



Decision-making training in local government emergency management

Decision-making
training

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Abstract

Purpose – The purpose of this paper is to contribute information and recommendations that could better equip emergency managers to prepare for and respond to emergencies and disasters, with a focus on improving their decision-making capabilities during response.

Design/methodology/approach – A questionnaire-based survey approach was used in this research and 48 different local government organisations participated. These results were examined in conjunction with contemporary emergency management decision-making literature. A combination of closed and open ended questions was used, enabling qualitative and quantitative analysis.

Findings – Results suggest that while there is information available about decision making, not all emergency managers are aware of the existence of this information or understand its relevance to emergency management. It is likely that those who did have a comprehensive understanding of decision making had gained this knowledge through non-emergency management-related courses. In total, 71 percent of participants said they would be interested in receiving more support regarding training and practice for decision making in Emergency Operations Centres.

Originality/value – A wide body of research has investigated decision-making styles. However, this paper shows that in the local government emergency management sector there is little awareness of the understanding of the different decision-making approaches. In addition, for those organisations surveyed, there is a great desire for further training and practice in decision making. It is thus vital that this need is addressed, to further improve the future response of these organisations to emergencies.

Keywords New Zealand, United States of America, Canada, Emergency services, Local government, Decision making, Emergency management

Paper type Research paper

Introduction

Analyses of response management in studies of natural and technological disasters have consistently identified issues with decision-making processes and group dynamics (Flin, 1996; Flin *et al.*, 1997; Longford, 2008; Paton *et al.*, 1998). These findings have significant implications not only for the people and teams that have responsibility for incident management, but also for the organisations and agencies in which they work and have responsibility for training and response.

In many countries, this responsibility rests with local government organisations. As part of their response capabilities most local governments operate an Emergency Operations Centre (EOC). EOCs function as the control, coordination, and communication headquarters for planning and decision making during a disaster or an emergency (Perry, 1995, p. 37). This research paper presents preliminary exploratory research into how local government organisations understand decision making, and its training, with a particular focus on response within the EOC



environment. The management of uncertainty and the use of intelligence to enhance these decisions is also discussed. Research was carried out using recent literature and the results of a survey of 48 local government departments with EOCs from Canada, New Zealand (NZ), and the USA. Findings reveal local government organisations need and desire more information and practice regarding emergency management decision making.

Several types of decision making are required in emergency response including analytical, naturalistic, procedurally based, creative, and distributive decision making (e.g. Crichton and Flin, 2002). We focus here on two; analytical and naturalistic decision making (NDM). Analytical decision making, sometimes referred to as autocratic, is based on weighing up different options and selecting the best option. NDM is a faster more intuitive approach that relies on experience (Flin, 1996). Both have a role in emergency response. The former is used when time permits and the latter when the disaster-operating environment requires making decisions in high risk and low time contexts that make using the more traditional analytical style less applicable. They can be considered to be end members on a continuum of approaches (Martin *et al.*, 1997). The study of NDM and its practical application is therefore directly relevant to the EOC operational environment, particularly as the infrequent nature of disasters limits opportunities to gain the kind of experience implicated in NDM (Paton and Flin, 1999) and this, in turn, creates issues regarding how to develop NDM capacity.

Local government EOCs present one such environment in which this can occur. EOCs support operational response implementation undertaken in the field and provide for multi-agency coordination. The EOC opens infrequently and often only does so in unique and exceptional circumstances. Without preparation this situation can be unfamiliar and challenging to council employees and other participating agencies unaccustomed to the emergency response environment. Furthermore, the lack of social scientific data available to guide emergency managers who must construct, activate, and operate EOCs (Perry, 1995, p. 37) adds to the need to investigate training, particularly with regard to the pivotal role that decision making, using imperfect data under considerable time pressure, plays in activated EOCs. This situation can be stressful for an unprepared person in the EOC and further compound decision-making issues (Paton and Flin, 1999). How decisions are made in this setting are important for the response to and recovery from an emergency.

Poor decisions lead to poor emergency management. Therefore effective and efficient decision-making needs to be researched and understood, learned, practiced, and effectively implemented during response. Increasing effectiveness thus draws attention to the need to develop information and decision management competencies and procedures. Boin and Hart (2003, p. 545) discuss leadership challenges in crisis management and note that organisational chaos, media pressure, stress, and inaccurate information are but a few factors that make it challenging for crisis leaders to make sound decisions. They say that successful crisis leaders bypass routine policy-making procedures to expedite decision making in complex, dynamic environments in which the decision maker must remain flexible. The infrequency with which decision makers operate in emergency contexts makes it pertinent to know if emergency managers are utilising information in ways consistent with contemporary decision-making theory and research.

Factors influencing the decision-making process and the decision maker are wide and diverse. At the organisation or group level some of these factors are coordination, cooperation, communication, and constraints such as clashes over organisational

domains or jurisdictional differences, information sharing and intelligence, team work and shared mental models, policy ideology, political and economical priorities, and uncertainty. These factors may overlap onto the individual decision maker and could also include the individual's experience, knowledge, skills, trust, stress risk, time pressure, leadership ability, overwork, conflict over responsibility, personal priorities, control, deviance, and political goals (Boin and Hart, 2003; Handmer, 2008; Quarantelli, 1997).

