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Emergency Management Benchmarking Study: Lessons for Increasing Supply Chain Resilience

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EMERGENCY MANAGEMENT BENCHMARKING STUDY:

LESSONS FOR INCREASING SUPPLY CHAIN RESILIENCE

THESIS

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Abstract

The challenge to manage a business today is bigger than ever, because we cannot think only about our organization, but the intricate network of organizations that form our supply chain. Some organizations cope far better than others with both the prospect and the manifestation of unquantifiable risk -- they share a critical trait: resilience. This study researches emergency management organizations which are required to maintain a state of readiness for immediate reaction, and evaluates best practices in preparedness, detection, response and recovery. Extracting insights from multiple interviews, this research verified that most of the current emergency management best practices do indeed increase resilience without increasing redundancy; consequently, performance is improved in a cost-effectively way. Applications to supply chain management are made to recommended enhancements to overall resilience.

To Family, Beloved and Friends

Acknowledgments

I would like to express my sincere appreciation to Dr. Pettit for advising my research and being extremely patient, for the research participants for their time and kindness, for AFIT personnel and colleagues for all their support and friendship, and for all those who made me feel home during all this time away from my beloved country.

José Marques de Morais Junior

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EMERGENCY MANAGEMENT BENCHMARKING STUDY: LESSONS FOR INCREASING SUPPLY CHAIN RESILIENCE

I. Introduction

Background & Motivation

The challenge to manage a business today is bigger than ever, because we cannot think only about our organization, but the intricate network of organizations that form our supply chain. As defined by The Global Supply Chain Forum(GSCF), supply chain management is the integration of key business processes from end-user through original suppliers that provides products, services, and information that add value for customers and other stakeholders. As we become more integrated to other organizations expecting to increase efficiency, we become more dependent on them and more susceptible to disruptions.

Managing the supply chain of the U.S. Air Force is an increasing challenge as well, because our budget does not grow proportionally to the costs of modern weapon systems. Maintaining high performance with this kind of restriction requires evolving management skills. One way to manage risk and uncertainty in our supply chain is to apply forecasting techniques to predict our demand, but we cannot anticipate everything nor afford the cost of excess inventory.

Some organizations cope far better than others with both the prospect and the manifestation of unquantifiable risk and they don't have in common a secret formula, but they share a critical trait: resilience (Sheffi, 2005a). A resilient enterprise has the capacity to overcome disruptions and continually transform itself to meet the changing needs and expectations of its customers (Pettit, Fiksel and Croxton, 2008).

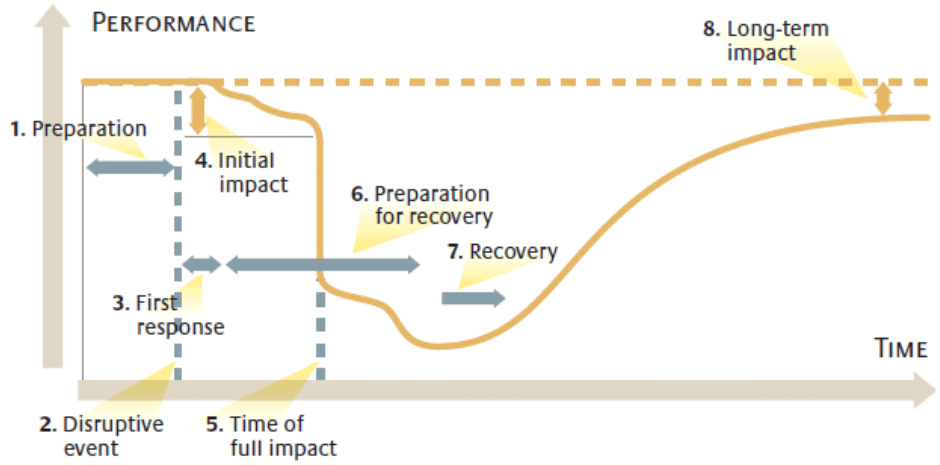

Figure 1. Disruption profile (Sheffi and Rice, 2005)

The disruption profile in Figure 1, presented by Sheffi and Rice (2005) to explain the supply chain view of a resilient enterprise, is a good example of what happens when supply chains are disrupted and businesses are impacted, characterizing the nature of the disruption and the dynamics of the organization's response by eight stages of disruption:

1) Preparation: when some kind of warning allows the company to foresee and prepare for the disruption, minimizing its effects;

2) Disruptive event: when the event happens;

3) First response: aimed to control the situation and avoid further damages;

4) Initial impact: when the performance starts to deteriorate after the disruptive event;

5) Time of full impact: can be immediate or delayed, but when the full impact hits the performance drops precipitously;

6) Preparation for recovery: typically start in parallel with the first response and sometimes before the disruption (when it has been anticipated);

7) Recovery: efforts for getting back to normal operations levels;

8) Long-term impact: the impact can be especially long-lasting and difficult to recover from when the customer relationships are damaged, but if the company learn and improve its processes the performance can become better than before.

More details about building resilient supply chain will be discussed in the following chapter, but the solutions for the public sector could be different from the private sector, and most of the literature is focus in the private sector. As an approach to overcome this issue, we had to look for those organizations in the public sector with the necessary sense of urgency to plan for disruptions.

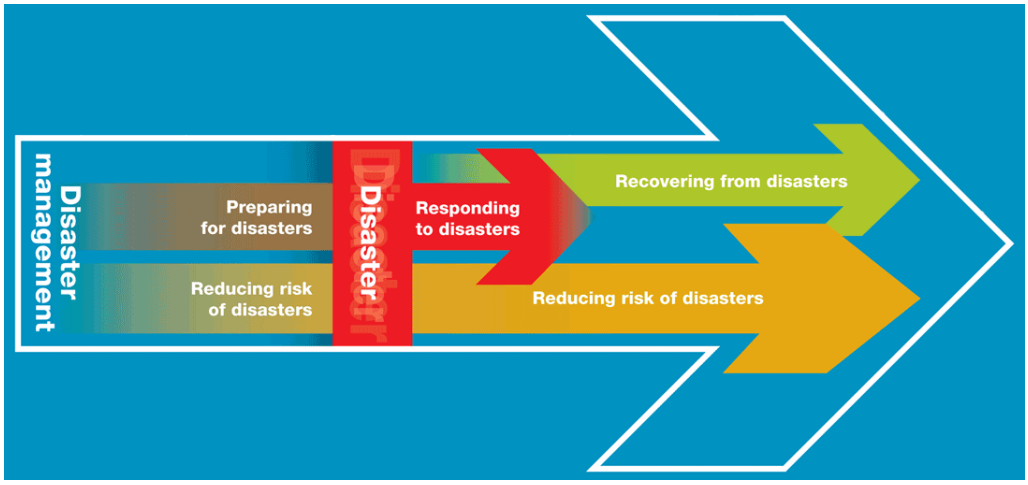

Figure 2. Disaster Management (IRFC, 2010)

In the public sector we can find some organizations that must be prepared for disasters. By definition from the International Federation of Red Cross and Red Crescent Societies (IFRC, 2010), a disaster is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community's or society's ability to cope using its own resources. They also define Disaster Management as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, detection, response and recovery in order to lessen the impact of disasters.

In Table 1 bellow we listed observed similarities between Figure 2's IRFC (2010) disaster management phases and Figure 1's Sheffi and Rice (2005) disruption profile:

Observed similarities	
Figure 1 Sheffi and Rice (2005) disruption profile	Figure 2 IRFC (2010) disaster management
Disruptive event	Disaster
Preparation	Preparing for disasters
First response	Responding to disasters
Preparation for recovery, Recovery	Recovering from disasters

Table 1. Observed similarities between Sheffi and Rice (2005) disruption profile and IRFC (2010) disaster management

Such organizations like FEMA (Federal Emergency Management Agency), State and Local Emergency Agencies, Hospitals, Fire Departments, Police Departments, and others are not profit-oriented, but have budget restrictions, as the Air Force, so management practices similarities are expected.

Emergency management in the United States has faced every kind of disaster: natural, human-made, and political. The lessons learned from those experiences and the way the emergency responders' system was pushed to evolve after the terrorist attacks of September 11, 2001 and hurricane Katrina of August 2005 can be extremely valuable.

Research focus

The focus of our research is to study organizations that are typically dealing, directly or indirectly, with emergency situations that could not be prevented. Interview questions will involve the practices used to be prepared for such disruption event, how they detect, respond and help in the recovery and mitigation. So we can say that we have four phases of interest: 1) Preparedness; 2) Detection; 3) Response; 4) Recovery.

Research objectives

The goal is to uncover the best practices of emergency response organizations that can be applied to improve effectiveness and efficiency of operations, thus creating a more resilient organization. We expect that our results can be useful for the participants recommending opportunities for improving their organizational performance.

The purpose is to identify the best practices of the organizations in the typical activities of emergency management (preparedness, detection, response and recovery) and improvements they would like to see for the coming years. The same kind of study will be conducted in the literature.

Theoretical lens

From the literature we can already anticipate some practices that would increase the resilience of a supply chain. Each practice can be applied in one or more phases, probably in different levels of importance for each phase.

First, organizations should create enough sense of urgency between enough people, avoiding complacency and false urgency (lots of activity that drains needed energy and produces nothing), to keep people prepared for disruptions (Kotter, 2008). One thing that can help is to bring customers to meetings, so you can hear directly about the impact of your decisions and what really matters.

Collaboration between organizations is another way to increase resilience, allowing them to learn from each other and also to coordinate their efforts in common operations (Sheffi, 2005b:137).

Agility is another powerful way for achieving resilience, creating networks capable of faster responses (Christopher and Peck, 2004). Detecting a disaster is not always easy, the organization should be able to distinguish a true problem from normal variations of the regular tasks (Sheffi, 2005b:155). Communication is also the key here, making it easy for suppliers and customers to reach each other and can also empower frontline employees if they have the appropriate sense of urgency for reacting quickly or at least alerting the upper levels.

Implementing flexibilities and standardization in an organization are other ways for avoiding disasters or reacting faster (Sheffi, 2005b:243). Of course there are other ways to increase resilience, but the cost-benefit of each one must be evaluated. For example, implementing redundancies may be an undesired solution if it means overly capacity.

Methodology

All data was qualitative and collected through face-to-face interviews. Some participants gave further information through reports, plans and presentations containing qualitative data to complement their answers. A consistent Interview Protocol was used for key people of different kind of emergency responder organizations.

The design and methods for the research were based in literature about case studies and grounded theory construction, not only to design the interview protocol but also to choose the participants.

The multiple case study approach, selecting different kinds of organizations across the board of emergency responder organizations, allowed understanding of the dynamics involved. Typically, multiple case studies provide a stronger base for theory building (Yin, 2009: 61); the theory is better grounded, more accurate, and more generalizable (Eisenhardt and Graebner, 2007).

Although a questionnaire was developed for the interview protocol, the focus on extracting key information required the interview to be more conversational. Interviews continued until we stopped getting new insights, and ended including eight different organizations, at State, Regional and Local levels.

The disadvantage of conducting a multiple case study is that it requires extensive resources and time beyond the means of a single student or independent research investigator (Yin, 2009:53). Therefore, the sources of evidence were restricted from each organization, basically relying on interviews and some documentation at the interviewees' discretion.

Preview of remaining chapters

This chapter provided background information and introduced the problem. Chapter II will review the literature, looking for known solutions to increase the resilience of supply chains, as well as studying common practices and trends of emergency management. This review was also important to gain insight for research gaps to construct the interview protocol. Chapter III will present the research methodology used in the study. Chapter IV presents the data collection, analysis and results. Lastly, Chapter V provides conclusions and recommendations for future research.

II. Literature Review

Overview

This chapter summarizes the foundational literature used by this research to look for the best practices and recommended improvements to increase the supply chain resilience. This begins with a brief overview of definitions and recommendations from the literature on supply chain management, change management and resilience, and then focuses on emergency management literature.

