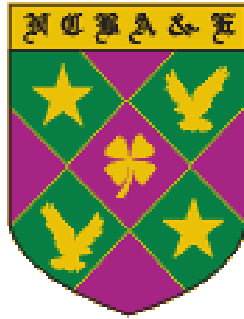


*National College of Business
Administration & Economics
Lahore*



**STRENGTHENING C2 ARCHITECTURE
FOR DISASTER MANAGEMENT**

BY

MEHREEN ASHRAF

**MASTER OF PHILOSOPHY
IN
BUSINESS MANAGEMENT**

FEBRUARY, 2014

**NATIONAL COLLEGE OF BUSINESS
ADMINISTRATION & ECONOMICS**

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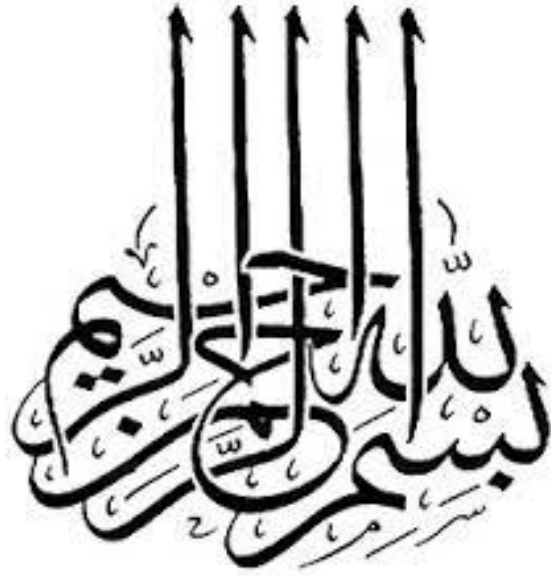
MEHREEN ASHRAF

**A dissertation submitted to
School of Business Administration**

**In Partial Fulfillment of the
Requirements for the Degree of**

**MASTER OF PHILOSOPHY
IN
BUSINESS MANAGEMENT**

February, 2014



***In the Name of ALLAH,
The Most Beneficial,
The Most Merciful,***

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Dissertation Committee:

Chairman

Member

Member

Rector

National College of Business
Administration & Economics

DECLARATION

It is to declare that this research work has not been submitted for obtaining similar degree from any other university/college.

MEHREEN ASHRAF
February, 2014

DEDICATED
TO

My Parents
Beloved Father Fazal Ashraf
&
Mother Mubarka Ashraf
who has been a
Source of Encouragement
for me.

ACKNOWLEDGEMENT

With the name of Allah, Who is most gracious, generous and most merciful. He always showers His countless blessings, leads right direction and always protects me in my entire life. Due to His guidance and support I have been able to complete my research.

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RESEARCH COMPLETION CERTIFICATE

Certified that the research work contained in this thesis entitled **“Strengthening C2 Architecture for Disaster Management”** has been carried out and completed by **Mehreen Ashraf** under my supervision during her **M.Phil. Business Management** Programme.

(Dr. Suleman Aziz Lodhi)
Supervisor

SUMMARY

Task accomplishment is important aspect for disaster management organizations. This is more challenging for disaster management organizations to make accurate decision according to the situation and nature of crisis. Some certain standards and effective system is required to overcome the crisis situation. Coordination and communication are two important aspects for performance management. For efficiency and effectiveness disaster management planning processes should be enhanced. The processes should be integrated and synchronized. There is a need to develop a framework for disaster management organizations. In Disaster Management the major challenge for organizations are task accomplishments with efficiency. The present study describes “Command and Control” application and proposes a holistic framework for decision making and strategic planning. The study revisits the models and establishes a real and operational model for Disaster Management Organizations. It provides complete support and awareness in crisis operations; furthermore decision making will provide effective results that enhance the processes.

This research will provide a direction to Disaster Management Organizations and institutions for planning and decision making. This study is highlighting the important aspects of disaster management, such as on time response, strategic planning, communication, and coordination, decision making, control and monitor the activities. With the help of this research the DMO’s can make quick decisions according to the nature of disasters. Task accomplishment is becoming more challenging due to environmental problems, and the unpredictability of crisis. This research will come under the traditional domain of strategic management and performance management.

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CHAPTER 1

INTRODUCTION

1.1 GENERAL BACKGROUND

In 2010 and 2011; Pakistan has faced the worst floods of the past hundred centuries. The heavy monsoon rains starts in July 2010, as a result it affected widespread most regions of Pakistan; exclusively the fertile Indus River basin (Indus, Sutluj, Jhelum, Chenab, Ravi). Almost one-fifth of Pakistan was affected by this flood. As the National database the death toll estimated 2,000. Nearly 20 millions of people were directly affected by the catastrophe through demolition, loss of families, disruption of houses, resources, businesses and transportation. This was caused the shortage of food items, medicines and shelter for the affected people and sufferers. The direct and indirect financial implication of this disaster indicates huge loss approximately more than into billions of rupees. The 8th of October, 2005 witnessed an earth quake with a magnitude of at least 7.6 on rector scale affecting Northern Pakistan. The worst affected areas were Azad Kashmir, Khyber-Pakhtunkhwa, and Northern Punjab. The official human mortality from this earthquake was about 74,698. International agencies estimated about 86,000 people dead.

Similarly, in international arena the eastern states of Japan in 2012 have experienced an earthquake of rector scale 9.0 which was one of the worst cases recorded in the history. The Japanese authorities reported more than 21,000 deaths or missing people in the aftermath of this natural disaster (Singapore Red Cross, 2010; Pakistan Floods, 2010). Sichuan earthquake, China (2008) on 12 May, 2008, Sichuan quake was a severe earthquake which rated 8.0 on the rector scale. The human casualties were estimated at over 70,000. Direct loss and fatalities from the interruption was about \$29 billion. Massive quake kills nearly 10,000 in China (MSNBC, 2008). Another disaster that occur in USA known as "California Super Storm Sandy" (2012) is also a sad scenario that sank western California. Sandy was an extraordinary storm, a combination of 3 different weather systems morph into a large super storm. This is so-called "Big One" that makes many Californians nervous even today and 24 US States were in some way affected by Sandy. The most affected areas were the New Jersey shore, Maryland, New York, and Coney Island.

1.2 DISASTERS IN PAKISTAN

Pakistan is facing earthquakes since last few years. Floods, cyclones, and droughts intensity factors are increasing day by day. Although, Pakistan has a recovery and response plan for disaster management but due to lack of information, communication and resources, the system cannot be properly executed.

Government response is almost poor due to unavailable and lack of resources as well as improper and inadequate training for task accomplishment. All donor organizations usually follow the directions set out for contribution through the government agencies with vague information, instructions and procedures. The systems needs to overcome on disasters need to update procedures. National Disaster Management Authority is working on crisis management and other issues related with disaster management. The major concentration of National Disaster Management Authority is to formulate a strategy for significant authority system that is competent for holistic disaster management.

District government is responsible for local level arrangement of task. However, Local Government Ordinance (LGO), 2001 has again proven to be weak in disaster response. National Disaster Management Authority (NDMA) framework proposed an integrated structure on regional level but the prevailing culture of incompetence and indifference is not properly responsive to a crisis situation. The emergency responsive agencies such as the massive Civil Defense services, firefighting and police emergency are equally lacking the equipment and financial resources to affectively deal with these large scale disasters.

Pakistan Red Crescent Society (PRCS) has designed institutional framework from relevant practices and knowledge. October, 2005 earthquake, PRCS has passed a notification for resources from the global Red Cross network. It has contemporary relevance but lacking in operations. It need to be collaborate the procedures with proper guidance and control for an effective disaster response players.

Due to old rules and regulations the procedures and policies are not only inappropriate, but they lack professional supervision. The trouble is also due to overlap in actions, lack of leading agencies in a local surroundings and inadequate government policy. Though the best operational services have given assistance to the leaders who are working in the absence of an integrated structure leaves much to be desired. In Pakistan the Government of Punjab has introduced a well-economic emergency service availability, which is identified

as 'Rescue 1122'. So the present services are with lack of resources need to be integrated for effectiveness and sustainability. Besides all such agencies need to do periodic joint work exercises to test both their operating procedures and equipment in order to be effective in a real disaster situation. These regular work exercises should define a policy so, that in such emergencies the residents can be helpful in times of natural calamities.

The disaster management organizations of Pakistan should improve early warning for multiple disasters. Proper procedures must be tabulated and put to immediate use when an early warning of these disasters is received. At present there is no warning system for vulnerable people who are living at against sea-side hazards, flash floods and in hilly areas. It is essential, to organize a timely response system through the full governance system, whenever an early warning is received. Evaluations systems identify weaknesses in disaster response in a society. A proper and timely response because of early warning can be a great help in lessening the suffering from a natural disaster. Besides adequate relief, remedy or compensation can be more methodically and equitably dispensed if all systems function properly. Systems must be accurate first by framing standard operating procedures that support sustainability and clarity in function and deliverables. There is no replacement to structure the system for predictable standards.

Immediate response to disaster related activities required special experts with different skills, complete instructions, and different training workshops with universal and appropriate standards. The evaluation shows that there is a constant absence of planning element, immediate on time response to forewarning systems. The operational emergency planning should be effective and strong. The disaster management organizations have the power and ability to handle different circumstances, but due to lack of interconnection between activities the expected results cannot achieved fruitfully.

Communities are essential for disaster response units. When we configure the first line of defense for disasters, we find that they lack of expertise, resources and collective association. Support is needed for building structures and disaster related processes. The affected regions have to be known and actions towards on time response. This can encourage a socially responsible state of mind to make the next generation more hazard conscious and create awareness. The districts and communities are responsible in disaster response activities and its impacts. Current experiences have adequately highlighted their evident boundaries.

As disaster coping mechanism is getting difficult the forewarning and strategic planning process should be incorporated for effective outcomes. By

drawing and analyzing new procedures, and synergies, we can improve disaster management systems. The disaster management plans should be revised, the major issue is how to protect and survive people? A shared link is required between local government and disaster management organizations.

The Command and Control concept with respect to Disaster Management simply stated is a system with command and control to manage the procedures. This research examines the impact of Command and Control on the Disaster Management of an organization for the implementation of new expertise. Disasters on national and international level has been predictable to meet the diverse and ever changing needs of the Disaster Management spectrum to prepare the organizations with conceptual and technical knowledge towards all operative measures. Disaster Management is continually restructured with contingency situation and variation in procedures. The fusion of task excellence with practical expertise expands capabilities of Disaster Management Organizations and gives them a cogent understanding of operation challenge.

C2 architecture along with Disaster Management, are designed to provide an opportunity for working organizations to enhance their effectiveness and capabilities. In the domain of Disaster Management, a vital component is "Disaster Response with Command & Control", because it is the first component which needs activation in case of disaster. It provides a complete system for disaster response. Before going further, we need to understand various factors of a disaster with command and control perspective. Because the catastrophe so called is massive and synchronization of tasks becomes unfeasible. At times the task which has to be addressed first may have to be dealt a little later in order to streamline other issues that become substantial.

