Lessons learned from emergency response management to ensure business preparedness for future crisis events
A literature review

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ABSTRACT

Business persistence is the most important task for business managers to conduct, with the evolvement of the global economies and interdependencies this job is threatened more and more. Business crises are undesirable and have crucial consequences for business practices. Because of the two factors of business crises being; low-probability and high-complexity the lessons learned are scarce and every different crises lead to new lessons learned. The field of emergency response management is the research field of public organizations responding to emergencies, disasters and incidents, which is their core task to ensure safety for communities. These organizations deal with emergencies way more often and therefore this area of research consists of valuable lessons learned. Such a comparison between these two disciplines is unique and is therefore a valuable addition to the existing literature**.** In the first section a literature review is conducted and the lessons learned are shown. In the second section the relevancy of these lessons learned for business is evaluated. This evaluation led to valuable implications for business continuity. The most renewing finding was the use and the need for implementation of technologies which can support multiple activities in crisis management.

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Keywords

Six-eight keywords are your own designated keywords

Emergency response management, business continuity, disaster management, incident management, decision-making, organization, learning

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1. INTRODUCTION

More and more incident management and crisis control are of rising importance for private organizations. ′’Disasters, terrorism, public order disruption, infection deceases, floods but also international, managerial and business crises force organizations to crucial decisions about life and death of civilians and co-workers and about the persistence of the organization’’ (Muller, 2009). Crises are threats that come with uncertainty and require urgent measures. Historical crises have shown that businesses are vulnerable for disruption and suffocate under the effects of crises and these effects keep increasing with the evolution of today’s business environment. ‘‘The potential for crises to develop and escalate in business today is greater than ever because of the inter-connectedness of organizations within and between economies’’ (Morrisson et al, 2002). Crises are disruptive events which threat the persistence of business. Dealing with the persistence of business and bringing the business as soon as possible ‘back to normal’, is called business continuity management (BCM). The Business Continuity Institute (BCI, 2007) defines BCM as: ‘‘A holistic management process that identifies potential impacts that threaten an organization and provides a framework for building resilience with the capability for an effective response that safeguards the interests of key stakeholders, reputation, brand and value creating activities.’’ Crises threat business continuity and therefore the importance to study this concept is high.

Because of this importance the area of crises is studied frequently over the last three decades and researchers all seeking to describe the phenomena of crises. But two characteristics of crises being inevitably, crises are low-probability, high-complexity events which threaten organizations persistence. Research showed that ‘’of the companies that experienced a crisis as a major data loss without having a solid business continuity disaster preparedness plan in place, 43% never reopened, 51% closed within two years, and only 6% survived long-term’’ (Snedaker et al. 2013). Comprehensible, crisis preparedness is a key managerial issue, but it is often experienced as difficult to handle. ‘’ Of the issues that managers face, crises are experienced as among the most challenging’′ (Kovoor-Misra et al., 2001).

With this in mind, it should be self-evident to prevent companies for future crisis. Although preventing companies from crisis sounds as an ultimate managerial goal, it is according to Mitroff (2008), impossible to eliminate crisis events and therefore of high stake to make a company crisis preparedness plan. Heath (2004) emphasized the importance of strategic preparation for crisis responses, because organizations are likely to suffer less damage from the crises when they are better and strategically prepared. Mitroff (2008) argues, ‘’the crisis-prepared suffer fewer crises, recover faster, and are more profitable than the cost conscious, crisis-prone businesses’’. The importance of crisis preparedness is evident but the concept needs more explanation; ‘’crisis preparedness is an important element of anticipating a crisis that involves mentally rehearsing scenarios and equipping the company with systems and procedures so that responses are appropriate, sufficient and timely’’ (Hill et al., 2002).

Consequently, the question rises; ‘how to be ultimately prepared for future crisis events?’ Carmeli & Schaubroeck state that; learning from failures is an important facilitator of preparedness for both present and prospective crises. Many crisis situations could be prevented or would not result in major damage if adverse events prompted participants to learn new behaviors. A historic American author William Soroyan already brought us with a high valued wisdom; ‘‘Good people are good because they have come to wisdom through failure. We get very little wisdom from success, you know.’’ Obviously, learning from failure is a key activity of developing a business crisis preparedness plan. According to Argyris and Schön, ‘’learning involves the detection and correction of error from historical events.’’

Given that one of the two main characteristics of crisis is low-probability, the acknowledgement of the scarcity of lessons learned in business is made. So to seek situations, to differentiate lessons learned off, are critical and need to be thought of extensively. In this paper the focus will be on lessons learned from emergency response organizations, because there is no work field where crisis needs to be handled as frequently as in emergency response organizations. Therefore, there are valuable lessons learned in the way these emergency response organizations deal with crises. But conversely, there is no comparison made in historic research which evaluated lessons learned from emergency response organizations and implemented these in a business crisis preparedness plan. Therefore the following research question will be answered in this paper; *‘What are the lessons learned from emergency response management to make a business crisis preparedness plan for future crisis events?’* With the sub questions; *What are the lessons learned on the subject of organization? What are the lessons learned on the subject of decision making? What are the lessons learned on the subject of Learning? How could these lessons learned be transferred into a relevant implication for the business context?* Because emergency response management is a broad concept, this topic is divided into three main subjects, categorized being; Organization, Decision making and Learning. By the execution of an extensive literature review from literature from well-established researchers, journals and books the lessons learned will be identified, illustrated and evaluated.

Elucidating, the concept of crisis is a broad concept and it requires some clarification. The notions crisis, incident and disaster frequently appear simultaneous in emergency response management, but do have different meanings. A crisis is a situation “in which important decisions involving threat and opportunity have to be made in a particular short time” (Shaluf et al., 2003) and a disaster evolves out of a crisis with “management procedures that must be maintained and management problems coped with under conditions of major technical emergency involving threats of injury and loss of life” (Shaluf et al, 2003). An incident on its turn is ‘’an unwanted situation that differs from the state of affairs that could cause a crisis, this crisis could lead to a disaster’’ (Bruinsma, 2005). A disaster could exist of multiple crises and multiple incidents could take place simultaneously ’’ (Bruinsma, 2005). To narrow the subject, the focus in this paper will be on dealing with incidents and crises and on the preparedness and response part of emergency response management.

