

# Principles for the Arrangement of Social Media Listening Practices in Crisis Management

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**Abstract.** Social media listening is used to support the need for information throughout the crisis management life-cycle with emphasis on the phases of response and recovery. The arrangement of practices of social media listening in crisis management has been done through trial and error. The academic literature argues that to integrate social media as a source of information, implementation strategies need to look beyond the acquisition of sophisticated technologies. The arrangement of practices not only includes technologies for information extraction and analysis but also s additional resources, capabilities, and fundamental characteristics of the environment where the practice takes place. Therefore, by performing an analysis of existing knowledge about practices that address this phenomenon, we propose preliminary guiding principles that support the arrangement and improvement of practices of social media listening as a tool to fulfill information needs. This study contributes to the standardization process of social media practices in crisis management.

**Keywords:** social media · social media listening · crisis management · principles

## 1 Introduction

Social media is increasingly used as a source of information in crisis management [42] but the integration to existing crisis management practices remains a challenge [17, 48]. Social media use as an information source has not been formalized [49]. Whereas these practices are emerging from improvisation [15]. The emergence can happen either from a top-down initiative, where managers believe in the relevance of social media or a bottom-up approach, where practices emerge from the scarcity of information specially during the early onset of crises [49, 36].

Social media is a widely researched topic with an extensive body of knowledge that focuses on explaining and addressing existing challenges from a social, organizational, technical, or sociotechnical point of views [43]. Efforts in improving the status quo are focused on prioritizing technology-based solutions as the means to achieve objectives as opposed to considering the phenomenon from a sociotechnical perspective [17, 21]. The existing studies advocate for the need of such sociotechnical perspective. In this regard, we integrate the fragmented literature to organize knowledge regarding the emergence, adoption and improvement of

practices in crisis management. We argue that existing knowledge works as a starting point for the formulation of principles that aim to guide the arrangement of social media listening practices in crisis management.

We formulate guiding principles that stem from the identification of the core features of social media listening practices. These principles are derived from studies that look at views from stakeholders, namely users, implementers, decision makers, researchers, designers and developers [12]. These stakeholders influence the enactment of social media listening practices. Thus, we seek to answer the following research question:

What are the principles that could guide the arrangement and improvement of the practice of social media listening for crisis management?

Practices of social media listening keep on evolving while knowledge is captured as a static snapshot in time. By formulating guiding principles from the literature we aim to motivate the transcendence of knowledge in the dimensions of temporality and space that change as practices are enacted [40].

The remainder of the paper is structured as follows: Section 2 provides conceptual and theoretical underpinnings of the practice of social media listening. Section 3 describes the methodology used in this study; Section 4 formulates and describes the guiding principles. Section 5 presents a general discussion and future research avenues. Finally, Section 6 concludes.

## 2 Conceptual and Theoretical Underpinnings

In this section we discuss the concept of imbrication to theorize the practices of social media listening in crisis management.

Understood from a sociotechnical perspective, the social media listening practice is the recursive shaping of information [33, 3] configured by the environment living in social media platforms and the need for information in during the management of crises that can be supplemented by listening to the social media conversation[16]. Thus, practice fulfills objectives by performing the extraction, classification, summarization, analysis, and reporting on the social realities expressed in social media conversations.

In crisis management the importance of monitoring social media in crises is unquestionable [42, 50] but technological, environmental and organizational challenges constrain the recursive interaction [48]. The focus in the social media listening practice is the fulfillment of objectives as entities in the practice are entangled without predefined boundaries [35] throughout the crisis management life-cycle, namely preparedness, response, recovery, mitigation and prevention [8]. Therefore, discerning whether actions are performed by human abilities or material automation is difficult. In addition, the context in which crisis occur is uncertain, unfamiliar, complex, volatile, and rapidly changing [3, 19]. In social media listening the technical entities (i.e. software, artificial intelligence, social media platforms) are not passive entities controlled by users, instead, these entities count with agency and capabilities that contribute to shape realities [34]. Human intervention and guidance is part of the process as the objectives in crisis management deal

protecting essential human needs such as security, food and shelter [30] that through collaboration systems encourage resilient communities [3, 45]. However, skepticism and lack of trust towards new processes and technology capabilities are still present in the field [49].

