Use of Web-based Group Decision Support for Crisis Management

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ABSTRACT

Web-based group decision support systems (wGDSS) are becoming more common in organizations. In this paper, we provide a review and critique of the literature on wGDSS, raising a number of issues that need addressing. Then we report on a small scale experiment using *Groupsystems ThinkTank* to manage an issue to do with food safety. We also describe how we propose to use ThinkTank in a crisis situation.

Keywords

collaboration; distributed decision making; web-based group decision support system (*w*GDSS)

INTRODUCTION

In many countries crisis management is by undertaken by multi-organizational teams (Niculae et al., 2004, Carter and French, 2005). By *crises* we mean rare events with significant negative impacts that are managed by processes outside those used in normal working. When responding to a crisis, a team must bring together the right information, expertise, and leadership ability, and work under time pressure (Briggs et al., 1997/1998). In the public sector, crisis teams are often drawn together from several organizations and thus at the outset of an incident, have to come together and form before they can function effectively (Carter and French, 2005). These people must continuously develop and evaluate possible courses of action in response to the unfolding situation.

Group Decision Support Systems (GDSS) are interactive computer-based environments that support concerted and coordinated group effort towards completing a task. Early work clearly shows that using GDSS within organizations to solve complex problems can be cost-effective by increasing productivity and reducing elapsed hour to reach decisions (Grohowski et al., 1990, Post, 1992). Features such as parallel and anonymous contributions can overcome process losses like production blocking and evaluation apprehension, and thus help the individuals participate more equally and produce more contributions of higher quality (Dennis et al., 1990, Gallupe et al., 1991). Many studies report higher quality outcomes and higher satisfaction for groups using GSS. These and other benefits of GDSS have been discussed widely (Nunamaker et al., 1996, Fjermestad and Hiltz, 1998-1999, Post, 1992, Morton et al., 2003, Dennis and Wixom, 2001). Initially GDSS were built on networking technologies and confined to an organization and perhaps a specific GDSS room; modern web-technologies allow collaborative participation to take place beyond organizational boundaries, For many years, GDSS have been developed to help decision makers address different decision contexts: we denote such systems by *w*GDSS. It is now possible to discuss issues, debate objectives, formulate problems, access data and analyze models, vote, decide and implement actions, all via virtual meetings with no need for the team to meet up face-to-face (French *et al.*, 2007). In organizations with a common culture and common working practices, these tools are proving very successful. But for crisis teams coming from disparate backgrounds, without much experience of working together this may not be true. Therefore, we ask whether *w*GDSS has a place in crisis management.

WEB-BASED COLLABORATION

Individuals working together divide their efforts between three cognitive processes (Nunamaker et al., 1996):

- Communication –people devote their attention to choosing words, behaviors, images, and artifacts, and presenting them through a medium to the others in the group.
- Deliberation – people devote cognitive effort to forming intentions toward accomplishing a goal, including clarifying and formulating the problem, developing and evaluating alternatives, choosing, monitoring, and so on.
- Information processing –storing, retrieving analyzing and summarizing the data needed to support group deliberations.

ThinkTank developed by *GroupSystems* is a *w*GDSS offering support for these processes. *ThinkTank* employs a Web 2.0 architecture to support techniques such as brainstorming, organizing ideas, voting on alternatives, prioritizing, building consensus, etc. It also creates a clear, custom output of the content created during the innovation process for alignment on action or for future reference.

Can such a tool be used in crisis management? As we have noted the team, which may not have worked together before, has to come together and form before it can function fully. If they have used *w*GDSS before, they may have used different systems with different conventions. Now with the trend towards the use of such tools in broader intra-organizational contexts, social networking and, indeed, societal decision making, there is less commonality in terms of objective, culture, working practices and familiarity with the *w*GDSS concerned, making the timeliness and effectiveness of their use more questionable. For crisis management teams, the issue of learning to use the particular *w*GDSS might outweigh the gains of not needing to meet face-to-face. Communication with *w*GDSS is less capable of providing concurrent feedback, i.e. body languages, gestures, or expressions. Such feedback plays an important role in communication and team formation. Its absence from *w*GDSS will reduce social presence, and might result in inaccurate communication and increased time to complete a task. Thus using *w*GDSS for distributed crisis teams might be less effective and take longer than more conventional face-to-face meetings.

EXPERIMENTS

We are undertaking two experiments with *ThinkTank* to test the effectiveness and efficiency of *w*GDSS to support decision making process for public issues within the RELU-RISK project (Shepherd *et al*., 2006). The first experiment is not a strict crisis situation, but it enabled us to explore some features of *ThinkTank*. The second, still ongoing, relates to a food safety crisis. We will have finished and begun to analyze this second experiment by ISCRAM2008.

Trial Experiment

Experiment

The first experiment is based on a food safety case study about campylobacter in chicken. Campylobacteriosis is the most common form of food poisoning in England and Wales. Although the illness is usually self limiting and only lasting a few days, it occasionally leads to complications and to serious health effects, and even to fatality. Campylobacteriosis contributes strongly to the total economic burden of infectious intestinal illness which, in the UK in 2000, was estimated by the FSA to be about £1.5 billion. The economic and health impacts of campylobacteriosis stimulate sustained regulatory and scientific effort aimed at managing and controlling the hazard. The current strategy of the Food Standards Agency in the UK includes an explicit objective to achieve a 50% reduction in the incidence of UK produced chickens which test positive for campylobacter by 2010.