Supply chain management overview

The term supply chain management (SCM) appeared first in the beginning of 1980s and become widely used since then (La Londe, 1998). One can find many different definitions in the literature, but as a management philosophy, Mentzer et al (2001) proposed the following characteristics for SCM:

- a systems approach viewing the supply chain as a whole, and managing the total flow of goods inventory from the supplier to the ultimate customer;
- a strategic orientation toward cooperative efforts to synchronize and converge intrafirm and interfirm operational and strategic capabilities into a unified whole; and
- a customer's focus to create unique and individualized sources of customer value, leading to customer satisfaction.

In adopting a supply chain philosophy, management practices had to be established by the firms that allow them to act or behave according to this philosophy. Mentzer et al (2001) identified many activities that were focused by many authors, suggesting that they are necessary to successfully implement a SCM philosophy (see Table 2).

Supply Chain Management Activities
1. Integrated behavior
2. Mutually Sharing Information
3. Mutually Sharing Risks and Rewards
4. Cooperation
5. The Same Goal and the Same Focus on Serving Customer
6. Integration of Processes
7. Partners to Build and Maintain Long-Term Relationships

Table 2. Set of activities to implement SCM Philosophy (Mentzer et al, 2001)

The organization's **integrated behavior** should be extended to incorporate customers and suppliers (Bowersox and Closs, 1996). This behavior requires **mutually sharing information** among supply chain members, especially for planning and monitoring processes, with frequent information updating among all for effective SCM (Cooper, Lambert, and Pagh, 1997). Open sharing of information such as inventory levels, forecasts, sales promotion strategies, and marketing strategies reduces the uncertainty between supply partners and results in enhanced performance (Andel, 1997; Lewis and Talalayevsky, 1997; Lusch and Brown, 1996; Salcedo and Grackin, 2000). **Mutually sharing risks and rewards** also brings advantage over the long term (Cooper, Lambert, and Pagh, 1997), as well as **cooperation** involving cross-functional coordination across the supply chain members at several management levels.

Establishing **the same goal and the same focus on serving customers** is a form of policy integration (Mentzer et al, 2001), avoiding redundancy and overlapping, while seeking a level of cooperation that allows participants to be more effective at lower cost levels (Lassar and Zinn, 1995). This so called policy integration is possible if there are compatible cultures and management techniques among the supply chain members (Mentzer et al, 2001).

The implementation of SCM needs the **integration of processes** from sourcing, to manufacturing, and to distribution across the supply chain (Cooper, Lambert and Pagh, 1997). SCM also requires **partners to build and maintain long-term relationships,** in reality Cooper, Lambert and Pagh (1997) believes that the time horizon of such a relationship extends beyond the life of the contract, perhaps indefinitely, and the number of partners should be kept small to facilitate cooperation.

There are also antecedents to SCM that enhance or impede the implementation of an effective supply chain. According to Mentzer et al. (2001) research, these antecedents are the willingness to address **trust**, **commitment**, **interdependence**, **organizational compatibility**, **vision**, **key processes**, **leader** and **top management support**. These will enhance SCM to achieve lower costs, improved customer value and satisfaction, and competitive advantage.

The concept of SCM continued to evolve. We can see in Figure 3 a more complex view of SCM by the Global Supply Chain Forum, listing eight cross-functional and cross-firm processes that they consider to be essential.

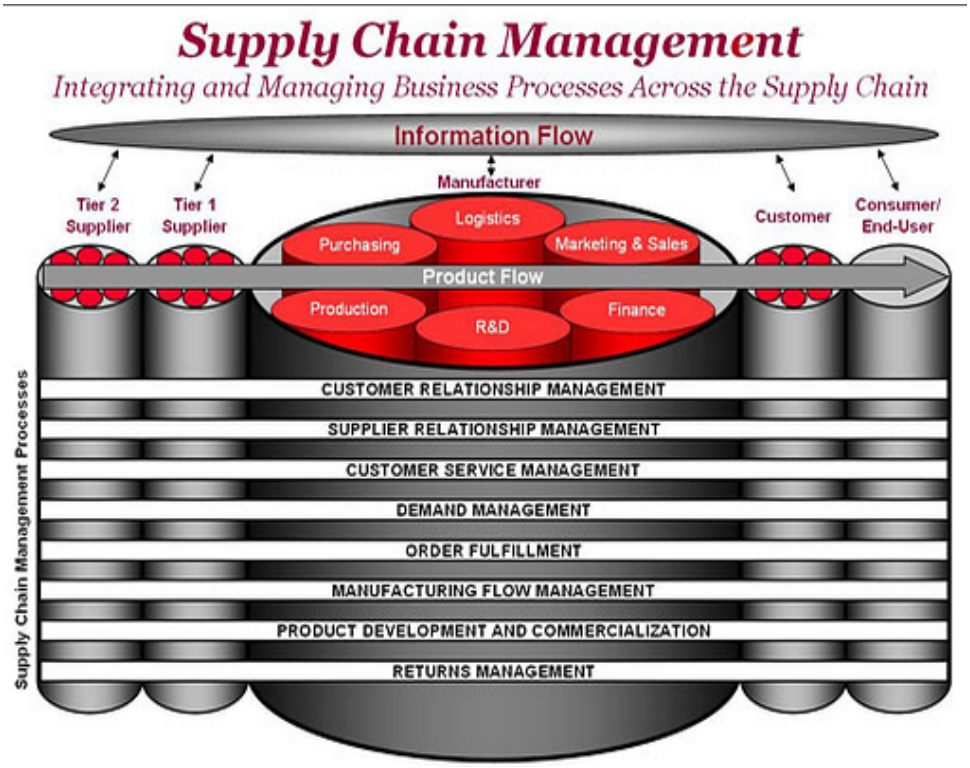

Figure 3. SCM view by the Global Supply Chain Forum
(Lambert, Cooper and Pagh, 1998)

The Supply Chain Council (SCC) has a simpler view of SCM than GSCF, as we can see in Figure 4, known as the Supply Chain Operations Reference model (SCOR), based on five core management processes, as we can see in Table 3 (SCC, 2008).

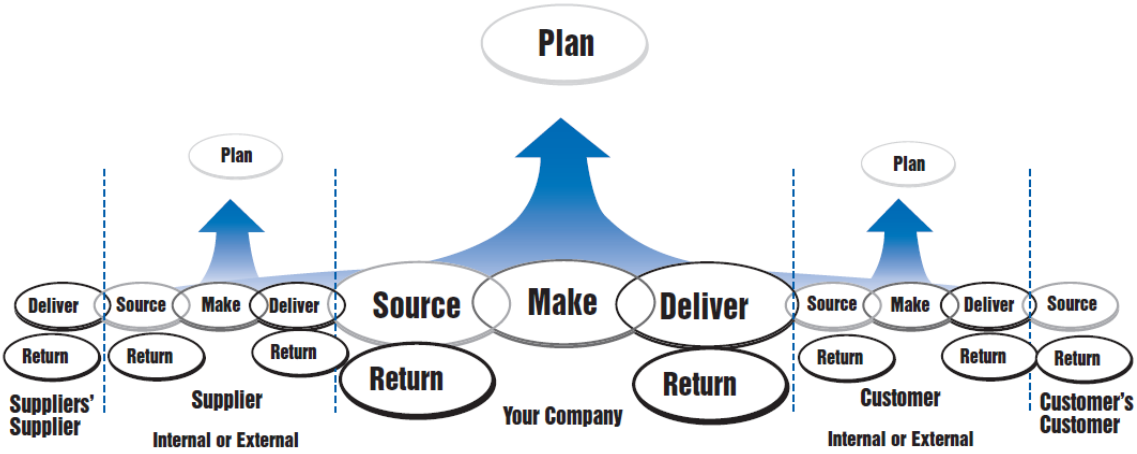

Figure 4. SCOR model, SCM view by the Supply Chain Council (SCC, 2008:3)

SCOR Process	Definitions
Plan	Processes that balance aggregate demand and supply to develop a course of action which best meets sourcing, production and delivery requirements
Source	Processes that procure goods and services to meet planned or actual demand
Make	Processes that transform product to a finished state to meet planned or actual demand
Deliver	Processes that provide finished goods and services to meet planned or actual demand, typically including order management, transportation management, and distribution management
Return	Processes associated with returning or receiving returned products for any reason. These processes extend into post-delivery customer support

Table 3. SCOR Processes Definitions

Although it is not our purpose to expand on this subject, it is important to state that both views focus on the implementation of cross-functional processes in the supply chain, but this research focuses out of those boxes. Smith and Buddress (2005) suggested a new way to pursue research on SCM that is focused on theory building based on learned borrowing from other disciplines and how they might be applied to SCM. That is aligned with the purpose of this research, looking for insights in emergency management to present thought-provoking paradigms and methods that can be found useful in supply

chain management. Next, a brief overview of change management will be presented as an important subject for those who want to apply later findings, as well as an overview on supply chain resilience.

Change management overview

Changing or reacting to change is hard. The previous overview of SCM practices and processes can help to respond faster to changes or problems, but having an idea does not ensure successful implementation.

Goranson (1999) differentiates between agility and flexibility. Agility is the ability to respond to (and ideally benefit from) unexpected change, an unplanned and unscheduled adaption to unforeseen and unexpected external circumstances. Flexibility is the scheduled or planned adaptation to unforeseen yet expected external circumstances. Flexibility, agility, robustness and resilience are four very related topics in supply chain risk management.

Kotter (2008), a respected authority on leadership and change, pointed that during his studies about change in the last eleven years he found that in 70 percent of the cases where important changes were needed, either they failed or were not fully launched, or were achieved late, over budget and with great frustration. But in 10 percent of the situations, the achievements were better than expected, and he observed that in all a similar formula was used, that he described as eight steps:

- Create enough sense of urgency between enough people;
- Form a strong and committed team to guide a challenged change initiative, even if the members are already overworked or overcommitted;
- Effort by the team to find smart visions and strategies for dealing with the issue;
- Communication by the team of the visions and strategies to relevant people, obtaining support and generating more urgency in the organization;
- Empowerment of those who are committed to turn the vision in reality, by removing the obstacles in their path;
- Achieve short-term wins that silence critics and disarm cynics;
- Never let up until the vision is a reality, avoid complacency;
- Make change stick by institutionalizing it into the structure, systems and culture. (Kotter, 2008)

Kotter (2008) observed that **the biggest error when implementing change was not to create enough sense of true urgency** to fight complacency and avoid false urgency (lots of activity that drains needed energy and produces nothing). So he developed one strategy and four tactics to increase true urgency, and the focus that must be used in all moves is to aim not only the minds and thoughts of others, but above all the hearts of them. A good example is to imagine if Martin Luther King Jr. had announced on the Washington Mall, "I have a strategic plan." You have to create full human experiences, using all our senses, creating the emotional reaction you want, using the surprise factor and leading others to embrace goals beyond the status quo.

The Strategy.

Create action that is exceptionally alert, externally oriented, relentless aiming at winning, making some progress each and every day, and constantly purging low value-added activities, and always focusing on the heart and not just mind (Kotter, 2008).

The Tactics.

Bring the outside in. Reducing the gap between what is happening on the outside and what people see and feel on the inside and overtime creating a culture of external focus, by:

- Listening to customer-interfacing employees;
- Using the power of video (to show at the right time and to the right people an emotionally and intellectually honest relate of a customer, for example);
- Not always shielding people from troubling data;
- Redecorating (important information must be on sight, changing frequently, and visually interesting);
- Sending people out to bring information and feelings (visits, training, conferences, etc);
- Bringing people in (invite customers and experts to meetings, hire people that share your vision and bring consultants for a period of time);
- Bringing data in, but in the right way at the right time (enough info that feels interesting, surprising or dramatic, from customers, competitors or about new technologies, in small amounts each day, to as many people as possible, without fears);
- Not creating a false sense of urgency. (Kotter, 2008)

Behave with true urgency every day. People must see that you move with speed, acting with true urgency and don't just talking about it, you must match words and deed, never ending meetings without clarity about who will quickly do what and when. You have to purge low-priority items, cancel distracting projects, delegate and not allow subordinates to delegate up to you. You must speak with passion and feeling,

and make it infective. Behaving urgently does not mean constantly running around and creating stress for others, that is false urgency, you must be urgent patience. Ask a trusted colleague to look at all you do to know what you have to change in your behavior to send the write message (Kotter, 2008).