In addition to the survey of local government departments, this paper discusses how managing uncertainty will influence the quality of decisions made. Handmer (2008) explains sources of uncertainty as three different human factors; that humans do not have perfect knowledge; that the future is not known; and that human factors such as deviance (power, control, desire for excitement), political and economic priorities, implementation problems, policy ideology, all conspire to prevent the perfect application of knowledge (Handmer, 2008, p. 265). These uncertainties expose the decision maker to considerable stress risk. It is therefore important to reduce this risk by improving the decision-making confidence and capabilities of these individuals (Paton, 2003).

Information itself, either in abundance or in scarcity, is the basis of most uncertainty; therefore a tool which helps to alleviate the effects of both these conditions should be beneficial in reducing uncertainty. This paper thus also introduces the concept of using intelligence as a tool to manage information and facilitate decision making (Longford, 2008). A combination of technology, human interaction such as improved teamwork, and information sharing will ensure that uncertainty can at least be coped with. Training and opportunities to practice decisions during response should be designed considering these factors.

Decision making

The discussion here focuses on the relative contributions of analytical and naturalistic processes in emergency management. The analytical approach during readiness and recovery phases; and the naturalistic approach for the faster paced critical response phase of an emergency, where analytical decision making could be a hindrance (Flin, 1996).

Analytical decision making. Analytical decision making in its simplest form begins with the identification of a problem and the generation of options for solving the problem. This is then followed by the evaluation of each of these options using strategies such as weighting and comparing the relevant features of each option. A choice is made and that choice is implemented. Theoretically, the best decision should be made this way providing there is unlimited time, mental energy, and perfect information available (Flin, 1996). Perfect information means all relevant information is presented without the influence of bias, distracting irrelevant or inaccurate information. This analytical approach represents what some researchers call the classical decision model (Klein and Calderwood, 1991). According to Flin (1996) this is typically the way incident management personnel are trained. However he also notes, that in reality decisions can often be made automatically on the basis of experience using an intuitive judgement.

The analytical approach has its place in emergency management, particularly in planning and policy development when time is not limited (Paton *et al.*, 1999). However, classical decision models depend on a number of assumptions that are often not applicable to the emergency management environment. These assumptions are: that

goals can be isolated, that utilities can be assessed independent of context, that probabilities can be accurately estimated, that choices, goals, and evidence are carefully defined, and that the utilities of an outcome are independent of other outcomes (Klein, 1997). It is apparent that operational environments will rarely meet most of these assumptions. If the assumptions are rarely met, then this model is not useful in explaining how quality decisions should be made during an emergency (Klein, 1997). Care needs to be taken not to force experienced decision makers to adjust to prescriptive models of decision making so their ability to make use of their experience is not compromised. People with experience can use it to generate a reasonable course of action in the first instance (Klein, 1997). It is important to understand the basis of this expertise to enhance the decision maker's abilities (Klein and Calderwood, 1991).

NDM

NDM addresses how people use their experience to make decisions in real-world, low time, high-risk field settings (see reviews in Flin *et al.*, 1997; Zsombok and Klein, 1997; Lipshitz *et al.*, 2001; Crichton and Flin, 2002; Klein, 2008). During emergency response the environment is dynamic, uncertain, and considerably ambiguous. An analytical approach to decision making is often inappropriate if not impossible simply because the availability of perfect information does not exist and there is usually not enough time to analyse all of the options. Until recently, the prevailing paradigms in decision research were based in simplified and highly structured laboratory tasks. Tasks that have limited utility in operational domains characterized by high time pressure, uncertainty, continually changing conditions, ill-defined goals, and distributed decision responsibilities (Klein and Calderwood, 1991).

Klein and Calderwood reviewed studies based on naturalistic tasks and found that with a different orientation to decision research, a very different model of decision making emerged. They investigated decision making in the field using observations and interviews of staff from various environments such as nuclear power plants, urban fire departments, command and control centres, and courtrooms. They identified an alternative description of decision making based on recognising the situation and applying experience to it which they labelled recognition-primed decision making (RPD). The RPD model describes how experienced decision makers can rapidly appraise a situation and decide on the appropriate course of action in high-pressure situations based on that appraisal (situational awareness). RPD lies within the field of NDM and is particularly useful when studying emergency management decisions (Flin, 1996). The simplest version of RPD is when the situation is recognised by the decision maker, the appropriate response is known already, and the course of action implemented. If the situation is not immediately recognised there may be a situation assessment phase included and the use of feature matching or story building will help the decision maker in diagnosing the situation (Flin, 1996). The latter is likely to prevail in disaster response given the complex and atypical nature of disaster response contexts.

Perhaps the most important difference between NDM and classical decision making models is the fact that the primary effort is usually not the moment of choice but rather in situation assessment (Klein and Calderwood, 1991). This means identifying and clarifying the current state of the world including goals and assumptions and is sometimes called the pre-decision process (Klein and Calderwood, 1991). Feature matching is where the decision maker thinks of several interpretations of the situation

and uses key features to determine which interpretation of them provides the best match with the available cues. Alternatively these features may have to be combined to construct a plausible explanation for the situation, it is occasionally called story building. In some cases, often where the decision maker is less sure of the situation they will briefly evaluate the situation by mentally preplaying out the course of action to be taken. If problems are identified during this, the course of action is modified (Flin, 1996).

