Manage everything or anything? Possible ways towards generic emergency management capability

Borell, Jonas

Published in:
Proceedings of TIEMS annual conference

2014

The International Emergency Management Society
2014 Annual Conference, October 20-23, 2014, Niigata, Japan

MANAGE EVERYTHING OR ANYTHING? POSSIBLE WAYS TOWARDS GENERIC EMERGENCY MANAGEMENT CAPABILITY

J. Borell[1]

[1] *Researcher, Faculty of Engineering, Lund University, Lund, Sweden*

ABSTRACT:
This paper explores two different approaches to information processing and learning in societal safety efforts; stressing the specifics and aiming at the general. How the two approaches relate to higher-level efforts at societal safety is discussed, as well as the relationship between the two approaches and their consequences. As a background, the paper briefly explores the concept of generic capability - What is it? How can it be understood? How can it be developed? - and relates it to the interplay between specifics and generalities. The paper outlines examples of factors that may contribute to generic capabilities represented in the safety and emergency management literature. From the traditions of continuity management, resilience engineering and high reliability organizations examples are given and discussed in terms of focus on the specific and/or the general. The paper also discusses scenario-based learning and the perspective of semantic hierarchies, which explains how a move to more abstract concepts, encompassing the main meaning of more concrete instances, may support the development of generic capability. Conclusions regarding suggestions for practice and needs for further research are presented.

KEYWORDS:
Emergency management, generic capability, all-hazards approach, learning, training.

1. INTRODUCTION

Crisis and emergency management to protect society is highly important. Societal safety may be defined as concerning the "ability to maintain critical social functions, to protect the life and health of the citizens and to meet the citizens' basic requirements in a variety of stress situations" (Olsen, Kruke, & Hovden, 2007, p. 69). The "variety" inherent in that definition points towards the fact that societies tend to be under threat from a plethora of different hazards. The multitude of potential stressors makes the task of emergency management complex. When designing societal efforts at societal safety, this complexity motivates the strategic question whether society's safety-efforts should be oriented towards *everything* or *anything*. Although being rhetorical, the question deserves serious attention. Societal emergency management efforts need to cope with the complex reality and the uncertainties that accompany the vast potential of risks. Effective managing of specific emergencies requires a good understanding of the relevant unique properties of each emergency situation, and ideally hazard and risk identification should consider all threats. However, this is often both practically and principally impossible; no person or organization can exhaustively consider all existing threats towards a community. Furthermore, it isn't feasible to make separate preparations and planning for each element in a vast set of different possible emergency situations. This means that a trade-off between specificity and generality is required in the practice of emergency management. This paper explores two different approaches to information processing and learning in societal safety efforts - *stressing the specifics* and *aiming at the general*. This is done through examining some aspects of the relation between specificity and generality, with the intention of arriving at conclusions regarding ways to develop generic emergency management capability.

2. INVESTIGATING THE TENSION BETWEEN THE SPECIFIC AND THE GENERAL

Risk analyses have a given part in the management of risks (cf. ISO22399:2007), and thus the concept of risk is intrinsic in emergency management. Risk can be defined as the triplet of "What can happen?", "How likely is

it?", and "What would the consequences be?" corresponding to *the risk scenario, its likelihood*, and *its consequences* (Kaplan & Garrick, 1981). With a quantitative approach to risk analysis, allowing for mathematically based prioritizing and optimization, it is highly desirable to have disjunct (i.e., not overlapping) scenario definitions, since that makes comparisons and calculations of probabilities straightforward. In some cases it is desirable with very precisely defined scenarios, since that allows for high resolution in the examination of the risk spectrum. For attempts at managing certain risks narrow and precise definitions of risk scenarios can be a key to success. In such cases the specifics are in the foreground.

