Crisis Informatics for Everyday Analysts: A Design Fiction Approach to Social Media Best Practices

Abstract
The importance of social media usage during crisis has been well established in academic and practitioner communities. Yet, the promise of rendering insights from social media for responders in a consistent and reliable manner remains a challenge and accepted standards of practice have yet to emerge. Inspired by a May 2017 workshop consisting of 15 Crisis Informatics practitioners from 3 continents, we imagine a training curriculum aimed at developing the necessary skills to harness social media data during a crisis. We call the recipients of that training Crisis Informatics Research Technicians (CIRT). We offer this design fiction to stimulate a conversation among Crisis Informatics scholars, Human-Computer Interaction scholars, crisis response professionals, and the public on best practices, tools, limitations, and ethics of using social media to improve crisis response.

Author Keywords
Crisis Informatics; Social Computing; Design Fiction; Social Media.

ACM Classification Keywords
K.4.1 Public Policy Issues; K.4.3. Organizational Impacts.
INTRODUCTION

Because such a large swath of the public uses social media, there are now many kinds of workers responsible for monitoring, analyzing, and rendering insights from SM data pertaining to crises. Initial use of social media (SM) during crisis was informal and emergent [8, 17, 32, 37]. Over time, information work enabled by SM has become its own form of crisis response. For example, digital humanitarians collaborate via SM to amplify important information and curb misinformation [6, 29]. Crisis mappers use collaborative ICT tools and SM to curate damage assessments after major disruptions [15, 26, 33, 45]. Similarly, all types of government entities increasingly task staff to monitor SM for risks to public safety.

Despite growing acceptance of its importance, rendering insights from SM that can consistently and predictably guide crisis response activity remains challenging. SM use by the public continues to evolve. The platforms themselves constantly change. Techniques and tools of collecting, curating, and understanding SM data are also evolving. Even as the research community and the public are becoming more attuned to the challenges of deriving insights from SM numerous commercial, academic, and community-driven tools aimed at supporting SM analysis in crises have been introduced [33, 45, 52]. Concerns over demographic biases, platform biases, and biases in the analytic tools rise as when SM data is mined for a crisis insights [2].

There are currently no standards for what good data analysis looks like from SM [27]. There are also few attempts to integrate SM data with other kinds of knowledge during a crisis response in real time [24]. To summarize, understanding SM trends is now an essential part of crisis response, but best practices for doing this work are very much a work in progress.

One group steeped in the opportunities and challenges of using SM to understand crises are Crisis Informatics researchers. Coined in 2006, Crisis Informatics (CI) refers to a branch of human-computer interaction research that is strongly informed by crisis and disaster sociology. Like those fields, much of CI research is driven by fieldwork with researchers frequently working directly with volunteer, non-profit or government response organizations. Though CI is by no means strictly about SM, early on CI researchers recognized that SM was both an important new realm of crisis information work as well as a new type of data to inform crisis response itself [13, 36, 49]. Therefore, many CI researchers have developed significant expertise in collecting and analyzing SM crisis data.

In May of 2017, 15 Crisis Informatics researchers and analysts from 3 continents and 9 institutions gathered at the University of Colorado to discuss Grand Challenges in Crisis Informatics. The workshop provided space for collective reflection on what the CI field has accomplished in its first decade, where it stands, and where it is headed. The themes that emerged from the workshop were a direct inspiration for the design fiction we present here. This design fiction is meant to open and extend elements of the conversation we started at the workshop. Specifically, we invite others to imagine:

1) What productive, ethical, and scientifically grounded analysis of SM crisis data looks like.
2) How to highlight and promote essential knowledge, best tools, and best practices to everyday analysts.
In this design fiction, we offer a certification-training curriculum that results in a new Crisis Informatics Response Technician (CIRT). We draw on emergency response trainings offered to the public in the United States and abroad to imagine a five-day introductory training that presents skills and knowledge we deem necessary to perform the role of CIRT. By constraining the time given to the training, we hope to elicit perspectives on essential skills and knowledge required to render insights from SM data pertaining to crises. In the next section, we present much of the text of a brochure advertising the training to potential CIRT trainees.

Becoming a CIRT: A Certification Overview

What is a CIRT?
A Crisis Informatics Response Technician (CIRT) leverages social media to support crisis response in real time. Since its creation in 2019, CIRT training has provided thousands of citizens with new skills and procedures to meet the promise of internet communication technologies, social computing, and social media in crisis response.

