The International Emergency Management Society
10th Annual Conference Proceedings, June 3-6, 2003
Sophia-Antipolis, Provence, France

THE PROMISE OF ICT SUPPORT FOR INCIDENT MANAGEMENT IN THE PORT OF ROTTERDAM

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Keywords: Emergency response, training, information, communication, incident management

Abstract

The first tests with the introduction of ICT tools in emergency response training in the port of Rotterdam gives rise to the expectation that such tools largely improve the coordination and decision making in the initial stage of an emergency situation. Traditionally incident handling in the Port of Rotterdam area is coordinated by a multi-services CoPi- team, which takes decisions on actual assistance at the scene of the incident and on additional safety measures for the wider environment of the site. These multi-services teams are the core of all information streams; they handle all incoming information from the field units, take managerial decisions and have to inform the higher command and the press. ICT is expected to enhance their tasks; better information, quicker access to information, and undisturbed communication is expected to downsize reaction time and to result in more efficient incident handling. In the training and simulation centre of the Rotterdam Port Authority experiments were conducted in which CoPi teams were confronted with scenarios of incidents, which they had to handle both with and without ICT support. In this research paper the experiments and their outcomes will be described and critically evaluated in order to answer the question: can the promise of ICT become true?

Introduction

On March 6, 2002 a small fire broke out on the Friesland, a trawler situated in a repair dock on a wharf in the municipality of Vlaardingen, which is part of the Rotterdam Port area. The fire started in the hold of the ship in the isolation part of the refrigerated holds. When the first appliance attended the incident, the officer in charge scaled up the incident handling according to the standard procedure. He asked for a Command Place Incident (CoPI) team to be installed and ordered several additional appliances to the incident, including fire-fighting vessels from the Rotterdam Port Authority. Moreover, the commander of the Rotterdam Fire Brigade and all the officers in charge of the Key services, were informed.

Direct after the scaling up a mobile command center arrived at the scene, a senior officer from the Rotterdam Fire Brigade took charge and in the first CoPI meeting, the five officers of the key services, the chemical advisor and the press officer tackled the issue of how to fight the fire (source fighting) and how to deal with the effects of the incident.

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At the location of the incident penetrative black fumes were vomited from the hulk of the vessel. Field units informed the CoPI that a cloud of black smoke headed in the direction of urban areas. CoPI reported to Higher Control they were fighting a fire in the isolation on board of a shipping vessel in a dock, ship is empty, no cargo, no dangerous goods, but heavy smoke.

At the scene of the incident it was clear that leeward from the fire sirens should warn people to keep doors and windows closed and to stay inside. At Higher Command this request seemed awkward for what seemed to be a minor incident with an empty vessel, no cargo, and only isolation burning. Based on the oral information by telephone different images existed on the seriousness of the incident. Consequently it took some time to convince Higher Command of the necessity of scaling up the incident and have the sirens go off. In the end the fire lasted several days, blankets of heavy black smoke covered the area and even lead to the closure of national highway A4 for days.

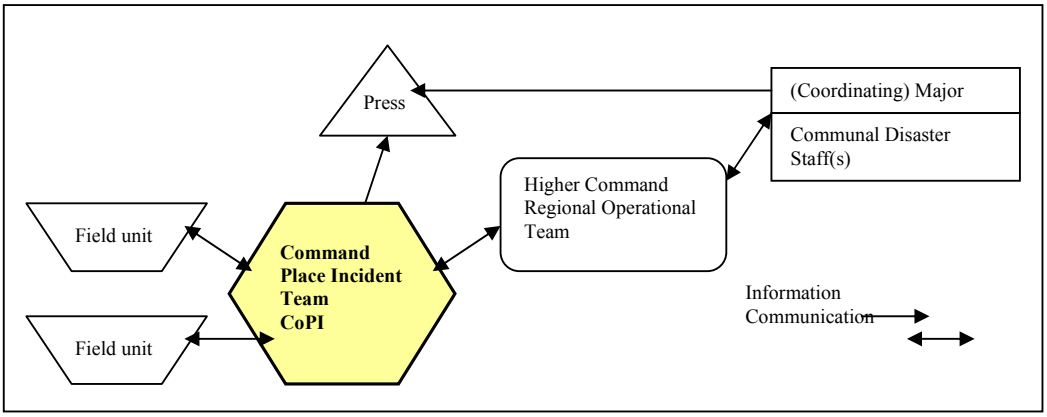
The Friesland incident illustrates the importance of a correct visualization or image of an incident, especially in the start-up phase of incident handling. This case illustrates that the reliability of the information and imaging can be very important and oral information alone does not provide that. Modern ICT tools applied both at the scene of the incident, at the CoPI and at Higher Command could be a solution for improving the communication and decision-making. Improved visualization, better assessment and quicker responses can be expected when incident handling can be supported effectively. This paper describes the first practical acquaintance of the CoPIs of the Port of Rotterdam with a support tool for incident handling.