1.3 LESSONS LEARNT FROM PREVIOUS FLOOD RESPONSES

OCHA has evaluated the performance of disaster management organizations working in Pakistan. The evaluation was about disaster management on time response and decision making capabilities. The main purpose is to develop a framework to create awareness, decrease the risk factors, examine the nature of hazard and forewarning mechanism, The emerging trends and new techniques should be applicable that will decrease the vulnerabilities. Create awareness to societies, local government that how to govern the activities and what should be a response regarding nature of hazard is major issue. In many organizations mitigation element is missing. The assessment is indicating the strength and weaknesses of disaster and crisis

management organizations. OCHA contribution is on enhancing the on time response activities of disaster management organization and communities.

Pakistan is most popular country regarding natural and man-made catastrophes. In October, 2005 country faced a massive earthquake in previous history. The major occurrence of quake was in Himalaya, Karakorum, Koh Hindu Kush areas. In 1935 an earthquake of greater than 6.5 high scale shocked Quetta and approximately 35, 000 were dead. The early period 2005 due to earthquake previous studies highlighted that country is facing disasters constantly. Pakistan has faced tsunami and other sea-based disasters. In 1935 an earthquake on 8.5 Richter scale affected Baluchistan seashore due to tsunami, almost 4000 people killed as well as fishing town was drastically affected. Karachi and Gawadar were also at threat. In 1999 a cyclone in Thatta and Badin caused economics loss and many people lives affected extensively. The coastal related areas have same impact of heavy rains in 2003.

In summer season the heavy floods, water crisis and land sliding disasters often in monsoon season caused loss of human life and property losses. Due to unpreparedness we cannot overcome the disasters. Although droughts hazard also cause financial losses, viral infections, for example bird-flu virus and dengue fever. The rate of dengue virus is constantly rising up and almost 4100 people were affected in Karachi, Punjab and other regions. Media is trying to focus on these issues regarding preparedness.

Disasters are creating difficulties, day by day related with many incidences of road accidents, fire issues and industries collapsed. The tragedies cause damages and destructions, communities and government have to be conscious about the effective practices. Emergency organizations need to enhance and update their procedures for better accomplishment of the task. Pakistan has a power of being a nuclear state. The nuclear protection standards have to be adopted.

In Pakistan poverty level is increasing rapidly, as well as increase in population rate, limited resources, un-clean environment with health issues, no awareness of hazard protection measures are creating troubles. Formalized and effective procedures are required. Forewarning system is required with on time response activities and communication processes for people to respond. A well-organized structure is needed for act and responses. Hence there is no present system to recognize communities and urban regions from the flood overflow crises. In many organizations there is no concept of risky factors, awareness, no participation of government and corporate relief and fund procedures. The vulnerability is rising from low to high regarding massive floods.

Due to limited interconnection between activities and forewarning systems, the danger can shift into disaster condition if appropriate actions with government response system not taken immediately. Right now there is no forewarning system and preparedness plan exist. Consequently October, 2005 has given consciousness and instructions to follow about hazard. Draught related system for early warning is in working. Government plays a major role at local and regional level. The Disaster management organizations, Institutions, and emergency response organization needs to be governed. They have to revise their processes and plans. These are the most emerging challenges. National Disaster Management Authority has identified many steps to improve the efficiency of local government and decision making procedures.

1.4 NEED FOR UNIFIED DISASTER MANAGEMENT SYSTEM

Disaster Management has become a universal and important issue to the management of crisis all over the world. So numerous changes have been done by the Disaster Management Organizations globally in disaster arena. Research will look at the link between the Command and Control with respect to Disaster Management.

We see that countries faced disasters in past and would likely to be similar in future therefore countries have to prepare for disaster management. Disaster management also known as emergency management it includes evacuation, shelter, preparedness activities before, during disasters, medical aid, rebuilding and support societies. A comparative discussion of Disaster Management practices and systems focus on the extent that why Disaster Management is facing difficulties to handle in the crisis circumstances? It will be the major and vital part of this thesis. The emergency response services in Pakistan are not fully organized and collaborated. The aftermath of October, 2005, earthquake affected Azad Jammu Kashmir, NWFP, the consequences of related disaster were the loss of human life, and resources. There is a need to establish an institutional policy to overcome the crisis situation to coordinate and implement the strategies.

The Command and Control mechanism is applicable for Disaster Management. The complexities of disaster management, coupled with the growing needs of multitasking operations that has increased the need for effective and stable disaster management processes that can be applicable for emergency response organizations. The need for strong policy planning has been fulfilled with the execution of Command and Control. The Command and

Control are major essentials of disaster management and would engage to integrate the function of the first line of defense for disaster. This research will examine the role of Command and Control with Disaster Management nationally & internationally that will provide inspiring corpus of knowledge on the dynamics and challenges of managing operations that how different approach reflects execution and other imperative factors. The major challenges for disaster management at the present time this needs to augment and boost up the knowledge about specific task like command and control action to its greatest assistance. This chapter evaluates the performance of two major services Civil Defense services and Pakistan Red Crescent Society (PRCS) are major organizations to govern the structure.

1.5 DISASTER MANAGEMENT ORGANIZATION & AGENCIES WORKING IN PAKISTAN

Disaster management also known as emergency management which comprises on preparation before disaster, evacuation, accommodation, medical aid and awareness, reconstruction and support society after natural disasters such as, earthquakes, drought, tsunami etc. Voluntary organizations include National Disaster Management Authority, Active Learning Network for Accountability & Performance and Pakistan Red Crescent Society plays a vital and crucial role in providing the services after disaster.

1.5.1 Civil Defense Services of Pakistan

Civil Defense Service in Pakistan has established by British Administration. These services organized at country level. The Act 1952 Civil Defense organization is responsible for actions related to protection of overall nation regarding any crisis. In 1993, the mission of this organization is to enhance the processes with effective methodologies for natural and manmade catastrophes.

1.5.2 Pakistan Red Crescent Society

In past the basis of Pakistan Red Crescent Society (PRCS) was named as a Red Cross Society before sub-continent of India. In 1948, through the government act, it was re-designed as “Red Cross Society” in Pakistan. The (PRCS) Pakistan Red Cross Society gain strong association from International Federation of Red Cross, as well as with International Committee of Red Crescent and with many countries. This service in actively playing a major

role in all four provinces, 80 regions, and has a coordination workforce of approximately 1000. 50,000 volunteers are working with wholeheartedly. PRCS worked competently in disaster response activities at national and global level. These are working for relief activities, accommodation, restructuring, water and sanitation problems, cleaning environment activates, and improve living standards.

PRCS has decision making capability in disaster response activities, the mission of this organization is to provide emergency health care services, standardize the operational procedures and reorganize the task settings. Due to the association of ICRC and IFRC organizations creating more power and strength to overcome the hazards. Global network is most important for organizations, government and organizations should be in collaborate in pre, post and during disaster operations. A uniform crisis response policy is required to manage the unexpected situations. PRCS should work for more contribution of improved services. PRCS is a disaster and crises response organization. PRCS has more authorized power from past years of practices, knowledge, and skills. PRCS has adopted operational standards. Disaster management required to work more systematically with governance to accomplishment of task.

The problem is related with emergency services. A well-defined system is required for emergency services. The services related with appropriate procedures, resources, on time ambulances and firefighters response. The major faults in urban areas where multiple storied buildings are raised up day by day and ignoring fire prevention system, for example Karachi is growing rapidly without firefighter stations. Due to shortage of space there is hardly any place available for emergency services organizations due to negligence and institutional exploitation. In such condition, the effectiveness of emergency services will be failed to respond. These difficulties are relevant with the value of services provider.

Now there is a need to integrate the emergency services locally to avoid duplication of activities. This matter has been discussed as a debate by different decision makers but no any positive results yet. This happens due to non-existence of an operational policy and governance. For instance the administration governs firefighter organizations, these organization have no any update policy, so the condition becomes void to overcome. Firefighter services have been established under 2001, Act of parliament as a Tehsil Community. This Act was revised after some time, to place these services under the control of city government in major cities.

Most crisis related services have not knowledge about different practices at training workshops. Rarely few organizations are concentrating on foreign training. There is no any collaboration in country to share professional practices. Just only Karachi firefighting service is associated with Houston Fire Department to enhance their procedures and adopt highest standards of living. The major difficulties in firefighter services are implementation of rules and regulations and appropriate actions. There is no integration between actions. The duplication of actions creates trouble. All efforts are towards to improve the quality and value services. Police emergency services are working all over the world over the past number of years. These services help and assist people by immediate response; crisis medical aid facilitates direct leadership and also provides home facilitation services.

The firefighting services have fascinated media more attention towards it, but unfortunately due to lack of budget and resources the emergency medical services are not successful e.g. ambulances, medical aid. The training courses have been generally limited for police officers and those who hired in such services they have to learn through practice. This is important for feedback to enhance the quality of services.

In 2004 another emergency services were designed with the name of Punjab Emergency Service known as Rescue 1122. This service attains good repute by providing quality services. According to statement 24,000 fatalities provides on time response, medical aid, and safe transportation. If we contrast with further emergency services, Rescue 1122 creates a positive impact on environment. It proposed extensive integrated emergency services. The operational control block monitors current processes through satellite based networking systems. It has also the system of data record keeping and analysis of new trends. To enhance training and operating techniques the international standards has been adopted. A well-organized system requires interconnection between disaster management organizations. Firefighting Services collaborated with civil Defense and consider as a one structured platform.

A man who created a free charitable emergency relief service in Pakistan, The service organizer name Abdul Satar Eidhi popular all over the Pakistan. He has shown remarkable results in contributions. He leads neither through his performance and actions nor with arguments. Eidhi Ambulance service is working with excellence in Pakistan, where government performance services are completely unsatisfactory. The purpose of Eidhi Service is saving life of people and creates operational measures of emergency evacuation.

Emergency Relief Cell is responsible to monitor the disaster activities and create a framework for disaster support mechanism. The traditional Relief Commissioner constructed provincial Disaster Management designs that are now being adapted for National Disaster Management Authority procedures. In Punjab, Relief Commissioner is responsible for immediate disaster response and restructures the activities. By making effective plans and policies, we can improve our decision making processes. In terms of action planning NDMA has early warning systems, strength to handle the crisis response phenomena. Much work is pending in Pakistan regarding disaster management, but in a promising way UNDP (United Nation Development Program), ISDR (International Strategy for Disaster Reduction), and OCHA (Office for the Coordination of Humanitarian Affairs) are supporting very well.

The Catastrophic events are typical examples where crisis management plays a significant role. Circumstances in which successful handling of ground reality arising from such large scale destructions, can only be overcome through the application of well-organized Command and Control systems to handle such situations. Disaster Management includes handling the whole disaster spectrum with preparation, feedback, rescue, rehabilitation, and finally refurbishment. This research highlight to improve the performance of Disaster Management Organization by enhancing its command and control systems (C2).The research can also be used in other domains like military deployment, emergency situation control, etc.

The response in case of disaster is most important. It is the key feature which needs activation in case of disaster. This system generates the desired information in the simplest way possible; however the contribution for such information has to be concrete and absolute. If this process executes appropriately then maximum rescue is assured. For crises management, it delivers stability between efficiency and control. By enhancing the operations in emergency situation provides efficient and appropriate response to catastrophes especially through shared application of operational procedures, implementation and rapid deployment of resources. It also indicates the reduction of disaster, controlling the platform and emergency response through active exchange of knowledge, and expertise using various sharing and learning modes.