Because social media analysis can be done from anywhere with an internet connection, a CIRT can provide off-site or on-site support to:

- Distributed teams of digital humanitarians;
- Volunteer organizations that support formal response such as Virtual Operation Support Teams (VOSTs);
- Within emergency management agencies;
- In companies or non-profits that either need or can supply analysis of social media crisis data.

CIRTs are trained in many different types of internet-based communication tools. Training introduces best practices from scientific and practitioner communities for leveraging social computing for emergency applications. This includes tools, techniques, limitations, and ethical considerations.

To be effective, a CIRT should also be aware of general human behavior in crises; the many uses (and non-uses) of social media during crises; and incident management systems as they pertain to different types of crises that CIRTs may be called upon to support.

CIRTs work in many different capacities. Some examples of their tasks include:

- Analyzing social media during crises;
- Developing tools, or techniques for leveraging social media during crises;
- Shaping institutional policies and practices on leveraging social media post-response.

Who Certifies CIRTs?
The CIRT training program is a nationally recognized course within the Federal Emergency Management Agency (FEMA). The CIRT training program is also an essential course of the United Nations Development Programme (UNDP) focus on Crisis Response.

How Do I Become Certified?
All training materials are freely available online. However, qualifying CIRT Training is offered through many partner agencies and fees may apply. This training is a 5-day process that covers 1 Unit, organized by thematic area, each day. Intense, 1-day CIRT boot camps can also be attended for rapid certification when an active crisis response requires
additional support. Each Unit except the first is evaluated through a simulated crisis response exercise where CIRTs in training are required to apply the key lessons of the Unit in real life scenarios.

What Will I Study?
Reflecting the many kinds of knowledge required to leverage social media data in large-scale crises, CIRT training integrates the knowledge of five core areas, organized as individual Units. Certification is awarded after successfully completing training in each Unit.

Curriculum
Unit 1: Human Behavior and Types of Crises
To gain insights from social media during crises, it is helpful to first survey the social scientific research on crisis and disaster. This unit introduces the human response to crises in three ways 1) how people behave in crises, 2) typology of different kinds of crises, and 3) the crisis management cycle.

Well-attested findings into human behavior during crises are introduced from individual, organizational, and cultural perspectives. It is international in focus, reflecting the global nature of the CIRT training program. As a CIRT, you may not always be asked to engage data from your country of origin.

A typology of crises is also introduced. This background is essential for interpreting the information needs and information flows during a crisis. Different types of crises produce different kinds of information and necessitate different forms of response and recovery. For example, a bombing and the pursuit of a bombing suspect will require a different set of skills than identifying potential geographic areas that need assistance after a flooding event.

Successful crisis response extends beyond the immediate emergency period. Preparation and mitigation prior to a crisis will influence long-term recovery and resilience. This unit concludes with different theories of the crisis management cycle with an emphasis on the interconnection between each phase.

Learning Goals:
- Participants will become familiar with the history of disaster management and will demonstrate understanding of contemporary practices and controversies in this area.
- Participants will learn to apply lessons of disaster sociology to accounts presented in social media and mainstream news outlets.
- Participants will be able to demonstrate understanding of key concepts such as resilience, hazard, risk, and vulnerability.
- Participants will be able to describe how context shapes the information needs of the public and formal emergency responders related to disaster.

This unit typically takes between 10 and 12 hours to complete and is the most reading intensive of the units.

Unit 2: Formal Response Mechanisms and Internal Data Hierarchies
This training incorporates a basic introduction to U.S. emergency management processes and crisis response procedures known as the "Incident Command System.” It incorporates FEMA training IS-100.b: Introduction to Incident Command System, which provides participants with foundational understanding of formal emergency
response practices. The Unit then builds on that basic knowledge to cover the way information is managed within the Command as well as how information is intended to flow between the Command and the public. Because volunteers—whether spontaneous or organized—often fill gaps in formal response, this unit will benefit a CIRT regardless of whether they intend to work directly within formal response or not.

Learning Goals:

- Participants will become familiar the structure of formal response activities between types of crises.
- Participants will become familiar with the terminology used by different types of government agencies around the world.
- Participants will be able to critically evaluate information management practices of responders working in different types of crises.
- Participants will be familiar with key challenges in developing effective crisis communication between the public and government response agencies.

This unit typically takes between 5 to 10 hours to complete.