Incident handling at the Port of Rotterdam

The Port of Rotterdam is the worlds leading harbour in volumes and one of the worlds biggest concentrations of (petro-)chemical industry and storage of chemical products. The harbour area stretches some 50 kms inland and is about 600 square kilometers. Some 1 mln. people live in this area in cities like Rotterdam, Schiedam and Vlaardingen.

Effective and efficient incident handling to prevent accidents growing into disasters is crucial in such a densely populated environment. Incident handling for that reason is well organized; staffs are well-educated and abundant training facilities are available. A regional operational plan has been implemented in 1985 providing guidance for all incident handling. It coordinates the input, cooperation and deployment of the police, fire-fighters, ambulance units, chemical experts, and harbour authorities for fighting any potential hazard. Except for coordination between the different organizations involved in incident handling mentioned, coordination is required between different levels of incident handling. For that communication is needed between the operational level – the people at the scene of the incident, the tactical level – the coordination between services and management of people and material, and the strategic level where the regional operational commanders are responsible when the incident grows beyond local impacts. Moreover, when the incident gets a more than local character the communal disaster staff or even inter communal disaster staffs get actively involved. Clearly the operational level, which is called the Command Place Incident or CoPI is a critical factor in incident handling. Professionals staff a CoPI and in the early stages of incident handling the CoPI is the spider in the web of all information handling. Its task is difficult: the team members have to decide quickly on often blurred and uncertain information on what to do, whom to inform, how to deploy? (See fig 1)

Figure 1. Central position of the Command Place Incident (CoPI) team in the information and communication network in incident handling



Until now all communication between the field units and the CoPI team is done by radio transmission and (mobile) telephone. This is not optimal as many disturbances occur: electrostatics, background noise at both ends of the line and human misinterpretation and misunderstanding cause communication problems and misunderstanding. Communication with Higher Command uses the same telephone devices, thus contributing to the hectic of the start-up of the CoPI team. Expectations are that modern ICT can help to improve the quality of the communication between the various levels of incident handling both in speed and content. Better communication is expected to lead to better and faster incident handling thus reducing the chance for incidents growing into disasters.

As seen from Fig 1. the field units are tactically supported by the CoPI team. A CoPI team consists of:

- A senior officer of the fire department, who is the incident manager,
- A duty officer of the fire department
- An officer of the medical support organization (GHOR)
- A regional duty officer of the Rotterdam Port Authority
- A duty officer of the police
- An advisor dangerous chemicals (DCMR)
- A pubic relations/press officer (police department)
- Ad hoc additional specialists

The procedure for decision making on emergency management is called CRIP: Coordinated Regional Incident-Management Procedure. CRIP is activated whenever at least one of the CoPI members calls for a coordinated response, like the fire department officer in our trawler example. CRIP has four coordination alarm levels coinciding with the scale of the incident (Bouwman et al. 2001). In this paper we will focus on CRIP 1 and CRIP 2, the level of local incidents, which can be handled by the services provided by the CoPI members. CRIP 1 situations occurred, on average, twelve times a year during the last years. In a CRIP 1 situation the tasks of the CoPI team are (Port of Rotterdam, 1999):