Find opportunity in crises.

- Always think of crises as potential opportunities;
- Don't forget that crises do not automatically reduces complacency;
- To use a crisis to reduce complacency make sure it is visible, related to real business and creates a challenge;
- Develop specific plans of action imagining how people will react, and implement the plans swiftly;
- Plans and actions must focus others hearts as much or more than minds;
- Do not wait for a crisis to solve your problems;
- If you consider creating a crisis to raise urgency, take care, you can lose control or people don't like to be manipulated;
- If you are not on the top, but see the opportunity in a crisis, identify an approachable and more powerful person, who you can take the lead with your warnings. (Kotter, 2008)

Deal with the Urgency Killers. Some people are highly skilled urgency killers, they will do anything to discredit those who are trying to create a sense of urgency and to derail processes that attempt to create change. They are more than skeptics; they cannot be convinced by any evidence, don't waste time trying to co-opt an Urgency Killer and never ignore one, otherwise they will certainly work on the backstage to mine your effort. So you must identify them and use one or more of this three strategies to deal with them (Kotter, 2008):

- Create an active distraction to an Urgency Killer far away from where urgency needs to be increased, pairing them with someone who understands that must keep them away;
- Get rid of them (not always possible);
- Immobilize them with social pressures. (Kotter, 2008)

Sense of urgency is something expected from emergency response organizations and one of the reasons for choosing them for this research, but to apply any findings to other organizations the importance to create the desired sense of urgency must be considered to effectively implement changes.

Supply chain resilience overview

Supply chain networks are inherently vulnerable to disruption and the failure of any one element in it could cause the whole network to fail. Rice and Caniato (2003) identified that the first step to create a supply chain network that is both secure and resilience is to recognize that security is different from resilience. According to them, actions to improve security can be classified into three categories: physical security, information security and freight security. However, actions to improve resilience can be divided into two categories: flexibility and redundancy. In their article they present the following table (Table 4) with possible actions to increase resilience to disruption and the correlated advantages and disadvantages. The organization should pursue those particular responses that make the most sense for them based on a range of operational and market factors.

Resilience to Disruption in …	Action	Advantages	Disadvantages
Supply	Use multiple and/pr local sources in different locales.	Spreads risk across multiple firms, multiple locations; local source protects against international supply shortages.	Higher cost to qualify supplier, lower volume leverage, no assurance additional supplier is more resilient.
	Use single source	Known supplier, high supplier commitment, leveraged volume.	Vulnerable to disruption unless supplier has multiple flexible sites, backup plans.
	Contract for supplier flexibility.	Contract obligates supplier in advance.	Potentially higher cost per unit, may entail fixed costs for "take or pay" committed volume.
	Modify inventory levels.	Right parts inventory and risk pooling may reduce inventory costs.	Requires periodic analysis by item as conditions change.
	Modify product to use standard parts.	Reduces part and inventory cost, complexity.	Costly to modify existing materials standards.
Transportation	Prepare for and use multiple modes.	Pre-disruption relationship ensures support during crisis.	May need to commit volume to the alternate modes to get access during disruption
	Use spot market for capacity.	Efficient transaction with no upfront or lasting commitment.	Unknown carrier means added risk, potential Transportation for high pricing.
	Use logistics providers to source transportation.	Providers have greater leverage and access.	Requires commitment (volume, cost) and relationship with logistics provider.
Production facilities	Use multiple sites, each making multiple products.	Enables shifting production around locations.	Requires standardization in production operations, additional capital for additional facilities.
	Modify inventory levels and policies.	Right finished-goods-inventory levels and risk pooling may reduce inventory costs.	Requires periodic analysis, potential redesign of supply network.
	Modify product to use standard processes.	Leverages common processing capabilities for lower cost, easy backup available.	Costly to modify product and production processes.
	Identify and contract backup production facilities.	Committed backup assured, potential to co-locate at supplier or customer.	Not dependable without contingency contract for the facilities in disruption.
Communications	Use full range of communication media.	Able to communicate in nearly any event.	Must maintain a broad range of old and new technology.
	Back up data.	Protects against data loss.	Still requires physical system in event of full system loss.
	Contract for backup IT system.	Provides for near-term system availability.	Potential delay in immediate response to massive system disruption.
	Set up and operate parallel or mirrored IT system.	Affords immediate system availability.	Requires building, operating, and maintaining separate system in protected environment.
Human Resources	Develop cross-trained workers.	Enables shifting of employees and production as needed.	Must cross-train employees and modify work system to utilize multi-skilled employees.
	Modify production process for unskilled labor.	Allows rapid increase or decrease in capacity.	Requires simplification of production process, not always feasible.
	Back up knowledge.	Best practices captured and documented.	Requires significant investment to capture and maintain knowledge in useful form.

Table 4. Supply chain resilience responses by failure mode (Rice and Caniato, 2003)

Resilience should be distinguished from robustness and flexibility. All three are strategies to address problems of supply chain disruptions, and a best practice supply

chain is likely to include all three, making it robust, flexible and resilient at the same time. Asbjornslett and Rausand (1997) defines the following:

Robustness is the ability to accommodate any uncertain future events or unexpected developments such that the initially desired future state can still be reached. **Flexibility** is the ability to defer, abandon, expand, or contract any investment towards the desired goal. **Resilience** is the ability of a system to return to its original state or state or move to a new desirable state after being disturbed.

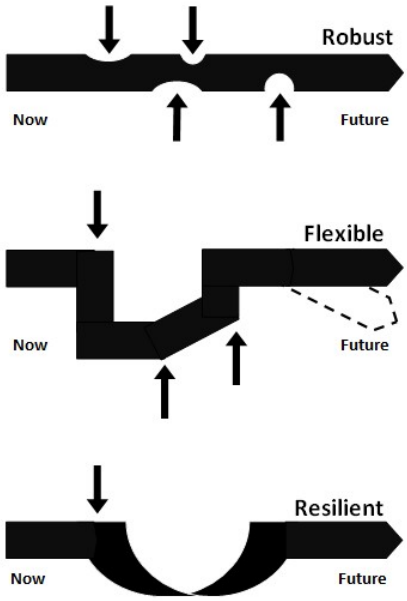

Figure 5. Differences between robustness, flexibility and resilience (Husdal, 2009)

Husdal (2009) agrees with these definitions, alleging that the three are different sides of the same coin, yet at the same time very different (see Figure 5). **Robustness** refers to the ability to endure changes in the environment without adapting whereas **flexibility** is the inherent capability to modify current operations to accommodate and successfully adapt to such changes. **Resilience**, in essence, is the ability to survive these

changes despite severe impact. The Figure 5 from the article synthesizes this idea. The ability to survive (resilience) is likely to be more important in a business setting than the ability to quickly regain stability (robustness) or the ability to change course (flexibility or agility).

Starting with definitions is important, but what this research is looking for are answers to better prepare a supply chain for a disruption or crisis, and how to react when the unexpected hits the supply chain. Natarajarathinam et al. (2009) studied 118 peer-reviewed and published articles and, although they did not come with a direct answer, they came with an interesting classification framework. The **source** of a crisis can be internal or external. The **scale** of a crisis may affect only a single company, or the whole or part of a supply chain, or may have wider and regional impacts. The **stage** of a crisis refers to the level of crisis management: mitigation, preparation, response and recovery. The **research methodology** used in the literature is sometimes analytical, empirical, conceptual or applied. The **respondents** are divided into for-profit and not-for-profit (e.g. government) organizations, assuming that either organization puts a different value on crisis management. Table 5 shows how this framework is simple and comprehensive, using 5 factors and 15 sub-factors to distinguish studies in supply chain. Their review was based on literature of both SCM and operations research/management science journals.

Source	- Internal - External
Scale	- Company - Supply chain - Region
Stage	- Mitigation - Preparation - Response - Recovery
Research method	- Analytical - Empirical - Conceptual - Applied
Respondent	- For-profit - Not-for-profit

Table 5. Classification framework for studies in supply chain (Natarajarathinam et al.,2009)

In the review done by Natarajarathinam et al. (2009), they developed insights listed in Table 6, identifying some gaps, including the **lack of literature on not-for-profit supply chains**.

- There is more research on external sources than internal sources o More needs to be done on internal sources
- There appears to be more research on the two proactive levels than the reactive levels o How to recover needs to receive more attention
- There is limited empirical research on how supply chain managers plan to handle crises o There is a need to develop scales for the right level of crisis management
- There is a clear lack of literature on not-for-profit supply chains o More research is needed for not-for-profit organizations
- Most of the research looks at crises from the perspective of a single member, while missing the wider picture o How does a supply chain crisis affect an entire region?
- Many of the models and solutions are developed for a specific crisis (or/and a specific company or industry) o What is needed is the development of more generic management tools

Table 6. Natarajarathinam et al. (2009)'s insights and implications

Supporting this concern, Beresford and Pettit (2009) analyzed commercial logistics' ideas and solutions in humanitarian supply chains, studying emergency logistics and risk mitigation in Thailand following the Asian tsunami in 2004. They cite that the literature on commercial supply chain management is extensive and often related to specific industries, reflecting the fact that logistics or supply chain solutions may not be directly transferable between industries, and concluded that commercial logistics is as well seldom directly transferable to humanitarian logistics.

The idea behind the disruption profile of Figure 1 (Sheffi and Rice, 2005) presented in Chapter I is not new. The same argument in Einarsson and Rausand (1998) adds that many companies are blissfully unaware of their vulnerability, and that a risk and vulnerability analysis is a small step towards better preparedness. Their article shows

how to do a **vulnerability analysis**, with the objectives listed below. The focal point of a vulnerability analysis is the survivability of the system.

- Identify potential threats to the system
- Verify that the vulnerability of the system is acceptable
- Verify that the system has adequate security and safety
- Evaluate the cost-effectiveness of proposed actions
- Aid in establishing an emergency preparedness plan
- Help design a robust or resilient system (Einarsson and Rausand, 1998)

For achieving optimal resilience the vulnerability analysis should be followed by a **capability analysis**, as presented by Pettit, Fiksel and Croxton (2008). According to them, an optimal resilience is defined as the balance between vulnerabilities (fundamental factors that make an enterprise susceptible to disruptions), and capabilities (attributes that enable an enterprise to anticipate and overcome disruptions). **Optimal resilience occurs when capabilities are managed to best fit the inherent vulnerabilities of the supply chain**. Deviation from this balance would be considered as a resilience gap, either eroding profits through excess capabilities or creating excessive risk through less than optimal capabilities.

Sheffi (2005b) uncovered key themes in how organizations can build resilience in commercial enterprises. Companies can develop resilience in three main ways: **increasing redundancy, building flexibility, and changing the corporate culture**.

Redundancy. In theory, resilience can be built by creating redundancies throughout the supply chain. The organization could hold extra inventory, maintain low capacity utilization, have many suppliers, etc, but although redundancy can provide some room to continue operating after a disruption, typically it is a temporary—and very expensive—measure. The company must pay for the redundant stock, capacity, and

workers; moreover, such excesses are likely to lead to sloppy operations, reduced quality, and significant cost increases. A focus on redundancy actually inhibits an organization's ability to achieve efficiency with strategies such as the Toyota Production System, lean production processes, and Six Sigma practices (Sheffi 2005b).