Unit 3: Social Computing Platforms, Everyday Use and Extraordinary Use

Building on the general knowledge of human behavior in crises gained in Unit 1, this unit looks closely at how people employ SM in crisis. This unit explores social computing platforms in three ways 1) Common SM platforms used in crises, 2) patterns of mass participation and collaboration in crises, and 3) Mass participation crisis communities.

This lesson first provides an overview of major social computing platforms. These platforms include Facebook, Instagram, OpenStreetMap, Pinterest, Snapchat, Twitter, Reddit, Wikipedia, WhatsApp, and Weibo. For each platform, the technological affordances, demographics, cultures, and practices of users are considered. Commonalities and differences in information flows are emphasized.

People’s use of technology and their trust of information sources are strongly conditioned by their everyday experience. This everyday experience informs behavior of individuals during a crisis response effort. The second part of this unit explores day-to-day SM practices as well as extraordinary use during a crisis response.

This unit concludes by examining community participation in crisis response efforts in two ways. First, in the last decade, several patterns and behavioral repertoires among SM users have emerged that follow from one crisis to the next. For example, hashtags such as #Prayfor<name of place> or the creation of memorial Facebook pages occur within minutes of a disaster. Some of these are “prosocial” such as repertoires for fundraising and some are “anti-social” such as repertoires for spreading disinformation. Second, highly organized, digital teams like the digital humanitarians, Virtual Operation Support Teams (VOSTs) and crisis mappers have solidified behaviors, practices, and tools. Each will be explored.

Learning Goals:

- Participants will become familiar with current trends in social computing.
- Participants will become familiar with the self-organizing behaviors present on social computing platforms.
• Participants will be able to critically evaluate the resources needed to harness different platforms given the availability of resources in a particular kind of crisis.
• Participants will be able to identify falsehoods and rumors and separate them from useful, awareness enhancing data made by people on the ground.

This Unit typically takes 8 hours to complete and requires a smart phone, tablet, or laptop.

Unit 4: Leveraging Social Media Data
This Unit covers the two basic approaches to leveraging SM data for crisis 1) the curation model and 2) large scale data analysis.

Much crisis-specific SM analysis is achieved through tools and practices that will be familiar to most SM users. These include cultivating and curating follower-following relationships with trusted information sources and monitoring keywords such as crisis-specific hashtags. We call this the Curation Model of SM analysis and we introduce several exemplars of this model as it is employed by different sets of volunteers, NGOs, and emergency management organizations.

Large-scale analysis of SM data is a field of active innovation among academics, practitioners, and developers. We introduce a number of approaches to large-scale data analysis as employed by practitioners and researchers emphasizing the opportunities and challenges of each.

An important feature of this Unit is consideration of common sources of error in interpreting social media data. This includes biases shaped by demographic limitations, SM participation, how SM platforms are arranged (algorithmic biases), how SM data is collected and analyzed, and assumptions of the analyst.

Learning Goals:
• Participants will become familiar with key information streams produced by social computing.
• Participants will be introduced to common tools used to analyze data produced by social computing.
• Participants will be able to critically evaluate social computing data and apply that knowledge to a live dataset.
• Participants will be able to identify key points of information that enhance coverage of activity on the ground.

This Unit typically takes 8 hours to complete and will be the most technologically immersive aspect of the training. A pre-unit knowledge quiz and study guide is provided in the online study materials.

Unit 5: Crisis Data Ethics
An important aspect of the still-evolving usage of SM in crises pertains to the vulnerabilities it can expose for users. In over a decade of SM use in crises, there are numerous examples of life-saving aid and assistance mediated through SM. There is increasing awareness that SM information needs to be handled with care to protect the safety and privacy of individuals.

Past examples of social media usage in crisis have highlighted important concerns related to SM usage. For example, during the VA Tech shooting in 2007, college students presumed that their Facebook posts were within their own social network and were not aware that posts would be of interest to media and other external audiences. In the Mumbai attack of 2008, terrorists used SM posts to locate victims. The
trade-offs of making information available publicly are complex and context specific. Though public understanding and perceptions continue to evolve, it is important for CIRTS to be aware of the risks their analysis may pose.

Learning Goals:

- Participants will become familiar with how crisis response influences safety and privacy and the ethics of data use.
- Participants will be able to identify key aspects of data security.
- Participants will be able to critically evaluate data warehousing efforts and relevant ethical concerns.
- Participants will be able to identify ethical issues and tactics for addressing them during crisis response efforts.
- Participants will be familiar with important strategies for self-care used by CIRT practitioners who may be called upon to work long hours in emotionally difficult or stressful situations.