- Coordination deployment of incident handling units in the direct vicinity of the incident
- Operational management at the site for all participating disciplines
- Taking of measures to prevent and/or limit casualties
- Assistance for casualties
- Provision of information to Regional Operational Team (RegOT - higher command)
- Request for assistance to Regional Operational Team

The CoPI team is concerned with coping with the incident itself. When effects occur in a wider environment, for instance when living areas have to be evacuated because of dangerous fumes,

this is not organized by the CoPI but by one of the higher commands like the RegOT. We then consider it to be a CRIP 2 situation. The essential task of the CoPI is coordination of the incident fighting and the prevention of potential hazards: get the right people at the right place at the right time to prevent unexpected events to develop into more serious accidents or even disasters. The start of incident handling is characterized by: (Worm, 1999)

- Uncertainty because of the lack of information
- Ambiguity because of contradicting information
- Time pressure and delays
- Highly dynamic circumstances
- Distributed teams with limited information exchange abilities, which leads to different perceptions of the problem
- Goal conflicts as incident handling may hurt production continuity
- Stress - high physical and mental workload because of dangerous circumstances

Reaching the right decisions in due time is crucial in these difficult circumstances. Reliable information and communication structures are expected to enhance this task. (Bouter, 2000, Bouwman et al. 2001)

The research project described in this paper assessed the potential impact of the use of new ICT-tools by CoPI teams in their practical incident handling. For that reason a prototype decision support system was build according to requirements set through research of the current incident handling practice in the Port of Rotterdam (Bouwman, 2003). The hypothesis was that both quality and speed of the decisions taken by the teams working with ICT support would improve.

Experience and expectations of CoPI team members who participated in the ICT supported training sessions were registered both before and after their training exercise in which various CoPI teams used the support system for handling incident scenarios. The experiment and the results of this test will be presented and evaluated in the following paragraphs.

Theory and Method: Expectations about ICT

As mentioned above the central hypothesis of this research was that both quality and speed of decisions taken by CoPI teams working with ICT support would improve.

The research was performed through a number of steps:

1. Analysis of current practice in incident handling
2. Measuring expectations about ICT in incident handling
3. Formulation of design requirements for ICT support
4. Prototyping of support tool
5. Testing
6. Evaluation

The current practice of information and communication handling in incident handling and staff training was studied in order to discover design requirements for support tools. Literature and evaluation reports on incident handling were studied, training exercises were observed and a number of interviews with tactical and strategic resource personnel held. (Bouwman et al. 2001; Bouwman 2003). Next to this the interviews were used to make inventory of the wishes of CoPI members with respect to specific tasks or applications. Combination of outcomes led to a list of requirements for ICT support. Most important requirements for the support system were:

- Fast
- Reliable
- Simple (fool-proof)
- Supportive

- Support current practice
- Restricted communication (internal and external)
- Allow for distributed working
- Allow photographic or video images
- Include GIS system for plot making
- Contain databases/information systems
- Allow for making and sending situation reports

From the literature on information systems and Emergency Management Systems, like Quarantelli (1997), some additional requirements were gained:

- Mobility
- Protection (water and shock proof)
- Stable and equipped with back-up system
- Training
- Prevent information overload
- Supporting not replacing direct interaction

During the training exercises that were observed a survey was done amongst others for asking the trainees about their expectations about the possible contribution of ICT to the effectiveness of incident handling by a CoPI team. 14 People filled in the electronic forms. A nine point Likert scale was used for expressing the level of agreement or disagreement (with 5 being the neutral position). Asked after the potential added value of ICT support for incident handling the respondents graded this statement 7.15 with a standard deviation of 1,57. In general respondents are positive on the expected effect of ICT support; they are especially positive about the potential availability of timely images and site maps. Some statements and answers can be seen in the Table 2.