Social media listening is therefore a vehicle that supports crisis management tasks through the provision of information. However, using social media data is attractive, but involves the adoption or change in sociotechnical routines that assemble attributes such as technology, training, context, and additional resources that shape the assemblage of practices of social media listening. In meeting objectives, practices are enacted through arrangements of physical, social and technical entities [2]. For the purposes of this paper, when proposing guiding principles it results necessary to analytically separate entities that take place in practice [16, 28] even though we recognize that all practices are co-constituted by the social and the material and that relations emerge dynamically in practice [2]. We do so by relying on the metaphor of imbrication [24] where patterns are produced through the interlocking of material and social that forms an infrastructure that allows the fulfillment of tasks. Imbrication suggests the social and the material form an integrated structure, but social agency and material agency are different and retain their distinctions despite depending on each other for the assembly and perpetuation of practices [28, 24].

Agency is understood as the capability of doing, the capacity of action [11]. Human agency is characterized by intentionality or the ability to form and realize one's goals [25]. Material agency refers to non-human entities' capacity to act without human intervention [25]. Technologies exercise their agency through the things they do without human control [25]. The space between social and material agencies is where possibilities and limitations are constructed, negotiated and decided on. It is in this trading zone where agencies converse and, therefore, imbrications occur [26]. With imbrication, human and non-human entities are interdependent but maintain their distinct attributes when conforming and performing practices [24, 22].

As in imbrication, crisis management is a dynamic and cyclical process continuously developing. Pre-existing imbrications in crisis management are the starting point for subsequent ones [24]; the iterative process of the intertwining of agencies produces the attributes of practices of social media [18]. These attributes are not static, but evolve through time, calling for an adaptation from established practices as well evolves [27]. While imbrications can be undone and remade [28]. As the structure of imbrications strengthens through time, repetitive interlocking is more challenging to influence because of the dependencies created with other imbrications [18]. Which can explain the barriers and challenges in arranging social media in crisis management organizations.

From this perspective, social media listening is recognized as a unit with a continuous flow of action in constant state of development. Thus, our guiding principles take place in that trading zone where attributes of practice are defined. In crisis management, social media listening contributes to fulfill a need for information throughout the crisis-lifecycle with focus on the response phase [43].

**Table 1.** Summary of process for systematic literature review

| Parameter                 | Description   |
|---------------------------|---|
| Search terms              | <ul style="list-style-type: none"> <li>– Social media listening, monitoring, intelligence.</li> <li>– Crisis, disaster, emergency</li> <li>– Practice, system, organization, configuration</li> </ul>   |
| Databases                 | <ul style="list-style-type: none"> <li>– ProQuest</li> <li>– Web of Science</li> <li>– Scopus</li> <li>– AIS Library</li> <li>– IEEE Xplore</li> </ul>  |
| Literature                | Peer-reviewed journals and conference proceedings.  |
| Language                  | English   |
| Automated steps           | <ul style="list-style-type: none"> <li>– Filtering irrelevant fields of study.</li> <li>– Fusing the literature.</li> <li>– Removing of duplicates.</li> </ul>  |
| Manual inclusion criteria | <ul style="list-style-type: none"> <li>– The article should talk directly about social media use as an information source.</li> <li>– The article should involve stakeholders from the crisis management field.</li> <li>– Articles describing recounts of practice, organizational configurations or improvisational experiences.</li> </ul> |
| Manual exclusion criteria | <ul style="list-style-type: none"> <li>– Articles proposing methods for information extraction without validation with crisis management practitioners.</li> <li>– Absence of practice experience.</li> </ul>   |
| Coding approach           | Inductive that brought pattern identification.  |

At the same time, the information outputs from social media listening may contribute to decision making [7]. The literature illustrates that social media listening is used mostly as a reactive mechanism to an urgent and instantaneous need for information [36, 10]. However, it has the potential to serve as a preemptive avenue that complements crisis management operations [17].

### 3 Methodology

Our formulations are routed in a systematic literature review [32] that analyzed multidisciplinary studies involving sociotechnical features of social media use in crisis management. The process, illustrated in Table 1, started with a scope definition and a formulation of Boolean operators to search for relevant literature in five academic databases. Then the process continued with a series of iterative steps involving manual and automated processing of the literature to select the final number of articles for analysis.