Explanatory, the terms preparedness and response, could be clarified by the emergency response cycle which is shown in figure 1. ‘‘Emergency management could be conceptually divided into four areas: the mitigation stage (minimizing the effects), the preparedness stage (planning how to respond), the response stage (efforts to minimize the hazards created), and the recovery stage (returning the community to normal) (Waugh and Hy 1990, 2)’’. Vecchiato (2012) argues that whatever the kinds of uncertainty are, the main contribution that foresight efforts bring to strategy formulation lies not in predicting the future (i.e., in the predictions themselves that represent the outputs of foresight), but in preparing the managers of the organization to handle the future (i.e. in the learning process about the future enabled by these predictions). So the focus of this paper will be preparing managers of the organization how to deal with crisis in the future.

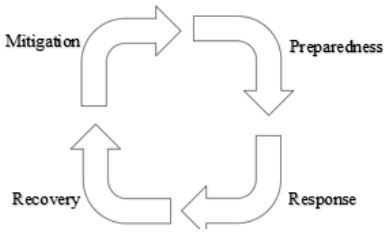

Figure 1. The emergency response cycle

2. METHODOLOGY

In order to answer the question; *what are the lessons learned from emergency response management to make a business crisis preparedness plan for future crisis events',* a literature review was conducted. By making use of a literature review, the paper informs practitioners and researchers about the available body of research (Rhoades, 2011). To find literature database Scopus is used and the terms used are 'emergency response management', 'disaster management', 'and ´incident management'. As mentioned before the research field of this paper is evolving rapidly and therefore the focus will be on recent literature. To narrow the number of hits, the focus will be on literature originating from the year 2005 or later, with open access and articles written in English, these are the inclusion criteria. Scopus was searched in combination with the sub concepts 'Organization', 'Decision making' and 'Learning'. These three sub concepts are shown in figure 1.

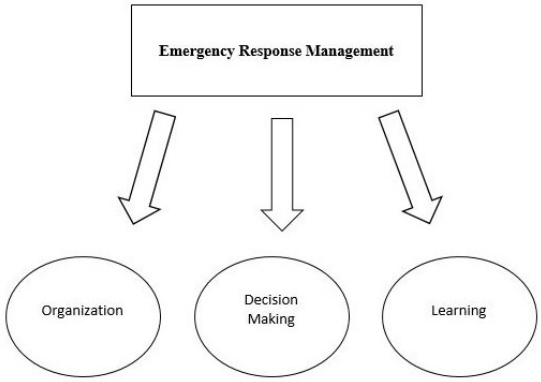

Figure 2. Sub concepts of Emergency Response Management

To create a good set of literature, a search strategy was determined. In this literature review the Boolian search strategy was applied. Boolian search means searching with Boolian logic operators which are the words AND, OR and NOT, to create a subset of search results. The three subjects of emergency response management were used in combination with the before mentioned concepts in this Boolian strategy. The entered search term in Scopus was: [[(Emergency respons* manag*) OR (Disaster manag*) OR (Incident manag*) AND (Organi*]].The asterisk in the search term is called 'wildcard searching' and this means that conjugations and plurals will be included in the results. For example for respon*, the words response, responsiveness, responder and responders will be included.

After this search term the results were narrowed by the exclusion on subject, which was done in a subject selection. The residual articles were screened on the title and abstract to indicate relevance and usefulness. Besides the systematic search for literature the forward and backward snowballing technique were used to find literature. Forward snowballing is the identification of articles that have cited that article and backward snowballing is finding literature by using the reference list of a found article. The before mentioned topics will form the body of the research and the entire search process with applied search strategies and inclusion and exclusion criteria is graphically shown categorized per subject in figure 2. In appendix A the literature is summarized in a summary table where the literature is categorized per subject on findings.

3. LITERATURE REVIEW

This section will elaborate on the lessons learned found in the literature. Structured per subject; Organization, Decision making and Learning these results will be demonstrated structurally. In figure 2 the process of searching and eliminating literature is shown.

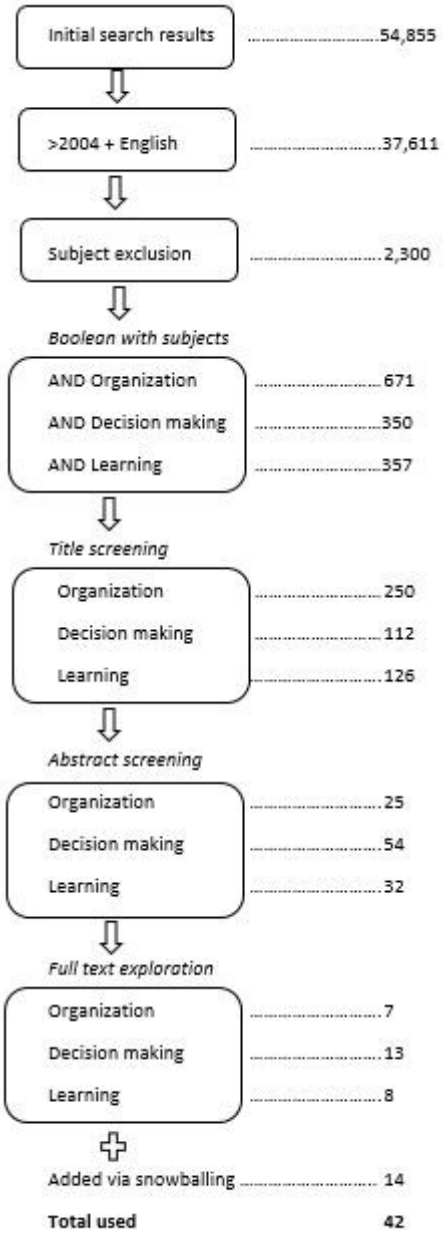

Figure 3. Literature selection process

3.1 Organization

The unique nature of an emergency decides what response is adequate, each emergency demands variances in use of personnel and resources (Chen, Sharman, Rao & Upadhyaya, 2007). This

section will elaborate on these subjects, with first handling the subject of (multi) cooperation which will introduce crisis teams and cooperation between different institutions or departments and about the competencies these teams and people involved will need. The second subject of this section will focus on the allocation and dispersion of resources. The next section will be about decision-making among this personnel, teams and resources and the last section will be about learning from these responses.