Table 1. Some results of Survey 1. (After: Bouwman 2003)

Statement	N	m	σ
ICT support for CoPI incident handling has added value	13	7,15	1,57
ICT support helps to get the right information sooner, leading to a faster startup of incident fighting	14	6,93	1,64
Take up of pictures (of the incident) has added value for incident handling	14	8,21	1,12
Use of GIS in incident handling creates added value	14	8,07	1,21
ICT support will enable better communication with other levels (RegOT)	14	7,64	1,22

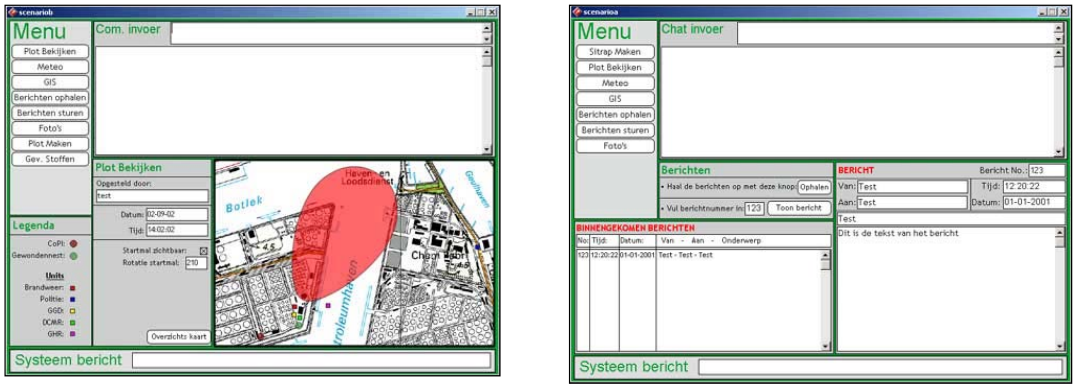
Demo

Departing from the above design requirements a prototype decision support tool was designed, inspired by Group Systems, which is a standard support tool with the Rotterdam Port Authority and EMPROV, which had been used in earlier experiments. (Beroggi et al. 2001) Macromedia Director 8.0 was used for prototyping as it allows for multimedia use and for exchange of information. Shockwave Multiuser Service (by Macromedia) was used for communication support. Each CoPI team member got his own PC equipped with a chat function for communication with the other team members. An important element in the prototype DSS was the so-called 'plot function'. Setting the plot is important in the functioning of a CoPI team: knowing what the exact location of the incident is and where the fumes are heading for. Not only would the central plotting function help the CoPI team to gain time, it would also allow for updating the regional commands. Figure 2 shows two of the screens CoPI members will use during an emergency exercise.

Next to the users application a facilitators application was made to supply participants with information on the incident and for monitoring, measuring and evaluation purposes.

For testing the effectiveness of the ICT support tool a number of test runs was held. Except for learning about the added value of ICT in incident handling the test were used for evaluating the design requirements and to measure (changes in) expectations about ICT support amongst CoPi members.

Figure 2. Images of the DSS, to the left a situation plot, to the right a communication screen



Performance Impact Assessment

In order to assess the impact of the use of ICT on performance CoPI teams were presented two different incident scenarios, which they had to handle either in the traditional way, or supported by the DSS tool. Table 1 gives the grouping of the experiments that were conducted between 31 May and 3 July 2002.

Table 2. group/scenario distribution (After: Bouwman 2003)

Exp.	Traditional	ICT supported	Participants					
			Rotterdam Port Authority	Police Department	CoPI leader – fire department	Fire Department	Ambulance Services (GGD)	Hazardous Substances Specialist
1	bravo	alpha	X	X	X	X	X	X
2	alpha	bravo	X		X	/		X
3	bravo	alpha	X	X	X		X	X
4	alpha	bravo	X	X	X	X	X	X
5	bravo	alpha	X	X	X	X	X	X
6	alpha	bravo	X	X	X	X	X	X

The group performance was registered through direct observation, video observation and through time measurement. After the sessions a survey was held and a debriefing with the training staff took place. Just like the first survey this one too consisted of three parts: general questions, questions concerning user satisfaction, and questions on specific application in the tool. The second part of the survey was based on the research principles for measuring user satisfaction (Bailey and Pearson, 1983; Nunamaker et al. 1997; Briggs et al. 2003). A number of questions about the expectations on usefulness of ICT support matched with questions asked in our earlier survey at the annual CoPI training in December 2000 (Bouwman et al. 2001). In this way a comparison could be made between expectations of CoPI members without prior knowledge or experience with dedicated support tools and after their first practical experience.