The concept of command and control have been in use on national and international level for about 30 years, but in Pakistan it still needs to be implement for crisis situation. In this context successful operation of Command and Control for “Disaster Management” can aid in improving the decision making process. Conditions in which successful handling of circumstances arises from such large scale destruction, it can only be done

through the application of a Command and Control. Command and control is most important structural design, which needs more and more deliberation to work on.

1.6 RESEARCH QUESTION

Pakistan is facing crisis, disasters since last few years, for example cyclones, floods, droughts, thunder-storms and flash floods. Pakistan has a recovery and response plan but due to lack of information about the nature of hazard, communication and coordination problems, lack of resources, inappropriate procedures, the system and task cannot execute efficiently and properly. Government response most time fail due to improper and inadequate training and processes for task accomplishment. Same problems are facing by defense services, military organizations operations, firefighting teams and police services. There is a need to develop the system and enhance the processes to overcome on disasters.

The purpose of this study is to create competitive advantage for Disaster Management Organizations. This competitive advantage can be restructure the processes and develop new framework to make organizations more efficient. So our research question is

- Which processes are absent in Command and Control System (C2) of emergency organizations in Pakistan?

What are the hurdles we are facing and what are the gaps regarding limited resources, coordination, and communication? How disaster recovery agencies can improve their response time?

1.7 AIMS AND OBJECTIVES

The main objective of command and control is to enhance the process of flow of information and coordination among institutes. The aim is to develop a unified mechanism to the disaster of its practical and environmental obstacles. Enhance the processes of all disaster management organizations missions. Eliminate duplication of activities.

The research is interconnected with the spheres of ‘Strategic Management’ and ‘Performance Management’ in the traditional “Management Sciences” domain. The specific objectives of the research are:-

- a. Develop C2 architecture to improve the performance of large scale Disaster Management Organizations in Pakistan.
- b. To improve the decision making and coordination capabilities of Disaster Management Organizations.

1.9 SIGNIFICANCE OF STUDY

The domain of Disaster Management with Command and Control has emerged as a multi-task exploration outline for addressing the challenge. Main purpose is to gain competitive advantage for an organization. This competitive advantage can be in the form of generating new ideas, creativity and integration of operations for Command and Control to make it more efficient. Improved Command and Control capability of an organization would help to develop their processes efficiently, increase innovative aptitude, improve the performance and reduce the crisis situation. Further development and modification of proposed approach will ultimately leads to knowledge and provide robust autonomous operation analysis platform that can effectively control the situation and overcome the issues.

C2 is command and control. It is power and direction that appropriately entitles to commander for achievement of the task. C2 accomplished through predicting, organizing, coordination; monitor the activities, communication and operations for accomplishment of mission. Architecture in this research applies to structured approach for establishing organizational processes so as to improve organizational performance.

Since twentieth century, disaster management focus on communication, coordination and expertise. In Disaster management organisation there should be a system of consciously coordinated activities to handle the complex situation to obtain objective. How to manage and organise the people who are suffering is quite complex and challenging task for any disaster management organizations. To manage people, disaster management organization must try to understand the needs and requirements that what are the factors or consequences what ought to be enhanced? Recent years have witnessed a number of countries & regions globally being targeted with devastating natural disasters as we observe a continuous increase in human population. Consequently, it is feared that such disasters in future may lead to rising human loss.

Disaster management organization mandatory for any country but in several cases, they are not adequate to determine that what root cause is?

Recent theories have suggested that successful accomplishment of task is a function of the configuration among lots of variables such as performance of Disaster management organization, expertise, organization structure, disaster management process, management & coordinating skills, standards, and command and control capabilities. As the human population grows up and natural resources decline, there is a need to apply command and control system. We see that countries have faced disasters in the past and would likely be facing similar disasters in the future and therefore the countries have to prepare for Disaster Management.

1.7 STRUCTURE OF THESIS

A brief structure of thesis mentioned below in the form of table 1.1.

Table 1.1
Structure of Thesis

S.No.	Chapter	Description
1	Introduction	A general background of disaster management has given. Past flood responses lessons identified. An overview of Disaster Management Organizations & Agencies working in Pakistan. Significance of Disaster Management systems has described. As well as Aims and objectives are defined.
2	Literature Review	A long discussion on disaster management research, frameworks. The research related to overcome the crisis. To manage the task effectively and efficiently.
3	Develop a Unified Command and Control System	By analyzing both models, an integrated framework has developed with VSM and OODA. Main focus is on recovery, response and decision making.
4	Research Method	Meta-analysis. Critical analysis of all C2 models and decision making frameworks.
5	Future Research	This chapter will identify the views and concepts of C2 Architecture, and gives the directions to future avenue.

CHAPTER 2

REVIEW OF LITERATURE AND RELEVANT PRACTICES

2.1 BACKGROUND

The literature review contains diverse assessments of Disaster Management Systems through research published during (1939-2013). The purpose of this research is to analyze the performance of disaster management systems and improve the performance of disaster management organizations. Organizations are usually complex in nature. The aim of this research defines the factors regarding what, when, why and how certain difficulties effect the disaster management organizations. In addition, such studies endeavour to learn and develop new practices and transformation in processes. The results of these studies are beneficial for organization performance. The research generates the problem solving methods. As the current trends are changing rapidly and new methods are using for support and execution.

2.2 COMMAND AND CONTROL MODELS

Different types of C2 models and other disaster management frameworks have been identified. In detail all previous and current models of command and control discussed. We describe that how system can support with C2 architecture and can visualize the contemporary situation. In disaster management one vital aspect is interconnection between different organizations and their processes. The crucial factors of this research is on time response, recovery activities, inter and intra organization collaboration.

2.2.1 Plan Do Check Act Model

Shewhart (1939) proposed the “Plan - Do - Check - Act (PDCA)” model initiated for excellence. This model was aimed to evaluate the efficiency of domestic and municipal organizations. This ‘Plan’ establishes the objective and process to develop consequence with anticipate result. It is recommended that ‘Do’ implement the plan, execute the process and develop the product. ‘Check’ analyzes the actual result with expected result. ‘Act’ analyzes to determine the major root cause that how we may well enhance our product or process? Shewart was declared with a cyclic model

(Specification - Production - Inspection). PDCA is the important perspective of management for innovation and stay ahead of completion.

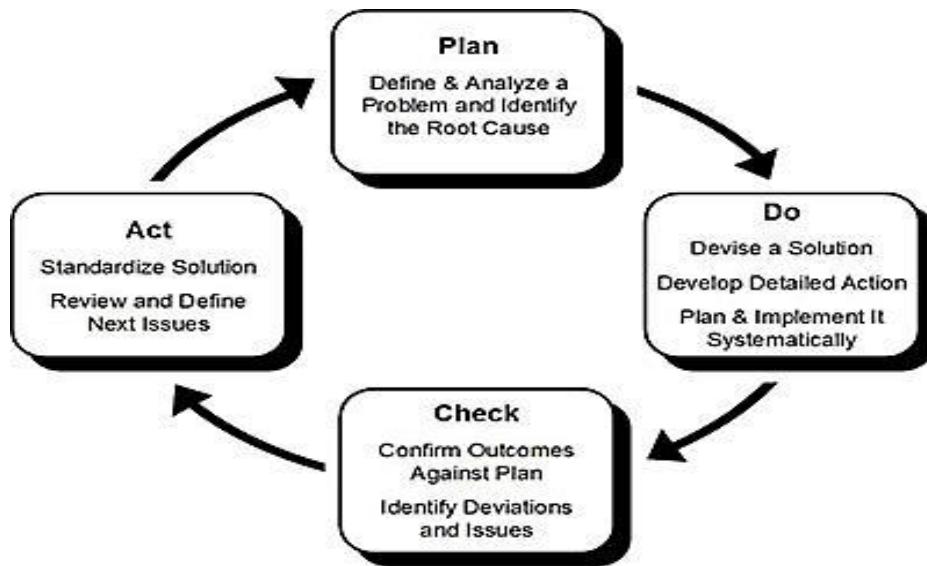


Fig. 2.1: Plan Do Check Act Model (Shewart, 1939)

2.2.2 Stimulus Hypothesis Option Response Model

Wohl’s SHOR, (1981) states Stimulus-Hypothesis-Option-Response (SHOR) Model” for armed consequences and activities. SHOR is for the store and recall the information. SHOR’s focused on strategy and establishing sub-processes.

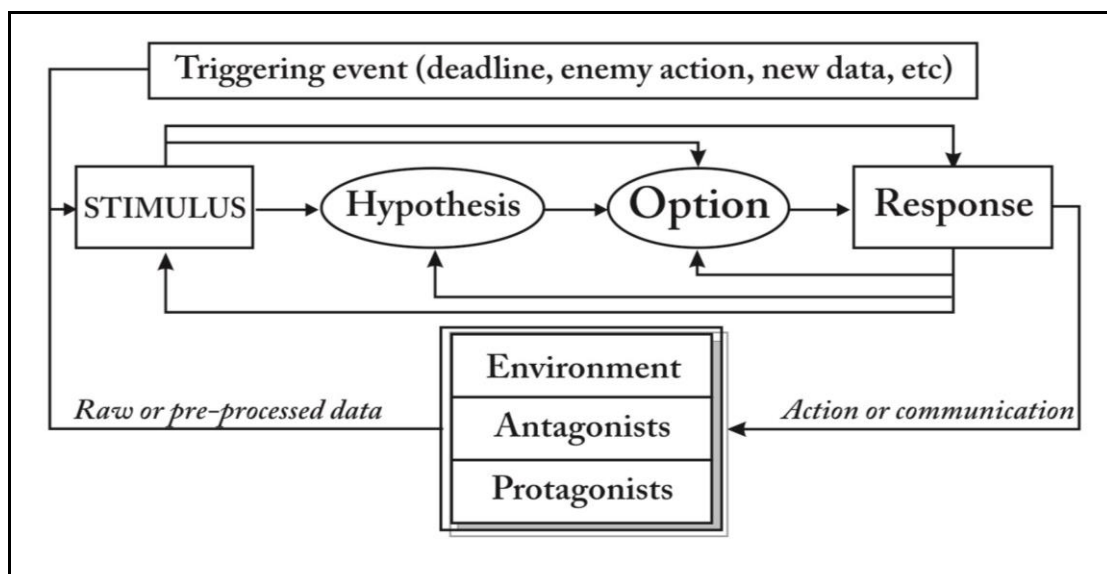


Fig. 2.2: Stimulus Hypothesis-Option-Response Model (Wohls, 1981)

2.2.3 Model of Human Thinking in Supervisory Guiding Control Model

Rasmussen, (1983) declares a model of Human Thinking in Guiding Control. Rasmussen's categorizes three types of reasoning. Integrate rule-based decision-making. Rasmussen supposed that, decision makers try to decrease Intellectual struggle, as thinking is such a robust effort. Decision making expert must struggle to identify indicators that authorize them to take action at the lowest, skill-based level of reasoning. No need to think, just act, & assume via stimulus-response behavior. If skill-based reasoning fails, then decision making expert should follow rule-based reasoning to match the system's state to a mission that they can accomplish. Rule-based reasoning application is shared in armed activities such as processes, policies, and conventional operative procedures. If rule-based reasoning is ineffective, then the manipulator must drop back on knowledge-based reasoning. Rasmussen's model is appropriate for effective architecture of C2 structures.