This unit typically takes 4 to 6 hours to complete. Post unit readings consisting of case studies and past CIRT work within ethics are available in the study materials.

The Crisis Informatics Workshop

This training was developed by the Crisis Informatics Workshop (CIW), a community of academics and practitioners who work together to innovate how social computing can support crisis response. The yearly workshop is a gathering through which members share best practices of analysts working across widely varying contexts.

CIW is an independent non-profit that curates and maintains training materials and other resources developed by practitioners and researchers. Maintenance and curation are paid for by training fees and donations. CIW encourages bottom up innovation and rapid transfer of knowledge in a fast-evolving field.

CIRT trainings focused on U.S response efforts are developed in coordination with the Federal Emergency Management Agency (FEMA). A multinational training unit has been developed in coordination with the United Nations Development Programme (UNDP) and the International Federation of Red Cross & Red Crescent Societies (IFRC).

Author’s Statement

The imagined curriculum for a Crisis Informatics Response Technician (CIRT) is inspired by an assessment of current themes in Crisis Informatics (CI). These themes were identified by a workshop of CI scholars at University of Colorado Boulder in the spring of 2017. In this section, we link our design fiction to some of the major themes that emerged during discussion. We express them here as four commitments related to Crisis Informatics research and practice that we identified attendees as expressing at the workshop

Commitment to Multiple Knowledges

Our imagined curriculum draws from several knowledge areas that CI researchers use in their research. The necessity for drawing upon multiple epistemological traditions were expressed during the discussion in two ways. First, in discussions of the various methodological commitments researchers in the field make in their own research. Second in frustration over how CI work can

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1 Grand Challenges for HCI Crisis Informatics Researchers Workshop, May 6, 2017.
be misinterpreted by audiences outside of the field who lack one or more of the knowledge areas that CI draws on.

SM often makes visible slices of both formal and informal crisis response that would otherwise be challenging for researchers to study (e.g. [48]). An early insight of CI was that SM both made visible the emergent work that publics do in crises while simultaneously changing how that work occurs [18, 35-37, 44, 46, 47, 49]. So far, new behaviors and practices visible through SM extend but do not circumvent core insights from sociology of crises and disaster. Therefore, our imagined curriculum first introduces a primer on social science research on crisis.

CI researchers can attest to the fact that misconceptions about how people behave in crisis prevail among those not primed in the sociology of crises. For example, the stereotype that humans are little more than panicked animals during a crisis is as common among our peer reviewers as it is among the public. However, the reality is that decades of social science research in disasters have shown that during times of disaster, people tend to be calm, rational, and cooperative [9, 14]. Once their immediate safety has been secured, they seek to help others as well as obtain information on the condition of their family, friends, and neighbors [7]. They converge, both physically, and digitally on "the scene" in an effort to find out what happened and assist affected people. In short, to interpret SM data in crises, it helps to understand how emergent self-organization and cooperative behavior generally work in crises [9, 10, 30, 40]. SM analysts are disadvantaged if they are unaware of common human behaviors in crises.

Depending on your point of view, formal crisis response mechanisms either fill the gap of emergent informal response or vice versa. Either way, SM analysts focusing on crisis should understand how formal response works [3, 20, 31]. Though formal response training gives some background on the sociology of crises, formal response training necessarily emphasizes the mechanics of emergency response. This can leave those in formal response organizations with a gap in understanding emergent online behavior in crises.

Another important feature of the curriculum is introducing a typology of different kinds of crises. This typology should emphasize that different kinds of crises result in (and require) different patterns of information sharing. This is essential for effective response to specific crises. Through this fact, it should be noted that CI professionals are often pressured to generalize across crises in a manner that is not empirically supported.

Disaster sociology is only one of the traditions that CI relies upon. A good deal of discussion at the CI workshop concerned the nuances of interpreting SM data. This is a strong focus in not only CI, but also many kinds of data science. CI Researchers were early adopters of exploiting SM data for research. As such, many CI researchers have become specialists in working with SM able to make methodological contributions to SM research in other thematic areas.

SM are far from neutral technologies. It takes considerable work to understand each platform. Each socio-technical system is vastly different. Here, another cornerstone of CI is important, awareness of Human Computer Interaction theory. HCI theory helps to
explain and amplify the numerous innovations that have taken place among crisis practitioners.