The third part of the survey focused on the evaluation of the various tools within the DSS, like the plotting tool, chat and report making functions. Special attention is given to the communication aspect of the tool as the latter is considered crucial.

Two scenarios

Two scenarios were used for assessing the team's performance. Both scenarios had been used before in CoPI exercises but not with our participants. The Alpha scenario plays at a refinery plant in the Rotterdam Europoort area. In the night of 1 January 2000 several alarms are sounding at their Fluculatedbed Catalic Cracker Unit or FCCU. An emergency stop is being executed but systems fail and an explosion is witnessed. The explosion causes a fire, which threatens the Crude Distillation Unit and there is a gas leak. At the outset of the exercise the number of victims is unknown and petrol carriers are in the 3rdPetrol harbor close by and the crew complains about respiratory problems. During the exercise more information comes available, like the number of victims, the chemicals concerned, the weather. The CoPI has to decide upon numbers of personnel and equipment, closing off roads, evacuation of ships and the more.

The Bravo scenario takes place in the Rotterdam Botlek area on board of a ship. The ship is carrying various dangerous chemicals and is unloading. A fire started on board and temperatures in one of the adjourning tanks loaded with Styrene Monomer is rising. The rising temperature is caused by a lack of inhibitor but that becomes clear to the CoPI team only after a while. This scenario was derived from an incident that took place in 1977 on almost the same location. Here too the CoPI team has to decide on personnel and equipment, on blocking roads, fairways and harbors and on special assistance.

Results

In the first exercise some problems became manifest. There was misunderstanding on the Situational report (Sitrap) that was requested by the CoPI leader - was this an internal briefing or a report to Higher Control? There were some disturbing messages in the alpha scenario and the wireless network suffered from failing connections. These problems were solved satisfactorily in the next runs. From the observation and time measuring it was clear that first time use of this prototype support system did not really lead to real timesavings. However, the fact that first time users of the system did not spend much more time to reach decisions raises expectations that learning effects will contribute to real time savings when such a system would be used in daily routine practice.

Comparing CoPI teams in their incident handling is a difficult task as each team develops its own strategy and these strategies can differ widely. Incident managers do use different strategies; some start by immediately closing off roads, while others postpone such a decision till there is evidence for the need of such measures. The latter can be explained by the general approach to incident handling in the Netherlands and Europe in general, which can be characterized as 'improvisation' rather than the more procedural approach of incident handling dominant in the US. Through observation and analysis of the videos that had been made of all exercises some reference points could be distinguished, like the location of the CoPI and setting of the plot in the beta scenarios and the closing of a road and harbor in both scenarios. Results are shown in Table 3. Session two of the Alpha scenario was not executed; session five did not lead to comparable results.

Tables 3 and 4 show that on average decisions were taken later when a CoPI had to work with the new ICT support tool. At first sight this might be against expectations but the reason for this is obvious as this was the first nearer acquaintance of the CoPI members with a decision support system. Moreover, most team members are not used to computers in their daily work, and as the evaluation showed the prototype was not optimal user-friendly. The number of experiments at this time is too few to make any statement in support or in deviance of ICT

support, nor can we say anything about the quality of the decisions that were taken. We can, however say more about the expectations that were raised through the exercise. The participants were asked to express their satisfaction with the tool and their expectations about the future use of such ICT tools in their practice of incident handling. These outcomes are presented in Table 5. The outcomes of the evaluation after having taken cognizance of ICT support in Table 5 can be compared to the outcomes of the pre-measurement of Table 1.

Table 3. Observation results of Alpha exercises.

