Temporality in Crisis Informatics: Representations and integrations of time in humanitarian crowd work

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Introduction

The study of temporality in crisis informatics research tends to be confined to "clock time" and how the sequential passage of past, present, and future influence emergency response data collection, decision-making, task coordination, risk/probability models, etc. Measuring linear time in terms of perspective, speed, recency, and productivity are important considerations in crisis-driven social computing, human–computer interaction (HCI) work, and emergency management.

However, time manifests in several ways that are currently unaccounted for—as physical, mechanical, spatial, social, cognitive, and sensory phenomena. In computer-supported cooperative work (CSCW), time is a simultaneously complex, entangled, interdependent, rhythmic, and collective experience [4].

We believe that the grand research challenge for crisis informatics over the next decade is the study of social constructions of time and how these human factors should be better represented, integrated, and supported in humanitarian-motivated crowd work.

The Need to Study Time in Crisis Informatics

Natural disasters are a constant threat to humanity. The aftermath of 6,457 weather-related disasters recorded between 1995-2015 are staggering: 606,000 lives lost worldwide, more than 4 billion people injured, left homeless or in need of humanitarian assistance, and more than US$2T in economic losses suffered [2].

Meteorological disasters tend to be classified as slow-onset disasters and consequently embody their own temporal rhythms of event genesis, emergency alert, immediate response, and recovery period. Each type of disaster, such as rapid-onset geophysical events, disease epidemics, mass political disruption, and chronic climate-driven events, possess unique temporal characteristics. Further, the social construction of these events, the behaviors they motivate, and ways of framing the experience are also influenced by individual and community time representations.

The study of crisis informatics is as much an endeavor of social science as it is of computational science [7]. Behavior matters—whether it is prosocial acts like social media participation, helping, cooperative work, sense- and/or decision-making. Understanding how crisis-related behaviors may be influenced by temporal characteristics is underexplored.

Prior work in crisis informatics has focused several important data validity concepts that drive behavior during disasters: The triad of *credibility, trust* and *helpfulness* [8] and the broader notion of *information quality* [5]. While temporality has been acknowledged as an important element, it has received little direct attention in the literature. Issues around data temporality also have implications for the broader domain of information science. Moreover, investigating these concepts in a temporally-rich environment, like crisis informatics, can help unpack multidimensional and complex effects on information quality.

Time, as a function of perspective, speed, recency, and productivity, is especially relevant to the notion of *trust* (or lack thereof) in crisis informatics data collected through crowdsourcing, peer production, and other CSCW methods. Much ink has been spilled in the quest to deconstruct cooperative work, its behaviors, motives, outcomes, and impact in minute detail. However, apart from some stand-out work on cyclical representations of time that alternate between progressive moments and stability [4], and an emerging framework of *temporal logic in group work* [6], few resources have been committed to studying psychological constructions of time and its potential effects on producing trustworthy cooperative work.

From a computational perspective, crisis informatics systems are not well-equipped to represent different temporal states of data. Take, for instance, the vast amount of social media data collected during a crisis event. The capacity to temporally classify data in present or past states, and model potential future states would mark a major advancement in determining crisis zone situational awareness with more precision.

Thus, one of the big challenges is to explore how various representations of time interact with the principle categories of crisis informatics research: Affected people/responders, crisis events, data, and information systems (Table 1).

Category	Temporal type	Potential study domains	Related work
People	Time perspective	• disaster-affected people • emergency responders • V&TC/VOST members/groups	Zimbardo & Boyd [12]
Crisis events	Onset speed	• slow disaster • rapid disaster • chronic disaster	Salvado et al. [9] Gralla et al. [3] van de Walle et al. [10]
Data	Mediated recency	• data creation • crowdsourcing/data collection • verification/correction • curation/distribution/redistribution	Ludwig, Reuter & Pipek [5] van de Walle et al. [11]
Systems	Productivity	• crowdsourcing/knowledge search • collective intelligence/knowledge management • impact/performance metrics	Burns & Shanley [1]

Table 1: Proposed temporal factors to study in crisis informatics

About the Authors

Wendy Norris is a second-year PhD student in the Department of Information Science at CU Boulder. Her research focus is crisis informatics, human-computer interaction, and social computing in collective intelligence/knowledge search methods. The overarching goal of her work is designing social computing systems that leverage temporality in the context of natural disasters and humanitarian crises.

Stephen Voida is an assistant professor and founding faculty member of the Department of Information Science at CU Boulder. He directs the Too Much Information (TMI) research group, where he and his students study personal information management, personal and group informatics systems, health informatics technologies, and ubiquitous computing.

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