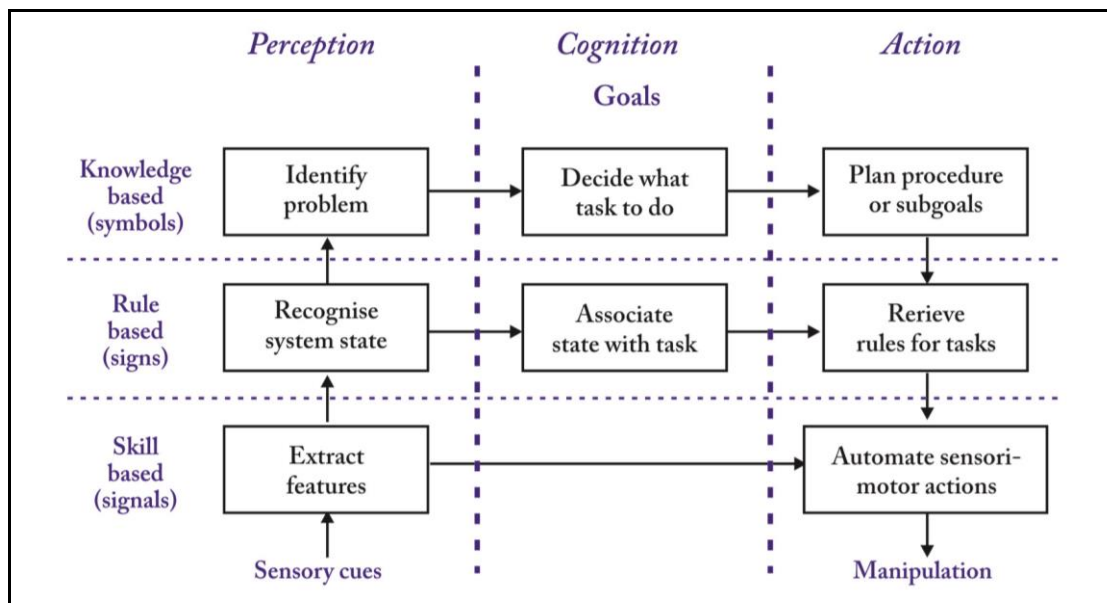


Fig. 2.3: Three-Level Model of Operator Thinking (Rasmussen, 1983)

Mayk and Rubin (1988) revised fifteen C2 models. According to them the present C2 prototypes are decisions theoretical in nature. They detected the decision guidelines and applications to optimize action for a specified observation.

2.2.4 Observe Orient Decide Act Model

Boyd (1996) presented a model for command and control system. Boyd's Observe-Orient-Decide-Act (OODA) model is for decision-making intended to identify fighter pilots in combat. OODA has been implemented by

other military services. OODA has been proposed for operations during fighting, OODA has also been acknowledged as a business process model for Command & Control (C2).

Observe is for analyzing the environment and acquiring the detailed information about the situation. It gets guidance and control from orient and feedback from decide and act. Orient process describes representations, opinions, or imitations of the World. Orientation is how to perceive, adopt, and perform? Decide is the process to select possible options among hypotheses about the environmental situation and react according to the situation immediately. Decide is led by internal Feed-forward from Orient, and delivers internal feedback to Observe. The last stage is Act which is the process of testing the selected proposition by relating with the situation. Act achieves internal guidance and control from the Orient procedure, as well as feed-forward from Decide. It provides an internal feedback to Observe. OODA is more consideration on tempo i.e. the decision cycle time frame (the completion time frame of one action as early as possible with minimal response time).

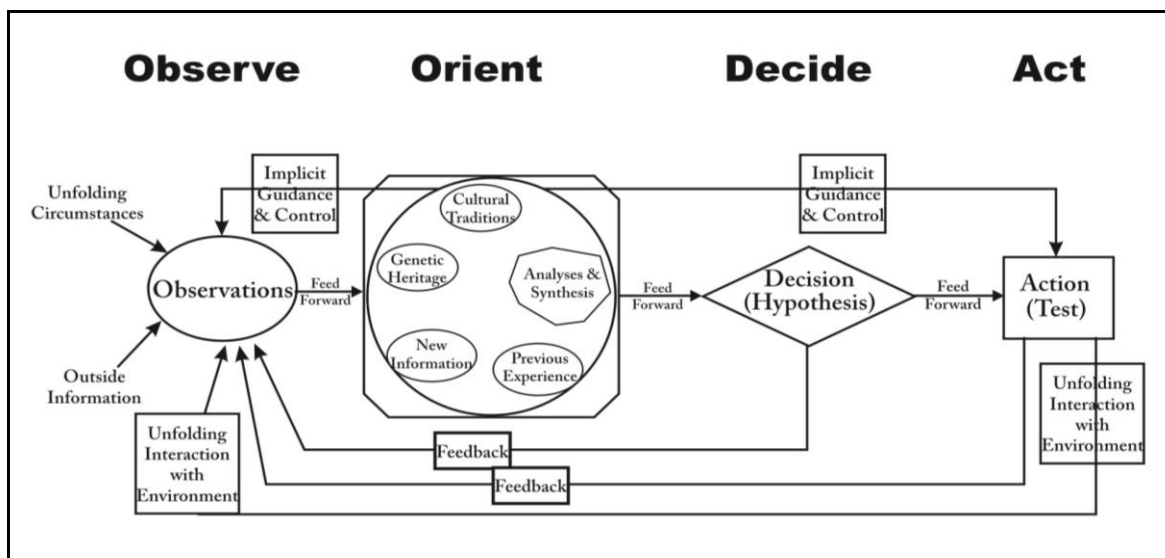


Fig. 2.4: Observe- Orient- Decide-Act Model Boyd's (1996)

2.2.5 Model of Recognized Primed Decision Making

Klein's (1998) delivered a framework of standard decision making concept. Decision making creates from decision concept is a sub-division of economic philosophy. Kleins identified certain options and responded to them as soon as possible. He recommends identifying each evaluation option, weighting each evaluation, scoring each evaluation and lastly selecting the option with the highest weighted score.

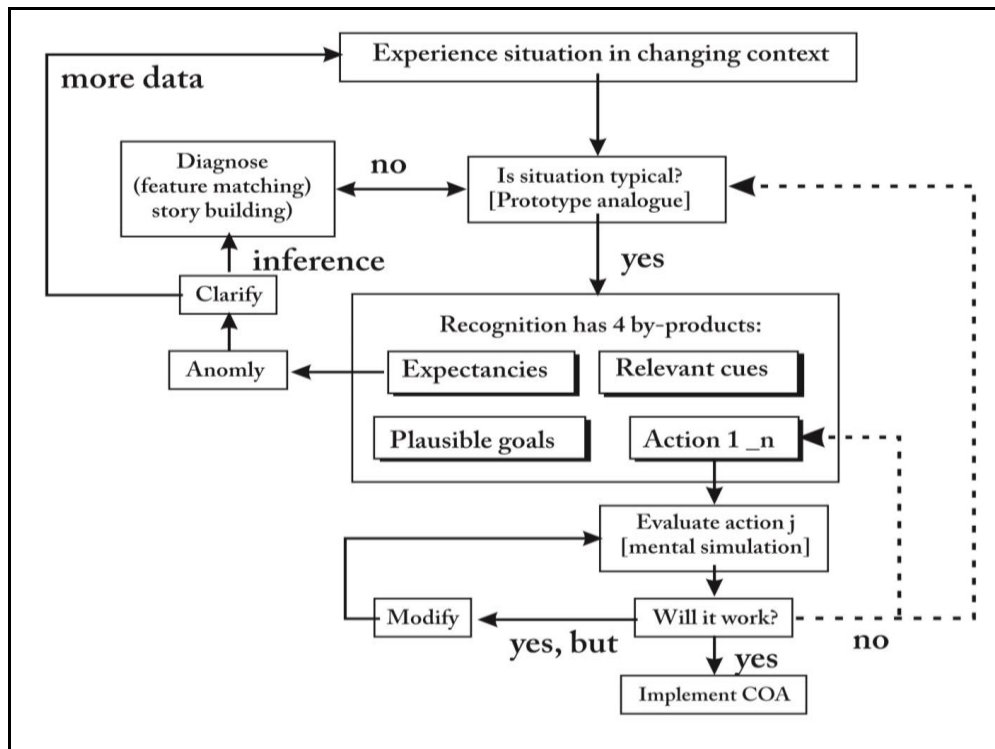


Fig. 2.5: Recognition-Primed Decision- Making Model (Klein's, 1998)

2.2.6 Situation Awareness Model

Endsley (2000) presented a model on situation awareness. C2 is the main feature of this system. The commanders and their staff has the situational awareness to analyze the big picture, a jet view or helicopter view. They have to gain and maintain situation awareness. If they have lost then their decisions almost bound to fail.

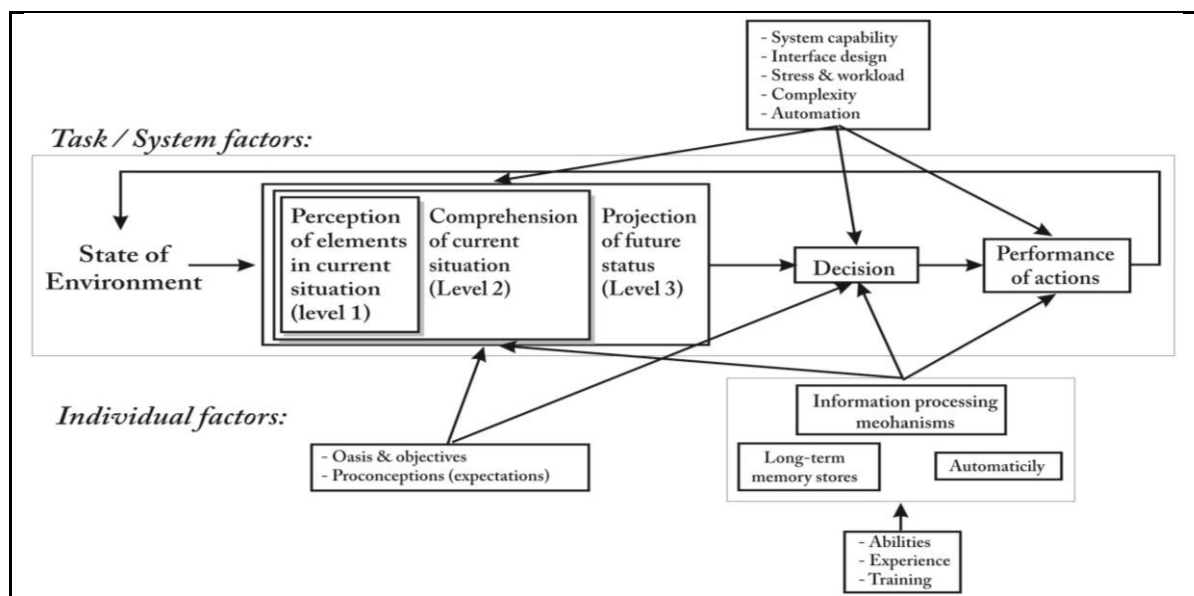


Fig. 2.6: A Model of Situation Awareness (Endsley, 2000)

2.3 DISASTER RESPONSE AND RETRIEVAL EFFICIENCY MODEL

Meissner et al. (2002) deliberates on disaster response and retrieval efficiency emphasizing on time management and direction of the community disaster services in command to save survivors and reduce financial damages. The main aim for this system is to pioneer a cohesive disaster management communication and information system, explicit system for communication, alignment, improvement of data management problems through the response and rescue reformation, decision support, visualization, Geographic Information Systems (GIS), and preparedness. The major challenge during a disaster is awareness of disastrous situation, then estimation of affected areas. The coordination and communication network are the most important aspects. Wide area network and local area network within a disaster site is important.