3.1.1 (Multi) cooperation

When talking about cooperation the literature mainly focusses on cooperation within teams, with executives of different departments or organizations, and between other operating teams or organizations. The first step in these cooperation is assessing who and what is needed to respond to a disaster, therefore scaling methods are designed. Scaling is simply a method in which a disaster can be placed in a certain level of response required. One of the first scaling methods is still used being; the scale invented by Charles Francis Richter. He introduced this scale in 1935 to analyze the power of an earthquake, determined by the strength of the vibrations (Richter, 1935). In the Netherlands for example the scaling method of GRIP (Gecoördineerde Regionale Incidentbestrijdings Procedure) is introduced which exists of five different scaling levels from Grip 0 to Grip 4. Each level of GRIP is linked to a set of institutions and governmental officials and they will be automatically activated when a disaster in that level of GRIP occurs.

Emergency expects involved parties to transform from autonomous actors into interdependent decision-making teams (Janssen, Lee, Bharosa & Cresswell, 2010). Going deeper, Curnin, Owena, Paton & Brooks (2015) introduce the concept of a supra-organization. Where independent agencies need to assemble to a multi-agency team where routine and emergency actions need to be combined and applied appropriately to respond to the changing situational demands of an emergency (Janssen et al., 2010). The supra-organization is operating in an environment which is constantly changing because of the factors of the emergency environment being, time, uncertainty and complexity (Walker, Stanton, Salmon and Jenkins, 2014). The supra-organization is composed by the demand of the emergency and the organization must have the flexibility to adjust to these demands. Stakeholders of both parties who facilitate the linkages across organizational boundaries are called 'liaison officers'. According to Curnin et al. (2015) liaison officers need three facets of knowledge about the supra-organization, 1) knowledge of the liaison officers own agency; (2) knowledge of other agencies; and (3) knowledge of the work domain arrangements. As opposed by Norros (2014), supra-organizations works best when liaisons act as intermediaries and be able to assemble collaboration, skill and knowledge among this supra-organization. In uncertain, dynamic and complex environments it is of high importance that collaboration, skills and knowledge are seemly integrated. This is graphically shown in figure 3.

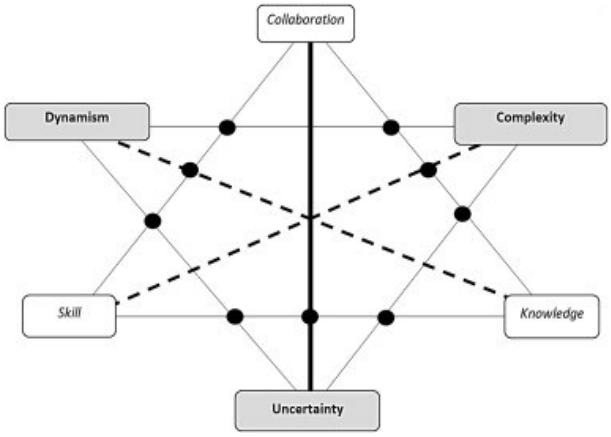

Figure 4. Norros' emergency response environment (2004)

In addition, Capucu (2005) stated the importance of the concept of trust. Effective response and recovery operations require collaborations and trust between government agencies at all levels and between the public and non-profit sectors. Ongoing collaboration raises trust, and the importance of broad collaboration among various governmental levels and between government, the private sector, the non-profit sector, and the public cannot be overemphasized.'

3.1.2 Resources

With the factors of the emergency response management discussed before being complexity, dynamic and uncertain the resource allocation is a difficult process. Time, quantity and quality of the resources are limiting factors and therefore an optimal schedule should be designed for assigning resources, within a limited period of time (Fiedrich, Gehbauer & Rickers, 2000). Time is the factor that makes the resource allocation in emergency response operations a complex process. Literature about scheduling resources is limited and therefore Friedrich et al. (2000) invented a model which is tested on a hurricane situation. Which involved five factors: 1. Survival rate for trapped victims, 2. probability of secondary disasters, 3. survival rate of rescues persons without medical treatment, 4. transportation time and 5. Time to complete the work. Their model takes into account the danger of secondary disasters which could destroy inputted resources. In the transportation time factor, the shortest-path-algorithms are used to compute the best paths depending on the network and kind of resources. The high complex model is tested and the research has shown that the results are promising and the model has good capability to act as a decision-support system to give insight about resource allocation in times of emergency.

3.2 Decision making

In emergency response management, decision-making is about life and death. Bad decisions can lead to tremendous losses and have catastrophically consequences. In the decision-making process, many factors are of critical importance and in emergency situations this process is complicated by two factors. First, an emergency decision must often be made in a short period of time using partial or incomplete information, especially in the early stages of the disaster occurrence (Yu et al., 2011). Second, these decisions may have potentially serious outcomes. In many situations, a wrong decision could result in deadly consequences (Levy et al., 2007). In general, decision-making is a broad researched phenomena and lot of its research is focused on consensus modelling. 'Ideally, consensus refers to unanimity among individuals when selecting an option or a course of action that best represents the interests of the entire group' (Xu, Du & Chen, 2015). This research area is focused on reaching a consensus over a before set period of time and a before thought level of complexity (Zhang, Dong & Xu, 2014). But in because of the characteristics of the emergency response environment it is impossible to reach a consensus.