**Table 2.** Actors in social media listening practices for crisis management

| <b>Actors</b> | <b>Instance</b>   |
|---------------|---|
| Implementer   | Decision makers, process, and technology solution designers.  |
| User          | Decision makers, population affected by a crisis, population that receives services from the organization that enacts social media listening. |
| Enactor       | Those performing social media listening activities (i.e., analysts, information officers, digital volunteers).                                |
| Theorizer     | The research team, existing research, and future interview objects.   |

With the concept of imbrication in mind, and with the aim to help practitioners in crisis management to take advantage of social listening, we formulate guiding principles that focus on flexibility, cyclical routines and coordination aspects that stand out in the literature. Inspired by Gregor, Chandra Kruse and Seidel [12] and Halabi, Sabiescu, David, Vannini and Nemer [13], we turned their points of discussion into our approach where descriptive knowledge [40] informs preliminary guidance based on previous experiences with social media in crisis management. Therefore, we analyzed our data and formulated key principles following the aim, context or boundary condition, means of achievement, and justification structure proposed by Gregor, Chandra Kruse and Seidel [12]. Finally, we outlined a plan for further validation and testing routed on empirical data.

## 4 Guiding Principles for the Arrangement of Social Media Listening

We abord our formulations from the perspective of implementers and enactors, leveraging Gregor, Chandra Kruse and Seidel [12] terminology, concerned with adopting and taking advantage of the full potential of insights from social media data in crisis management. As mentioned before, we structured our principles using the aim, context or boundary condition, means of achievement, and justification structure and the identification of actors illustrated on Table 2. We aim to understand and frame the benefits and challenges of practice adoption, integration, implementation, and perception of social media listening practices in different organizational, technical, and environmental contexts.

Considering that crisis contexts are characterized by unpredictability and rapid decision making and that enactors act with incomplete information that comes as a crisis event unfolds [49] and that adoption of practices is influenced by the imbrication processes that occur in trading zones, we thus propose and discuss the following principles.

*Principle 1: Knowledge, Familiarity, and Craft* To enact social media listening practices and facilitate the information gathering, analysis and reporting of findings to decision makers, facilitate access to knowledge and techniques that

foster expertise in social media analytics and crisis management operations. Because practice is strengthened by the increased human and artificial ability to navigate social media platforms through text and multimedia queries [5] and the understanding and experience in managing and responding to crises [49, 44].

Social media listening obtains a perceived snapshot of events by connecting experiences illustrated through text and multimedia data enclosed in a social media platform [5]. The extraction and analysis of that data is only possible by a combination of objectives and information requirements [20], big data processing technologies [19], and knowledge on how to manipulate technologies and recurring crisis response [44]. The lack of knowledge, experience [1], and reluctance to adopt or improve current information seeking and reporting practices [10] makes social media driven insights a lost opportunity as crises or disasters become more frequent.

*Principle 2: Cyclicality* When crises are spotted (whether through social media or other mechanisms), to allow systems to rapidly adapt from non-crisis to crisis management, implementers need to set the conditions and priorities that guide the shift and continuity of response operations throughout the duration of the crisis. Defined strategies and roles in crisis and non-crisis periods are the starting point to allow for continuity of the enablers operations as activities flow throughout the areas of preparedness, response, recovery, and mitigation. Because objectives and focus changes when transitioning through the crisis management life-cycle. Priorities shift towards saving lives, damage assessments, casualties, basic needs, response capacity, and sentiment.

In social media, shift in crisis management is evidenced as a behavior change where authorities shift from providing situational awareness to extracting situational awareness and content shifts to safety and response themes [37]. Established protocols will seek to enhance capacity in trying to continuously understand the situation. Operation centers are examples where cyclical operations are exercised throughout the life-cycle of crisis management [41]. Where response protocols are studied and exercised during non-crisis periods. Dedicated social media and digital information management roles are created to continuously keep an eye on in social media for disruptions, assess reputational risk, or find opportunities to engage with local communities in preparedness, prevention, and mitigation [38, 29]. Crisis management is a constant practice as it learns through each cyclical enactment.

