observations was conducted from a team-member perspective; while this provided privileged access, it entails a risk of insider bias, which was mitigated through the iterative validation of the process models with members of other teams. The perspective of requesting authorities was not collected directly but was reconstructed from the VOST perspective, so the requesting entity is represented only as a black-box pool in the process model. Finally, the study captures a cross-sectional account of current practice; it does not trace how these processes evolve over the course of a single, extended deployment, nor how they might change as the psychosocial focus become more explicit over time.

5.4 Future research

Comparative studies of VOST or equivalent structures in other countries would help clarify which aspects of the process described here are specific to the German civil-protection system and which generalize more broadly. The observation that mood categorization currently remains dynamic and deployment-dependent points to a need for developing and validating standardized psychosocial categories that could ease both manual coding and eventual technical support, without narrowing the situational flexibility VOST members currently value. Given that most of the work identified here remains manual, research into the design and evaluation of training methods for VOST members, particularly for the psychosocial dimension of their monitoring, would directly support the professionalization of these teams. Furthermore, the analysis is predominantly based on VOST members' own assessments of their working methods. Future research should therefore integrate the perspectives of decision-makers, opinion leaders, and policymakers on VOST and, using the process model provided here as a basis, examine barriers and facilitators of VOST implementation. Finally, semi-automated tools that preserve human judgment for ambiguous or high-stakes classification while reducing the manual burden of routine detection could help address the continuity concerns raised above and would benefit from being evaluated directly against the manual baseline this study provides.

6 Conclusion

VOST are established organizations with substantial expertise in gathering information from digital sources, particularly SM. According to the participants, approximately 90% of the teams' work is manual, which enables a detailed identification and derivation of working processes based on team members' practical experience. This predominantly manual approach provides a solid empirical basis for analyzing general manual procedures for deriving psychosocial needs and resources from SM.

In summary, German VOST show a consistent overall orientation and a largely uniform approach and working method; differences arise mainly from local familiarity, areas of responsibility, team size, and day-to-day integration arrangements. Data detection relies primarily on platform-specific search functions, keywords, and the targeted observation of situation-relevant accounts and groups, while evaluation remains largely manual. Through their structured integration into disaster-protection structures, VOST convey insights from the digital space to the command staff via clearly defined transmission points, with the technical advisor supporting interpretation and highlighting possible courses of action.

With regard to psychosocial content, German VOST understand mood capture as the collection of emotions and feelings and the identification of discrepancies between the population's perceived and

actual situation, with particular attention to mood changes over time. In substance, this assignment already closely resembles a psychosocial situational picture, although the latter has not yet been formally used in practice. Compared to technical approaches (Müller et al. 2026), VOST's manual, deployment-specific procedure allows for a more differentiated, experience-based assessment of relevance, but at the same time complicates automation, as dynamic categorization would require pre-classified data sets.

The finding that most of VOST's work remains manual underscores the need to compare existing IT solutions, clarify the relevant legal framework, and identify the competencies required for their use. Despite increasing technologization, the human factor remains decisive for digital situational monitoring and assessment.

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