ABSTRACT

Motivation – To investigate the impact of command and control systems with geographical information system (GIS) functionality in a crisis management organization. Research approach – Controlled experiments using a computer based simulation in which Swedish municipal crisis management teams are tested. Findings/Design – Earlier results found that command teams using GIS performed better than command teams using paper-based maps and that the communication density varies between the conditions. This study replicates the earlier, but uses participants with a relevant professional background.

Keywords
Geographical Information, Simulation, Emergency Management

INTRODUCTION

The objective of this research is to investigate the impact of command and control systems with geographical information system (GIS) functionality in a crisis management organization. An earlier study (Johansson et al. 2007) revealed that command teams equipped with GIS technology outperformed teams using only paper maps in a simulated forest fire fighting task. The participants in that study were university students. In this abstract, we describe an ongoing study with actual municipality crisis management teams. The goal is to investigate differences in the work procedures of a team that have access to a GIS in its command post compared to a team that do not have access to a GIS.

Sweden is organized into 21 regions and 290 municipalities. The municipalities are responsible for a wide variety of areas, including crisis and rescue management. The municipalities are obliged to be prepared for handling any crisis, to have a crisis committee and contingency plans and to have a rescue service. The municipalities are partly free to shape their work. The information and communication technology, such as GIS used in the organizations thus varies among the municipalities.

METHOD

The method used is controlled experiments using a microworld. The microworld provides a computer-generated task environment that has complex, dynamic and opaque characteristics (Brehmer and Dörner, 1993; Granlund, 2002; Gonzalez et al., 2005).

In this study, the C3Fire environment (Granlund, 2002; Granlund and Johansson, 2003) is used. The C3Fire environment simulates forest firefighting. In the C3Fire environment, organization and the communication structures can be set up in the accordance with the research goal. The “world” in C3Fire is comprised of a number of quadratic cells, which, apart from representing different types of terrain, can take different states (not burning, burning, closed out, burned out). The GIS module includes GI visualization, GIS functionality and map input. It is possible to use different map views and layers.

Experimental Design

The study is a between groups design with one factor: (a) C² teams using a C² tool with GIS-functionality providing access to real-time data on the units position and the fire outbreak, and (b) C² teams using traditional paper maps. The difference between the two conditions is thus the support the participants obtain in terms of visualization and data sources. All teams face the same scenarios. In this study, we aim to test 20 teams. Each team consisted of six participants; three working as commanders in the command module and three as ground chiefs controlling three fire brigades each, see figure 1. Every team performed five trials.
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The persons working as command post are located together and can speak freely with each other. They command their ground chiefs in order to control the simulated forest fire. Two members of the command post are responsible for communicating with the three team members working as ground chiefs. The command post in the GIS condition has access to a digital map. The command post in the paper-map condition has a paper map instead of the digitalized map, see figure 2. The command post with GIS can see the area of sight of all nine fire brigades. However, they cannot see fire that is outside the area of sight of their brigades. The command post with paper map cannot see any fire brigade actions, but they have the same ability to communicate with their ground chiefs.

The situation for the three persons working as ground chief is the same in both conditions. The ground chiefs are located solitary and cannot speak to anyone. They can communicate with their command post via text messages. The ground chiefs are in command of three fire brigades each.

Figure 1. The two conditions, GIS to the left and paper map to the right

PRELIMINARY OBSERVATIONS

The ongoing study is about half-way done (10 teams out of 20 have been tested). It is too early to state any statistically valid results, but there are indications that the communication volume has decreased in both conditions compared to the student teams in experiment one (Johansson et al., 2007).

REFERENCES