*Principle 3: Spontaneous Coordination* For information requirements to be fulfilled by enactors during early crisis response, include flexibility where improvisation and spontaneous coordination is accepted within the parameters of objective meeting and under a regulation framework. Because speed is the main objective in decision making during the first 48 hours of operations where numerous unknowns exist and pressure to act is latent [49]. Empowering social media listening practices to act outside the established protocols encourages agility.

Practice studies indicate that during the first 48 hours of a crisis impact, decision-making is performed on the spot and by-passing established protocols.

Information requirements are both dynamic and static [47], the dynamic information requirements that result from unexpected developments demand speed in action that leads to alternative means of response and organization or spontaneous coordination [10, 9].

*Principle 4: Collaboration and Relationships* To increase the enactors capacity (man-power and technical resources) when a crisis strikes and as a crisis evolves, decision makers and enactors should establish a network of contacts or known trusted organizations that can be easily integrated/embedded in the organizational structure. Because initial demands for information and workforce exhaustion, demands, and criticality [46] affect the continuous flow of information during crisis response. Rigid command and control structures of response agencies contribute to increase the burthen on the workforce [49].

As crisis events unfold, stakeholders meet both online and offline. Collaboration patters are observed in social media platforms by sharing and resharing information and guiding affected communities towards available services [23]. However, lack of awareness of social media presence of key stakeholders, influencers, and other drivers of information results in delayed flows of information and missed opportunities for online collaboration [9]. Moreover, demands for information require the temporary increase of capacity that can be filled with additional resources such as digital volunteers [10], reserve staff [29] or alliances (personal or formal) with organizations with similar objectives [49]. Much of these relationships emerge from personal contacts and networks of professionals made during non-crisis times and maintained through meetings and collaboration [49, 36]. Synergy between technical tasks and social-relational activities is needed [14]. Cooperation and alignment with digital volunteers and other stakeholders at the local, national, and international level ensures common understanding and operationality [10].

*Principle 5: Inter-Organization Expansion and Contraction (Operations and Systems)* To facilitate the fulfillment of information requirements at different stages of a crisis, processes, systems, and organizations should align technological, organizational, and structural attributes beforehand [4]. This is done by encouraging implementers and enablers to actively and transparently establish relationships, share system and process specifications and protocols; establish formal collaboration agreements; and conduct simulations during non-crisis periods and strengthen those ties as collaboration routines grow with each disaster response [6].

Technological, organizational and structural attributes defined as, outcomes, principles, community, action, social fabric, infrastructure, services and governance, are some of the considerations that need to be defined and agreed before a crisis occurs and strengthened through time [4]. Moreover, considerations such as collaborative work, geographic dispersion, backchannel conversations and trusted networks are some mechanisms that influence the orchestration of operations under a collaboration scheme [6].

*Principle 6: Preempting and Foresight* For decision makers and designers to develop and implement a social media listening system for situational awareness [37], two-way conversations [20] or early warning [14] to provide information that impacts decision making in the management of crisis, ensure that human and technical resources and infrastructure are considered, available, and in place before crisis periods. Because of the nature of crisis management, during a crisis immediate demands and objectives are prioritized leaving research, implementation, process improvement, training, and design solutions on stand-by until crises are stabilized.

Most social media analytics tools are designed during non-crisis periods, based on historical data from past crises [42]. In addition, studies indicate that barriers of adoption of social media in crisis management are resources, availability, knowledge and experience with both crises and technology [48, 44]. Therefore, during non-crisis times enactors could get to know and mastering their systems and the social media environment that represents the community and context they work with [38], including testing of new technologies in collaboration with developers and researches [39] and prepare by leveraging drills and simulations of potential crisis scenarios [31].

*Principle 7: Alignment* For social media as a source of information to be integrated into crisis management tasks and systems by users and enablers at an organizational and operational level, implementers could enable fusion methodologies and architectures that integrate various sources of information with organization wide systems and infrastructures. Because social media listening practices are performed in isolation and are considered a non-authoritative data source that complements traditional sources such as physical and remote sensors and context or event specific warning systems[9].

Social media listening practices reach validation by integrating with currently operating systems organization wide [9]. Triangulation, verification, and management of uncertainty allows information to be perceived from different angles [10]. However studies of social media practices show that specific and different sets of systems are used for particular contexts and functions diminishing the value of integrating social media based systems in a general manger [17].