2.4 VIABLE SYSTEM MODEL

Beer (2002) specifies the system is viable. A viable system is a system organized to meet the difficulties of living in a fluctuating situation. The key is that it has to survive and adapt. Viable system describes the explanation of all observational indications that had initiated to accumulate from the military experience. Viable system is designed for handling the complexity of situations. It delivers the outline & presents the procedures and opposes some highly argumentative problems about both the decision-making and systematic models. Stafford mapped a theoretic model of the brain.

Cybernetic model of any viable system clarifies that there are five essential and adequate subsystems cooperatively involved in an organization that is accomplished with shared communication. Each system is viable and recursive in nature. System 1 is responsible to handle the primary activities. Each system is viable and implements transformation. System 2 is responsible for information channels and bodies that allow system 1 to communicate between each other and system 3 to check and collaborate the activities. System 3 indicates the layout and control of the system as well as its resources, rights, rules and regulations. It provides interface between system 4 and 5. System 4 is responsible for the future environment and how its organization remains viable. System 5 depicts policy decision making to steer the organization as a whole and to balance the demand and needs of the current environment.

Cybernetic is “The science of communication with control on the actions of animals and machine”. Broader definition is “The science of real and effective organization” (Norbert Wiener 1948).

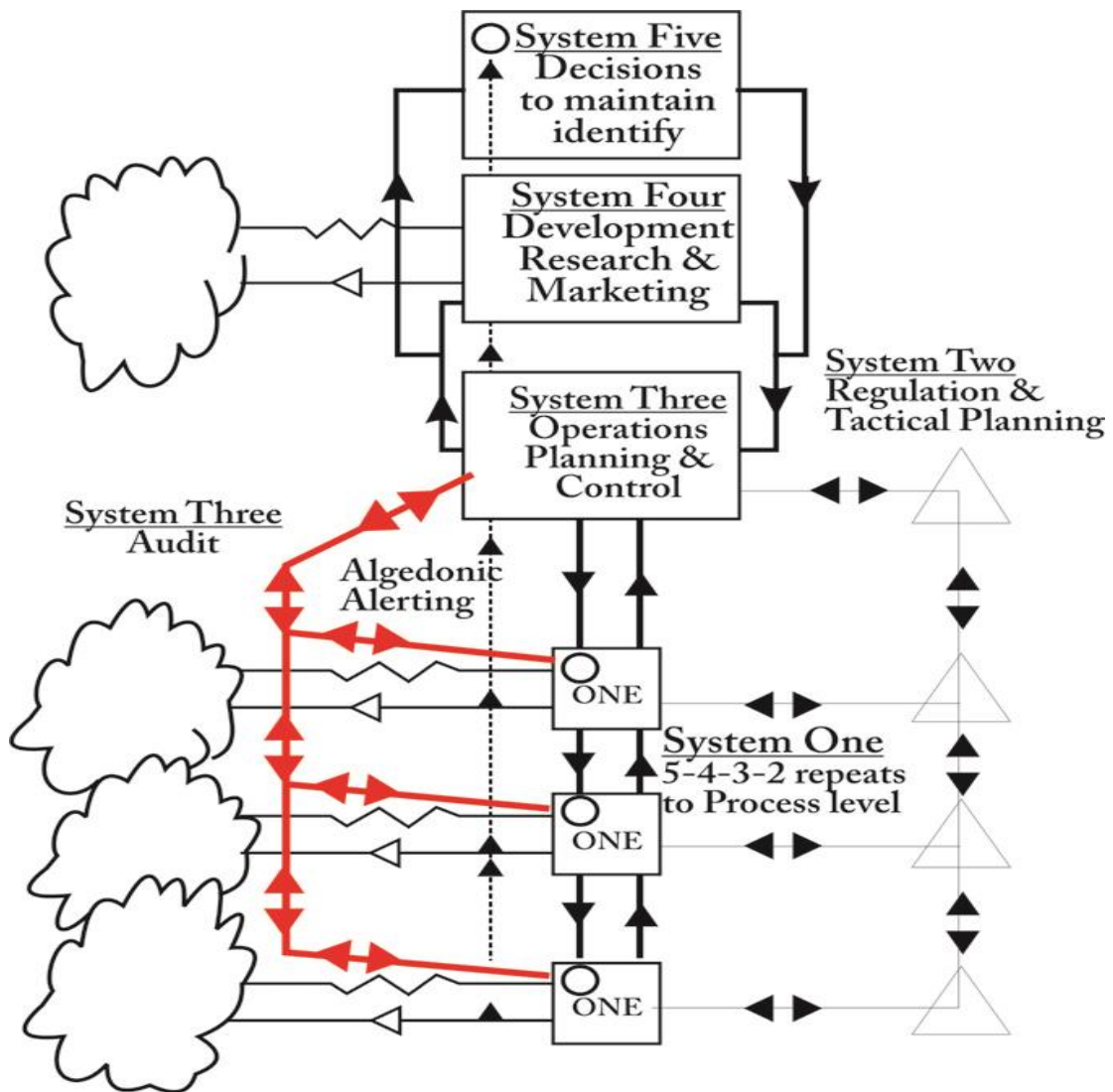


Fig. 2.7: Viable System Model (Beer, 2002)

In the last decade, the world has observed huge and fatal disasters, such as hurricanes, tsunamis, and earthquakes including the World Trade Center in 2001. Espejo (2005) proposed that a viable system model is the most supportive tool for organizational strategy and analysis. It allows us to detect the structural mechanisms & communications within and between organizations. This is a platform for organizational design. VSM is important to steer interaction to produce actual organizational mechanisms. VSM has own problem solving capacity according to the demands and needs of an organization or unexpected hazard.

2.5 FRAMEWORK FOR DISASTER RESPONSE PLAN IN CLIMATE VARIATION

Brien (2006) shed the light on climate change variation. Disaster response activities are dependent on many aspects regarding weather changes difference. A preparedness plan is needed to recognize the certainty of weather difference as well as government's assistance, to assess the weather dissimilarities. This model is focusing on improvement of activities with restructuring, and practicality of procedures. The objective of this paper is to reduce the risk factor of climate change. Hazards can be classify in three different categories natural, procedural and complex disasters.

2.6 DATA DRIVEN APPLICATION SYSTEM MODEL

Y. Shi et al. (2007) presented an application for communication processes for crisis response managers with the situation consciousness. The aptitude towards on planning specialists, immediate responders, community protection representatives, the broadcast mass media. The people can deliver the information to administrators about the crisis situation. The individuals have not ability to see the crisis picture accurately, frequently given information always vague, contradictory and imperfect. Moreover, the accurate information must be stuck not articulated picture of the whole crisis event. For effective results empowerment is necessary for emergency managers. The model Wireless Phone Based Emergency Response System (WIPER) is proposed the concept of enhance the awareness of disaster response managers. This application called Dynamic Data Driven Application Systems (DDDAS).The succeeding segments assessment exposed exploration problems with the DDDAS perception. The strategy and progress structures of the WIPER model that address specific vulnerable problems. The paradigm proposed the possibilities of successful modeling approaches, and enhancing the investigation and forecast competences of simulation method.

2.7 NATIONAL INCIDENT MANAGEMENT SYSTEM (NIMS)

Dourandish (2007) presented on shared military operational procedures for disaster management. The features are collective environment of civilian crisis response that frequently comprises on diverse factors, such as firefighter and police services, with their own mission, protocols and command processes. Armed C2 is expected to manage strategic procedures and actions, these are related with highest goal accomplishment. The integration of these activities can enhance the operative response during the first 72 hours of a

crisis. This paper consider limited civilian factors such as response managers, volunteers, command and control factor, role of a leader in disaster management organization. Hurricane Katrina was one of the most huge disaster in United States past history. A model of transformation with C2 architecture was suggested for National Incident Management System (NIMS) for first 72 hours a major crisis happen. This time period is critical for response to evaluate the nature of disaster.

It is quiet expectable that countries and humanities have potential to respond during the initial phase of a hazard progressively. A synchronized framework was designed for commanders in decision making process, by empowering them they can accomplish the mission and desired goals effectively. This military C2 is well structured, with strongly bonding in procedures, and work competently and swiftly to overcome the crisis situation.

2.7.1 Incident Command Model

The Incident Command Model is designed to observe and organize the disaster management activities. As hazard level rise up then more difficulties in response activities. Another command and control mechanism required to accumulate. Preparation and implementation of major crisis event's protection and evacuation procedures are very difficult. Command and Control (C2) of major events can be observed as universal accomplishment of shared assembly, organization and investigation of facts, preparation, decision-making, synchronization, implementation and sustainment of actions and events carried out by several agencies directed by diverse authorities. Thus, it seems that cross agencies communication; coordination, association and integration are important factors for a fruitful C2 of major events. Collective situation awareness, shared intent, trust on teams, communication and information sharing policies are key enablers for major events C2 efficiency.

Comfort (2007) stated that cognition is important aspect in disaster management. Cognition can be define as ability to analyze the intensity / degree of hazard (crisis) and which community is affected and unprotected. According to this situation what type response is needed? As Hurricane Katrina proved that traditional method of standard procedures of emergency management failed because lack of cognition in crisis response. The author re-establish that the system should be appropriately govern and regulate with the changes of need requirement and the public response. The suggestions for coordination, communication, cognition and control were re-defined to overcome the crisis and extreme events.

The cognition will effectively analyze the communication between 3Cs communication, control and coordination of disaster management. It visualizes the disaster response activities. No action is successful with cognition element. The association between activities and cognition transforms into crisis management rule-bound set of processes. These processes based on social perception to examine, rationalize and regulate in fluctuating environments. It also timely acknowledgement, legal facts. The major contest is to form the capability for cognition at various stages of organization and achievement in the valuation of danger to helpless societies. Four Cs reframed and identified for cognition and emergency organization cognition, communication, coordination, and control.

2.8 DECISION SUPPORT SYSTEM MODEL (DSS)

Xu (2008) Model integration is one of the vital explored areas in the management of Decision Support Systems (DSS). In modern disaster management procedures, an independent DSS framework monitor and handle particular decision-making essential components. There are many advantages in integration of these frameworks. Thus, there is a need to develop such models with appropriate selection and integration of models. Model integration describes the incorporation of different frameworks into a consistent joint model. The proposed system is to get an integrated framework has been explored as a clarification to decrease the trouble and insufficiency of dealing with numerous tasks. The proposed integrated model based on different subroutines that provide appropriate solution to the problematic crisis, such as dynamically changes in needs and disaster situations, in the evolution of decision support system for disaster management.

