# Building an Ontology for Crisis, Tragedy, and Recovery

*Edward Fox, Uma Murthy, Naren Ramakrishnan, Andrea Kavanaugh, Steve Sheetz, Donald Shoemaker, Venkataraghavan Srinivasan*
**Virginia Tech**

Crises and tragedies are, regrettably, part of life. While always difficult, recovery from tragic events may be increasingly facilitated and supported by technology. Yet, advanced intelligent information integration methods have not been applied to this domain, which we refer to as Crisis, Tragedy and Recovery (CTR). The impact of tragic events is felt over extended periods, requiring longitudinal studies of complex inter-dependencies. Consequently, with the Internet Archive and other partners, we will build CTRnet, an integrated distributed digital library network providing a comprehensive suite of CTR-related services.

A key task is development of a CTR ontology, for integrating information across tragic events. The ontology will aid information organization, exploration, visualization, and analysis (including temporal modeling of events as they unfold). We will employ ontologies for browsing and semantic query expansion. Ontology-based tagging will leverage the involvement of the community, and attach shared meanings to the elements of the digital library.

A comprehensive ontology will be connected into a knowledge base that relates to events, studies, findings, and results / lessons learned / best practices. It would include: variables to measure, activities and behaviors to monitor, effects to test, and connections with the theories and knowledge of a variety of social and behavioral science disciplines.

We will seed the ontology building process with data gathered from initial focus group analyses, as well as knowledge gained from literature in this domain and from Crisis Informatics. The User interactions and log data gathered from the CTR website and Facebook application will aid further refinement.

In a brief pilot exploration, we extracted top phrases from the abstracts and keywords from papers in the 2005 and 2007 ISCRAM[1] proceedings using the N-Gram Statistics Package[2]:
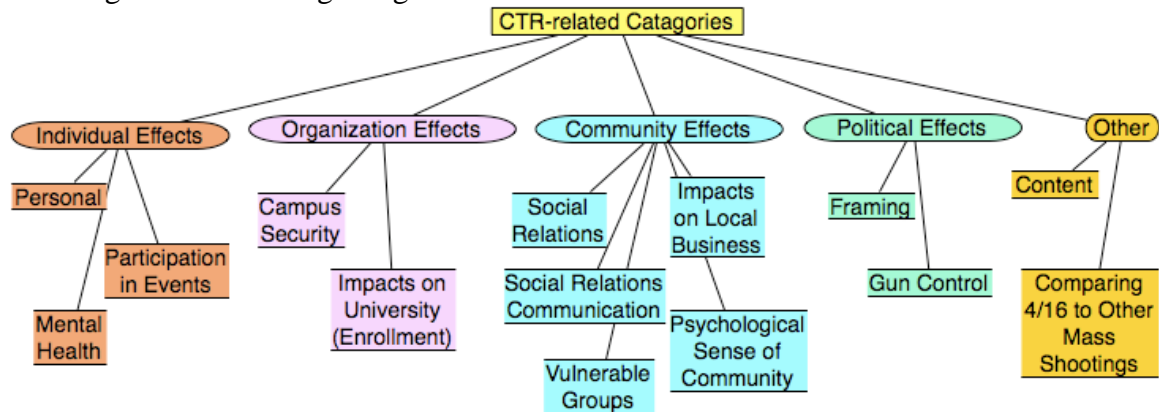
| Selected distinctive word pairs identified from ISCRAM proceedings | | | |
|---|---|---|---|
| emergency response | Decision support | information systems | teams participants |
| decision making | data models | disaster monitoring | teams maps |
| command teams | disaster plan | Crisis management | sms text-message |
| flood alerts | information seeking | situational awareness | disaster registry |
| physical communication | human disaster | teams access | decision preference |

---

[1] International Conference on Information Systems for Crisis Response and Management
[2] http://www.d.umn.edu/~tpederse/nsp.html

We conducted focus group interviews following the April 16, 2007 tragedy at Virginia Tech. We employed the Group Cognitive Mapping System to generate ideas, issues, concepts, and important research questions that are relevant to the events of April 16th, resulting in the following categories:

CTR-related Catagories

Individual Effects — Organization Effects — Community Effects — Political Effects — Other

Personal
Participation in Events
Mental Health

Campus Security
Impacts on University (Enrollment)

Social Relations
Impacts on Local Business
Social Relations Communication
Vulnerable Groups
Psychological Sense of Community

Framing
Gun Control

Content
Comparing 4/16 to Other Mass Shootings

We will evaluate the ontology in several ways. One connects with our information retrieval and digital library research; we will measure the breadth and specificity of the coverage of our content by the concepts in the ontology. Second, through focus groups and user studies we will measure the coherence, consistency, and other indicators of ontology quality. A third form of evaluation concerns the ease with which new CTR instances can be folded into the ontology.

At the NKOS workshop, we will solicit expert views, ideas, and suggestions for an optimal strategy for development and evaluation of a CTR ontology. We will learn about other related projects, useful software, and possible collaborations. Of particular relevance is our goal to work toward a global CTR ontology that is applicable in diverse cultures and in many languages.