The objectives of the experiment were, firstly, to test how *w*GDSS can be used to support public decision making process, particularly with distributed participants in asynchronous situation; and, secondly, to gain experience in the use of *ThinkTank* in order to plan the next experiment for crisis management situation. 12 postgraduate students were involved in this trial test, 8 of whom had at least one training session on using *ThinkTank* before the test. The exercise is to inform the participants of the campylobacter case study and get them engaged in a decision making process to develop and prioritize the risk mitigation strategies in order to reduce the incidence of campylobacter in chicken.

Previously we have designed and validated a structured process for conventional face-to-face stakeholder workshops for the same case study. It was customized in the experiment to match the techniques supported by *ThinkTank*. The agenda consists of several stages:

- **Initial Assessment** to familiarize participants with the problem situation. The participants were asked to read a web page containing the background information about the case study, and list the questions they concerned about the situation. The experts or other participants then gave answers.
- **Risk identification** to identify the risks along the food chain. The participants were asked to brainstorm the risks that can happen from production to consumption, and then assess each risk based on the criteria of likelihood of occurrence and severity of any impact.
- **Risk mitigation** to develop possible strategies for managing the problem situation. The participants brainstormed the actions that should/can be taken to reduce the incidence of campylobacter. We then summarized and organized the ideas into four general strategies and ask the participants to assess each strategy based on criteria of feasibility, effectiveness and financial cost.

At the end of each session the participants evaluated the effectiveness of the processes they had just undertaken.

Results

The results from the *ThinkTank* experiment were similar to those from earlier conventional workshops. All agreed that education at the consumer end of the food chain should be the most important strategy. One observation is that the expertise and explanation power seems to shift from the experts to the stakeholders in the *ThinkTank* experiment, perhaps because the participants were active in searching the web and finding explanations to the questions and comments from the other participants.

While the trial experiment seemed to be successful and gives us the confidence to assess *Thinktank* in the pressurized circumstances of a crisis, the process is fraught with challenges that can be improved for future practice: The *ThinkTank* interface is user-friendly and the use of the application is limited to several simple operations. All the participants are postgraduate students who use computers with their daily work, and several have used *ThinkTank* before. Even so, it still takes some time for the participants to get used to the software environment and kick off the discussion.

What a virtual team can accomplish depends heavily on getting participants engaged in the process and then maintaining that involvement throughout (Romano et al., 1998). The trial experiment suffered problems from getting the participants to focus on the task, particularly in the asynchronous sessions. That is partly due to the virtual teams lacking feedback mechanisms and nonverbal cues than those who work in the same place at same time. Feedback from other group members working asynchronously becomes slower. Participants can feel alone on the system if they do not receive immediate feedback, and choose to be an observer rather than participants. The absence of nonverbal communication from *w*GDSS will reduce social presence and can result in reduced accuracy of communication and increased time to complete a task. Moreover, people tend to write down key words or simple sentences without given detailed explanation what they really mean. Others who read the information may perceive different meanings and become confused. Once it is hard to understand the ideas presented by the others and it is time-consuming to search for certain information, the participants may lose interest in taking part. Additionally, the participants were recruited from students, who were not real problem owners and did not have a direct interest in the task itself. An individual's contribution cannot be specifically identified in the experiment due to anonymity. Thus, they are more prone to distraction, and are easily engaged in multiple unrelated tasks while keeping one eye on the meeting without others knowing they are doing so.

Ongoing experiment

The ongoing experiment concerns a crisis situation. The story starts from a report of increased chick mortality and morbidity of broiler chicks, reduced growth rate, ataxia and neck oedema on a broiler farm and another one of a sudden drop in egg production in laying flock. The case study evolves as chicken samples are submitted for further testing and similar signs are found in other farms. A feed company soon reports to FSA an incident involving probable contamination of poultry feed. The exercise is divided into three stages and the participants are presented different information at the start of each stage.

The protocol in the trial experiment will be re-used in this experiment, but with modified questions to fit with the current case study. The process of initial assessment, risk identification and risk mitigation repeats at each stage. The participants are asked to continuously refine their thoughts and judgments in response to the unfolding situation, and to make decisions under time pressure.

In contrast to the trial session, we will ask the participants to use aliases to indicate their roles in the discussion so that their contribution can be identified. It has been suggested that working anonymously may help the teams to produce more ideas than when they are identified, since the participants may be reluctant to propose ideas that might provoke negative reactions from peers or superiors (Dennis et al., 1990). However, crisis teams are often brought together specifically for the task in hand, and the group dynamics and politics are very different from teams within single organizations i.e. no predetermined hierarchical relationships exist among them. There are concerns that people tend to exert less cognitive effort when they are working anonymously (Shepherd et al., 1995/1996) which might outweigh the possible benefits of reduced evaluation apprehension.

A short pre-training session is planned before starting the discussion on the real issue so that the participants can get to know the software operation and the other participants they will be working with. It may also help to create a favorable atmosphere for team formation. We will compare the performance of the experiment with the conventional workshop in terms of several criteria: i.e. the number of ideas generated, the time and resources cost, and the extent to which the participants are satisfied with the process and the outcomes.

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