The term scenario might also be used in a broader sense, meaning what might happen in a potential emergency situation. Defined in that way it includes a risk scenario according to the definition given above, but typically also encompasses further effects and possible attempts at management. This use of the term scenario can be found in contexts of action-oriented emergency management. For example, the concept of an *all-hazards approach* has long been used by practitioners as well as scholars. The logic behind the all-hazard approach is that there are effects of emergencies that tend to be common to many different causes of emergencies. This means that different causes (or risk scenarios, in the narrow sense), such as for example earthquakes and hurricanes, bring similar or identical needs that have to be managed in emergency management (or emergency scenarios). As a consequence, the functions of caring for such needs (e.g., evacuation, finding shelter, providing food, etc) can be at the center of preparations, thus contributing to a generic emergency management capability. This logic certainly has much merit, and its advantages have been extensively advocated (and sometimes contested). The related notion of integrated emergency management, as described by McLoughlin (1985) with the functional phases of mitigation, preparedness, response and recovery, exemplifies an attempt at a generic model for the structuring and organization of emergency management fitting (more or less) all possible emergency scenarios. The FEMA model of *comprehensive emergency management*, as described in for example FEMA's (1996) "Guide for All-Hazard Emergency Operations Planning" is a suggested generic organizational principle built around the aforementioned phases of emergency management, intended to help "the community start from a position of relative security (FEMA, 1996, p.1-5)". Generic emergency management capability can be understood as a potential to effectively deal with a wide variety of somewhat uncertain future situations. That emergencies will occur is (almost) certain, but exactly *what* will happen, *when*, and *where* is not known. Therefore preparations need to address a wide and uncertain set of possible emergency scenarios. Hence, comprehensive emergency management and an all-hazards approach are mainly concerned with the general.

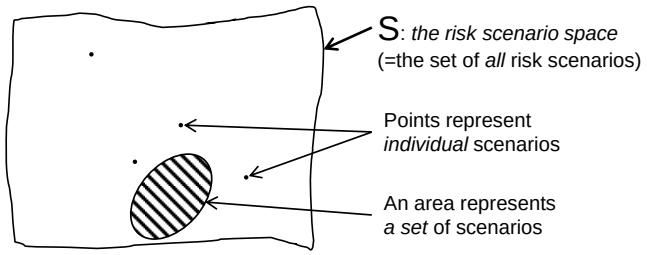

Figure 1 The risk scenario space represented as a Venn diagram

The relationship between narrowly defined, specific risk scenarios and more general abstractions can be illustrated in the following way: A particular risk scenario may be seen as a point in the scenario space encompassing all possible risk scenarios (Kaplan, Haimes, & Garrick, 2001) (see Fig. 1). In the performance of risk analysis and in the application of its results focus can lie on the particular scenarios, (i.e., the very details inherent in a scenario description). As mentioned above, this is highly desirable, even necessary, for some forms of quantitative processing of risk information, such as the summation or comparison of different risks. However, such an atomistic approach can sometimes be inadequate. When risk analysis is performed with the ultimate purpose to improve societal safety it can sometimes be more relevant to move focus away from the specific details of certain risk scenarios to more general characteristics, as when adopting an all-hazard approach in organizing emergency management. Making emergency management preparations intended to fit a set of

different risk scenarios is economical, and can be illustrated by *areas* in the Venn diagram representation of the risk scenario space shown in Fig. 1.

We have described how some applications of risk analysis are more quantitatively oriented, stressing the importance (or at least value) of accurate numbers, quantifying likelihood and severity of consequences for each separate, disjunct risk scenario processed, while other applications of risk analysis can be more process oriented, emphasizing the need for results that allow for broader, more generic utilizations of analysis output. It is thus possible to differentiate between different approaches to risk assessment, which bring different consequences. Since the method for risk assessment adopted and how its practice is actually manifested decides what comes out, it can be highly relevant to discuss what kind of effects one is looking for, and along which paths the desired effects are supposed to come about. The next section offers a look at the role of learning processes in different emergency management activities, highlighting the roles of specificity or generality therein.

3. LEARNING PROCESSES IN EMERGENCY MANAGEMENT

Learning occurs when something taking place in one situation is detected or experienced, so that it affects what happens (or what might happen) in another situation. The connection between the situations is referred to as *transfer* (of learning) (Baldwin & Ford, 1988). This means that without (potential for) transfer there can be no learning.