According to Broome (1992), the expected utility theory is a proper decision model to handle uncertain situations. But it cannot be applied to emergency response management while, 'in risky situations the expected utility theory tells us how we should make decisions under uncertainty: we should choose the option that leads to the greatest expectation of utility.' This theory does choose for the decision with the highest utility, but takes the risk of the hazardous situations which are not likely, but absolutely

not excluded, to happen. As mentioned before, decision-making in emergency response management is about life and death and therefore the expected utility theory is not proficient for emergency response management. But concluding, all literature agrees in finding two factors, time pressure and complexity, making decision-making in emergency response management a complex and hazardous process.

It is interesting to go deeper in the concept of time pressure and complexity. Reviews of research on time-pressure have identified a number of ways in which the outcomes and processes underlying judgement and decision-making change when the time available is limited (Svenson & Maule, 1993; Maule, 1997; Maule & Edland, 1997). This concept is studied more frequently for instance, Svenson and Benson (1993) found a weakened framing bias under time-pressure indicating an increase in the quality of decision making. Busemeyer (1993), using a gambling situation, showed that time-pressure only affected risk-taking when the variance of the probabilities of winning and losing was high, not when it was low. Because of those contra dictionary findings Maule, Hockey & Bdzola (2000) wanted to explore what influenced these different outcomes and which factors do influence decisions made under time pressure. They found that in addition to feeling, time-pressured participants choosing under time-pressure were more anxious and more energetic. So, anxiety and energy are the emotions felt during decision making under time-pressure. The second factor is complexity, according to Yua & Laib (2011) this complexity exists because of the impact on public interests, the involvement of large numbers of decision makers from diverse professional backgrounds in the decision-making process in combination with the high risks that are at stake.

According to Xu, Du & Chen (2015), there are 4 aspects that characterize the emergency response process; (a) the group usually involves more than 20 decision makers from different sectors and professional fields, (b) the final decision must be made within a short period of time, (c) it is often very difficult to reach a unanimous agreement among the decision makers, and (d) a wrong decision or one made too slowly may result in disastrous losses. Several researches came up with mathematic decision models which support the decision making process but Xu et al. (2015) designed the most evaluated and recent one which also take into account the consideration of the management of minority opinions and non-cooperative behaviors. Because of the high complexity of the decision making process, it requires two basic needs to be efficiently enough to minimize the damage of possible consequences; leadership to manage the decision making process and a way to manage the information (Plotnick, Ocker & Rosson, 2008).

3.2.1 Leadership structure

There is extensive literature on managers' leadership behaviors, which concentrates on organizational outcomes relating to productivity, profit, and turnover. For emergency response situations the drivers are different and therefore a different point of view is needed. Leadership roles are traditionally categorized in eight different roles, being; monitor, coordinator, director, producer, innovator, broker, facilitator and mentor roles (Quinn & McGrath, 1985). In emergency response management these roles are also applicable, but there are some things that should be kept in mind. According to Plotnick et al., 2008 the structures of leadership in emergency response management can be different from the traditional in, for example centralized groups with one leader per team, decentralized with one leader per subgroup or hierarchical which is a combination of centralized- and decentralized leadership. In their study emergency teams were simulated and they found evidence that leaders adopted a variety of roles including that of broker, coordinator, monitor, producer, and integrator. Leadership was sometimes shared, but often one subgroup member emerged as an overall team leader in a hierarchical structure.

On the other hand, Weng (2009) does not agree on the fact that the traditional roles could be assigned to leaders in emergency response management and introduced the concept of 'adaptive leadership'. 'Metaphorically speaking, adaptive leadership is the capacity that allows mental and physical states to transit into different domains under evolving conditions.' This process is a continuous one that is both reflective and simultaneous and most importantly is fulfilled by one person.

Additionally, speaking about the required leadership in emergency response management Waugh & Stribe (2006) speak about standard leadership styles often being counterintuitive. 'Information often flows from the bottom in a traditional hierarchy, to the extent that it flows at all. Such a situation may be better handled by a style that is affiliative, open and democratic.' Goldsmith and Eggers (2005) state that; 'an Authoritarian response would certainly be faster and more consistent, but it would require insight and vision that may not be available to those with actual authority and media access.' Flexibility is according to their research the key requirement for leaders in emergency response management and hierarchical decision processes are against expectations nor flexible nor speedy in fast changing circumstances. The literature on leadership had very different point of views but flexibility is the point where all findings come together, provided that the information flows are of vital importance to leadership.

3.2.2 Information management

As explained before, the distribution of information is of critical importance in emergency response management. 'This information is often incomplete, incorrect and influenced by the perception of the distributors of information' (Goldsmith et al., 2005). Romanowski, Mishra, Raj, Howles & Schneider (2013) state that the biggest challenge, is the process of data fusion. Data fusion is by The US Departments of Justice and Homeland Security described as "the overarching process of managing the flow of information and intelligence across levels and sectors of government and the private sector''. Romanowski et al., (2013) refer to this process as being fundamental to anticipate to threats, as well as develop effective responses during emergencies. The data fusion process transfers raw data and intelligence into actionable knowledge to forecast threats and hazards which evolve and provide a continuous flow of information. To ensure all these aspects first a data fusion model should be adopted. Esteban, Starr, Willetts, Hannah and Braynston-Cross (2005) and Harris, Bailey & Dodd (1998) introduce several data fusion models which suit different types of organizations and situations. To ensure direct and reliable access to this essential information Romanowski et al., (2013) enlighten the importance of an operating platform which will account for a seamless integration between multiple databases. Multiple companies developed such operating platforms but all of these require 3 features;

1. Communication – The ability to support information exchange among the emergency responders during a crisis. Examples include real-time communications through a dashboard or a web interface, redundant infrastructure support, email, text, and fax.
2. Coordination – The ability to support interaction within and/or between emergency management teams on different elements of joint tasks. This functionality requires a uniform presentation of information across different groups.
3. Collaboration – The ability to support interaction within and/or between emergency management teams on common tasks. Effective resource sharing and management

capabilities are required to achieve this goal. When a data fusion model and an operating platform are adopted the data fusion process will be more continuously and integration of information flows will be increased. 'Effective emergency management needs more than just boots on the ground, but also technological and knowledge support, presented in a useful fashion' (Schneider, Romanowski & Stein, 2013)

Mühren & van der Walle (2014) enlighten the human side of information management and introduce the concept of sense-making. 'Sense-making literally means making sense of things, making things sensible. Sense-making is not just the end product of understanding itself, but is even more so the process of how people try to find out the story, the deliberate effort to understand events and how they give meaning to what is happening in order to reduce the equivocality and ambiguity that surrounds them'. They investigated information exchange between people in emergency response management and found that three activities are core in this exchange to reach sense-making: noticing, interacting and enacting. Noticing is about spotting there is a problem, interacting is about communicating with each other to reduce ambiguity and enacting is about taking information to action. While the specific details of these three activities differ from those mentioned by Romanowski et al., (2013) the core concept is the same; communication, coordination collaboration are the basic needs to transfer information into action.