Christian Uhr (2009) suggests a framework for how multi structural emergency response management can be a tacit. A technique for gathering and examining facts on persons and their connections has been established and verified. The system is embedded in social network philosophy and accelerates additional investigation of the complication related with responses to disasters in which many assets from diverse sections of the civilization are involved. Moreover, in order to construct an outline for accepting, the models of command and control, coordination, emergence, and trust are clarified and associated to pragmatic studies. A combination of observed studies and fiction lessons is offered as a model to demonstrate how multi-organizational emergency response management can be enhanced implicit by reviewing communications between persons. Communications are fundamentals for coordination of activities. Such activities can be both scheduled and developed. Both the indicator of an interface and the actual synchronization

action are inclined by normative standards and personal beliefs. The system creators and crisis response managers should recognize this difficulty and improve policies to correspond the native adaptive conduct of a multi-organizational emergency response system. When a society is crash by crisis such as a flood, a forestry fire, a hurricane, or a disease, numerous funds are carried to tolerate to encounter several desires. Such resources build an emergency response system. An emergency response system can consist of not only legislative societies but also civil service such as sacred societies, isolated system of government, the broadcasting and evolving clusters. This research mends the facts on how emergency response systems are accomplished. A significant hypothesis is that pragmatic expertise is a precondition for the expansion of normative philosophies.

The process for information gathering and investigation is embedded in models on social networks and concentrates probable investigation of several kinds of communications that develop in an emergency response system. Four concepts have been acknowledged for further clarifications: command and control, coordination, emergence, and trust. The “old” approach to command and control highlights the significance of a dominant power for a fruitful consequence of an action. The “modern” approach to command and control recognizes system phenomena such as self-organization, the casual grids, and central power. Multi-organizational emergency response management can be enhanced anticipated by look over communications between persons. Emergency response management ought to be established on the familiarity that variation in challenging organizations develops from modifications. An important challenge is to design system clarifications so that coordination among various local conducts can be accomplished.

2.9 NATURAL DISASTER MANAGEMENT COMMUNICATION SYSTEMS

Nicolai et al. (2009) explored a solution to facilitate and accelerate the procedure of allocating resources during a disaster by managing the outcome more competently and successfully. It deliberates a research on Natural Disaster Management Communication Systems. It is not possible to avoid the costs of disasters and tragedies; however human pains can be minimized by effective disaster management communications at limited management levels. It is extremely significant for timely decisions to be done rapidly and exactly.

2.10 A REAL TIME DELPHI DECISION MAKING SYSTEM AND ANALYSIS OF CONTEMPORARY SYSTEMS

The constraints acknowledged for this system include the proposed model, prototype description, implementation of plan, database relationships system model, practical design, best scenario visualization, and so on. Decision making is the most important feature for disaster management. On spot decision making and analysis of contemporary situation is mandatory and intended for this perspective introduced by White et al. (2010). The constraints defined for this proposed system is stress, information overload and time pressure. This system is assigning primary importance to decisions influencing factors like stress, time pressure, information overload and uncertainty for the catastrophe managers. It is a web based tool that indicates the mutual coordination difficulties during a catastrophe. Practical and logical design is the prerequisite of this system. This system is applicable in multiple ways and explains the hypothesis that triggers the estimation power of the model. It enumerates the factors like Usefulness, Ease of Use and Confidence that influence the satisfaction and usage among its users. For investigators it supports the understanding and requirements of the operator. It tends to improve practice guidelines seeking assistance from current investigators. More than a few developments are essential to be fulfilled, so that the Delphi Decision Maker can be used by any crisis domain to support them in the utmost crucial time.

2.11 A MODEL FOR TEMPORAL COORDINATION AND DISASTER RESPONSE ACTIVITIES

In disaster management traditional methods of predictability become irrelevant, therefore, on spot decision making and coordination become the only feasible method to cope with a particular event. Franke et al. (2010) highlighted some of the parameters like centric activities, coordination, and minimum response time, management of unforeseen events and cross organization coordination. The said paper proposed an activity centric system for managing crisis response activities. The resulting output is to be modeled using business process management systems providing the basis for this proposed activity centric system. Modeling phase provides the convenience of forecasting serious difficulties. This system can be categorized into three parts i.e. Activities/Dependencies, Execution and Visualization. The model contributes to the understanding of information systems for crises management and provides stability between efficiency and control with ease and expressiveness.

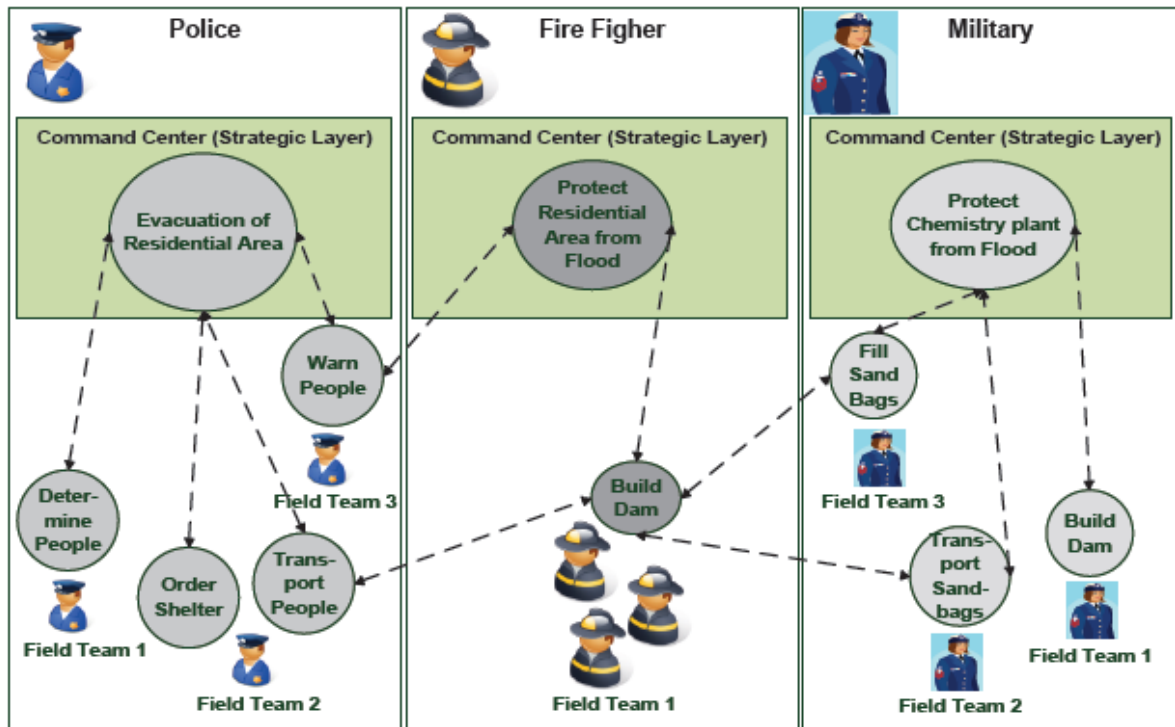


Fig. 2.8: Activity Centric System (Franke, 2010)

2.12 FRAMEWORK FOR IMPROVEMENT OF WORKFLOW MANAGEMENT SYSTEM (WFMS)

Sell et al. (2010) contributed a framework for the improvement of workflow management systems to better manage the emergency response plan. Emergency plans are designed for incident management systems. They direct the procedure for evacuation and preparedness. Workflow (Emergency Plan) Model is based on activities, control and connections. A model for workflow management system proposes (WfMS) to associate the modeling, implementation and organization of emergency plans before and during a disaster. The objective of this contribution is to support the staff in the execution of emergency plans. It supports unstructured activities and delegation of resources.

2.13 A MODEL FOR BARRIERS TO COORDINATION IN DISASTER RESPONSE

A proposal declared by Scotter et al. (2010) deliberates the barriers related with coordination procedure in disaster response. These two research studies have led to identify the main obstacles in coordination of disaster response. They also help to recognize the major relations among any

interruptions. These two studies indicate about development, preparation, command, governance, and communication. The mission addresses inter-organizational coordination problems like inadequate knowledge, planning, communication, training, and command and control problems.

2.14 SOCIAL VULNERABLY INDEX FOR DISASTER MANAGEMENT

The importance of appropriate and relevant use of available information in any disaster management scenario has been emphasized in the above mentioned literature. For development of social vulnerability, Flanagan et al. (2011) emphasized that community susceptibility is directly dependent on their socioeconomic and demographic structure which limits the flexibility of communities. Social susceptibility in terms of reduction in human loss/pain and economic damage are also both directly associated with social services and public support availability after a catastrophe. This paper describes an enhancement of a social vulnerability index to apply in disaster management. A particular disaster cycle contains parameters which address accountability, overall improvement, feedback, and revival.



Fig. 2.9: Social Vulnerably Index for Disaster Management (Flangan et al. 2011)

2.15 A COMMUNICATION & DSS MODEL FOR DISASTER MANAGEMENT

Lee et al. (2010) presented a model of decision support system and communication process. The main focus is on sharing the information through different Disaster Management Organization. If we consider 9/11 crisis, firefighter team were not able to get the information about WTC and the structure of WTC. Disaster response towards quake, floods, terrorism are complex due to complexities, ambiguities and unreliable information. Disaster management activities are comprehensive in nature. Main objective is to cope with the specific type of crisis. Access the correct and accurate information is vital for Disaster Management organizations to resolve the problems and performance under challenging situations. Because wrong information quality can be disastrous for both victims and emergency response organizations.

Levchuk (2010) identifies that at the present time military command and control (C2) organizations are mounting with excessive struggle. It is fetching progressively inspiring for these organizations to acclimate swiftly in vibrant situations and creates the essential variations to improve performance. In inadequate clashes, comprising nautical prohibition, municipal safety actions or disaster relief assignments, the outdated classified C2 organizational structures do not deliver sufficient flexibility desired to enable agile operations of the force. The results once again show the efficiency of model-based C2 design solutions, shed the light on the explanations behind enhancements in performance, and deliver vision on how optimization models could be used to improve further competent C2 architectures and procedures. A traditional command and control (C2) structure has a topology that largely confines communications between associates of the organization to direct superior/subordinate collaborations and whose number of stages is determined by the restrictions of gap of command (Albert and Hayes, 2003).

Command and control is categorized by incorporated planning, reintegration of responsibilities, and control processes that mostly depend on de-confliction. Hybrid organizational structures bring both the ability to adapt the organization and stay organized and coordinated over the time of the mission. Currently, their C2 design is performed manually by mission planning experts, and many concepts of non-traditional C2 structures primarily in resource and role allocation have been used. Command system specifies role allocation, subordinates, and supportive associations among command nodes. It allows commanders to allocate tasks among each other and make prioritization decisions.

Communication and information flow network specifies what information can be shared among commanders and how it can be passed. The research focuses on the capability to describe C2 proposal strategies that acclimate to peripheral proceedings, the state and performance of the organization and its members, and fluctuating desires of the commanders. However, during dynamic military engagements the knowledge of what tasks and operations have been executed, which operations are ongoing, who is involved in them and why behavior of commanders are often inadequate?