In the literature on how to protect society a number of different schools of thought concerning how to promote safety and understand and manage threats or risks can be found. Among the more prominent ones one can find operational continuity management (ISO22399:2007), Resilience Engineering (Hollnagel, Woods, & Leveson, 2006) and High Reliability Organizations (HRO) (Weick, 1987; Weick & Sutcliffe, 2007). These schools of thought share some central ideas. One of the commonalities between them is how they stress the importance of learning, which is intertwined in more or less all activities associated with societal crisis and emergency management (cf. Borell, 2013).

In *operational continuity management* according to ISO22399:2007, the entire work process shall be subject to continuous improvement. Within the framework, risk assessment - covering risk identification, analysis and evaluation – is prescribed as a means of gaining input. Here the balance between interest in specifics or generalities depends on the situation.

The goal of *resilience engineering* is to increase operational success, which according to Hollnagel (2011) relies on four cornerstones of which 'learning from the factual' is one. In resilience engineering continuous re-evaluation of the ever-changing state of reality is acknowledged as a means to avoid failure (Woods & Hollnagel, 2006). With such a view it is clearly not the specifics of what has happened in the past that is essential for learning, but rather projections of possible futures that might occur. This is in accordance with the definition of learning as transfer between situations.

In the tradition of HROs expectations, which are based on cognitions, are viewed as a mixed blessing, since they on the one hand enable proactive safety work, but on the other hand also constrain what might be detected and acted upon (Weick & Sutcliffe, 2007) – there are 'blind spots' due to the particular view adopted in a certain situation. Therefore, Weick and Sutcliffe (2007) argue, there is a need for critical re-thinking, in order to update and calibrate the understanding of a system or situation and thus avoid 'the unexpected'. Such functioning might be considered learning, as it means that something that takes place in one situation is detected or experienced, so that it affects what happens (or what might happen) in another situation.

By reporting errors and failures HROs increase their knowledge base. According to Weick and Sutcliffe (2007), the best HROs even reward people who report errors. In the HRO tradition specifics about errors and failures in a complex system are thought to contribute to a better understanding of the system's total behavior. Attention to detail, and a reluctance to simplify models and expectations, give a richer differentiation and ability to capture more minute details in projections of possible outcomes (Weick & Sutcliffe, 2007), which in turn can contribute

to more effective proactive emergency management.

A good example of learning processes within applied societal risk management is risk assessment (McLoughlin, 1985), which should encompass the integrated processes of risk identification, risk analysis and risk evaluation (ISO31000:2009). The need for organizational learning connected to risk assessment becomes evident when the results of risk assessment are to be utilized in risk management, which requires a transfer of relevant information (i.e., learning results) from one activity or process (risk assessment) to another (risk management). Another example is learning from instances of emergency response, aiming at transfer from experiences of actual emergencies to potential future situations through learning-oriented evaluation processes (Borell & Eriksson, 2008). Yet another example is the similar, proactive activity of learning from crisis management exercises. There, the transfer from fictive training scenarios used in exercises should be applicable in other situations, certainly not identical to the training scenarios, which calls for a focus on generic capabilities (Borell & Eriksson, 2013).

The linking from specifics of what has happened to a general capability to manage a large set of futures, which here has been presented at the level of organizational aims and processes, will reappear in the next section. There the main focus lies on the level of individuals and their learning, which should correspond to the level of organizational learning.

4. BRIDGES TO GENERIC CAPABILITY

Learning has to be about something, and the 'substance' of a learning process is called the *learning object* (Gagné, 1972). That is where emergency scenarios come in – they often fill the function of learning object in emergency management training. Scenarios can be used in all phases of emergency management, and scenario-based methodologies are especially common in emergency management training (Alexander, 2000). But how does the desired learning from scenario-based training come about? This section will discuss some possible answers to that, along with a few aspects of generic capability development that does not necessarily require scenarios.

Deliberate emergency management training and exercises can start with defining the *intended learning outcomes* (Harden, 2002), preferably in terms of knowledge, understanding, skills and abilities that the participants should have after the learning process (Hussey & Smith, 2002). People's conceptual capacities are paramount to emergency management capability (Comfort, 2007), and human capabilities depend on people's conceptions of the world (Jonassen, 2006). A large repertoire of different mental representations of the environment, that can be used to generate rules for controlling behavior, enables humans to cope with complexity (Rasmussen, 1983). Put together this means that conceptual capabilities typically qualify as relevant intended learning outcomes for emergency management training.