3.3 Learning

According to Voss and Wagner (2010), disasters mean failure of existing cognitive and material safety provisions, accordingly they point to inadequate societal organization and mental maps. Therefore, it is important to spot where the failure occurred and how it can be improved, especially in emergency response management where lives are at stake, which is called learning. Edmondson and Moingeon (1999) state that learning is the extent to which agents of a particular organization use data to guide behavior in order to advance the organizations' adaptability. Learning can happen in various ways and forms. Learning is a continuous process in which one could improve a situation, for example single-loop and double-loop learning (Argyris and Schön, 1997), replace current strategies by implementing lessons-learned via documentation about data and decisions-made during an emergency (Savoia, Agboola & Biddinger ,2012) and prepare for a situations, for example with training (Chen, 2013).

Undoubtedly, in all literature there agree on the characteristics an organizations needs when operating in emergency response environment. Because of the dynamic, uncertain and complex situations, organizations need to be adaptive and agile to react to the demands of this environment. (Thompson, Savoia et al,. Chen, 2012, 2012, 2013). According to (Argyris and Schön, 1997), single-loop and double-loop learning are processes which describe different learning processes. Single-loop learning is an error-and-correction process where goal divergence and adaptation errors are recognized and corrected (Voss et al., Savoia et al., 2012, 2010). The single-loop learning permits the business to carry on its standard policies and achieve present objectives, therefore single-loop learning is suitable for a stable environment where routine experiences are valuable. To create a learning environment which is adaptive and agile the first capability which should be learned is the concept of 'unlearning' (Antonacopoulou, 2009). Unlearning is the process of connecting lessons learned to action to transform tensions into ex-tensions. Savoia et al (2012) refers to unlearning as the process of breaking of habits and previously learned behaviors to establish new patterns deriving from the lessons learned from failures. So one could agree that in the emergency response environment, unlearning is the key to adjust to dynamic, uncertain and complex situations. When unlearning behavior acquired, double-loop learning could be introduced. Double-loop learning also is an error-and-correction process where correction involves modifying organizations values, objectives and policies (Savoia et al., 2012). After the detection and correction of error double-loop learning will elaborate on the underlying causes of the error and identify new behavior and patterns to prevent these error to reoccur in the future. Hedberg (1981) introduced this type of learning as 'turnover learning' which is the same behavior learning as double-loop learning being learning for improvement and goes beyond simple error correction. They all agree that in the environment of emergency response management double-loop learning is required.

3.3.1 Training

In order to learn new behaviors or patterns training is important to provide knowledge and skill, which both are part of Norros (2004) emergency environment action requirements (figure 3). There is a wide range of emergency management training, to foresee knowledge and skills. These types of trainings vary from simple workshops to virtual trainings and to gaming, in which situations are truthful imitated (Thompson, 2010; Chen, 2012; Greitzer, Kuchar and Huston, 2007). These types of training could not only be used as training personnel which is already working in the organization, but also for hiring people for positions in highly complex environments or to appoint emergency managers by letting them work on a casus and to analyses competencies and weaknesses.

One of the oldest emergency response training methods introduced by Fowlkes, Dwyer, Oser and Salas, 1998) is called the Event Based Approach training (EBAT) and EBAT is the basis of what in the present is known as 'gaming'. The aim of EBAT is to provide opportunities for a team to develop important competencies, by practices in simulated environments that represent realistic operations conditions. After these simulations, the participant derive performance-based feedback. The EBAT technology evaluated out of traditional training methods where training existed out of learning knowledge only and not evolving skills (Wong and Raulerson, 1974). EBAT has shown that it can contribute to the adaptability of personnel which is a core competency in emergency management. A big disadvantage of EBAT and gaming are the high costs involved with simulating real disasters (Stolk, Alexandrian, Grosc & Paggiod, 2001). Therefore they came up with a cheaper new computer-based gaming platform, which was one of the first in its area. In this computer-based gaming platform, situations are imitated and participants are forced to take decision. With the evolving technologies virtual training methods have developed extensively and there is a wide range of different virtual training methods which could be used (Chen, 2012). The main advantage of virtual-methods of training are that these systems are more cost-efficient and can be executed on different geographical locations, so not all participants should be present at one location (Chen, Thompson, 2012, 2012).

3.3.2 Documenting

In order to design the training methods, data is needed about the occurred disasters and about the emergency response process performed to these emergencies. Again, with the evaluating possibilities of technologies this data gathering process is simplified because the data about the emergencies and the data about the response process are stored more effectively (Savoia, Agboola & Biddinger ,2012). But, it is not only the possession of data which leads to lessons learned, the quality of this data has to be of value and it should be structured well. Savoia et al., discovered that the After Action Reports (AAR's) are often

poorly structured and suffer of a lack of factual information which support writers' findings. Ward (2008) agrees on this aspects and even adds that AAR's mostly come too late. Because of the bureaucratic process which come with AAR's, for example a research committee which has to make an AAR, the final publish date is often later than a year after emergency. Wards argues that, because of the dynamic characteristic of emergency response environment the findings are after a year already outdated and therefore lose value. Therefore a less bureaucratic way of structuring AAR's is needed to provide organizations with valuable accurate lessons learned.

