



Information Technology and Quantitative Management (ITQM2016)

Unconventional Emergencies Management Based on Domain Knowledge

Mengyan Feng, Aihua Li^{a*}, Chuanliang Jia, Zhidong Liu

^aSchool of Management science and Engineering, Central University of Finance and Economics, Beijing, 100081, China

Abstract

Unconventional emergencies generally lack experiences, and the development of the situation is always dynamic. So it's easy to pose a threat to the security and stability of the society. By introducing the standardization of domain knowledge in emergency decision system and giving an effective remedy for the emergency decision making method based on artificial intelligence, domain knowledge and ontology in the field of unconventional emergencies are helpful to solve the problem of the low degree of the pertinence and participation of the experts. It has some inspiration for the future emergency management.

© 2016 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of the Organizing Committee of ITQM 2016

Keywords: Unconventional Emergency; Emergency Management; Domain Knowledge; Ontology; HTN

1. Introduction

The famous German sociologist Ulrich Beck proposed a concept called "Risk Society" in his literary work *Risk: Towards a New Modernity* in 1986. He thought today's post-industrial society were fraught with risks, and this society was a society full of disastrous. Over a period of decades, national emphasis of social risk management is increasing day by day. And for the conventional emergencies it has corresponding more perfect emergency plans. But with the change of social development, the progress of science and technology and the change of the natural environment, all kinds of unconventional emergencies have a significant increase in the occurrence probability in the world. Because of its rare and unpredictable, the state and the departments almost have no corresponding available and effective contingency plans for unconventional emergencies. Coupled with the current node association between the various social subsystems increasing, the degree of interdependence increases. Once it occurred, it would have a serious impact on the whole society. In recent

* Corresponding author. Tel.: +86-10-62288622; fax: +86-10-62288622.
E-mail address: aihuali@cufe.edu.cn.

years, there are some unconventional emergencies occurred in China, like snow and ice storms in southern China in 2009, Dalian oil pipeline explosion in 2010, and Tianjin Binhai New Area of dangerous items explosion in 2015.

Non-conventional emergencies usually have characteristics such as paroxysm, the tendency to spread, uncertainty, severity, community and so on [1]. So it has the following challenges in emergency decision making: (1) The urgency of time. Because of the severity of the unconventional emergency situation, the general reaction and instruction time for decision makers is short. (2) Inapplicability of traditional management. Due to the low rates of such an event, and its evolution rules are generally unknown, the management is more difficult. So we cannot use the traditional "prediction-deal with" management mode, and we should change to the emergency management mode of "scenario-response". (3) Uncertainty of subsequent derivation. Emergencies are generally in the process of continuous dynamic change, the future evolution of the situation is not clear, which has brought great challenges and complexity to the management and decision-making [2].

From this dangerous goods warehouse explosion incident in Tianjin Binhai New Area, it can be seen that Chinese government's emergency treatment of unconventional emergencies need to be improved. A variety of publications follow-up reports mentioned the relevant institution lack of emergency management ability and scientific approach, mishandling of unexpected fire, and all these led to many casualties of rescue firefighters and related personnel. Firefighters were lack of training and knowledge of dangerous goods. In addition, the commanders on the scene, although with some relief experience, but may not understand the characteristics of high-risk chemicals and lack of scientific command ability. And these are related to the domain knowledge of the corresponding professional. In this paper by introducing the standardization of domain knowledge in emergency decision system and giving an effective remedy for the emergency decision making method based on artificial intelligence, domain knowledge and ontology in the field of unconventional emergencies are helpful to solve the problem of the low degree of the pertinence and participation of the experts. It has some inspiration for the future emergency management.

2. Domain Knowledge Structure of Unconventional Emergencies

2.1. Domain Knowledge

Domain knowledge refers to the knowledge framework which is composed of experts' experience, skills and management quality in a certain industry. In simple terms, it is the specialized knowledge and skills in the field of industry[3]. It's like an organization and reorganization of knowledge, as well as the explicit and tacit knowledge, through the acquisition, organization, distribution, application of knowledge, to achieve knowledge sharing and knowledge innovation [4]. Domain experts at the scene to deal with the emergency rely upon the accumulated rich experience and intuition over the years to find out the solution and then to use logic to prove the feasibility and effectiveness of the proposed method [5]. Their thinking process is like Fig.1.

Feeling features → Intuitive association → logic verification → conclusion

Fig. 1. Thinking Process

Digitization and materialization of domain knowledge is equivalent to provide the general people the process of "Intuitive association" shown above. Domain knowledge will be able to save a lot of time costs and human capital, and to ensure the efficiency and quality.

Download English Version:

<https://daneshyari.com/en/article/488333>

Download Persian Version:

<https://daneshyari.com/article/488333>

[Daneshyari.com](https://daneshyari.com)