## 5 Discussion and Future Work

We started with identifying principles for the arrangement of practices of social media listening in crisis management. In doing so, we conducted a systematic literature review and identified seven principles. These principles are aimed as guidance for managers and decision makers in strategizing the enhancement of information gathering and analysis in crisis management organizations. These principles are proposed with practice and system designers alike (such as but not limited to: managers, software developers, or information officers). We contribute to the existing crisis management knowledge by mapping these principles to the cycle of practices of social media listening [15]. For example, the principles

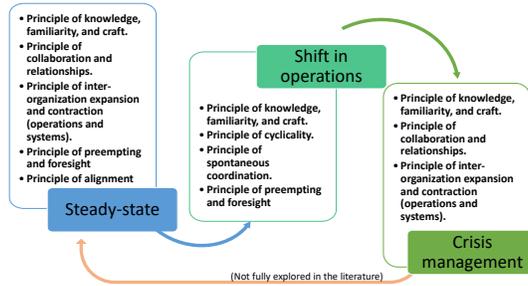


Fig. 1. Mapping principles to the social media listening cycle

aim for cyclicalty and their applicability varies depending on the social media listening cycle [15]. This cycle is inclusive of the general crisis life-cycle phases of preparedness, response, recovery and mitigation [8]. The practice shifts between steady-state, shift in operations and back to a new normal after the crisis. Figure 1 presents the cyclicalty approach of the practice of social media listening and we relate the principles proposed in this paper.

Another contribution is the theorization of practices of social media listening through imbrication that is dynamic and continue to transform through time and space. The changes are manifested through a spectrum that ranges from either the consolidation and institutionalization or dissolution. The proposed principles aim at the sustainability of practices with suggestions that influence social media listening and the parallel practices that converge in decision making and future action. Moreover, our formulations explore trust and flexibility as enablers of continuous imbrication where the degree of intertwining in social media listening could be dictated by the learned relationship that morphs within the cyclical nature of crisis management.

We also contribute by suggesting guiding principles that emerged from the collective analysis and pattern generalization of previous experiences in implementing social media as a source of information. This is a first step towards generalizing and integrating a knowledge base for the arrangement of practices that shows the maturity of processes in crisis management. Considering these principles would save time and resources for managers wanting to establish social media listening capabilities. Managers or analysts interested in social media listening can rely on past experiences and know what to expect. Reducing the need for improvisation and spontaneous coordination.

Finally, we suggests avenues for future research as follows: The prescriptive nature of the principles suggests that practices can be designed, and prescriptive knowledge can emerge from the design process. Previous approaches to designing with a focus on practice include Bjørn and Østerlund [2], where practices are considered as a set of boundings and design interventions influence and reconfigure existing and new boundings follow practices proposed; and Leonardi and Rodriguez-Lluesma [28], who leverage the concept of imbrication as a means to

maneuver design propositions where social and material entities converge while preserving their agency and properties. Both approaches focus on introducing artifacts and fostering innovation. Future work will contribute to the design knowledge from a cyclical practice perspective.

We emphasize the preliminary nature of our results because of the absence of a verification, validation and decomposition steps that make them current and useful for implementers and users alike, which is proposed as a future research activity.

Given that the step from crisis management to the a new steady state has not been explored in the literature, we haven't formulated principles for that step. This will be a part of future analyses.

## 6 Concluding Remarks

In this paper, the seven guiding principles identified through a review of the academic literature on social media listening in this paper act as a road map to advance constantly evolving practices. The guiding principles for the arrangement of practices of social media listening are grounded in the concept of imbrication [24]. In addition, we mapped the principles to the different stages of social media listening practices. Future research will include empirical data to validate our propositions, generate additional principles and illustrate the trading zones that occur while social media practices navigate through the crisis management life-cycle [8]. Interviews with stakeholders will be used to gain insights into how practices are configured. Then workshops could validate the combined guiding principles. In addition, simulations could serve as an observation platform for rapid analysis of interventions in practice. Moreover, further analysis could include the performance of practices during extended crisis scenarios such as the current COVID-19 pandemic, a condition new to the social media environment.

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