The rationale for applying NDM in uncertain, high stake, decision-making environments can be summarised as follows (Klein, 1997, p. 50):

- classical methods do not apply in many naturalistic settings (e.g. in relation to the complex, dynamic, and evolving contexts in which disaster response occurs);
- experienced decision makers can be used as benchmarks of ideal individual or team performance (from which training needs and training strategies can be identified to build this performance ability in inexperienced decision makers);
- NDM tries to build on the strategies people use; and
- experience lets people generate reasonable courses of action (when high risk and low time constraints exist in the operating environment).

Characteristics and mechanisms of effective naturalistic decision makers

Before discussing how to develop or enhance decision-making capability the characteristics of a good decision maker need to be identified. NDM was used by Canon-Bowers and Bell (1997) to identify the characteristics and mechanisms of an effective decision maker to determine what experts did that was different from novices when making decisions. They identify six notable characteristics of an effective decision maker (flexibility, speed, resilience, adaptability, risk taking, and accuracy) and five mechanisms that the decision maker uses to make good decisions, as follows (Canon-Bowers and Bell, 1997, p. 106-7).

- (1) Situation-assessment skills:
Literature and research suggests that expert decision makers are able to perform situation-assessment more quickly and accurately than novices. Overall it is believed that situation-assessment accounts for much of the ability of experts to make rapid decisions, and it also contributes to their decision-making accuracy. Two aspects of this situational behaviour are cue and pattern recognition. Experts are better and faster at identifying the relevant cues, the significance of them, and the patterns that they form.
- (2) Organised knowledge structures:
Experience allows experts not only to know more, but also to effectively organise what they know. Knowledge templates can be built up by the individual from this experience. These templates are well-organised knowledge structures containing objective features (e.g. goals), action features (such as methods), and environmental features.
- (3) Mental simulation:
When a situation is novel (in other words there is no prior template) it is hypothesised that mental simulation is the primary mechanism for selecting a course of action. The individual mentally rehearses or plays out the decision

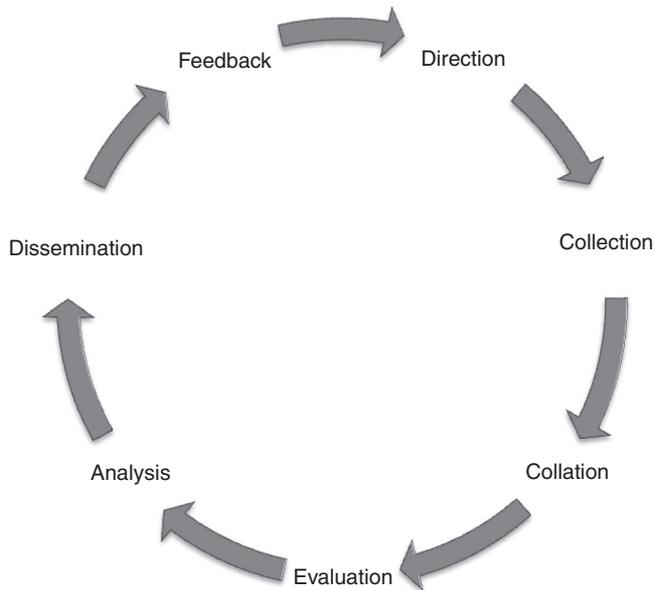
and its consequences prior to making the decision. This allows the decision maker to determine if a possible solution is viable and can be applied to the situation or needs adjustment. This method contributes to the accuracy of decision making and saves time.

- (4) Strategy selection/modulation:
Skilled decision makers learn strategies best suited to the situation, and continue to regulate the chosen strategy in relation to a changing or potentially changing environment. Continual assessment and modulation is required.
- (5) Reasoning skills:
These skills include creative problem solving, analogies, critical thinking (such as testing assumptions, checking facts, seeking consistency among cues), and domain-specific problem-solving skills.

Information, intelligence, uncertainty, and teamwork

Factors influencing decision making include information either in abundance or scarcity, intelligence, uncertainty, and teamwork. How the decision maker interprets information and consequently uses it, combined with how the decision-making team operates, their team dynamics, cooperation, and coordination affect the decision outcome. Uncertainty is defined as “not known or established, questionable, not determined, undecided, or not having sure knowledge” (Longford, 2008, p. 219). Handmer (2008) says that there is a tendency among some emergency managers to wait for certainty to avoid making a small error. However, this may result in a major mistake. Possible external sources of uncertainty include media and political response, and the impact on people and property (this is reduced by the availability of science and technology, but is often based on assumptions and judgements) (Handmer, 2008). Internal sources of uncertainty include operational issues such as dealing with the network of organisations and people many of whom are volunteers, highly territorial, and have incompatible management cultures, communications systems, and missions. There are also internal uncertainties about predictions of events (e.g. flood or storm forecasts) which can be closely related to the experience of key decision makers, which is frequently limited (Handmer, 2008).