Flexibility. In contrast, when a company increases supply chain flexibility, it can both withstand significant disruptions and better respond to demand fluctuations. To achieve built-in flexibility, a company should take the following actions (Sheffi, 2005b):

- Adopt standardized processes. Master the ability to move production among plants by using interchangeable and generic parts in many products, relying on similar and even identical plant designs and processes across the company, and cross-training employees. Interchangeable parts, production facilities, and people allow a company to respond quickly to a disruption by reallocating resources where the need is greatest.
- Use concurrent instead of sequential processes. Employing simultaneous rather than sequential processes in such key areas as product development and production/distribution speeds up the recovery phase after a disruption and provides collateral benefits in improved market responses.
- Plan to postpone. Design products and processes for maximum postponement of as many operations and decisions as possible in the supply chain. Keeping products in semifinished form affords flexibility to move products from surplus to deficit areas. It also increases fill rates and improves customer service without increasing inventory carrying costs, because the products can be completed when more accurate information about what the customer wants becomes available.
- Align procurement strategy with supplier relationships. If a company relies on a small group of key suppliers, it must maintain a deep relationship with each. Such suppliers are so vital to an enterprise that the failure of any among them can have a catastrophic effect on that enterprise. By knowing each trading partner intimately, a company can better monitor the group to detect potential problems—and rely on them for help to deal in unforeseen circumstances. On the other hand, if a company is not closely allied with a small group of suppliers, its supplier network had better be extensive if it is to be resilient and responsive to the market. A company with shallow relationships is less knowledgeable about its trading partners and therefore

> less likely to be forewarned about supply problems. Therefore, maintaining a large network of arm's-length suppliers would distribute the risk should a failure occur. Neither strategy is necessarily correct; the issue is to choose the approach that aligns a company's supplier relationships with its procurement strategy. (Sheffi, 2005b)

Cultural change. After a disruption, the factor that clearly distinguishes those companies that recover quickly, and even profitably, from those that falter is corporate culture. On the surface, they may not seem to have much in common, but these resilient organizations share several cultural traits (Sheffi, 2005b):

> - Continuous communication among informed employees. They keep all personnel aware of the strategic goals, tactical factors, and day-by-day and even minute-by-minute pulse of the business. Thus, when a disruption takes place, employees know the company's status: what is selling, where the raw materials are, what it is they were trying to do before the disruption hit, and so on. They can use that knowledge to make better decisions in the face of the unforeseen.
> - Distributed power, so that teams and individuals are empowered to take necessary actions. Before a potential disruption is even visible to managers, those that are thus empowered and are "close to the action" can take necessary measures; moreover, they can respond quickly, significantly enhancing the chances of containing a disruption early on.
> - Passion for work. Successful companies engender a sense of the greater good in their employees.
> - Conditioning for disruptions. Resilient and flexible organizations are apparently conditioned, as a result of frequent and continuous "small" operational interruptions, to become innovative and flexible in the face of HILP (high impact low probability) disruptions. (Sheffi, 2005b)

In the following section, ideas from the emergency management literature are presented to assess and mitigate vulnerabilities, as well as worth capabilities that can further improve resilience.

Emergency management

Emergency response organizations have the necessary sense of urgency to constantly seek for ways to apply the necessary changes to increase the system's resilience. Their practices are more applicable to the Air Force as a not-for-profit organization.

According to FEMA (2009), the disaster life cycle describes the process through which emergency managers **prepare** for emergencies and disasters, **respond** to them when they occur, help people and institutions **recover** from them, **mitigate** their effects, **reduce the risk** of loss, and **prevent** disasters such as fires from occurring.

It is important to explain the roles of state and local emergency management organizations and their collaborative affiliations with FEMA. The states are given the responsibility for public health and safety under the U.S. Constitution. The federal government becomes involved only after the state government has requested assistance or when it is apparent that the state agencies are or will be unable to fulfill their basic functions. However, the federal government is the primary source of the funding for public health and safety programs, with the states and communities as the primary recipients, resulting in a strong federal presence in emergency management. The competition for oftentimes scarce resources, coupled with the immediate priorities of state and local governments, has ensured a strong federal influence in emergency management – a trend that may be changing (Haddow, Bullock and Coppola 2008: xvi). See Figure 6 for an overview of activation of federal assistance (DHS, 2008).

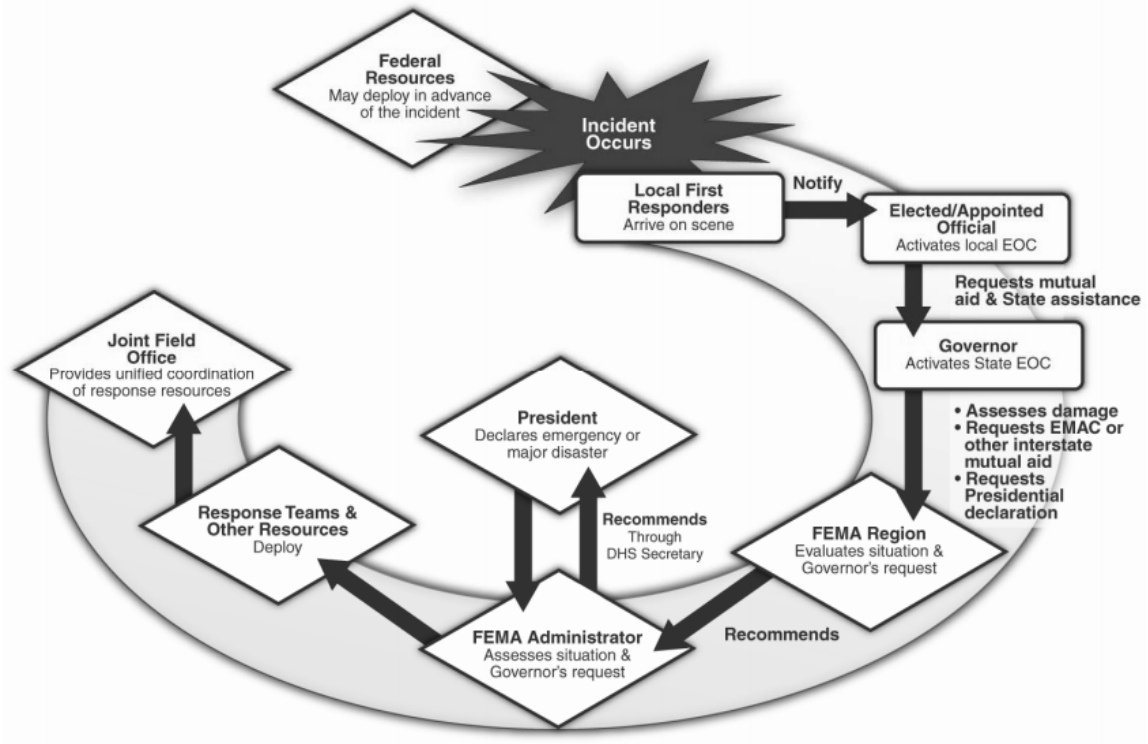

Figure 6. Overview of activation of federal assistance (DHS, 2008)

Hurricane Katrina brought some lessons to avoid the disorder and ineffectiveness of the government's response. Haddow, Bullock and Coppola (2008) discussed the reasons for this chaos to happen in the United States and included the deconstruction of FEMA, the transfer of significant expertise and financial resources out of FEMA to other priorities within the Department of Homeland Security, a change at all government levels from an all-hazards focus to one that favors terrorism above all else, and a lack of political commitment and leadership to emergency management. The rush by the emergency community to follow the new terrorism money may have been shortsighted, but it is understandable because the discipline historically has been dramatically underfunded (Haddow, Bullock and Coppola, 2008:388).

The U.S. Government Accountability Office (GAO) is known as "the investigative arm of Congress," supporting the Congress in meeting its constitutional responsibilities and helping improve the performance and accountability of the federal government for the benefit of the American people. Their report GAO-06-365R (GAO, 2006) identified the following three key lessons to avoid problems in the response as seem with Hurricane Katrina:

> - Clear and decisive leadership. Prior to a catastrophic event, the leadership roles, responsibilities, and lines of authority for the response at all levels must be clearly defined and effectively communicated in order to facilitate rapid and effective decision making, especially in preparing for and in the early hours and days after the event.
> - Strong advance planning, training, and exercise programs. To best position the nation to prepare for, respond to, and recover from major catastrophes like Hurricane Katrina, there must be strong advance planning, both within and among responder organizations, as well as robust training and exercise programs to test these plans in advance of a real disaster. Although it is expected a proactive national response in the event of a catastrophe, the nation does not yet have the types of detailed plans needed to better delineate capabilities that might be required and how such assistance will be provided and coordinated. In addition, it was observed that the training and exercises necessary to carry out these plans were not always developed or completed among the first responder community. The leadership to ensure these plans and exercises are in place must come from DHS (Department of Homeland Security) in conjunction with other agencies, state and local authorities, and involved nongovernmental organizations.
> - Capabilities for a catastrophic event. Response and recovery capabilities needed during major catastrophic event differ significantly from those required to respond and recover from a “normal” disaster. Key capabilities such as emergency communications, continuity of essential government services, and logistics and distribution systems underpin citizen safety and security. In addition, as these capabilities are brought to bear, streamlining, simplifying, and expediting decision making must quickly replace “business as usual” approaches to doing business. Better contingency plans and the resources to carry them out are needed to all identified capabilities.
>
> (GAO, 2006)

One recent article, Stewart, Kolluru and Smith (2009), studied if public-private partnerships could improve community resilience. In essence they concluded that in order to achieve community resilience, **public and private owners of critical infrastructures and key resources must work together, before, during and after a disaster**. The key issue is to recognize and embrace the public-private interfaces that can improve the ability of a community to manage the response and recovery phases of disaster management. This is important because much of the critical infrastructure necessary for a disaster response is in private, not in public hands. Of course it depends on which country the disaster hit, but in much of Europe and particularly in the U.S., it is true.

Much of the disaster management research relates to social sciences. This type of research focuses on disaster results, sociological impacts on communities, psychological effects on survivors and rescue teams, and organizational design and communication problems. Altay and Green (2006) tried to compile OR/MS research in disaster operations management. First they defined disaster operations as the set of activities that are performed before, during, and after a disaster with the goal of preventing loss of human life, reducing its impact on the economy, and returning to a state of normalcy. OR/MS was defined as a scientific approach to aid decision making in complex systems. Their search resulted in 109 articles. About 44% of all the papers reviewed address mitigation, with nearly half of them on risk analysis. The article presents Table 7 with the typical activities of disaster operations management, important to understand the concerns of the emergency community. Many gaps were identified and suggested for

future research, and the authors recognized the fact that even the best programs developed will not be adopted by all participants, due to various reasons including time, staff availability and interest, funding, personalities, resistance to state intrusiveness, and denial.

Mitigation
- Zoning and land use controls to prevent occupation oh high hazard areas - Barrier construction to deflect disaster forces - Active preventive measures to control developing situations - Building codes to improve disaster resistance of structures - Tax incentives or disincentives - Controls on rebuilding after events - Risk analysis to measure the potential for extreme hazards - Insurance to reduce the financial impact of disasters
Preparedness
- Recruiting personnel for the emergency services and for community volunteer groups - Emergency planning - Development of mutual aid agreements and memorandums of understanding - Training for both response personnel and concerned citizens - Threat based public education - Budgeting for and acquiring vehicles and equipment - Maintaining emergency supplies - Construction of an emergency operations center - Development of communications systems - Conducting disaster exercises to train personnel and test capabilities
Response
- Activating the emergency operation plan - Activating the emergency operations center - Evacuation of threatened populations - Opening of shelters and provision of mass care - Emergency rescue and medical care - Fire fighting - Urban search and rescue - Emergency infrastructure protection and recovery of lifeline services - Fatality management
Recovery
- Disaster debris cleanup - Financial assistance to individuals and governments - Rebuilding of roads and bridges and key facilities - Sustained mass care for displaced human and animal populations - Reburial of displaced human remains - Full restoration of lifeline services - Mental health and pastoral care

Table 7. Typical activities of disaster operations management (Altay and Green, 2006)

Technology implementation can also play an important role as seen in the detailed framework proposed by Pathan and Hong (2006), who studied of an efficient **Disaster Management Communication and Information System** which takes the advantage of the next-generation **wireless networks**. While the networks would help for quick and reliable data delivery from the disaster hotspots, other associated technologies like disaster prediction or forecasting, databases, web services, intelligent systems, image processing etc. should work collaboratively for tackling disasters successfully. Moreover, acquiring secured data at every step is very crucial. Communications and Information Technologies, skills, and media are essential **to link** scientists, disaster mitigation officials, and the public; **to educate** the public about disaster preparedness; **to track** approaching hazards; **to alert** authorities; **to warn** the people most likely to be affected; **to assess** damage; **to collect** information, supplies, and other resources**; to coordinate** rescue and relief activities; **to account** for missing people; and **to motivate** public, political or institutional responses.