Kapucu (2011) declares a model for decision making procedures. The focus is on crisis management, a collaborative and synchronized framework has designed. The model name is EMAC (Emergency Management Assistance Compact). The EMAC decision making is fruitful, flawless in communication process. It decreases the uncertainty level. How can people respond to disastrous events possess the knowledge and resources needed to manage the situation when called upon? What are the skills and challenges required?

Michele M. (2012) shed the light disasters regarding terrorism and other crisis with communication perspective. The major factor of policy decisions is to make plan and implementation of disaster operations. These operations are based on system approach and observed evidence. Recent catastrophic events are seems to be recurrent and strange. On 11 September, 2001 many people killed minimum 2973. This was a unique and unpredictable event in the country's history and caused many Americans in danger, as well as those who were not directly affected. In December 2004 an earthquake with a rector scale 9.2 caused by Tsunami. This was a massive and most horrible earthquake, due to this earthquake 2, 30,000 people killed. In August 2005 Hurricane Katrina was the huge earthquake. In 1928 the Hurricane submerged more than 80% area of New Orleans city and 1500 losses identified.

The earthquake Haiti affected many individuals in January, 2010, almost 2, 30,000 killed and evacuated figure is more than 3.5 million people. In Japan the tsunami and nuclear disasters are still undisclosed. The crisis mentioned above, there are no any strategies to formulate. The disasters are becoming more complex due to complexity. In the meantime, uncertainties about future terrorist attacks still exist.

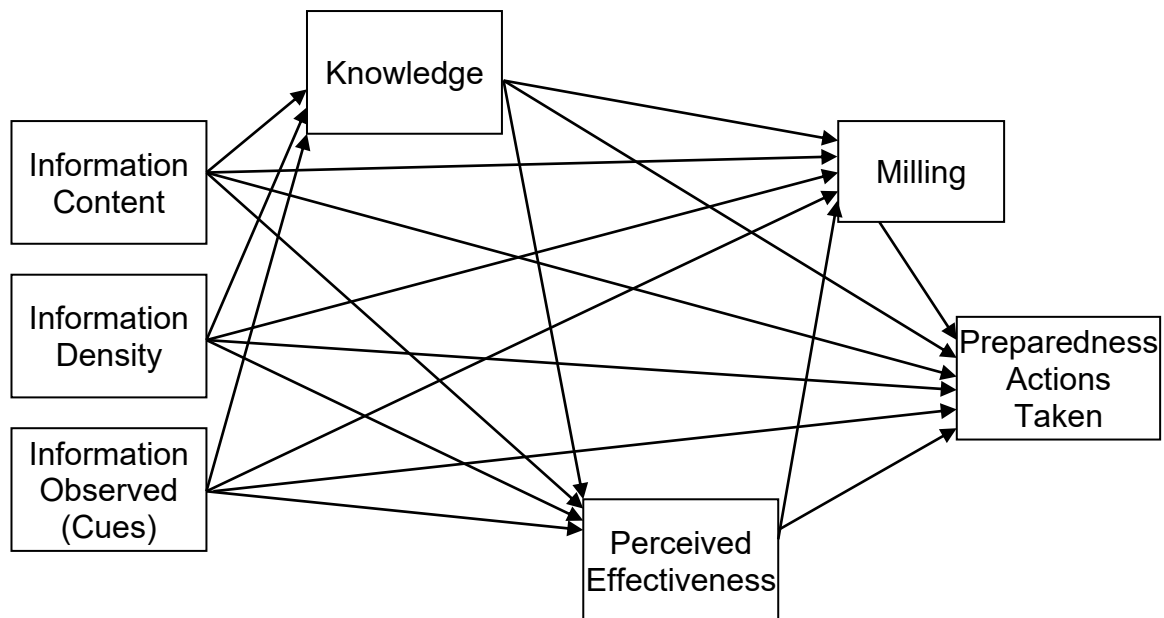


Fig. 2.10: Theoretically derived model of actionable risk communication and its effect on proactive risk reduction behavior (Michele, 2012)

Pauliina Palttala (2012) discussed about communication gap in disaster management. The major troubles in recent disasters are becoming challenging for crisis communication. The objectives of this paper is to identify gaps between communication and planning process in disaster managements to create knowledge from those circumstances. The paper delivers a real-world about the communication and the limits in crisis. A quality measurement system was used for crisis communication. This communication is focusing on major accidents, natural disasters, and philanthropic disasters are creating awareness in organizations. This research explains the limitations between disaster management communication practices and tasks of communication process of organization with different stages of a crisis incident and collaboration between the crisis response networks.

However, from many years the communities and societies, have neglected the communicative aspects of crises in the area of disaster management. The crisis communication did not create itself as a self-determined investigation area till afterwards the disaster Chernobyl in 1986 (Nohrstedt & Admassu, 1993). The tsunami and Katrina are creating troubles due to greatest number of hazards and the intensity. The public blame on government about crisis communication. Government should have to create more consideration about crisis communication. In crises governments and people meet with threats conditions, they require a quick on time response from those who are accountable (Ulmer, Seeger, & Sellnow, 2007) to manage the activities. They need decision making plans under short time period. We

can categories disasters in different types, such as workplace crisis with violence, non-governance, disruption and violence.

An accidental crisis may be viral diseases, unexpected technical difficulties, and disasters (Ulmer et al., 2007). In public association crisis communication plays a crucial role with their own perspective. It deal with the strategies & focus on the views of communities to accomplish the task. It requires right description of any unpleasant event and specific hazard, to evaluate the conclusion and consequences, furthermore it provides harm decreasing information to affected regions and community (Reynolds & Seeger, 2005).

Different disasters threats take diverse forms, leads with different prospects regarding communication (Pauchant & Mitroff, 1992). Several communication methods exist, but most useful approach be determined by on shareholder's views and thoughts about the conditions and cause factors (Coombs, 1995; 2004). The nature of modern disasters have created troubles to those organization who managed them; initially government participating players, such as army forces, police, disaster emergency services, and military, they have to worked for several worldwide community, government for normal hazard or huge crisis (Visuri, 2003).

Therefore, effective crisis communication proceeds the evolving phases of a hazard (Reynolds & Seeger, 2005). A six stage framework was established (Reynolds & Seeger, 2005; Moe & Pathranarakul, 2006), a pre-crisis with evolution phase is required. A critical or disaster phase, monitors and track affected incident, but in post-crisis phase, queries related with cause, accountability, and preparation for a new disaster are stated. The communication process was integrated with planning element, this planning include before, after and during a disaster. Disasters indicates a normal phase in present evolution. (Sellnow, 1993; Weick & Sutcliffe, 2007; Kersten, 2005).

For an effective association and collaboration in well-developed countries, the organizations have good knowledge and capabilities of shared procedures (Palm & Ramsell, 2007). Mutual commitments can be helpful for preparedness factor. In crisis situation and disasters communication and coordination plays a vital role. Erik Battberg (2012) presented a model for coordination and contingency planning. After September, 11 event in USA, the Americans are still evaluating themselves that how much they are safe and protected at the present time? This argument is most relevant for the scholars to find out the protection and safety measures and transform them. This paper highlights the Don Kettl's contingency coordination framework. This framework describes the coordination challenges. The focus is on two aspects

one is procedural approach of contingency coordination framework and other is observed the past efficiency level of September, 11 the security reforms. This paper delivers a general estimation of how to determine the new methods to fortify the US security and protection system.

The terrorist attack of September 11, 2001 defines security issues were the major domestic public policy agenda. Afterwards the terrorist attack, the security and protection issue was a major mission for US government and management. It is immensely a challenging mission, because the general policy for Homeland Security entitles that coordination and interconnected system should be implemented at national, local, central government level and in all regions. The contemporary issue is that how system is coordinated between different actors and agencies? The terrorist attack of September 11 has shown negative results due to coordination and response problems between central government and local organizations (Perrow, 2007; 9/11 Commission, 2005).

If we look at large scale disasters Hurricane Katrina, in August, 2005 strikes the Gulf coast. The preparedness plans and response has shown failure in results due to inadequacy in procedures (Cooper & Block, 2006; Daniels, Kettl, & Kunreuther, 2006; Parker, Stern, Pagila, & Brown, 2009). Hurricane Katrina showed difficulties in decision making and a major issue was collaboration between local, central and national organizations regarding information. Lack of governance, implementation difficulties, no effective strategic planning among official organizations (Perrow, 2007; Cooper & Block, 2006).

Coordination tends to be more challenging aspect for organizations, institutions and societies due to lack of integration systems. Due to this difficulties of integration portraying the American federal system needs to define more challenges for coordination. (Kaufman, 1960; Peters, 2006). Since 1960 the growth level of coordination has decreased at international organizations and central government. These encounters are getting worse due to complex mission statement for safety and protection measures (Kettl, 2003a, 2007).

The role of federal government assistance has been insufficient for preparedness in emergencies and resources allocation before a huge disaster. The objective is to deliver recovery and on time response after any type of crisis when local resources are shattered (Lindsay & Sometimes referred to as 'The Philosopher's Stone of Public Administration) (Seidman, 1998). In public organizations coordination is a major issue (Morris & Morris, 2007) and it is particularly difficult to determine (Helsloot, 2008). The crisis management

organization researchers have deliberated that this is possible to regulate the system with complexities by government till then the accurate formation of coordination strategy is designed (Seidman, 1998. O’Hanlon, 2002; Sauter & Carafano, 2006). For immaculate coordination we required to divide the task and responsibilities within the organization for operational coordination, for inside coordination require checking and monitoring the activities of single department or units rather than between different distinct workforces. (Morris & Morris, 2007). The contradiction with this assessment, contemporary network system indicates coordination and association between numerous self-dependent organizations, but current organizations who are not collaborated. (Chisholm, 1992; O’Toole, 1997; Wise, 2002; Wise, 2006).

Many security and protection measures adopted for the country, we can say policies and implementation of laws, transportation, public well-being, nutrition care guidelines, disaster and crisis management information technology development, are dissimilar across multiple groups of different actors from government to different nationals and local authorities to the profit and non-profit communities (Lindsay & O’Hanlon, 2002; Sauter & Carafano, 2006). From theoretical point of view the paper is highlighting the aspects of capability, skills and efficiency to enhance organization’s competency to achieve goal and mission, plus struggles that are regularly assessed (Kaimen, 2005). A general literature on risk communication has upsurge in present years. This work recommends that individuals must have practiced or aware of dangers in order to work competently (Kaimen, 2005).

The consequences of Hurricane Katrina, crisis was severely criticized regarding preparedness and response activities of national and local authorities (CRS Report to Congress, 2008). Other issues identified were emphasis on the expanses of other dangers (Flynn & Prieto, 2006), the problem is to clarify the roles of the several actors and actions in response activities (Parker et al., 2009), and a multi-purpose disaster management system was established (Wise, 2006). The problem with this research was that some part of this research, is still incomplete at the time of the disaster (Daniels et al., 2006). The perception of strategy development between DHS organizers is missing (White House, 2007). The NRP was revised by a new document includes past lessons learned from the Katrina disaster called the NRF in January 2008 (CRS Report to Congress, 2008).