Managing information so that it can be efficiently and accurately utilised will help manage uncertainty. Decision effectiveness within emergency management is a function of the capability to access data from diverse sources and render them meaningful within a time frame dictated by an urgent or evolving environment. Consequently, information needs must be considered in relation to those from whom data and information are obtained, those with whom they will collaborate to manage hazard effects, and those to whom information will be provided to facilitate the performance of their role (Paton *et al.*, 1999). Intelligence is operationally defined as information to which value has been added for the purpose of explaining trends and patterns and enabling decisions. It can be a product or a process (Longford, 2008). Longford's intelligence cycle in Figure 1 shows the process of information sharing with the end result, the product as being the information to utilise during decision making. Decision-making efficiency and accuracy is dependent on the success of this cycle and the quality of its product. The efficiency of teams working through the intelligence process influenced by their team mental model (Flin, 1996) enhances the success of the intelligence cycle.



Source: Longford (2008, p. 122)

Figure 1.
The intelligence cycle
representing intelligence
as a process

Team work and how the team handles intelligence is a key factor influencing the decision-making process and, in relation to NDM, is a function of the quality of the team mental model used to make sense of circumstances and take coherent actions. Auf der Heide (1989) noted that although it may not be obvious initially, the need for joint decision making during large disasters soon becomes apparent. It appears that often the reason is expediency. One crisis scenario after another reflects the same dilemma, where front line individuals are often left to respond to a rapidly expanding and chaotic situation, with little more than their experience and whatever previous preparation they may have had (Kuban, 1996).

The effective development of information sharing capabilities is dependent on the quality of shared mental models derived from collaborative experience. Given the infrequent nature of mass emergencies and disasters, this experience is usually accumulated in simulations and exercises (Sinclair, 2011) with the aim of enhancing effective multi-organizational and multi-disciplinary coordination and performance within operating teams (Paton and Jackson, 2002). Mental models are generated by the accumulation of experience and provide a psychological basis for understanding, response planning, and for predicting outcomes (Paton, 1996). As members of teams learn to work together and gain more practice at specific roles in those particular environments their team mental models develop. This, in turn, increases implicit information sharing (i.e. where participants anticipate other's information needs and provide it without being asked) during high workload periods enhancing team performance (Paton and Jackson, 2002). This facilitates decision making in contexts in which participants are dealing with complex, rapidly evolving events by informing the development of the situational awareness and rapid assessment processes that are implicit within effective NDM. It provides the link between training emergency

management teams and enhancing the decision capabilities of responders, particularly with regard to developing the competencies essential for NDM.

In the absence of active experience required to develop the competencies required for emergency decision making, emergency management training provides the only opportunity to develop information management and decision-making skills (Perry and Peterson, 1999). In addition, training also incorporates team training designed to develop an expert “team of teams” (Schaafstal *et al.*, 2001). If applied to the EOC, this team training involves facilitating the capacity of all of the agencies who may be required to collaborate on incident management activities to develop a group team mentality (including coordination and communication) that facilitates using their collective knowledge and expertise to manage complex disasters (Pollock *et al.*, 2003).

Operational effectiveness relies on mental models typically derived from actual emergency experience (Flin, 1996). Effective training and exercises could help provide decision makers with response practice to acquire this experience before a real emergency. There are decision-making training resources available, developed for first responders and the military (Klein and Calderwood, 1991), however, the implications at this stage is that it is unknown how applicable this training is to local government emergency managers working in the EOC. The initial steps in this application is to first investigate what is known by emergency managers about decision making and how they are currently training for decision making in a response environment.

Methodology

A questionnaire-based survey approach was used in this research. A total of 48 different government organisations participated in the questionnaire. The data collected is a sample of initial exploratory research for local government organisations that are responsible for emergency management in their areas. The aim of the questionnaire was to collect data about the general understanding of decision-making styles, and how to train and practice for decision making. Through this we ask if there is a need for a greater understanding of how emergency managers make decisions, how they are trained, and if there is a need for more practice for decision making.

The participants selected for this study were from NZ and North America (NA) (BC in Canada; and CA, CO, and WA in the USA). NZ’s emergency management incident management system (IMS), the Coordinated Incident Management System (CIMS) and the EOC organisational structure, is based on both the British Columbian Emergency Response Management System and USA’s National Incident Management System (NIMS). North American systems have been influencing NZ’s emergency management over the past decade. Therefore, in addition to a study of EOCs and training in NZ, various similar governmental organisations across NA were approached and asked to participate in this study. These participants were chosen based on their geographic location and if the hazards they face were of a similar nature to those experienced in NZ. For example, the councils on British Columbia’s Vancouver Island were contacted because the island is of a similar size and demographic to NZ, and the hazards are similar to those in NZ. All those who answered the questionnaire were either the emergency manager of the organisation or the emergency management advisor. They were instructed at the beginning of the questionnaire to answer the questions from the point of view of the organisation they worked for. This aimed to give an accurate representation of how each organisation operates.

A total of 48 completed questionnaires were received out of 96 organisations contacted. Each organisation was asked if they would like to participate in the study

by answering an electronic questionnaire. Table I lists the different types of organisations that responded to the study. A total of 36 North American government organisations were asked to participate in the study. A total of 12 of these returned the questionnaire. Attempts were made to contact all regional, district, and city councils in NZ, via phone calls. Of the 61 NZ councils successfully contacted, 36 completed and returned the questionnaire.