In addition, as a research community with over a decade of experience in trying to do science with large-scale SM data, we are well aware of the opportunities and challenges such data presents. Even the mechanics of collection are fraught with potential pitfalls (and therefore an object of ongoing study and innovation) [1, 34]. The landscape of what can be collected, what the public is willing to share, and the mechanics of doing so continues to evolve, therefore our methods continue to shift.

As data science becomes more popular, increasingly complex tools to aggregate and analyze information are marketed to those without a background in computer or data science. It is important for domain specific researchers who work with large-scale data to take leadership in fostering methodological transparency. By pushing a curriculum that includes methodology and tools for interpreting SM specific to a domain, the possibility for wide-scale interrogation of methods is opened to a broader public than the methods sections of peer-reviewed papers.

Commitment to Ethical Research and Practice
Workshop participants also expressed strong interest in navigating the ethical implications of Crisis Informatics research and practice. A concern in this context is the value-vs.-vulnerability trade-off created by publicly available information about crisis-affected communities. This is highly context dependent. Data about crisis affected (and therefore potentially vulnerable) populations are made available by the public themselves. These data are then available for professional crisis responders as well as the public. Yet, the potential for trouble increases as wide-scale SM data becomes more widespread.

Workshop participants felt that the situatedness of different crises and the vulnerabilities of different populations made uniform rules about aggregation and disclosure unhelpful. However, an intermediate step could be to work collectively toward developing decision-making heuristics and sensitizing questions. Analysts could use this work as a values lever [23, 43] or moment that creates a consideration for the ethical consideration of a design or decision. The safety and privacy implications of large-scale data about crisis are still unfolding, but the central importance of this theme is expressed in our curriculum through the inclusion of a Unit dedicated to ethical considerations of crisis data.

Commitment to the Long View
A major frustration for workshop participants is the sense that CI research is boxed in by “the event.” The outsized attention that crisis events receive in the media and our politics as compared to the long periods of preparing for or recovering from them, carries over to how CI research is funded and to how and when those outside the field take an interest in its findings. A landslide becomes an international story when it kills 43 people, but this “event” would not have occurred at all if the county planning board had interpreted risk assessments differently years earlier [11, 12]. The CI researchers at the workshop were cognizant that mitigating future crises demands a long view of crisis mitigation, preparedness, response, and recovery.

Crises are the result of complex interactions between naturally or socially produced hazards and societally
constructed vulnerabilities to those hazards. The factors that shape these vulnerabilities influence how and when disasters strike, who is affected, and long-term patterns of recovery [28]. These factors also shape what technologies are available to communicate once an event disrupts that region. Even if CI remains boxed by telling stories of “the event” those stories will be most impactful on mitigating future crises if the interrelations between information needed before, during and after considered [42]. Therefore, our imagined curriculum introduces several versions of the crisis management “cycle.”

Commitment to the Global Community
The Crisis-Informatics Workshop included scholars from 3 continents and while we would like to say this is normal, in many ways it is not. With some important exceptions, much Crisis Informatics work has focused on the United States. Bombings [39, 48], Hurricanes [5, 16, 22, 50, 51], Mass Shootings [25, 37, 49], and different kinds of crisis like veteran re-integration [41] or public transit disruption in rural areas [38] all focus on the United States and its brand of response. This extends to web communities and web platforms as well [21]. As we constructed this curriculum, each of the authors (by extension of the CIW’s geographic dispersion) felt the limitations of that epistemological limitation. As such, we focused on international focuses like the creation of international VOSTs [4, 6, 19].

The causes and effects of crisis are global in nature. Efforts to understand and mitigate crisis must therefore also be informed by international perspectives. By focusing on CIRT as an internationally leaning certification, our design fiction highlights the need to increase the intersectionality of this type of work.

CONCLUSION
Our imagined curriculum allows us a new way to assess, carry forward, and communicate a discussion of important challenges and trends within Crisis Informatics research. Through consideration of what the role of CIRT could play within crisis response and what types of expertise would be needed to facilitate such a role, we were able to articulate some of the issues at stake, think through the trade-offs of prioritizing various training content, and speculate about what new partnerships between formal and informal crisis response might coalesce around.

By suggesting a certification that combines multiple threads of expertise into a single crisis-focused curriculum, we invite conversation with the academic research community, practitioners, and the wider public. Specifically, we offered a vision of 1) What productive, ethical, and scientifically grounded analysis of SM crisis data might look like and 2) How to highlight and promote essential knowledge, best tools, and best practices to both professional and lay analysts.

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