Scenarios can provide the learning object needed in learning processes for the development of emergency management capability. Being able to discern relevant aspects of situations is key to intelligent action (Bowden & Marton, 2004), and it is through becoming aware of (the potential for) variation in a dimension of reality a person might develop the ability to discern that dimension in future situations (Marton & Booth, 1997). For such individual learning to take place, the individual has to experience variation – in contrast to invariance – concerning the learning object (i.e., the crucial dimensions of potential variation) (Marton, 2006). The variation necessary for learning to take place can come within or between scenarios (Borell & Eriksson, 2013). In the former case the scenario description has to be altered to achieve variation, and in the latter contrasts between different scenarios can reveal differences (=variation) and similarities (=invariance). The principle of variation-based learning can be illustrated by the framework on learning from discussion-based emergency management exercises shown in Figure 2. When scenarios are used as the variation-offering content of learning processes the specifics of singular scenarios is significant, as they constitute the basis on which contrasts may be revealed. The things that (tend to) change - or not - as a scenario description is elaborated or when two or more scenarios are juxtaposed is what reveals the relevant dimensions of possible variation. Therefore the specifics of particular scenarios may be highly important as enablers of learning, and can also represent relevant content in learning

outcomes.

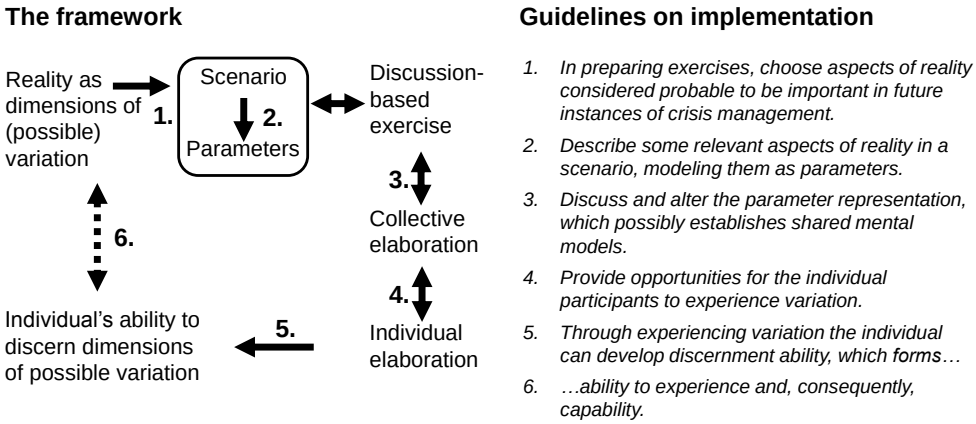

Figure 2 A theoretical framework on learning from discussion-based emergency management exercises, and guidelines on its implementation (adapted from Borell & Eriksson, 2013).

One way of describing how specifics and generalities can interplay in the creation of generic capability is through adopting the perspective of semantic hierarchies. In semantic hierarchies a subordinate semantic class inherits the properties of its superordinate class, and supplements that with some unique addition. More formally a concept or word [B] can be considered a hyponym of another [A], if the defining features of [A] are a proper subset of the defining features of [B] (cf. Cruse, 2002), and hyponymical relationships are the structuring principle behind semantic hierarchies (See Fig. 3). For example, the class of 'fruit' (hypernym) encompasses the subclass 'apple' (hyponym), and there can be concrete instances of 'apples'. Instances and classes can thus be ordered in a hierarchic manner, so that more abstract classes encompass sets of more specific classes. Hyponymical relations allow for the substitution of a more abstract concept (a hypernym) for the original concept. A cognitive move upward semantic hierarchies allows for comparisons between different instances or subclasses of a hypernym, and thus between different situations. Such opportunity for comparison come at the cost of a loss of detail and specificity. For example, one may start with an emergency scenario description portraying an actual chain of events from something that has occurred, and then change one or several of the constituent concepts through traveling first up and then down semantic hierarchies. This renders a transformed scenario description, which is neither identical nor equivalent to the original; some information has been lost and some has been added.