From the earlier questions in the survey it was found that most organisations participated in emergency training and most of them activated their EOCs during training at least once every year or more (Sinclair, 2011). The training programmes varied widely from one organisation to another, both within NZ organisations, and within NA ones. We focus here on the elements of the questionnaire that asked about decision making. The specific questions were:

- (1) In the last five years have you had any training about decision making in either your day-to-day role or an emergency management situation?
- (2) If yes, please specify what type of training it was and how decision making was incorporated into the training programme.
- (3) Are you familiar with any of the decision making styles – autocratic or analytic, NDM, RPD?
- (4) Would you or your organisation be interested in receiving training and practice specifically for emergency management decision making in EOCs?
- (5) Are there any other comments you would like to add?

Results

A total of 76 per cent of participants stated that they had undertaken decision-making training in the last five years. When asked to specify what type of training they participated in and how decision making was incorporated into the training programme the answers were diverse and varied (Table II). There were seven references to CIMS or NIMS training and three respondents said their decision making was part of their EOC training. Often answers were linked in some way to an incident command structure course rather than a specific decision-making course. In addition, several participants indicated that their training came from experience in the field or in

Type of organisation	Number of participating organisations	Percentage of total sample (0 DP) %	Number of organisations contacted
Canada municipality	1	2	12
USA state EM office*	2	4	2
USA county EM office	4	8	20
Canada regional district	5	10	2
NZ regional council	8	17	9
NZ city/district council	28	58	52
Total number of agencies participating/contacted	48		97

Note: $n = 48$. *Also includes a FEMA department group called Region X

Table I.
Number and type
of participating
organisations

Table II.
Summary of the responses showing type of training and how decision making was incorporated into the training programme

Type decision-making training	Number who participated in this type of training
Specific courses run by EM training organisations	10
Specific decision-making course run by national or federal government (MCDEM, FEMA incident command structure training)	9
CIMS/NIMS training	7
University degree (not necessarily EM degrees)	5
EM scenarios or exercises to practice decision making	4
EOC training	3
Experience in the field/ daily emergency management experience	3
Never heard of any decision-making training	1
Other (difficult to interpret/ambiguous answers)	2
Did not answer	15

their day-to-day role. The wide range of training methods provided suggests that there is a lack of clarity as to what actually constitutes training. When asked what decision-making styles the participants were familiar with most participants either knew all of the styles listed (31 per cent) or none of them (29 per cent) as shown in Figure 2. This suggests that when participants do learn the styles, they learn a wide range rather than just individual strategies. A total of 71 per cent of respondents said that they would be interested in receiving training and practice specifically for decision making in the EOC (Table III). As one respondent stated for the final question; “Definitely a need for more crisis management decision making training”. Interestingly, a greater proportion of the NZ respondents requested training. This difference should be investigated further in the future.

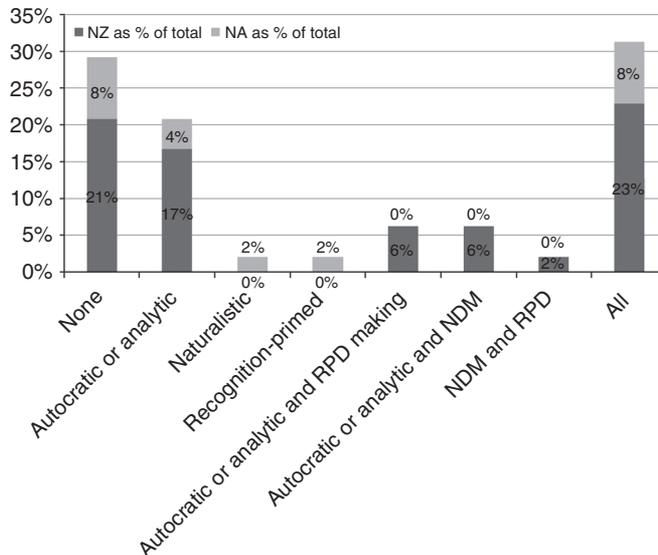


Figure 2.
NZ and NA distribution showing participants who were familiar with the different types of decision making

Discussion

A gap between the recommendations in the emergency management literature and decision-making practice is evident. Reasons for this can be found in relation to issues associated with how the characteristics of successful decision makers, mechanisms of decision making, and information management under conditions of uncertainty (Canon-Bowers and Bell, 1997; Handmer, 2008) affect capacity for NDM, particularly with regard to information sharing and its consequences for developing and using shared mental models derived from collaborative experience (Paton and Jackson, 2002). Enhancing teamwork combined with utilisation of the intelligence cycle has the potential to improve decision making.