Technology is already a reality in Public Health, with **real-time surveillance for emergency preparedness**, as shown by Chretien et al (2009). Public health agencies conduct surveillance to identify and prioritize health issues and evaluate interventions. Recently, natural and deliberate epidemics have motivated supplementary approaches to traditional surveillance methods based on physician and laboratory reporting. Fueled initially by post–September 11, 2001, bioterrorism-related funding, and more recently used for detecting natural outbreaks, these systems, many of which are called ‘‘syndromic’’ systems because they focus on syndromes recorded before the diagnosis, capture real-time health data and scan for anomalies suggesting an outbreak. Although

these systems as typically implemented have often proven unreliable for detecting natural and simulated epidemics, real-time health-related data hold promise for public health.

Somers and Svara (2009) alert that professional, local managers must seek to identify and prepare for all risks, regardless of which threats are receiving official attention in the programs of the federal and state government and are currently salient to the public. They also presented seven broad areas, listed bellow, on which local government managers should focus attention in order to ensure the appropriate handling of emergency management:

- Shaping the agenda and focusing attention
- Hiring and developing professional staff
- Promoting intra- and interorganizational cooperation and coordination
- Determining approach to planning and organization
- Planning for response and continuity of government
- Practicing and fine-tuning plans
- Developing an Incident Management System and emergency Operations Center (Somers and Svara, 2009)

The concepts and practices of management have changed from a traditional mindset to a new standard mindset. Now, an emergence mindset is forming, with the differences shown in Table 8 (Cunha et al., 2001).

	Traditional Mindset	New Standard Mindset	Emergence Mindset
Resources	Optimizing (doing the best with the best resources)	Satisficing (doing the possible with the available)	Bricolating (do the best with the available)
Means	Planning	Action	Planning and action
Ends	Efficiency	Effectiveness	Efficient effectiveness
Structure	Integration via hierarchies (visible control)	Integration via networks (invisible control)	Integration via minimal networks (clear responsibilities and deadlines = minimal controls = autonomy and flexibility)
Leadership	Authoritarian leadership	Democratic leadership	Authoritarian democratic leadership (managers ensure that minimal controls are respected, but accept the direction of the transient leader)

Table 8. Comparison of management styles (Cunha et al., 2001)

III. Methodology

Overview

This chapter summarizes the chosen methodology for organizing the research design, collecting relevant data and analyzing. This research reviewed literature on qualitative research and selected a grounded theory construction approach through multiple case studies. Using guidance from the literature, a series of questions were constructed for the Interview Protocol. The resultant interviews were the main source of data. Once the data was collected, a variety of case study and grounded theory construction analytical tools were employed and used to draw the conclusions outlined in chapters four and five.

Research Design

Gibbons et al. (1994) argue that we are currently experiencing a fundamental shift towards the reflexive production of more trans-disciplinary knowledge. In this new "mode" of production, knowledge is increasingly generated by users in the context of its application and in the field of management, this mode of knowledge-production system would bring together the "supply side" of knowledge, including universities, with the " demand side" , including businesses (Gibbons et al., 1994:7). The effectiveness of the whole system depends on a rapid interplay between management theory and practice (Tranfield and Starkey, 1998). Working together in a mutually trans-disciplinary frame, academics and managers attempt to learn from each other in a virtuous cycle of

understanding, explication and action (Partingtom, 2000). Academics learn from managers, processing deeds and words into normative benchmarks and blueprints for management practice, and in parallel managers learn from academics, developing and applying practically derived theories (Partington, 2000).

Glasser and Strauss (1967), founders of the term **grounded theory**, felt a need to provide a counterbalance to the dominance of the dogmatic concern in sociology with the rigorous verification of logically derived theories, which had allowed the persistence of a perceived embarrassing gap between theory and empirical research. In contrast, **grounded theory is derived from empirical data**. Glaser and Strauss (1971) offered four criteria which theory must satisfy to be considered useful: they would **fit** the real world; they would **work** across a range of contexts; they would be **relevant** to the people concerned; and they would be readily **modifiable**.

Partington (2000) states that the twin foundations of grounded theory are **theoretical sampling**, where the data collection process is controlled by the emerging theory, together with the **constant comparison** method of joint data coding and analysis. Although Glaser and Straus (1967) state that generated theories may be presented as a well-codified set of propositions or in a running theoretical discussion, it is the latter form, characterized by richly descriptive interpretation, which dominates their own work (Partington, 2000).

Theoretical sampling, according to Charmaz (2006), means seeking data to develop your emerging theory with the main purpose of elaborating and refining the categories constituting your theory. This means conducting theoretical sampling by sampling to develop the properties of your categories **until no new properties emerge**. Consequently , one must **saturate** categories with data and subsequently **sort** them to integrate the emerging theory. The advantage of conducting theoretical sampling is that it keeps the researcher from becoming stuck in unfocused analyses (Glasser and Straus, 1967). When engaging in theoretical sampling, the researcher seeks people, events, or information to illuminate and define the boundaries and relevance of the categories, and because the purpose is to sample to develop the theoretical categories, conducting it can take the researcher across substantive areas (Charmaz, 2006). Categories are saturated when gathering fresh data no longer sparks new theoretical insights, nor reveals new properties of these core theoretical categories.

This method overlaps with the case study approach and both were used in this research. According to Yin (2009) case study is an empirical inquiry which focuses on a contemporary phenomenon within its real-life context and boundaries between phenomenon and its context are not clearly evident. The method used was qualitative with a multiple-case studies design.

Validity and Reliability

This research quality was applying tactics described by Yin (2009) to increase construct validity, internal validity, external validity and reliability (definitions on Table 9). The tactics were applied throughout the subsequent conduct of the case studies, not just at the beginning, so the research design was actually being improved beyond the initial design plans.

Test	Definition
Construct validity	Identifying correct operational measures for the concepts being studied
Internal validity	Seeking to establish a causal relationship, whereby certain conditions are believed to lead to other conditions, as distinguished from spurious relationships. Only for explanatory or causal studies and not for descriptive or exploratory studies.
External validity	Defining the domain to which a study's findings can be generalized
Reliability	Demonstrating that the operations of a study, such as the data collection procedures, can be repeated with the same results

Table 9. Definitions of the four tests for judging research design quality (Kidder and Judd, 1986)

Yin (2009) recommended for each test the case study tactics listed in Table 10, and the associated phase of research when the tactic should be used. In the course of this research, where it was possible, those tactics were applied, when they do not compromised the exploratory essence of the study. For example, although it was expected to observe the same kind of practices across the participant organizations, the research intended not to ignore good practices even if they are only performed by one organization. That does not change the fact that, for including eight different kind of emergency response organizations of different sizes and goals, we end up increasing the validity and reliability of the research.

Tests	Case study tactic	Phase of research in which tactic occurs
Construct validity	- use multiple sources of evidence - establish chain of evidence - have key informants review draft of case study report	data collection data collection composition
Internal validity	- do pattern matching - do explanation building - address rival explanations - use logic models	data analysis data analysis data analysis data analysis
External validity	- use theory in single-case studies - use replication logic in multiple-case studies	research design research design
Reliability	- use case study protocol - develop case study database	data collection data collection

Table 10. Case study tactics for four design tests (Yin, 2009)

Data Collection

The data collection method used in this qualitative research to look for best practices in emergency response organizations was **intensive interviewing**. Charmaz (2006:25) states that intensive interviewing allows an in-depth exploration of a particular topic or experience and, thus, is a useful method for interpretive inquiry; its in-depth nature fosters eliciting each participant's interpretation of his or her experience. The interviewer seeks to understand the topic and the interview participant has the relevant experiences to shed light on it, thus the questions ask the participant to describe and reflect upon his or her experiences in ways that seldom occur in everyday life (Charmaz, 2006:25). The interviewer is there to listen, to observe with sensitivity, and to encourage the person to respond; therefore in this conversation the participant does most of the talking. "Both grounded theory methods and intense interviewing are **open-ended** but directed, shaped yet emergent, and paced yet **flexible** approaches" (Charmaz, 2006:28).

See the advantages of intensive interviewing for the interviewer in Table 11, and the advantages for the interviewees in Table 12.

Intensive interviews allow an interviewer to:
• Go beneath the surface of the described experience(s)
• Stop to explore a statement or topic
• Request more detail or explanation
• Ask about the participant's thoughts, feelings, and actions
• Keep the participant on the subject
• Come back to an earlier point
• Restate the participant's point to check for accuracy
• Slow or quicken the pace
• Shift the immediate topic
• Validate the participant's humanity, perspective, or action
• Use observational and social skills to further the discussion
• Respect the participant and express appreciation for participating

Table 11. Advantages of intensive interviewing for the researcher (Charmaz, 2006)

Intensive interviews allow interviewees to:
• Break silences and express their views
• Tell their stories and give them a coherent frame
• Reflect on earlier events
• Be experts
• Choose what to tell and how to tell it
• Share significant experiences and teach the interviewer how to interpret them
• Express thoughts and feelings disallowed in other relationships and settings
• Receive affirmation and understanding

Table 12. Advantages of intensive interviewing for the research participants (Charmaz, 2006)

Questions must explore the interviewer's topic and fit the participant experience, and should be asked slowly to foster the participant's reflections, and these kind of questions are sufficiently general to cover a wide range of experiences and narrow enough to elicit and elaborate the participant' specific experience (Charmaz, 2006:28). In this research, for example, we included in the Interview Protocol questions covering all

phases of a disaster: preparedness, detection, response and recovery. When stories tumble out, all the researcher needs to do is to be receptive and make a few clarifying questions or comments to keep the story coming, in our research trying to get the best practices and desired improvements of disaster management. At this point, when everything works as expected, the Interview Protocol become more a guide to keep track of what still have to be covered.

At some point this research had to stop gathering data. As already mentioned, the criteria used to dictate this was to stop when the categories were **saturated** and no new theoretical insights were revealed. This happened when we got to 8 different organizations. But grounded theory saturation is not the same as witnessing repetition of the same events and stories (Charmaz, 2006). Glasser (2001:191) stated a sophisticated view of saturation, as follows:

> **"Saturation** is not seeing the same pattern over and over again. It is the conceptualization of comparisons of these incidents which yield different properties of the pattern, until no new properties of the pattern emerge. This yields the conceptual density that when integrated into hypotheses make up the body of the generated grounded theory with theoretical completeness."

Along with the questions in the Interview Protocol **Likert scale** (Likert, 1932) items were also included for the main topics, as seen in the Appendix A (Interview Protocol). The main intention was to use the same items in future surveys to increase external validity and also to make comparisons between the participant organizations. Unfortunately, after some attempts, it was observed that those items were responsible to interrupt the flow of the interview or to make the participant uncomfortable, potentially affecting the main goal of the research, so they were not used.

Research Questions

The goal was to uncover the best practices of emergency response organizations that can be applied to improve effectiveness and efficiency of operations, thus creating a more resilient organization.

The participants were asked a series of questions relating to the best practices of their organization in the typical activities of emergency management (preparedness, detection, response and recovery) and improvements they would like to see in the next 5 years. All participants were engaged in disaster management activities on their organizations.

