

Third International Conference on Information
Systems for Crisis Response And Management in
Mediterranean Countries. October 26-28, 2016
University Carlos III of Madrid. Madrid, Spain

MADRID 2016
ISCRAM-med

POSTER PAPERS

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Madrid, Oct, 26.28 2016

Organized by:

Interactive Systems Group – DEILab. Universidad Carlos III de Madrid

Sponsored by:

Vicerrectorado de Investigación y Transferencia. Universidad Carlos III de Madrid

Published by the Interactive Systems Group. Universidad Carlos III de Madrid.
Avda de la Universidad 30, 28911
Leganés (Spain), October 2016
ISBN: 978-84-16829-03-3

Table of Contents

Organization	5
Conference Program	11
Poster Papers	19
Mobile Apps for Citizens	21
Inclusive access to emergency services: An action research project focused on hearing impaired citizens	21
<i>Vaso Constantinou, Andri Ioannou and Paloma Diaz</i>	
Information and Knowledge management	25
GIS-based Multi-Criteria Analysis and if then rules for ranking industrial zones	25
<i>Taibi Aissa and Atmani Baghdad</i>	
Emergency Crisis Management Models: an ontological review.....	31
<i>Ali Al Imem, Ahmed Maalel and Henda Hajjami Ben Ghezala</i>	
Social Computing	35
From the social semantic web to recommendation.....	35
<i>Firas Ben Kharrat, Aymen Elkhlei</i>	
X-ETL Engine: from relational model to a multidimensional model.....	39
<i>Nawfal El Moukhi, Ikram El Azami and Aziz Mouloudi</i>	

Emergency Crisis Management Models: an ontological review

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Abstract. Laziness and grievous un-seriousness methods taken by governments for handling complex crisis had only brought more fuel to the fire and unfortunately left it untreated. As technologies has reached significant progress to provide in time, urgent, management solutions to take over crisis of their own. Unluckily, an evidence growth on continuous emergent events still proves the opposite. Understanding this inability and setting up ways on how to resolve it requires meditation moment on current research studies. This move is an attempt to cut off with the gap mentioned above and another move to rethink modeling and developing modern crisis management approach. This paper presents the state of the art of Emergency Crisis Management and our envisaged approach.

Keywords: Crisis Management. Ontology. State of the art. Collaboration. Context.

1 Introduction

The chasing curse of crisis tragedy in all its myriad forms globally strikes planet earth, causing an immediate damage with no warning signs, driving the scene through a negative change in stability. Typically, a crisis is kept vague and unexplained for anyone to finally surprise and create chaos anywhere, anytime in a moment of inadvertency and surprisingly overload the management capacity. Knowledge engineering based technology's resounding success were chosen to treat crisis. Still, interpreting terrorist waves recently witnessed in Tunisia (Sousse 2015), France (Paris, 2015), USA (San Bernardino, 2015), resulting infrastructure destruction; to many deaths; injuries among innocent civilians, military and internal security staffs proves that traditional management ways are not playing their role and technologies are out of it. Luckily, ontologies' advantages are a corner stone to push crisis management phases works effectively. Our intentions are to provide a review of ontologies used so far for crisis management approaches and to state the missing points. The paper is organized as follows: Sect. 2 presents the state of the art of Emergency Crisis Management; Sect. 3 discuss our envisaged process; Sect. 4 ends up the paper with a conclusion.

2 State of the art

Intents behind reading the literature are redirected to build a coherent knowledge base on all phases of crisis management. For that we address the following questions:

- Where knowledge on crisis resides? (Social networks, databases, experts...);
- Has knowledge already represented or grouped in assembled models? How so?
- How and for what kind of use cases been used for? (e.g. firefighting rescue mission).

For the quest of proper, complete, and semantically understandable knowledge on crisis one major element have been adopted to do so are ontologies. In fact, ontologies stick to its capability to represent data and information towards higher conceptual level and derive more valuable knowledge. Indeed, ontologies were the main focus of several approaches for modeling knowledge on crisis and on their management. In this paper relevant ontologies were selected in terms of (1) crisis coverage; (2) use cases; (3) usage and roles; (4) goal; (5) crisis types. A more in-depth review of ontologies for crisis management can be found in [20]. The selected ontologies, concepts, taxonomies, vocabularies are used to support crisis management domain applications. The ontologies were more or less used for: (a) collecting and storing relevant information from heterogeneous sources; (b) feeding source for algorithms to make continuous analysis or interpretation; (c) information filtration process; (d) queries; (e) store hidden dependencies with engines help; (f) rules; (g) giving access to of users, agents or applications; (h) visualization of threats and terrorist networks; (i) event extractions (newspaper, articles, magazines etc.) [9, 4, 1, 5]. Up to now, the proposed ontologies were not detailed enough to cover most management phases and crisis types making it too generic [5, 13] or too specific for particular domain [4] and that both would be difficult for adaptation or to be reused. Further works added real-time concepts to ontologies to tackle complex and dynamic emergency situation and support real-time decision making [6, 16, 17, 18]. The complexity of crisis yet requires a unification of the right supplies and expertize on using them wisely. By that, context and collaboration was considered as a key cores to provide real-time decision making and construct situation awareness within disaster management resulting a collaborative environment to group units and let them work in intelligent manner to share convenient tasks, resources, supplies and receive optimal directions [12,7,11,2]. In these works, context concepts constantly vary in terms of numbers which make context an open research still very much an open research area. Context ontologies also considers mobility of users to send meaningful information or to allocate resources and items based on their profiles, devices capabilities, time of interaction, skills, location and the activities they perform. Matching standard ontologies as FOAF, vCard, owl-time, FIPA...raise situation awareness in crisis hardware and software [15]. In crisis, collaboration also plays critical role for the seamless integration of heterogeneous knowledge and treatments of critical situation through the coordination of processes, tasks, and activities between actors to achieve common objectives [10, 19]. The collaboration between crisis or context ontology by alignment functions to get access to standard ontologies such as w3c geospatial vocabulary, and semantic sensor network ontology empowers real time monitoring of incidents [3, 8, 15]. In summary we set up context, collaboration and mobility as key features to evaluate research studies (see Table 1). In

here knowledge on crisis are built upon layers, we aim to reuse and extend this effort in developing our approach.

Table 1. Comparative review on vocabularies, concepts, taxonomies used in crisis management of four dimensions provided above: context, mobility, collaboration done for adaptation purposes: ++: very rich; +: rich; +/-: less rich; -: poor.

Reference	Context Support	Collaboration Support		Mobility Support
		Static	Dynamic	
[9][1]	-	-	-	-
[4][5][13]	+/-	-	-	-
[6][16][17][18]	+	-	-	-
[2][8][7][11][12]	+	+	-	-
[15]	++	-	+/-	+
[10]	+	-	+	-
[3]	+/-	-	+/-	-
[19]	-	-	++	-

2 Envisaged Process

Managing crisis requires all potentials and a deeper knowledge to produce vital emergencies scenarios. Our envisaged process for the future will comprise various actors, ontologies, services and collaboration patterns to trend collaborative and context-aware mobile decision support approach for real-time emergency management.

3 Conclusion

A short review on the ontologies devoted to crisis is provided. Ontologies, collaboration, context, mobility are key features to develop our approach in the near future. Our intentions continue (i) to cover most crisis types and all management phases; (ii) To invest in artificial intelligence, knowledge, dynamic approaches to solve the dilemma; (iii) to validate our proposal based on real use cases.

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