Within the responding EOC, decisions need to meet immediate and often emergent needs and involve efficient use of available resources to do so. When time permits, analytical approaches can be used to make relatively more accurate decisions. However, under the kinds of low time, high-risk settings that are present when faced with emergent problems, naturalistic decision makers are required to make “satisficing” decisions (Simon, 1956). Problems arise when decisions are slow or not made at all, or alternative choices are overlooked or ignored. Thus problems with both analytical and naturalistic decisions result. This is because ill prepared EOC personnel are unable to apply their usual approach to decision making and lack training in appropriate alternatives such as NDM (Boin and Hart, 2003). This, in turn, reflects the limited opportunity for accumulating actual experience and where training and exercises fail to model the range of events and inter-agency circumstances required to develop the individual and team mental models required for adaptive decision making under high stress, complex operating conditions (Paton and Jackson, 2002; Paton *et al.*, 1999).

The results point to the fact that when asked about training, participants made few references to specific emergency management decision-making courses (see also Sinclair, 2011). There is little tacit understanding of the range of decision-making styles required in emergency response and simulations often lack the time and risk factors required to realise this (Paton and Auld, 2006). While training built around processes such as CIMS and NIMS introduce the team concept, they do not generally function in ways that facilitate the development of the shared mental models required for NDM. The content of training and practice exercises for local government thus tend to neglect the research findings (Paton and Auld, 2006). This is reflected in the results of the survey presented here indicating that it is rare that decision-making theory is applied directly to courses for local government EOC staff. The findings indicate that many participants believe there is limited opportunity for them to develop and practice their decision-making skills for response. This is particularly so with regard to naturalistic decision competencies. Whilst many techniques are available to train physical skills, there are few effective training techniques and tools to teach critical decision-making skills, particularly with regard to the unique issues that arise when having to deal

Table III.

	Yes %	No %	No answer %	Distribution of NZ and NA organisations interested in receiving training and practice specifically for emergency management decision making in EOCs
Total percentages for NA and NZ organisations ($n = 48$)	71	27	2	
NA percentage ($n = 12$)	55	45	0	
NZ percentage ($n = 36$)	78	19	2	

with emergency problems in stressful, complex, and uncertain circumstances. The move towards more training designed to facilitate NDM is constrained by the cost of conducting large-scale simulated emergencies, the perceived risk to participants, and the unique nature of each type of emergency situation making exercise design very challenging) (Kincaid *et al.*, 2003).

There were seven references to incident command systems (ICSs) by participants who were asked to describe their decision-making training (Table II). The ICS or IMS is utilised as a command and control management resource for disasters. There are many similar approaches to ICS, and all have in common the notion of coordinating the actions necessary to manage disasters and emergencies (Perry, 1995). Variations are common for organising and managing within the operating EOC. Results indicate that there is heavy reliance on teaching ICS in training and these systems may be contributing to perceptions of enhanced decision-making capability in emergency managers and EOC staff. A total of 67 per cent of participants said that they had received decision-making training in the last five years. However, further questions asking participants to describe the training showed that there were few specific references to any emergency management decision-making courses or practices. Often courses that were mentioned did not aim specifically at enhancing decision-making capability but rather focused on organisational structures and role definitions. Thus, while the training reported by participants to this study did draw attention to the need to function in a context in which other agencies provide inputs, the tendency for their training to be agency-specific meant that the input of others is virtual and so did not represent the kind of training context required to develop shared mental models and coordinated response procedures.

McEntire and Myers (2004) claim that ICSs fail to incorporate the human elements of decision making, where for example, the decision maker performs using their individual resiliency, expertise, and experience. The challenge in training for decision making is finding the balance between policy, planning, and procedures, and knowing when to be flexible adaptable, and innovative. Research proving the effectiveness of using ICS in the EOC and to teach decision-making capability is largely inconclusive (Buck *et al.*, 2006; Handmer, 2008; McEntire and Myers, 2004; Waugh and Streib, 2006). There is little research on the effectiveness of preparedness activities such as the use of ICSs in local government EOCs and it is an area characterized by conflicting ideas surrounding this subject (Buck *et al.*, 2006; Drabek and McEntire, 2003; Handmer, 2008; JIBC, 2002; McEntire and Myers, 2004; Waugh and Streib, 2006). More investigation is required into how decision makers can gain experience in responding to disasters and the applicability of the ICS to teaching decision making. This should utilise the kinds of training needs analyses required to identify the range of decision contexts that could occur (e.g. those in which analytical style is appropriate and those where NDM would be required) and to design training that tests these competencies and allows for their systematic evaluation (Flin, 1996; Paton and Jackson, 2002). The need for this is supported by the analysis (Table III) which highlights that 71 per cent of organisations surveyed were interested in receiving such training and practice specifically focused towards emergency management decision making.

NDM research has been conducted in settings such as nuclear power plants, urban fire departments, command and control centres and courtrooms (Klein and Calderwood, 1991). Applying it to disaster management requires that the rarity of large-scale disasters which present complex, multi-faceted response environment in

which collaborative response is imperative are accommodated in training needs analyses, design, and evaluation. Thus while EOC training could profit from what is done in these relatively more predictable contexts, it must be developed specifically to cater for the unique demands emergency managers encounter in disaster response contexts. Thus while similar processes (e.g. NDM) may be used across EOCs, the content of training will differ from one EOC (e.g. urban fire vs volcanic crises) to another. The lack of specific training in this regard was evident in the results. When asked about what training the individual has undertaken, there were very few references to specific emergency management decision-making courses. In some cases those who did have a comprehensive understanding of decision making had gained this knowledge through non-emergency management-related courses and previous experience.