Interview Protocol

See Appendix A.

IV. Analysis and Results

Overview

This chapter presents and explains the analysis and results of this study. First, the chapter describes the analysis process. For each category (preparedness, detection, response and recovery) and sub-categories, the bullets indicate typical statements from the participants of the interviews, explaining how the emergency system works from their point of view, what challenges exist, and what improvements they expect. These insights were summarized in a table and were related to emergency management activities and a brief analysis was executed to relate these best practices with the literature on supply chain management, change management and supply chain resilience. Coding helped to visualize the existing relations between emergency management practices and literature.

Analysis description

A necessary step to expedite the analytic work and accelerate productivity was to write informal analytic notes, commonly called memos. Memo-writing constitutes an essential method in grounded theory because it prompts the researcher to analyze the data and codes early in the research process (Charmaz, 2006:72). Through writing memos, one constructs analytic notes to explicate and fill out categories, helping to think about the data and to discover ideas about them (Charmaz, 2006:73). See advantages of memo-writing at Table 13.

Memo-writing helps you to:
• Stop and think about your data • Treat qualitative codes as categories to analyze • Develop your writer's voice and writing rhythm • Spark ideas to check out in the field setting • Avoid forcing your data into extant concepts and theories • Develop fresh ideas, create new concepts, and find novel relationships • Demonstrate connections between categories • Discover gaps in your data collection • Link data-gathering with data analysis and report-writing • Build whole sections of papers and chapters • Keep involved in research and writing • Increase your confidence and competence.

Table 13. Advantages of memo-writing (Charmaz, 1999)

Charmaz (2006) states that no single mechanical procedure defines a useful memo and one should do what is possible with the material that he or she has, and any of the following can be done in a memo:

- Define each code or category by its analytic properties
- Spell out and detail processes subsumed by the codes or categories
- Make comparisons between data and data, data and codes, codes and codes, codes and categories, categories and categories
- Bring raw data into memo
- Provide sufficient empirical evidence to support your definitions of the category and analytic claims about it
- Offer conjectures to check in the field setting(s)
- Identify gaps in the analysis
- Interrogate a code or category by asking questions of it.

(Charmaz, 2006:82)

Coding

Coding means categorizing segments of data with a short name that simultaneously summarizes and accounts for each piece of data. Codes show how data was selected, separated, and sorted to begin an analytic accounting of them. The codes used in this research were related to the four disaster phases: preparedness, detection, response and recovery. There were also sub-categories that were related to the questions of the Interview Protocol, like risk assessment, planning, mitigation, etc. Each one will be addressed in the analysis. See coding for categories and subcategories in Table 14.

Coding for categorizing insights	
Code	**Category**
Ep1	Preparedness
Ep2	- Risk assessment
Ep3	- Planning
Ep4	- Mitigation
Ep5	- Education, training and exercise
Ep6	- Performance indicators
Ep7	- Budgeting and resourcing
Ep8	- Equipment and supplies
Ep9	- Customer relationship
Ep10	- Information system
Ed1	Detection
Er1	Response
Er2	Recovery

Table 14. List of codes for relating insights to emergency management categories

During the analysis the insights of each category were related to the practices of supply chain management, change management and supply chain resilience literatures. Table 15 was used to code those relations.

The analysis will indicate topics that are more or less addressed, and maybe insights that bring a fresh idea to increase resilience.

Code	Related topic
S1	Supply chain management (Table 2 – pg.11):
S2	- Integrated behavior
S3	- Mutually Sharing Information
S4	- Mutually Sharing Risks and Rewards
S5	- Cooperation
S6	- The Same Goal and the Same Focus on Serving Customer
S7	- Integration of Processes
S8	- Partners to Build and Maintain Long-Term Relationships
C1	Change management (pg. 15):
C2	- Create enough sense of urgency between enough people
C3	- Form a strong and committed team to guide a challenged change initiative
C4	- Effort by the team to find smart visions and strategies for dealing with the issue
C5	- Communication by the team of the visions and strategies to relevant people, obtaining support and generating more urgency in the organization
C6	- Empowerment of those who are committed to turn the vision in reality, by removing the obstacles in their path
C7	- Achieve short-term wins that silence critics and disarm cynics
C8	- Never let up until the vision is a reality, avoid complacency
C9	- Make change stick by institutionalizing it into the structure, systems and culture
R1	Supply chain resilience (pg. 19):
R2	- Vulnerability analysis
R3	- Capability analysis
R4	- Redundancy
R5	- Flexibility
R6	o Adopt standardized processes
R7	o Use concurrent instead of sequential processes
R8	o Plan to postpone
R9	o Supplier relationship strategy for procurement
R10	- Cultural change
R11	o Continuous communication (distribution of knowledge)
R12	o Distributed power (empowerment of teams and individuals)
R13	o Passion for work
R14	o Conditioning for disruptions
E1	Weak relation to above topics, indicating a new insight from emergency management to increase supply chain resilience

Table 15. List of codes for relating insights to literature

Participants' Demographics

There were eight participant organizations in this research, with demographics as shown on Table 16:

Organizations	Participants
- One state-level emergency agency, where several people from distinct branches were interviewed, including the Director	10
- One association of emergency managers, where some members were interviewed collectively, all with great experience in the area	5
- One military organization responsible for emergency management on military facilities	1
- One regional organization responsible for environmental protection (hazard materials disposal)	2
- One local organization responsible for public health	4
- One local emergency agency	1
- One private organization (contractor) responsible for supporting surges of emergency medical services state-wise	2
- One fire department that also manages preparedness of regional medical response for all hazards	1

Table 16. Number of participants per organization

They were interviewed in this order, what helped to develop first a big picture of emergency management (larger organizations) and then explore further details (smaller organizations and first responders).

Insights' Coding and Analysis

Table 17 summarizes the most common insights from the interviews and relates each one to the literature (Table 15) and emergency management categories (Table 14). The insights listed on the table were cited by all or most participants, otherwise additional comments explain the reason for being listed.

#	Insight	Code	Implications/ Additional Comments
1	Preparedness is the most valuable category	Ep1|C4|R10	Indicates that one should be prepared to overcome disruptions
2	Planning and exercise are the most important sub-categories: an opportunity for integrating processes, sharing information, building personal relations, understanding others' limitations/capabilities, continuous collaboration and improvement	Ep3,5 S2-8 C2-9 R2,3,6,11-14	According to participants bringing people together plays a huge role for the importance of both.
3	Bringing people together for planning, discussing each point collectively with visual media support and copies of plans for all. Helps keeping it real, giving an opportunity to share capabilities and making communication better during events	Ep3 S2-8|C2-9 R2,3,6,11-13	R7 to this process would spare time, but important opportunities would be missed. Personal relationships are valuable to make people "put themselves in other shoes."
4	Planning reviews are usually mandatory, frequency ranging from 1 to 4 years (25% per year), but usually the feedback from events and exercises naturally results in updates. It is recommended to have the formal document signed by higher authorities for commitment.	Ep3 S3-7 C2-6,9 R10,11	Reviews are only valuable when there is a commitment of all participants, otherwise is just another useless formality.
5	Risk assessment to help prioritize actions. Usually updated when mandated or when capabilities, vulnerabilities or probabilities of occurrence changes.	Ep2,4,5,7,8 S4,S7 C2 R2,3	Although there is a trend for all-hazard approach, this assessment is considered essential to prioritize resources and actions. This relates with the optimal resilience literature.
6	Increasing trend of an all-hazard approach for preparedness. Budget is limited, so this practice save important resources (grants allow dual purpose) and time. This way you can address several hazards with common scenarios.	Ep2-5,7,8 R6,R7	This approach increases flexibility and thus resilience.

continued…

Table 17. Summary of interviews' common insights and their relation to emergency management, supply chain management, change management and resilience

Table 17: continued

#	Insight	Code	Implications/ Additional Comments
7	Exercises seen as extremely important not only to practice the plan, but also to improve it through feedbacks, although recommendations are not enforced.	Ep3,5 S2,3,7 C2,6,7,9 R10	A perfectly planned and executed exercise seems to play an important role in motivating people to improve the emergency response plans.
8	Exercises as almost the only tool to indicate performance, but they must be challenging and complex to make problems visible. People cannot be worried about looking bad. Briefing after exercise for feedback is as important as the exercise itself.	Ep5,6 S3,4 C2-5,9 R10	No other valuable performance indicator were cited, besides dispatch times for first responders and for representatives to arrive at EOC facility.
9	Frequent exercises (adding yours and others you can exercise every 2 months) of different kinds (tabletop, functional, partial, and full) and scales. Each is planned in advance (maximum of one year was observed) and it's not a surprise.	Ep5 S2,5,8 C9 R14	The military organization that participated was the only that execute a kind of surprise exercise. They only tell the week it'll happen to guarantee maximum attendance, but they don't specify day(s), time, place and kind of threat. Resilience is increased by conditioning for them.
10	Mitigation considered being closer to recovery, because of political opportunity that make funds available (avoiding to happen again). The practice is to have "shelf-ready" projects to capture funds when they are available.	Ep2,4,7|Er2 S6 C1 R2,3,6,7,10	Implementing the "shelf-ready" culture helps to increase the supply chain agility to respond.
11	When possible, apply the concept of just in time training, making equipments/processes easier to be explained (maybe only by manuals) in field briefings. The amount of people and the use of volunteers would make it hard/expensive to train everyone in advance.	Ep5,Er1 S5,6 C3,4,9 R5,6,8,10	This is a strategy of planning to postpone training that would increase resilience by speeding the response.
12	Equipment: they have an information system that lists and allow orders of assets from local, state, federal, military and contractors. If can have in 2 hrs and not using frequently (risk assessment), don't buy. Pre-arrangements are also suggested. Inventory should be built with info about priorities from risk assessment and budget. For example, shots for bio-terrorism for at least first responders and their families.	Ep2,7,8,10 S2-5,7,8 C4,9 R2,3,8,9,11	This strategy increases resilience but at the same time avoids redundancy in the supply chain. Important to share risks with your partners to keep the relation balanced.

continued…

Table 17. Summary of interviews' common insights and their relation to emergency management, supply chain management, change management and resilience

Table 17: continued

#	Insight	Code	Implications/ Additional Comments
13	Detection wasn't a concern; all considered 911 calls, news and weather forecasts to be good enough to detect disasters. But there are some other systems, like anthrax detectors in mail and disease outbreaks controls.	Ep10,Ed1 S2,3,5,6 C2,6 R11,12	Disruptions are not always so easy to timely detect. The lesson here is to give power for end-users to alert you, to observe trends in the economy (performance of your suppliers) and to develop forecasts for your demand.
14	Customer relationship through participations of emergency managers on citizens' councils and meetings. Larger agencies almost consider the local agencies and first responders as their customers.	Ep9 S2,3,5,6 C2,C8 R11	It is important to bring the outside into your organization, increasing the focus on serving the customer.
15	Response. It is the same people, just change hats. Suggestion to document everything you do (to help recovering the money later). Liaisons have an important hole to help locals, adding experience. Use of Emergency Operation Centers (people with authority to commit resources of their organizations working together and directly – not through EOC director every time). Group start to think about recovery in advance. Most would like maps and visual. Just in time training. Briefings and refreshers before going to field. Extremely important to know each other before an event (improves communication).	Ep3,5 Er1,Er2 S2-8 C2-6 R6	Involvement of the same people through all processes, from planning to recovering, helps to improve the processes. Local responders that are not used with a disruption should be assisted, to avoid over confidence, a common problem of inexperienced managers (according to participants).
16	Recovery. Should start with the response with a team doing damage assessment. Priority is to capture funds and keep money coming, recovering the critical infrastructure to let private sector do what they do best. If you exceed, people will stop doing their part and expect everything from you. Customers should also make their own plans. Opportunities for mitigation should be pursued.	Ep4,7,9 Er1,Er2 S2,4,5-8	Interesting point about sticking with your scope of responsibility, otherwise your partners in the supply chain get used to not do their part concurrently, just waiting for you to handle everything.

continued…

Table 17. Summary of interviews' common insights and their relation to emergency management, supply chain management, change management and resilience

Haddow, Bullock and Coppola (2008) states that preparedness within the field of emergency management can best be described as a state of readiness to respond to a disaster, crisis, or any kind of emergency situation; and that preparedness is not only a state of readiness but also a theme throughout most aspects of emergency management. Therefore it was not a surprise that this topic dominated the research's Interview Protocol and the participants' awareness, therefore it was sub-divided in sub-categories.