4. RELEVANCY FOR BUSINESS CONTEXT

In this section the lessons learned presented in the literature review, will be translated into lessons learned valuable and applicable to the business context. The findings will be sorted again on the three main subject. Herbane (2010), states that businesses often are not willing to invest in business continuity management because of the low value of return on investment, but in the present are required to develop a business continuity plan because of legislative conditions. More and more laws are obligating business to have a solid business continuity plan. Because the core task of emergency response management is assuring safety of communities a lot of lessons learned of value for business are applicable.

Moreover, the overall lessons learned from emergency response management are about the environment and the factors influencing this environment. All literature agrees on finding the emergency response environment dynamic, uncertain and complex as to be seen in figure 3. A crisis situation for business has the same environmental characteristics and the model of Norros (2004) could be applied to business continuity to develop a preparedness plan.

4.1 Organization

Explaining, in the subject of organization the following lessons learned raised to the surface. At first a scaling method should be designed which categorized crises in different levels. In this scaling model a protocol should be designed for the different levels, which could be automatically activated when a crisis occurs. Because of this categorization it is directly known which departments or people in a company should be informed and what actions need to be taken. A scaling method for, for example a small sized company, with only one establishment: level one being a crisis which could be solved in one department internally. The second level being where several departments and/or stakeholders of a company are involved or affected. A third level where the whole company and other stakeholders are affected. And a fourth level where the societal well-being is affected or endangered. Knowing in which level the crisis is expanding, the reasonable response strategy can be applied. For all stakeholders involved in the crisis it already gives some intelligibility and knowledge about the crisis occurring. And as spoken before knowledge is of high importance in a crisis.

4.1.1 (Multi) Cooperation

When this scaling model is designed the people involved have to form a team. Crisis teams cannot be composed on the fore-hand because the characteristics of the crisis are very differing so different types of knowledge is demanded for (Janssen et al., 2010). Therefore, the people who need to be in the crisis teams have to evolve from autonomous actors into an interdependent decision-making team. Teams and organizations are in crisis demanded to work together and make decisions with high consequences at stake, while they have never worked together before. Therefore flexibility is of high importance and the parties who have to work together have to transform in one collaborative 'supra-organization' with mutual interests. To assure this alignment, 'liaison officers' need to be appointed on beforehand, who know that at times of crisis have to act as intermediaries between multiple different parties which will have to work together (Curnin et al., 2015) and are responsible for the connection of all parties involved, in a vertical as well as in a horizontal direction. Liaison officers need to possess a big set of knowledge of all parties and therefore a multiple set of skills. Because liaison officers do not on beforehand now in which scale and therefore which department or subsidiary the crisis is expanding, their response is a reactive process in which as much knowledge about both parties should be acquired in a very short period of time. Therefore, liaison officers needs the skills of openness, flexibility and adaptability.

4.1.2 Resources

On the subject of resources the lessons learned are not extensively, but what is learned is that a resource allocation technology should be adopted. This resource allocation model should be a different resource allocation model than which is in use in normal business activity and its technology is specified to work in a crisis situation. The resource allocation technology as opposed by Friedrich et al. (2000) is in this state not applicable to business context. The three factors, secondary disaster, transportation time and completion time are the important elements of this model and these should be used to design a resource allocation model applicable for the business context. A resource allocation model is key for business in crises, because of the high uncertainty of the environment and the fact that overestimation can lead to losses of high value. Therefore it is important for business to add a variable of goods in stock to the resource allocation model. When a crisis threats the goods in stock, it is of high value to have as much information as possible to prevent the company of leading big losses.

4.2 Decision making

Undoubtedly it can be said that the decision making process is one of the hardest challenges faced in an uncertain, dynamic and complex environment. With this decision-making process the feelings of anxiety and energy influence decision-makers. Therefore, these feelings need to be acknowledged by the decision-makers itself because if one is aware of this feelings their effects could decline (Maule, 2000). Therefore, in training these feelings need to be explained and clarified to personnel to recognize these feelings and acknowledge the influence of these feelings on decision-making. Two main factors influence the decision-making process which are the leadership structure and information management.

4.2.1 Leadership structure

Elaborately, the lessons learned in leadership are important to the structure of the decision-making process. Previously it was stated, that different crises demand different types of knowledge and therefore different people to work in the decision-making process. There should be one pre assigned crisis leader, which is responsible for the final decision (Yap, 2007) but, in an open and democratic environment. There is one crisis leader in the decision-process but information and knowledge should come from bottom-up. The crisis leader is chosen because of its competencies in the crises environment, the crisis leader is a generalist which means that its skills are flexibility, openness and its knowledge is wide spread (knowing a bit from everything). The crisis leader cannot take decisions without the knowledge it gets from the specialists in the crisis decision-making team and these specialists have lots of knowledge about one certain area and provide the generalist crisis leader of knowledge. The crisis leader than collects all knowledge and makes a decision. This

leader is trained and aware of the tensions and feelings crises bring in mind, and has to act as a crisis coach to the specialists in the team. This type of leadership is called adaptive leadership in a hierarchal structure, and the crisis leader is trained to manage this process. The most important skill of the adaptive leader is flexibility and the ability to adapt to changing situations.

4.2.2 Information management

In the decision making process it is of high necessity to have more than 'just boots on the ground'. Knowing that the information flows in times of crisis is difficult to manage, it is of high importance for business to adapt a technology which overcomes the problem of 'data fusion' (Schneider et al. 2013). This technology is able to cluster the important information. An operating platform should be adopted which focusses on seamless integration between information from for example different organizations or departments within the company. The operating platform supports the supra-organization to have accessible information for all parties involved. In the information technology three aspects are very important and the operating platform should possess these factors being; communication, coordination and collaboration.

4.3 Learning

Clearly, the importance of learning from failures is extremely high. Therefore it is important to adopt a double-loop learning strategy, where failures are not only corrected but also the roots of a problem are handled. The most important factor is the process of 'unlearning' in which the organization is able to let go of routines, therefore 'unlearning' behavior has to be trained to the companies' stakeholders (Savoia et al.). 'Unlearning' is the basic of a dynamic learning environment where companies can learn from failures and adapt to the environment and preparing for future crisis.