Furthermore, the results identified diversity in people's understanding of decision making. This again reflects the lack of attention paid to developing training programmes that encompass the range of decision styles required for comprehensive incident management (Flin, 1996). This finding also points to the lack of professional development programmes that might increase knowledge of decision making in a response environment that would come from attending conferences and consulting an extensive literature that includes work specifically geared to practitioners (e.g. Flin and Arbuthnot, 2002). Therefore the results of a question asking about such terms would give a fair indication of the level of knowledge of an individual. A total of 29 per cent of participants did not know what any of the decision-making styles were, indicating that they had not participated in even the most basic level of decision-making training.

The lack of professional development was also evident in 71 per cent of participants saying they would be interested in receiving more training and practice for decision making in EOCs. The infrequency of the response circumstances does not provide regular practice for decision makers in an EOC. Therefore it is essential that training facilitates the development of decision-making capabilities, by focusing on teaching NDM theory and by facilitating practice through exercises. Emergency management organisations may need to restructure existing courses so that emergency managers learn how to conceptualise situations quickly and effectively, and to perform effective mental simulations, to develop team mental models and practice (NDM) during preparedness (Klein and Calderwood, 1991).

Characteristics and mechanisms of effective naturalistic decision makers were identified by Canon-Bowers and Bell (1997). To develop effective training for decision making the programme needs to focus on identifying and enhancing NDM characteristics in individuals and developing the NDM mechanisms required for making good decisions. Applied to training programmes, NDM will be undoubtedly beneficial to EOC managers and personnel. In addition teaching, practicing, and applying the principals of the intelligence cycle may be an answer to how uncertainty can be managed and potentially overcome (Longford, 2008).

Limitations of this research

The sample size means that results should be treated as exploratory. Some 50 per cent (36 out of a total of 73) of NZ organisations participated together with 12 North American organisations. Despite the small sample size the study did shed light on current preparedness activities of local government organisations. In order to gather more conclusive evidence a more in-depth study with a larger sample of participating

organisations would be required. The questionnaire used in this study was designed to identify areas of interest for future research. The questions used were, on some occasions, not specific enough to obtain an accurate or detailed representation of EOC use, training, or decision making. Along with the questionnaire each participant received a definition sheet. Referring to this sheet was optional and it is unknown if participants used this sheet to prompt their own level of knowledge about the subjects, particularly the questions asking about decision making terminology. This could have given a misrepresentative answer to some questions. A more comprehensive questionnaire and interview process with more specific questions based on the recommendations of this research will provide a clearer picture of emergency management preparedness activities in local government organisations.

Conclusion

EOC decision makers need to be able to develop decision-making expertise without the regular experience of emergencies. The factors influencing decision making discussed in this paper: information, intelligence, uncertainty, and teamwork combined with NDM, provide a starting point for developing specialised decision-making courses for EOC personnel. Emergency managers do not need to wait for a disaster to test out the capabilities of their local government decision makers.

References

- Auf der Heide, E. (1989), *Disaster Response: Principals of Preparation and Coordination*, Mosby, St Louis, MO.
- Boin, A. and Hart, P. (2003), "Public leadership in times of crisis: mission impossible?", *Public Administration Review*, Vol. 63 No. 5, pp. 544-53.
- Buck, D., Trainor, J. and Aguirre, B. (2006), "A critical evaluation of the incident command system and NIMS", *Journal of Homeland Security and Emergency Management*, Vol. 3 No. 3, pp. 1-27.
- Canon-Bowers, J.A. and Bell, H.H. (1997), "Training decision makers for complex environments: implications of the naturalistic decision making perspective", in Zsombok, C.E. and Klein, G. (Eds), *Naturalistic Decision Making*, Lawrence Erlbaum Associates, Mahwah, NJ, pp. 99-110.
- Crichton, M. and Flin, R. (2002), "Command decision-making", in Flin, R. and Arbutnot, K. (Eds), *Incident Command: Tales from the Hot Seat*, Ashgate Publishing Limited, Aldershot, pp. 201-38.
- Drabek, T.E. and McEntire, D.A. (2003), "Emergent phenomena and the sociology of disaster lessons, trends and opportunities from the research literature", *Disaster Prevention and Management*, Vol. 12 No. 2, pp. 97-112.
- Flin, R. (1996), *Sitting in the Hot Seat*, John Wiley & Sons Ltd, West Sussex.
- Flin, R. and Arbutnot, K. (2002), *Incident Command: Tales from the Hot Seat*, Ashgate, Aldershot.
- Flin, R., Salas, E., Strub, M. and Martin, L. (1997), *Decision Making Under Stress*, TJ International Ltd, Padstow.
- Handmer, J. (2008), "Emergency management thrives on uncertainty", in Bammer, G. and Smithson, M. (Eds), *Uncertainty and Risk: Multidisciplinary Perspectives*, Earthscan, London, pp. 231-43.
- JIBC (2002), "Introduction to emergency management in British Columbia", available at: www.pep.bc.ca/training/Intro_to_EM.pdf (accessed 23 June 2010).