On the next and final chapter this research will explore the challenges of doing this research, the managerial implications of the results, limitations of the research and suggestions for future research.

Results in the Disruption Profile

Closing this chapter, a list of best practices from emergency management was organized according to the disruption profile of Sheffi and Rice (2005). See Figure 7 and Table 18. Emergency management best practices applied to Sheffi and Rice's (2005) Disruption Profile

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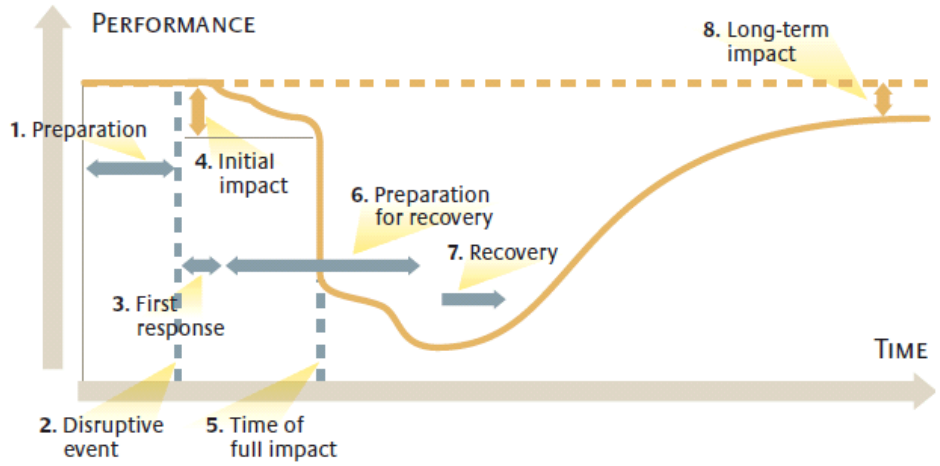

Figure 7. Disruption profile revisited (Sheffi and Rice, 2005)

Emergency Management Lessons in Each Phase # of the Disruption Profile: Increasing Supply Chain Resilience	
1 Preparation	Risk assessment to prioritize actions/plans/training/resources; Adopt an all-hazard approach when possible, one solution for multiple problems; Planning and reviewing plans collaboratively together; Bringing people together is an opportunity for integrating processes, sharing information, understanding others limitations/capabilities, building personal relationships and continuous improvement; Frequent exercise as a indicator of performance and source of feedback to improve resilience, but must be challenging and complex to bring problems; Share information about equipment available; Prepare shelf-ready mitigation plans to use when funds become sudden available.
2 Detection	Give power to your customers to alert you about the occurrence of a disruption; Try to develop controls to detect variations from the standard.
3, 4 First response	Send someone to help and to keep you informed; Use of briefings and refreshers to activate response plans; Keep Liaisons close to important partners; Just in time training; Activate operation center team with authority to commit resources from their organizations; Document everything you from the beginning, you can recover the money latter; Form team for recovery efforts.
5, 6, 7 Initial recovery	Recovery team should start damage assessment to use in recovery efforts; priority is to capture funds and keep money coming; use the opportunity of political pressures to activate mitigation plans with available funds and avoid future disruptions; Recover critical structure first to let private sector do what they do best.
8 Long term recovery	Don't exceed, or customers/partners will stop doing their part and expect everything from you; Customers should also make their own plan; Opportunities for mitigation should be pursued; Lessons learned should be shared and plans should be updated, get feedbacks.

Table 18. Emergency management best practices applied to Sheffi and Rice's (2005) Disruption Profile

V. Conclusions

Overview

On this final chapter it is explored the managerial implications of the results, the challenges conducting this research, limitations of the results and suggestions for future research.

Managerial implications

On the previous chapter many insights from emergency management related to increasing the supply chain resilience were listed on Table 17 (pp.49-51). As stated in earlier chapters, the importance of observing emergency response organizations was that most of them are also on the public sector (not-for-profit) and their cultures have an innate sense of urgency to constantly improve their processes and the ability to prepare for the unexpected.

The least observed characteristic to improve resilience from their insights was increasing redundancy. Most were related to risk assessment (vulnerabilities vs. capabilities analysis), increasing flexibility and changing culture. This means a focus on cost-effectiveness that we can mirror in our organization without incurring in taking more risks.

Challenges Conducting the Research

Conducting a qualitative research based on face-to-face interviews was challenging and it was essential to use the approach of ground theory construction, therefore one can start the analysis of the data before finishing the collection. This helped to improve the questions and explore details about contradictory views, and also to increase validity of the research's results.

It was a coincidence, but an almost top-down collection of data (from larger organizations to smaller ones) was conducted, and although nothing on the literature was found about it, the feeling was that it allowed to better contrast visions and explanations, starting from the big picture of larger organizations (focus on planning and supporting first responders' organizations) and ending with local organizations (focus on citizens' demands and community vulnerabilities/capabilities).

Limitations of results

External validity can be an issue because all organizations were from the same state and they were close enough to share the same culture and to maintain personal relationships and conduct face-to-face meetings.

Another issue was that although data was collected from multiple organizations across the board of emergency management, only one source of evidence (interviews) was observed, what could impact the construct validity of the research. Unfortunately for security reasons most organizations could not give access to their data.

Suggestions for Future Researches

First suggestion would be to improve the validity of the results, maybe through the application of a survey based on the results with emergency responders of different states and countries.

Another suggestion, that in reality came from one of the interviewees, would be to do a case study about utility companies, that supposedly know how to move around, have a plan, know how to do with less, have pre-arrangements with each other, and move equipment effectively and efficiently. Certainly their symbiosis of private practices with public services can be explored.

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Appendix A: Interview Protocol

Purpose of the study: To uncover the best practices of emergency response organizations that can be applied to improve effectiveness and efficiency of operations, thus creating a more resilient organization.

Benefits: You will receive a copy of the final report, including an executive summary supporting opportunities for improving your organizational performance.

Experimental procedures: You will be asked a series of questions relating to the best practices of your organization in the typical activities of emergency management (preparedness, detection, response and recovery) and improvements you would like to see in the next 5 years. This will take approximately 1 hour**.**

Participation: Your participation is completely voluntary. Your decision to not participate or to withdrawal from participation will not jeopardize your relationship with AFIT, USAF, or the DoD. Thank you for participating in this project.

Confidentiality: Your responses to this assessment will be kept strictly confidential by the research team in AFIT. You will be given the opportunity to add/remove comments and clarify any items prior to analysis. Additionally, your name and your organization will not be cited.

Questions: If you have any questions or concerns, please contact Capt. Jose Morais at jmorais@afit.edu, (937) 321-1009, Bldg 641, Room 201E, 2950 Hobson Way, Air Force Institute of Technology, Wright-Patterson AFB, OH 45433-7765.

www.afit.edu/en/ens

A routine emergency event is typically managed with the resources of a single governmental agency, or partial resources from several, using standard procedures, and with minimal dislocation. Operationally, the transition to a higher category of emergency occurs when resources become stressed, when non-standard procedures must be implemented or when special authorities must be invoked to manage the disaster event.

Considering **preparedness, detection, response and recovery** as the typical activities of disaster operations management, this interview is designed to find out what are the best practices to deal not only with routine emergency situations but also with major disasters.

For the following topics, focus on the practices that you are proud to perform today and the improvements that you would like to see in the next 5 years.

Text in red will appear as a guide to the researcher, to assure that all the information expected will be collected, besides the already mentioned "best practices" and "improvements".

Text in blue will indicate the expected answer.

1) Preparedness

a. Risk Assessment

i. How are threats assessed?
ii. How are capabilities assessed?
iii. How are vulnerabilities assessed?
iv. How are risks assessed?
v. How frequently are assessments reviewed?
vi. What defines an acceptable level of risk?
vii. How would you evaluate your organization risk assessment?

Extremely Poor	Bellow Average	Average	Above Average	Excellent	DON'T KNOW

b. Planning

i. What do you consider valuable in the existing plans and in the planning process?
ii. What improvements would you like to see in the next 5 years in the plans and in the planning process?
iii. Is there a plan for each emergency scenario?
iv. How are the typical activities of emergency management (preparedness, detection, response and recovery) covered? Does each one have its own plan?
v. How are the plans prioritized?
Example: by probability of occurrence.
vi. Do the plans include checklists and step-by-step procedures?
vii. What is the frequency of review/update of the plans?
viii. Are there feedbacks from events that promote immediate effort to update the plans?
ix. How are the plans disseminated?
x. How would you evaluate your organization planning?

Extremely Poor	Bellow Average	Average	Above Average	Excellent	DON'T KNOW

c. Mitigation (reducing risk)

i. How are opportunities of risk-reduction identified?
ii. How are risk-reduction actions prioritized?
iii. How these opportunities are implemented?
Examples: direct/indirectly, giving assistance to other organizations, insurance (transferring the risk to the insurance company), financial incentives, structural controls, hazard identification and mapping, land-use planning, design and construction applications, etc.
iv. How frequently opportunities are investigated?
v. What are the major impediments to mitigation?
Examples: denial of the risk, political will, costs and lack of funding, disagreements, etc.
vi. Should mitigation funding be tied to individual disasters or should it be independent of disasters altogether?
vii. How would you evaluate your organization contribution to reduce risks?

Extremely Poor	Bellow Average	Average	Above Average	Excellent	DON'T KNOW

d. Education, Training and Exercise

i. What is the target audience for education, training and exercise programs?
ii. What kind of interaction with other organizations exists for each program?
iii. What is the frequency of review/update of each program?
iv. What is the frequency of application of each program?
v. In what extent the plan for each possible event are covered?
Example: depends on the probability of occurrence, etc.
vi. In what extent the personnel are covered?
Example: 100% every year, etc.
vii. How are feedbacks from education, training and exercise incorporated?
viii. How would you evaluate your organization education, training and exercise programs?

	Extremely Poor	Bellow Average	Average	Above Average	Excellent	DON'T KNOW
Education						
Training						
Exercise						

e. Performance indicators

i. What current performance indicators do you consider valuable?
Examples: the number of agency plans developed, reviewed and updated; the number of emergency preparedness trainings and exercises conducted; the number of items identified and completed as a part of Corrective Action Plans; the number of agency staff, volunteers and stakeholders participating in emergency preparedness training; etc.

ii. What indicators would you like to see implemented in the next 5 years?

iii. How would you evaluate the current performance indicators of your organization's preparedness?

Extremely Poor	Bellow Average	Average	Above Average	Excellent	DON'T KNOW

f. Budgeting / Resourcing

i. Is there anything that you do not have sufficient funds?

ii. Do you feel limited by any resource?
Examples: personnel, etc.

g. Equipment and supplies

i. What do you consider to be the current best practices performed by your organization in acquisition, maintenance, distribution and inventory of equipment and supplies?
Examples: Supplier relationship management, demand forecast, shared inventory, flexibility, backup, etc.

ii. What improvements would you like to see in the next 5 years in managing equipments and supplies?

h. Customer relationship

i. What do you consider to be the current best practices performed by your organization in the relationship with your customers?
Examples: Partnership with the media; meetings with local councils; website; etc.

ii. What improvements would you like to see in the next 5 years in the relationship with your customers?

i. Information systems

i. What are the roles of information systems in your organization?
ii. What improvements would you like to see in the next 5 years?
Example: new technologies that you would like to incorporate, etc.

j. Preparedness

i. What do you consider to be the best practices performed by your organization in preparedness today?