Session # **Coordination incident handling**	**Session 3** **standard**	**Session 6** **standard**	**Session 1** **ict**	**Session 4** **ict**
N15 - road closed	10:00	16:00	17:00	
Beerkanaal closed	17:00	13:00	29:00	
Close doors and windows on ships	18:00			26:00
Markweg – road closed	29:00			35:00
Close doors and windows at Eastman, EECV, P&O	33:00		18:00	

Table 4. Observation results of Bravo exercises

Sessie # **Coordination**	**S 1** **standard**	**S 4** **standard**	**S 5** **standard**	**S 2** **ict**	**S 3** **ict**	**S 6** **ict**
Plot	09:00	04:00	06:00	06:00	10:00	13:00
CoPI located at Odfjell		06:00	24:00	08:00		
Burn victims	15:00	08:00	10:00	08:00		
Oude Maasweg - road closure		12:00	15:00	14:00		10:00
Welplaatweg - road closure		14:00			12:00	
3e PET – harbor closed		15:00	09:00	08:00	16:00	28:00
GRIP II	-	28:00	19:00	39:00	-	-

Table 5. Some results of Survey 2. (After: Bouwman 2003)

Statement	N	m	σ
ICT support for CoPI incident handling has added value	27	7,30	1,41
ICT support helps to get the right information sooner, leading to a faster startup of incident fighting	25	6,83	1,81
Take up of pictures (of the incident) has added value for incident handling	27	7,52	1,45
Use of GIS in incident handling creates added value	27	7,52	1,45
ICT support will enable better communication with other levels (RegOT)	25	6,16	1,72

Discussion of results

Table 5 shows that after the confrontation with ICT-supported incident handling there still is broad support for the statement that ICT support has added value. The mean of 7,3 might even be considered underestimated as only three out of the 27 respondents had a negative (<5) score on this issue. Obviously two of these were deviants as they scored very negatively on all questions asked (all answers in the range 1-3). Their deviance, however, should not be ignored, and their reluctance should be treated seriously as a CoPI has to operate as a team and all members have to work along smoothly and efficiently. The scores on the other issues: pictures,

GIS and communication in Table 5 are in the same range as before the respondent's acquaintance with the tool.

From their written and oral comments it was found that most objections concentrated on the fact that team members were physically separated, working in different rooms. Respondents proclaimed that they could work this way but had missed the direct contact and the non-verbal communication between the members of the team. Several statements were made that electronic communication is considered useful only when oral communication and deliberation is not possible: "Don't do this when the CoPI sits together in the command cabin; as soon as we are dislocated it is a good way of communication, better than by telephone" One location and oral communication is widely preferred. With respect to the external communication respondents are more positive. Although there exist some hesitance with respect to the use of computers by the field units: "as CoPI leader I do not picture myself typing in messages to send information", electronic communication with higher control is considered an improvement over current state of affairs: "it is perfect especially for sitrap and plot, but also for questions". Positive is the fact that messages can be stored and retrieved for control; traditionally working too often messages get lost or mutilated.

One of the threats mentioned by the respondents was information overload, which was also denoted before by Quarantelli (1997). **"**It is hard to keep overview - because of the chat there is an overload of information. The problem is that various sources of information coincide". Another respondent said: "The speed ain't the problem; it is the quantity of information and the lack of emotions."

Up to expectations was the fact that pictures could be received from the site of the incident and even though the plot setting in our exercises was not flawless participants held high expectations of ICT support in this area: "the plot was set very fast and very clear". Others suggested: "When the plot can be related to the dynamic harbor map it should even be possible to see the actual situation in the harbor area, moored and sailing ships." Standing out in their comments and recommendations are:

- The inclusion of photographic material for imagining the incident
- The required robustness of the tool
- The supportive character of the tool

The latter is a major issue: computers cannot and should not replace interpersonal contacts, but can only be supplementary and supportive to the current practice.