-
- Kincaid, P.J., Donovan, J. and Pettitt, B. (2003), "Simulation techniques for training emergency response", *International Journal of Emergency management*, Vol. 1 No. 3, pp. 238-46.
- Klein, G. (1997), "An overview of naturalistic decision making applications", in Zsombok, C.E. and Klein G. (Eds), *Naturalistic Decision Making*, Lawrence Erlbaum Associates, Mahwah, NJ, pp. 49-60.
- Klein, G. (2008), "Naturalistic decision-making. Human factors", *The Journal of the Human Factors and Ergonomics Society*, Vol. 50 No. 3, pp. 456-60.
- Klein, G.A. and Calderwood, R. (1991), "Decision models: some lessons from the field", *IEEE Transactions on Systems, Man, and Cybernetics*, Vol. 21 No. 5, pp. 1018-26.
- Kuban, R. (1996), "Disasters, Crises and their Consequences" *The Canadian Fire Officer's Guide to Emergency Management*, in Kuban, R. (Ed.), Pendragon Publishing Ltd, Edmonton, Alberta, pp. 21-52.
- Lipshitz, R., Klein, G., Orasanu, J. and Salas, E. (2001), "Focus article: taking stock of naturalistic decision-making", *Journal of Behavioral Decision-Making*, Vol. 14 No. 5, pp. 331-52.
- Longford, S. (2008), "Uncertainty in decision-making: intelligence as a solution", in Bammer, G. and Smithson, M. (Eds), *Uncertainty and Risk Multidisciplinary Perspectives*, Earthscan, London, pp. 219-30.
- McEntire, D. and Myers, A. (2004), "Preparing communities for disasters: issues and processes for government readiness", *Disaster Prevention Management*, Vol. 13 No. 2, pp. 140-52.
- Martin, L., Flin, R. and Skriver, J. (1997), "Emergency decision-making – a wider decision framework?", in Flin, R. Eduardo Salas, Strub, M. and Martin, L. (Eds), *Decision-Making Under Stress: Emerging Themes and Applications*, Ashgate Publishing Limited, Aldershot, pp. 280-90.
- Paton, D. (1996), "Training disaster workers: promoting wellbeing and operational effectiveness", *Disaster Prevention and Management*, Vol. 5 No. 5, pp. 11-8.
- Paton, D. (2003), "Stress in disaster response: a risk management approach", *Disaster Prevention and Management*, Vol. 12 No. 3, pp. 203-9.
- Paton, D. and Auld, T. (2006), "Resilience in emergency management: managing the flood", in Paton, D. and Johnston, D. (Eds), *Disaster Resilience: An Integrated Approach*, Charles C. Thomas, Springfield, IL, pp. 267-87.
- Paton, D. and Flin, R. (1999), "Disaster stress: an emergency management perspective", *Disaster Prevention and Management*, Vol. 8 No. 4, pp. 261-7.
- Paton, D. and Jackson, D. (2002), "Developing disaster management capability: an assessment centre approach", *Disaster Prevention and Management*, Vol. 11 No. 2, pp. 115-22.
- Paton, D., Johnston, D. and Houghton, B. (1998), "Organisational response to a volcanic eruption", *Disaster Prevention and Management*, Vol. 7 No. 1, pp. 5-13.
- Paton, D., Johnston, D., Flin, R., Ronan, K. and Scott, B. (1999), "Managing natural hazard consequences: information management and decision making", *Journal of the American Society of Professional Emergency Planners*, Vol. 6 No. 1, pp. 37-48.
- Perry, R.W. (1995), "The structure and function of community emergency operations centres", *Disaster Prevention and Management*, Vol. 4 No. 5, pp. 37-41.
- Perry, R.W. and Peterson, D. (1999), "The impacts of disaster exercises on participants", *Disaster Prevention and Management*, Vol. 8 No. 4, pp. 241-55.
- Pollock, C., Paton D.Smith, L.M. and Violanti, J.M. (2003), "Team resilience", in Paton, D.J., Violanti, J.M. and Smith, L. (Eds), *Promoting Capabilities to MANAGE Posttraumatic Stress: Perspectives on Resilience*, Charles C. Thomas, Springfield, IL, pp. 74-88.
- Quarantelli, E. (1997), "Ten criteria for evaluating the management of community disasters", *Disasters*, Vol. 21 No. 1, pp. 39-50.

-
- Schaafstal, A.M., Johnston, J.H. and Oser, R.L. (2001), "Training teams for emergency management", *Computers in Human Behavior*, Vol. 17 No. 5, pp. 615-26.
- Simon, H.A. (1956), "Rational choice and the structure of the environment", *Psychological Review*, Vol. 63 No. 2, pp. 129-38.
- Sinclair, H. (2011), "Local government emergency management emergency operations centres (EOCs), training, and decision making", Masters in Emergency Management Thesis, School of Psychology, Massey University, Wellington.
- Waugh, W. and Streib, G. (2006), "Collaboration and leadership for effective emergency management", *Public Administration Review (Special Issue)*, Vol. 6 No. S1, pp. 131-40.
- Zsombok, C.E. and Klein, G. (Eds) (1997), *Naturalistic Decision-Making*, Lawrence Erlbaum Associates, Mahwah, NJ.

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