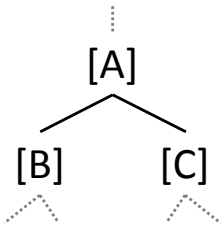

Figure 3 The principle of semantic hierarchy, where the concept [A] is a hypernym to its hyponyms [B] and [C].

Above it was established that the specifics of particular scenario descriptions may in themselves play a significant role in scenario-based emergency management learning. However, they may also play a more instrumental role, as when awareness is directed to more abstract concepts that are chosen to replace the specifics, as for example when a recurring class at higher levels of abstraction is identified as a commonality between different scenario descriptions. In practice, this can explain how established notions of recurring aspects of emergency management are found, as for example prescribed sets of usual emergency response needs thought to apply to a large set of potential emergency situations. For instance, FEMA (1996, p. 5-1) lists eight examples of functional areas that often or always are needed in emergency response operations: Direction and

Control, Communication, Warning, Emergency Public Information, Evacuation, Mass Care, Health and Medical Services, and Resource Management. The search for such 'common elements' (or invariance at an abstracted level) is an important tool in the development of generic emergency management capability. Through an extensive experience covering a relevant set of variation an individual can develop expertise, which is associated with faster problem solving and an ability to effectively manage more complex problems (Hutton & Klein, 1999). One factor behind expertise is the abstracted generalizations, for example in the form of semantic classes situated on higher levels in semantic hierarchies, which can enable sorting and intelligent organization of knowledge concerning specifics. For instance, that may support the selection and use of conceptual models fitting the actual emergency situation.

5. DISCUSSION

As we have seen, some activities employed under the umbrella of emergency management primarily utilize the power of specifics, for example when risk analyses operate on narrowly defined, disjunct risk scenarios. Other activities in emergency management use, or even require, more abstract and broad definitions of (groups of) scenarios, as for example preparations for all-hazard emergency operations. In the section on potential bridges to general capability it was demonstrated how the specific and the general often complement rather than compete with each other; a holistic stance requires a set of specifics that can be related to each other in order to be meaningful. Without a foundation in specifics the generic is pointless.

The paper has briefly sketched possible ways in which learning can take place that may help organizations and individuals to develop generic emergency management capabilities. Understanding the roles of specificity and generality in various information processing and learning activities related to emergency management is important, because knowledge about the pathways through which the needed learning can come about increases the chance of success in emergency management preparations.

Much of the content in this paper comes from gathering basic knowledge from various disciplines and applying it in the field of emergency management. Many of the ideas might seem trivial in themselves, and sure are in the perspective of their respective original subject areas. Yet, using them to scrutinize the practice (and perhaps also scientific studies) of emergency management might contribute to new insights. For example, a better understanding and management of learning processes related to emergency management could have a positive impact on emergency management capability, and perhaps also enhance scientific debate and research. More research is needed for further theoretical clarification of the roles of content specificity and generality and how they might contribute to generic capability in the emergency management context.

6. CONCLUSIONS

Some emergency management activities should focus on the specifics of certain emergency scenarios, others should focus on general abstractions related to sets of emergency situations, and yet others need a combination of specifics and generalities that interplay to create value.

Effective real world emergency management activities probably benefit from mastery of both approaches to information processing and learning - vivid and detailed specifics as well as abstracted generics – as they go hand in hand.

Theories from other disciplines can be used to demonstrate and explain some key factors of emergency management activities, as for example how broadly applicable, perhaps even generic, capability might be formed.

Aiming at capability to manage anything is often more economical than aiming at capability to manage everything.
Therefore more attention should be directed towards methods that can contribute to the development of broadly

applicable capability; there is a need for further research in the area.

REFERENCES

Alexander, D. (2000). Scenario methodology for teaching principles of emergency management. *Disaster Prevention and Management, 9*(2), 89-97.

Baldwin, T. T., & Ford, J. K. (1988). Transfer of training: A review and directions for future research. *Personnel psychology, 41*(1), 63-105.