Example: details about threat/vulnerability/risk assessment, identification of shortfalls between current preparedness and the requirements of an appropriate preparedness posture, implementation of enhancements, training, education, exercise, performance indicators, planning, etc.

ii. What improvements would you like to see in the next 5 years to your organization preparedness?
iii. How would you evaluate the overall preparedness of your organization?

Extremely Poor	Bellow Average	Average	Above Average	Excellent	DON'T KNOW

2) Detection

a. How often do you test the detection system?
b. How long does it take to detect after the event happened?
c. How are false alarms prevented?
d. How long to confirm it is not a false alarm?
e. What do you consider to be the best practices performed by your organization to detect an emergency event today?
f. What improvements would you like to see in the next 5 years to improve your organization's ability to detect an emergency event?
g. How would you evaluate your organization's ability to detect the occurrence of an emergency event?

Extremely Poor	Bellow Average	Average	Above Average	Excellent	DON'T KNOW

3) Response

Consider for the following items not only routine emergencies handled only by your organization also situations that need a joint involvement of other organizations.

a. How are plans activated?
b. How much time it takes between the detection of an emergency and the deployment of the first responders?
c. Who do you usually work with?
d. What changes occur in the work force during an event as compared to the preparedness phase?
   Help of volunteers; changes in effort (ex: working hours), etc.
e. How can the hierarchy between the responders be described?
   Examples: Coordination (all in the same hierarchy level) or Command & Control.
f. How are communications between responders performed?
g. How would you evaluate the responders' communications?

Extremely Poor	Bellow Average	Average	Above Average	Excellent	DON'T KNOW

h. What kind of backup systems do you have?
i. What do you consider to be the best practices performed by your organization to respond to an emergency event today?
   Examples: Roles and responsibilities are well defined; contribution of volunteer organizations; communication between response agencies; flexibility; standardized procedures; interoperable communications; establishment of a command post; etc.
j. What improvements would you like to see in the next 5 years to improve your organization's ability to respond to an emergency event?
   Examples: Better communications among responding agencies to compensate overlapping responsibilities and unclear delineation; Joint Information Center; etc.
k. How would you evaluate your organization's ability to respond to an emergency event?

Extremely Poor	Bellow Average	Average	Above Average	Excellent	DON'T KNOW

4) Recovery

a. What do you consider to be the current best practices performed by your organization for the recovery?
   Examples: Details about going back to normality and about learning about vulnerabilities; etc.

b. What improvements would you like to see in the next 5 years to improve your organization contribution for the recovery?

c. How is the experience shared back to the preparedness phase?

d. How would you evaluate your organization's contribution for the recovering from disasters?

Extremely Poor	Bellow Average	Average	Above Average	Excellent	DON'T KNOW

Is there anything you would like to add?
Examples: comments on preparedness, detection, response, recovery, etc.

You will receive a transcript of this interview and have the opportunity to add/remove comments and clarify any items prior to analysis. The final report with my findings will be delivered to you by the end of March, 2010.

Thanks for your cooperation.

Appendix B: Blue Dart

Blue Dart Submission Form

First Name: _Jose_____ Last Name: _Morais_____

Rank (Military, AD, etc.): _Captain_____ Designator #_AFIT/LSCM/ENS/10-09__

Student's Involved in Research for Blue Dart:_Jose Morais_____
_____

Position/Title: _Capt, Brazilian AF_____

Phone Number: _____ E-mail: _jmmj.oh@gmail.com_____

School/Organization: _AFIT_____

Status: [X] Student [ ] Faculty [ ] Staff [ ] Other

Optimal Media Outlet (optional): _____

Optimal Time of Publication (optional): _____

General Category / Classification:

[ ] core values	[ ] command	[X] strategy
[ ] war on terror	[ ] culture & language	[ ] leadership & ethics
[ ] warfighting	[ ] international security	[ ] doctrine

[ ] other (specify): _____

Suggested Headline: _____
Emergency Management Lessons to Increase our Supply Chain Resilience

Keywords: _____
Supply Chain Management, Change Management, Supply Chain Resilience, Emergency Management, Disaster Management, Disruption, Preparedness, Mitigation, Response, Recovery, Detection

Blue Dart

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Word Count: 358

The challenge to manage a business today is bigger than ever, because we cannot think only about our organization, but the intricate network of organizations that form our supply chain. As we become more integrated to other organizations expecting to increase efficiency, we become more dependent on them and more susceptible to disruptions. Managing the supply chain of the U.S. Air Force is an increasing challenge as well, because our budget does not grow proportionally to the costs of modern weapon systems. Maintaining high performance with this kind of restriction requires evolving management skills. One way to manage risk and uncertainty in our supply chain is to apply forecasting techniques to predict our demand, but we cannot anticipate everything nor afford the cost of excess inventory.

Some organizations cope far better than others with both the prospect and the manifestation of unquantifiable risk -- they share a critical trait: resilience. A resilient organization has the capacity to overcome disruptions and continually transform itself to meet the changing needs and expectations of its customers , but the solutions for the public sector could be different from the private sector, and most of the literature is focused in the private sector. As an approach to overcoming this issue, this research looks for organizations in the public sector with the necessary sense of urgency to plan for disruptions: emergency management organizations which are required to maintain a state of readiness for immediate reaction. The goal was to uncover the best practices of emergency response organizations in preparedness, detection, response and recovery that can be applied to improve effectiveness and efficiency of operations, thus creating a more resilient organization.

Extracting insights from multiple interviews, this research verified that most of the current emergency management best practices do indeed increase resilience without increasing redundancy; consequently, performance is improved in a cost-effectively way. One example was the importance of planning and exercising, both bringing people together for an opportunity to integrate processes, share information, build valuable personal relations, and to understand other's limitations/capabilities. Therefore, implementation of identified best practices can contribute to inducing continuous improvement and increasing collaboration toward a new level of resilience.

The views expressed in this article are those of the author and do not reflect the official policy or position of the United States Air Force, Department of Defense, or the US Government.

Emergency Management Benchmarking Study: Lessons for Increasing Supply Chain Resilience

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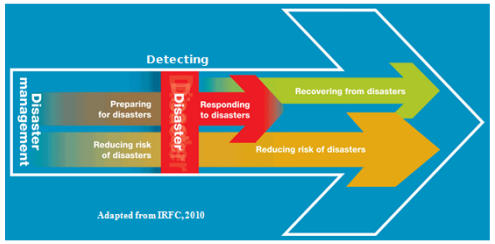
Research Question:
Uncover the best practices of emergency response organizations that can be applied to improve effectiveness and efficiency of operations, thus creating a more resilient organization.

Resilience is the ability of a system to return to its original state or move to a new desirable state after being disturbed. In essence, is the ability to survive despite severe impact.

Literature review

Supply Chain Management Activities (Mentzer et al, 2001)
1. Integrated behavior
2. Mutually Sharing Information
3. Mutually Sharing Risks and Rewards
4. Cooperation
5. The Same Goal and the Same Focus on Serving Customer
6. Integration of Processes
7. Partners to Build and Maintain Long-Term Relationships
Change Management (Kotter, 2008)
1. Create sense of urgency
2. Form committed team to guide a change initiative
3. Effort by team to find smart solution
4. Communication of solution by the team, obtaining support
5. Empowerment of those committed to turn into reality
6. Achieve short-term wins
7. Never give up, avoid complacency
8. Make change stick into structure and culture
Building resilience (Sheffi, 2005)
1. Increasing redundancy
2. Building flexibility
3. Changing the corporate culture



METHODOLOGY

- **Qualitative research**
- **Multiple case studies**
- **Grounded theory construction**
  - theoretical sampling: data collection process is controlled by the emerging theory; until fresh data no longer sparks new theoretical insights, nor reveals new properties of categories
  - constant comparison: method of joint data coding and analysis (memo-writing)
- **Intensive Interviewing,** using interview protocol as a guide, allowing to: Go beneath the surface of the described experience(s); Stop to explore a statement or topic; Ask about the participant's thoughts, feelings, and action; Keep the participant on the subject; Come back to an earlier point; Restate the participant's point to check for accuracy; Validate the participant's humanity, perspective, or action.

Results

Organizations	Participants
One state-level emergency agency, where several people from distinct branches were interviewed, including the Director	10
One association of emergency managers, where some members were interviewed collectively, all with great experience in the area	5
One military organization responsible for emergency management on military facilities	1
One regional organization responsible for environmental protection (hazard materials disposal)	2
One local organization responsible for public health	4
One local emergency agency	1
One private organization (contractor) responsible for supporting surges of emergency medical services state-wise	2
One fire department that also manages preparedness of regional medical response for all hazards.	1

Number of open-ended questions per topic in the interview protocol	
Topics	**Qty**
Preparedness(2) Risk Assessment(6), Planning(9), Mitigation(6), Education/Training/Exercise(7), Performance indicators(2), Budgeting/resourcing(2), Equipment/supplies(2), Customer relationship(2), Information systems(2)	40
Detection	6
Response	9
Recovery	3

Emergency Management Lessons in Each Phase of the Disruption Profile: Increasing Supply Chain Resilience	
Preparation	Risk assessment to prioritize actions/plans/training/resources; Adopt an all-hazard approach when possible, one solution for multiple problems; Planning and reviewing plans collaboratively together; Bringing people together is an opportunity for integrating processes, sharing information, understanding others limitations/capabilities, building personal relationships and continuous improvement; Frequent exercise as a indicator of performance and source of feedback to improve resilience, but must be challenging and complex to bring problems; Share information about equipment available; Prepare shelf-ready mitigation plans to use when funds become sudden available.
Detection	Give power to your customers to alert you about the occurrence of a disruption; Try to develop controls to detect variations from the standard.
First response	Send someone to help and to keep you informed; Use of briefings and refreshers to activate response plans; Keep Liaisons close to important partners; Just in time training; Activate operation center team with authority to commit resources from their organizations; Document every thing you from the beginning, you can recover the money latter; Form team for recovery efforts.
Initial recovery	Recovery team should start damage assessment to use in recovery efforts; priority is to capture funds and keep money coming; use the opportunity of political pressures to activate mitigation plans with available funds and avoid future disruptions; Recover critical structure first to let private sector do what they do best.
Long term recovery	Don't exceed, or customers/partners will stop doing their part and expect everything from you; Customers should also make their own plan; Opportunities for mitigation should be pursued; Lessons learned should be shared and plans should be updated, get feedbacks.

Appendix C: Quadchart

Vita

Captain of the Brazilian Air Force (BAF), Undergrad in Electronic Engineering, working since 2003 in the BAF Directorate of Aeronautic and Bellicose Materiel, which has a role equivalent to AFMC. There I was responsible for planning and budgeting acquisitions of avionics and also responsible to help in contract negotiations of acquisition and maintenance. I was also responsible to consolidate the flight cost per hour of BAF aircrafts and analyze data in our Information Systems.

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14. ABSTRACT

The challenge to manage a business today is bigger than ever, because we cannot think only about our organization, but the intricate network of organizations that form our supply chain. Some organizations cope far better than others with both the prospect and the manifestation of unquantifiable risk -- they share a critical trait: resilience. This study researches emergency management organizations which are required to maintain a state of readiness for immediate reaction, and evaluates best practices in preparedness, detection, response and recovery. Extracting insights from multiple interviews, this research verified that most of the current emergency management best practices do indeed increase resilience without increasing redundancy; consequently, performance is improved in a cost-effectively way. Applications to supply chain management are made to recommended enhancements to overall resilience.

15. SUBJECT TERMS

Supply Chain Management, Change Management, Supply Chain Resilience, Emergency Management, Disaster Management, Multiple Case Study, Qualitative Research, Ground Theory Construction, Intensive Interviewing, Theoretical, Preparedness, Mitigation, Response, Recovery, Detection

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