4.3.1 Training

Found is that training should be used to prepare personnel for future crisis. The training method most suitable for crisis situations is the computer based-gaming method. In which situations are simulated and participants experience the crisis environment. Knowing that the knowledge needed in a crisis team cannot be determined on advance, but a crisis leader does, computer based gaming could be very interesting in assigning or even hiring a crisis leader. The competencies of a crisis leader are easily testable with this computer based gaming method and therefore it is very interesting to choose or hire a crises leader based on its performance in the computer based gaming method.

4.3.2 Documenting

In documenting, it is of high importance to adopt a technology which makes information accessible after a crisis has occurred. These technologies should be used by an evaluating team which does research to the state of affairs of a crisis. It would be of high necessity to make a 'temporary After Action Report' which includes temporary findings and lessons learned, to adapt to the dynamic environment and overcome the problem currently occurring that After Action Reports are too late and therefore of non- or very low value (Ward, 2008).

4.4 Presentation of model

All findings agreed on the factors representing the emergency response environment being the same as Norros (2004) opposed. Dynamism, complexity and uncertainty. As to be seen in the previous findings, technology plays an important role in emergency response management. With the evolution of technology these systems keep improving and therefore it would be of high importance to attract technology experts which react to the changing technological environment. Given the specific character of the crises environment t it is important to understand that technologies play a big role but, act in a supporting way. Technology can decrease the complexity and lack of knowledge in certain situations, but crisis situations remain uncertain situations with high risks at stake. Because of the unexpectedness of the environment it asks for different ways to cope with the technologies and it enlightened the importance of the flexibility, adaptability, sense making and openness of all stakeholders involved. Concluding, a solid crisis preparedness plan demands a lot of skills, knowledge and collaboration, all the findings discussed above are grouped in the model of Norros' under skill, knowledge or collaboration, this can be seen in figure 5.

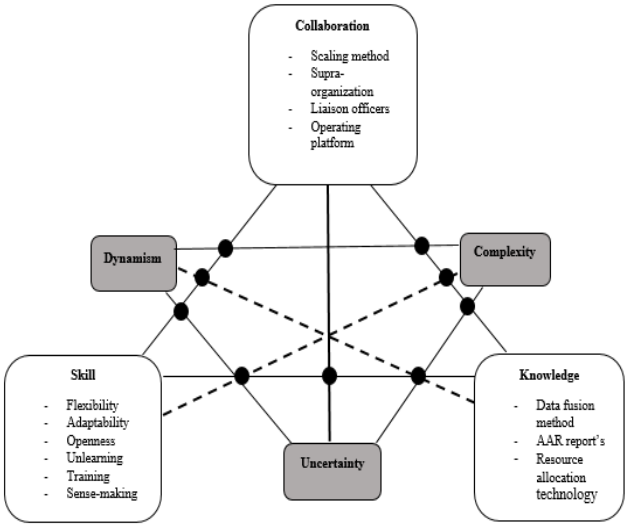

Figure 5. Findings grouped in Norros' model

5. CONCLUSIONS AND IMPLICATIONS FURTHER RESEARCH

This study examines the lessons learned from emergency response management to transfer these lessons learned to be valuable to business continuity. First, the subject area of emergency response was researched, grouped in three main subjects being: decision-making, organization and learning. By the conduction of the literature review these findings were given and structured within these subjects. Second, the lessons learned identified in the literature review were transferred into useable knowledge in the business context and the findings were showed in a model. The most renewing findings were the presentation of multiple technologies and systems which support emergency response management on multiple areas.

5.1 Implications for theory

Business continuity and emergency response management are two different areas of research but have a lot in common. The area of emergency response management is focusing on dealing with emergencies and disasters solely and therefore their lessons learned are valuable and because of the frequency emergency response management deals with these emergency events of high reliability. Therefore the transformations of the lessons learned in emergency response management into lessons learned for business is valuable. Such a comparison between these two disciplines is unique and is therefore a valuable addition to the existing literature.

5.2 Implications for practice

It is interesting to focus on business continuity management because this area is slowly transforming from a voluntary to an obligated territory where legislation is going to play an important role. The big multinational companies often already do have a solid preparedness plan because of legislation which obliges them to have a crisis preparedness plan, but especially for small- and medium sized companies there is a lot value in the findings of this study. The biggest problem for this small and medium sized companies is that it is cost-effective to invest in business continuity management, it is partially voluntary and the feeling that 'a crisis would not hurt them' is frequently present. This study is especially important to these small- and medium sized companies which are balancing on that line of having the choice if they or if they are not investing in a business preparedness plan. Therefore this paper enlightens the importance of having such a plan and the findings of this study can contribute to develop a solid business crisis preparedness plan for all companies, but especially for this small- and medium sized companies.

5.3 Limitations and further research

This study has several limitations that should also be considered. Because of the broad orientations of this this study, the findings are general and not making an in-debt analysis about one subject. Next, only articles written in English were evaluated, which excludes the impact of theories from other languages. The literature this paper reviewed are mostly from sophisticated journals and therefore the findings are of value, the reliability of relevancy for business should be tested in the field of business continuity to test the real value. By doing so, important implications can be made about the integration of technology in business continuity. Because of the general orientation of this paper it was not possible to make an in-debt analysis of these technologies. Since technologies keep innovating this is an interesting research area which requests further research in the future.