Conclusion and recommendations

The hypothesis that both quality and speed of the decisions taken by CoPI teams working with ICT support would improve, could not be corroborated, nor rejected in this research project. Nonetheless the expectations about ICT support for incident handling of CoPI team members in the Port of Rotterdam area are high. After a first acquaintance with a prototype decision support system their confidence in the expected contribution of ICT to the efficiency and effectiveness of incident handling was unshaken. CoPI team members do expect that ICT can support their work and that dedicated decision support systems can contribute to decision-making. Their original reluctance, distrust and hesitance with respect to ICT support have been diminished through this first acquaintance. Especially the availability of images and maps, and the production and communication of situation reports were seen as major contributions to effective incident handling.

A 'basic' system, which could be introduced shortly, should consist of the following elements:

- A communication device between CoPI and RegOT, through which photographic and cartographic information can be exchanged.
- The possibility to watch images of the incident.

- A simple GIS system, for example for finding locations
- A database on dangerous chemical

Epilogue

Clearly the experiment was conducted with a prototype DSS. Despite its flaws several off spins of the project have been introduced in the practice of incident handling in the Port of Rotterdam. One of the recommendations: the addition of an information manager to the CoPI team has been implemented and proven successful. The information manager keeps track of all records and is responsible for coordinating the making of the situational reports. Most important, however, is the finding that the short (half-day) exercises used in this research project turned out to be very effective for training CoPI members. These small exercises are much easier to organize and have less disruptive effects on the standing organization than the traditional annual large-scale CoPI training exercise, currently practiced. A new training practice is now getting shape.

References

Bailey, J.E., Pearson, S.W., Development of a Tool for Measuring and Analyzing Computer User Satisfaction in *Management Sience*, Vol. 29, No. 5, May 1983

Beroggi, G.E.G., D.van Gent, D. Menconca and W.A. Wallace, 2001. Assessing Group Decision Support Systems for Emergency Response Using Gaming Simulation. *Proceedings of TIEMS 2001*

Bouter, V. 2000. Onderzoek naar een efficiëntere manier voor het opzetten van calamiteiten trainingen voor de operationele diensten inde Haven van Rotterdam, Master thesis TU Delft/GHR

Bouwman, Marnix, Daan van Gent, and Giampiero E.G. Beroggi, 2001. Group Decision Making in Emergency Response at the Port of Rotterdam, *Proceedings of TIEMS 2001*

Bouwman, M. 2003. ICT in InCidenTen. Rapportage van het onderzoek naar toepassing van informatietechnologie bij de gecoördineerde operationele incidentenbestrijding in Rotterdam-Rijnmond. Master thesis TU Delft/GHR

Briggs, Robert O., GertJan de Vreede, Bruce A. Reinig, 2003. A Theory and Measurement of Meeting Satisfaction, *Proceedings of the 36th IEEE Hawaii International Conference on Systems Sciences.* ISBN 0-7695-1874-5

Hoffmann, Laurence. 2003. *Omgevingsanalyse voor CEDRIC: "Collaborative Environment for Disaster Relief with Integrated Communication"*, TNO-FEL rapport FEL-02-S232

Ikeda, Y., Beroggi, G.E.G. and Wallace, W.A., 2001. Evaluation of multi-group emergency management with multimedia, *International Journal of Risk Assessment and Management,* Vol. 2, Nos. ¾, p 263-275

Nunamaker, J., Briggs, R.O., Mittleman, D., Vogel, D./ Balthazard, P.A., Lessons from a Dozen Years of Group Support Sustem Research: A Discussion of Lab and Field Findings. *Journal of Management Information Systems* 13(3) pp 163-207.

Port of Rotterdam, 1999. *Incidentenregeling, Deel A Incidentenplan*, Oktober 1999

Quarantelli, E.L. 1997. Problematical aspects of the information/communication revolution for disaster planning and research: Ten non-technical issues and questions, *Disaster Prevention and Management*, Vol 6, pp. 94-106, 1997

Worm, A., Joint Cognitive Systems: Automation and Resource Management in Complex Systems Control, in *Proceedings of The International Emergency Managers Society,* 1999