Borell, J. (2013). *Learning for safety: Improvements of Swedish authorities' toolkits for societal resilience.*

Borell, J., & Eriksson, K. (2008). Improving emergency response capability: an approach for strengthening learning from emergency response evaluations. *International Journal of Emergency Management, 5*(3), 324-337.

Borell, J., & Eriksson, K. (2013). Learning effectiveness of discussion-based crisis management exercises. *International Journal of Disaster Risk Reduction, 5*, 28-37. doi: 10.1016/j.ijdrr.2013.05.001

Bowden, J., & Marton, F. (2004). *The university of learning - Beyond quality and competence*. London: Routledge.

Comfort, L. K. (2007). Crisis management in hindsight: Cognition, communication, coordination, and control. *Public Administration Review, 67*, 189-197.

Cruse, D. A. (2002). Hyponymy and its varieties. In R. Green, C. A. Bean & S. H. Myaeng (Eds.), *The semantics of relationships: an interdisciplinary perspective* (Vol. 3, pp. 3-21): Springer.

FEMA. (1996). *Guide for All-Hazard Emergency Operations Planning*.

Gagné, R. M. (1972). Domains of learning. *Interchange, 3*(1), 1-8.

Harden, R. M. (2002). Learning outcomes and instructional objectives: is there a difference? *Medical Teacher, 24*(2), 151-155.

Hollnagel, E. (2011). Prologue: the scope of resilience engineering. In E. Hollnagel, J. Pariès, D. D. Woods & J. Wreathall (Eds.), *Resilience engineering in practice: A guidebook* (pp. xxix-xxxix). Aldershot, UK: Ashgate.

Hollnagel, E., Woods, D. D., & Leveson, N. (2006). *Resilience engineering: Concepts and precepts*. Aldershot, UK: Ashgate.

Hussey, T., & Smith, P. (2002). The trouble with learning outcomes. *Active learning in higher education, 3*(3), 220-233.

Hutton, R. J., & Klein, G. (1999). Expert decision making. *Systems Engineering, 2*(1), 32-45.

ISO22399:2007. (2007). Societal security – Guideline for incident preparedness and operational continuity management: ISO. (Reprinted from: Not in File).

ISO31000:2009. (2009). Risk management - Principles and guidelines: ISO. (Reprinted from: Not in File).

Jonassen, D. H. (2006). On the role of concepts in learning and instructional design. *Educational Technology Research and Development, 54*(2), 177-196.

Kaplan, S., & Garrick, B. J. (1981). On the quantitative definition of risk. *Risk analysis, 1*(1), 11-27.

Kaplan, S., Haimes, Y. Y., & Garrick, B. J. (2001). Fitting hierarchical holographic modeling into the theory of scenario structuring and a resulting refinement to the quantitative definition of risk. *Risk Analysis, 21*(5), 807-819.

Marton, F. (2006). Sameness and difference in transfer. *Journal of the Learning Sciences, 15*(4), 499-535.

Marton, F., & Booth, S. (1997). *Learning and awareness*. Mahwah, NJ: Lawrence Erlbaum.

McLoughlin, D. (1985). A framework for integrated emergency management. *Public Administration Review, 45*(Special), 165-172.

Olsen, O. E., Kruke, B. I., & Hovden, J. (2007). Societal safety: Concept, borders and dilemmas. *Journal of Contingencies and Crisis Management, 15*(2), 69-79.

Rasmussen, J. (1983). Skills, rules, and knowledge; signals, signs, and symbols, and other distinctions in human performance models. *IEEE Transactions on Systems, Man and Cybernetics, 13*(3), 257-266.

Weick, K. E. (1987). Organizational culture as a source of high reliability. *California management review, XXIX*(2), 112-127.

Weick, K. E., & Sutcliffe, K. M. (2007). *Managing the unexpected: Resilient performance in an age of uncertainty*. San Francisco: Jossey-Bass.

Woods, D. D., & Hollnagel, E. (2006). Prologue: Resilience engineering concepts. In E. Hollnagel, D. D. Woods & N. Leveson (Eds.), *Resilience Engineering. Concepts and Precepts* (pp. 1-16). Aldershot, UK: Ashgate.