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7. APPENDIX A

Subject	Author	Year	Findings
Organization	Chen, R., Sharman, R., Rao, H. R., & Upadhyaya, S	2007	The unique nature of an emergency decides what response is adequate, each emergency demands variances in strategy to cope with emergency and the dispersion of for example; resources and personnel
Organization	Janssen, M., Lee, J., Bharosa, N., & Cresswell, A.	2010	Emergency response demands autonomous organizations, in standard situations working on their own, to transform into inter-dependent organizations
Organization	Curnin, S., Owen, C., Paton, D., & Brooks, B.	2015	Emergency response management demands the creation of a supra-organization in which all parties involved act as one organizations with most important letting go of routines and the flexibility to adapt to each other on knowledge, people and technologies. Liaison officers are needed to stimulate this process.
Organization	Walker, G. H., Stanton, N. A., Salmon, P. M., & Jenkins, D. P.	2014	The emergency response management is constantly changing because of the factors of the emergency environment being, time, uncertainty and complexity.
Organization	Norros, L.	2004	Liaison officers are needed to integrate; collaboration, skill and knowledge among this supra-organization, this is important in the complex, dynamic and uncertain character of the emergency response environment
Organization	Capucu, K.	2005	Effective response and recovery operations require collaborations and trust between government agencies at all levels and between the public and non-profit sectors.
Organization	Fiedrich, F., Gehbauer, F., & Rickers, U.	2000	Time, quantity and quality of resources are limiting factors in emergency response management. Therefore an optimal schedule is designed for assigning resources, within a limited period of time. Time is the factor that makes the resource allocation in emergency response operations a complex process therefore a decision-support system for resource allocation should be adopted.
Decision making	Yu, L., & Lai, K. K.	2011	Typically for emergency response management is the short period of time and the use of wrong and incomplete information in the decision-making process. Therefore a decision-support system should be adopted to support the decision making process.

Decision making	Levy, J. K., & Taji, K.	2007	A decision-support model should be adapted, because of the extreme consequences which come with decisions in the emergency response environment. The losses can be extreme, to support these decisions a model should be adopted which takes this into account.
Decision making	Xu, X. H., Du, Z. J., & Chen	2015	In a decision-support model the consideration of the management of minority opinions and non-cooperative behaviours should be taken into account in the design of the model
Decision making	Broome, J.	1992	The expected utility theory in the decision making process in the emergency response environment
Decision making	Svenson, O., & Maule, A. J.	1993	Influences of time pressure on the decision making process
Decision making	Svenson, O., & Benson III, L.	1993	The decision framing process, influenced by time pressure with the quality of decision increase under timer pressure.
Decision making	Busemeyer, J. R., & Townsend, J. T	1993	A gambling situation is used to investigate the linkage between time pressure and risk taking and findings were that time-pressure only affected risk-taking when the variance of the probabilities of winning and losing was high, not when it was low
Decision making	Maule, A. J., Hockey, G. R. J., & Bdzola, L.	2000	In addition to feeling, time-pressured participants choosing under time-pressure are more anxious and more energetic
Decision making	Yu, L., & Lai, K. K.	2011	The complexity of decision making environment is high and exists because of the impact on public interests, the involvement of large numbers of decision makers from diverse professional backgrounds in the decision-making process in combination with the high risks that are at stake
Decision making	Plotnick, L., Ocker, R., Hiltz, S. R., & Rosson, M. B.	2008	Leadership structures in emergency response management with for example, centralized groups with one leader per team, decentralized with one leader per subgroup or hierarchical which is a combination of centralized- and decentralized leadership

Decision making	Quinn, R. E., & McGrath, M. R.	1985	Traditional leadership styles, divided into 8 roles being: monitor, coordinator, director, producer, innovator, broker, facilitator and mentor roles
Decision making	Weng, Y. K.	2009	Adaptive leadership is needed in emergency response management, it is the capacity that allows mental and physical states to transit into different domains under evolving conditions
Decision making	Waugh, W. L., & Streib, G.	2006	Information flows and hierarchy in emergency response management, finding that open, affiliative and flexibility is needed.
Decision making	Goldsmith, S., & Eggers, W. D.	2005	Flexibility is according to their research the key requirement for leaders in emergency response management and hierarchical decision processes are against expectations nor flexible nor speedy in fast changing circumstances.
Decision making	Romanowski, C. J., Mishra, S., Raj, R. K., Howles, T., & Schneider, J.	2013	The biggest challenge, is the process of data fusion which transfers raw data and intelligence into actionable knowledge to forecast threats and hazards which evolve and provide a continuous flow of information, data fusion platforms are needed to integrate seamless between different information technologies
Decision making	Esteban, J., Starr, A., Willetts, R., Hannah, P., & Bryanston-Cross, P.	2005	Data fusion models, to overcome the data fusion process and ensure timely and adequate information
Decision making	Harris, C. J., Bailey, A., & Dodd, T. J.	1998	A multi-sensor data fusion tested in defence and aerospace to ensure information facility
Decision making	Schneider, J., Romanowski, C. J., & Stein, K	2013	Technical support systems, to support the facilitation of information in the emergency response environment.
Decision making	Muhren, W. J., & Van de Walle, B.	2010	Sense-making in the decision making process and the information exchange between people in emergency response management. Three activities are core in this exchange to reach sense-making: noticing, interacting and enacting
Learning	Voss, M., & Wagner, K	2010	Disasters mean failure of existing cognitive and material safety provisions, accordingly they point to inadequate societal organization and mental maps. Therefore, it is important to spot where the failure occurred and how it can be improved, especially in emergency response management where lives are at stake, which is called learning

Learning	Edmondson, A., & Moingeon, B.	1999	The use of data to improve the learning process, which makes the data of high value
Learning	Argyris, C., & Schon, D. A.	1974	Traditional view on single-loop and double-loop learning, which are both learning structures which could be adopted by organizations
Learning	Savoia, E., Agboola, F., & Biddinger, P. D.	2012	The use of after action reports (AARs) to promote organizational and systems learning in emergency preparedness, lessons about documentation.
Learning	Antonacopoulou, E. P.	2009	The process of unlearning, to create a valuable learning process the ability of unlearning should first be highlighted and learned.
Learning	Thompson, K.L.	2010	The most important quality in learning and correcting in the emergency response environment is flexibility.
Learning	Hedberg, H.	1981	Learning as 'turnover learning' which is the same behaviour learning as double-loop learning being learning for improvement and goes beyond simple error correction.
Learning	Greitzer, F. L., Kuchar, O. A., & Huston, K	2007	Different training methods, which can be used to prepare for future crisis.
Learning	Ward, J.	2008	Documents are inefficient and to late
Learning	Fowlkes, Dwyer, Oser and Salas.	1998	Event Based Approach training, being the first using gaming as training strategy