The preparedness plans regarding training sessions, workshops and regional activities plays a vital role in Homeland safety and protection, the collaboration of Urban Area Security Initiative network and federal Urban Area Security Initiative leadership may enhance the processes and activities of organizations (Jordan, 2010). At present time the Metropolitan Washington

Council of Governments (COG) has taken major steps for further growth of regional emergency coordination strategy based on UASI charities (Kaimen, 2005). For organization interactions and homeland protection the NRF (National Response Framework) and NIMS (National Incident Management Systems) were designed. In crisis situation and disasters the main problem is directly related with the lack of association between several organizations and institutions that are participating in emergency management events. On 5th February, 2003 the Director of Homeland Security named this as a Growth of National Response Plan (NRP). The objective is to revise the present planning processes with enhanced measures named National Incident Management System (NIMS).

Other difficulties were about terrorist attacks, dangers and expanses (Flynn & Prieto, 2006). The crisis situation is the failure to respond efficiently and describe the role of several participants and organizations, who are participating in disaster activities (Parker et al., 2009) in addition state a multi-purpose disaster management framework (Wise, 2006). Government plays an important role in disaster related activities nationally and internationally. Emergency management is important for disaster related activities.

Karen Tindall (2012) presented a model for consular emergency management. Government role is how to manage the situation effectively. Due to man-made or natural crisis, the security and safety of people is the major responsibility of government and foreign ministers to take action with planning and consular support. In early 2011 government has faced many difficulties due to the complexity of consular emergency management. During past two months the disasters in Japan and New Zealand the overseas citizens were stuck due to political issues and difficulties in Libya, Egypt, and Tunisia. Consular emergency management used in a broad spectrum for crisis management. It deals with standard rules and regulations. The official consular assistance was provided by government and consular management officers.

Many international organizations focused on the perception and assumption of the people that what they required from government regarding financial assistance during large scale crisis. What assistance and support government obliged to deliver? Consular emergency management examination is deal with the affairs related with consular management. Though, as Heijmans and Melissen (2007) analyzed that there is no any lawful act of consular emergency association. Consular affairs has been neglected in past decades. The significance of consular emergency services were highlighted for disaster management response activities (Leira & Neumann, 2008). Tsunami has affected 40 countries, the assistance was provided immediately after the crisis by public crisis management. Many countries affected due to Tsunami.

Disaster issue was gained maximum media attention. It reflects investigation and theoretical aspects. The bad effects of Tsunami are psychological and physical health issues. For example mental trauma of survivors (Heir and Weisæth, 2008; Råholm, Arman, & Rehnsfeldt, 2008; Johannesson, Lundin, Hultman, Lindam, Dyster-Aas, Arnberg, & Michel, 2009a, Johannesson, Michel, Hultman, Lindam, Arnberg, & Lundin; 2009b; Kraemer, Wittmann, Jenewein, & Schnyder, 2009; Heir, Rosendal, Johannesson, Michel, Mortensen, Weisæth, Andersen, & Hultman, 2011), between kids and youngsters (Jensen, Dyb & Nygaard, 2009), among those not directly suffered (Kristensen, Weisaeth, & Heir, 2009), among responders (Thoresen, Tønnessen, Vibe Lindgaard, Lie Andreassen, & Weisæth, 2009), and even amongst those who are not directly suffered by the tsunami (Västfjäll, Peters, & Slovic, 2008).

In disaster management and crisis communication activities planning plays a crucial role. For disasters and crisis a model has designed for communication and planning process was presented by Halliki Harro-Loit (2012). The reaction of people matters in disasters related information, that how people transmit the information? The information should deliver accurately, this can reduce the risk of crisis. The paper analyze the past experienced crisis and the warning information system by public. The analysis of risky factor is divergent due to perception and awareness of people is divergent from those who are the experts and researchers to estimate the death toll. People generally believe on past stories and general practices (Slovic, 1987; Slovic, Finucane, Peters, & MacGregor, 2004; Brehmer, 1987; Roberts, 1990; Kletz, 1996).

A communication gap is always lies because public not bother and pay attention to the crisis warning alarms and messages. Crisis can be of any type suppose loss of human, deadly consequences, water and air pollution, (Flynn, Slovic, & Mertz, 1993). Choi and Lin (2007) recommends that due to communication gap people did not shift from New Orleans area during Katrina Venette (2008). The Hurricane Katrina determines that many people did not evacuate due to warning messages comparison of Hurricane Camille in 1969, people misunderstand the intensity of risk and hazard. Venette suggested that the community and people should not contrast the warning messages with past disasters, if contrast define then it is extremely blunder towards the risk identification (Venette, 2008, p. 207). Smillie and Blissett (2010) defines that the public's perception of disasters and risk is based on past stories and histories of related crisis and it creates diverse cultural uncertainty.

For multiple type of hazards The National Crisis Communication defined the policies and challenges of their mission statement. If we compare

the risk communication then we can analyze that the receivers generally have short time period to explore and process information flow. Consequently, for organization growth and development risk education is necessary and enhanced policies are required to improve the ease of understanding of crisis messages (Quinn, 2008). The crisis relates with the cultural aspects that how individuals describes the intensity of disasters. Therefore how they will manage and cope with the crisis situation (Berkelaar & Dutta, 2007)? In crisis communication and risks, many scholar's findings shows about culture dissimilarities. Berkelaar and Dutta (2007) briefly described that culture can be constantly change, regenerate, indigenous and lively, through communicative bodies. Smillie and Blissett (2010) described that risk communication policy is crucial for the core strength of culture by Hofstede (2002; Hofstede & Hofstede, 2005).

Helsloot and Ruitenbergh (2004) analyzed that the societies has designed a disaster management system who not often face any crisis and disasters, the disaster management system includes operational frameworks, sharing of information and other processes which are essentially important. Eisenman, Cordasco, Asch, Golden, and Glik (2007), delivers qualitative research with an inclusive view of individual's perception about decision making, planning, evacuation process, social environment with cultural context.

Louis Anthony (2012) highlighted some difficulties and challenges of disaster management and crisis management systems. This paper specifies the major encounters of crisis management regarding unpredictable or uncertain disasters. It is difficult to determine and predict the impact of consequences and take accurate decision option. The past examples and theoretical models explain that what are the new processes that are required to enhance past decision theories for disaster management organizations and institution. Wrong decision may conflict with the risk management. The process is related with the current situation and the views of individuals. Individual handling tasks may contradict the situation and no stability between the actions.

The new approaches and trends have designed disaster resilient approach that can balance the decision making models. This will enhance the operational procedure and identify the real world problem to manage the disasters, hazards and life threatening crisis. Hazards transforms into massive disaster due to lack of awareness and lack of knowledge, no protective measures and other implementation of actions. In crisis situation there is always a confusion regarding synchronization of individual tasks, prediction problem, preparedness and further protection issues. These problems are creating difficulties for decision making models. This paper highlights the disaster crisis that how the situation can be control and cope with specific type

of crisis. For effective decision making different practices and approaches are required for risk management. Rare and frequent disasters are major challenges for organizations for decision making and risk assessment. The problems are related with useful information, assessment of risk, consequences, and visualization. A timely response is needed for planning and organizing the activities.

Justin Pidot (2012) recommended some aspects that disaster management models and processes should be revised. The super storm Sandy wiped out the northern United States on 29 October, 2013. The shoreline experienced with a huge heavy rainstorm. New Jersey, Atlanta and New York City suffered from disasters and cold wind storms. American faced natural crisis frequently in past histories. In 2011, US declared 99 Federal natural disasters. The New England destroyed in August, 2011 due to Irene Hurricane. The major consequences are over 15 billion dollar loss and destruction due to heavy thunderstorms, rivers flashfloods, demolish of homes, property damages. Hurricane Irene was a misfortune for many societies and individuals, due to huge loss of economy and financial crisis. This rainstorm was rare and unpredictable, it washed away the human living standards and all memories. Governor Cuomo identified that such type of disasters and crisis sometimes strikes quickly. These disasters happen because of natural forces. The infrastructure needs to be rebuild regarding houses, buildings and organizations.

Hans De Smet (2012) presented a different paradigm for disaster management. The results has shown the variation in disaster landscape. Disasters are increasing rapidly and creating life-threats for the people, organizations, institutions and societies. The qualitative research showed that due to evolution crisis management needs to be developed effectively for present situation and future aspects. The scholars expressed repeatedly about current disasters and future disasters of 21 century. The emergency plans and preparedness plans should be strengthen to manage the task correctly and efficiently. The researcher described the dissimilarities in natural crisis and hazards, because of natural powerful forces. The research focused on Disaster Impact and Complexity (DI&C). Over the past decade a process was defined for the investigation of disaster impact and regulate the new trends and policies. An awareness was created for dealing the crisis of 21 century.

The natural crisis are related with our planet earth, it has always at risk regarding disasters such as tsunami, flash floods, volcanic outbreaks, rainstorm, land sliding, violence, infection diseases etc. These crisis caused life-threatening to individuals and organizations (Cutter, 2005). Disasters caused destruction to social infrastructure (Perry, 1998). If the organization

and communities organized well and prepared, to provide protection, shelter to affected people then the risky factor can be reduce in disasters. Many societies are located at seashore and hazard prone areas, this is really dangerous. (Mileti, 1999; Lagadec, 2009a). Due to this problem the individuals and infrastructure problem are difficult to manage in hazards and crisis (Quarantelli, 1996). Natural disasters heavy rains, cyclone caused massive loss of humans and destruction.

As societies are growing and establishing, then the possibilities of disasters increased (Quarantelli, Lagadec, & Boin, 2006. In the Emerging Risks report, a major issue identified to focus for actions. The Organization for Economic Co-operation and Development (2003) classifies the four types of forces behind the evolution of disasters. Demography: The constant growth of population, particularly in Africa, Asia, and South America, as well as number of cities is increasing. It results increase in population then more risk regarding hazards. Time management and location issues. (Quarantelli, 1993; Mileti, 1999; Hunter, 2004).

The environment: Changes in weather, pollution and dust issue, global warming, plus lack of knowledge of utilization of natural resources such as massive cut down of trees and plantations make the environment more vulnerable and dangerous (Raggatt, Butterworth, & Morrissey, 1993). Technology: Technological development makes variation in culture, and structure causing the task more complicated and tends to be more weak (Castells, 1996; Perrow, 1999a). The socio-economic structures: Due to overall globalization, the nation and culture merge as a shared network with communication. The trade mechanism, transportation caused civilization at higher risk (Rosenthal, 2009). As the intensity and nature of disasters are changing, so disasters are increasing due to this reason. Different investigators (Rasmussen & Batstone, 1989; Granot, 1998; Eshghi & Larson, 2008) and research articles(International Federation of Red Cross and Red Crescent Societies, 2007) has shown a continuous increase in disaster frequencies and numbers during the preceding years.

Many scholars has defined disasters as 21st Century Disasters or mega/extreme crisis (Rosenthal, 1998; Boin & Lagadec, 2000). (Rosenthal, 2009) described societies and organizations not only have to deal with normal crisis but should be prepare for unexpected diverse situation. This was named as a new ball game. Disasters and hazards must be handle with thoughtfulness. Main issues are lack of information systems and processes. The 21st Century disasters are more life threatening, dreadful consequences on humanities, devastation of infrastructure, and many fatalities on 26, December 2004. There is a need for enhanced and improved procedures to reduce the risk (Lagadec &

Carli, 2005). A massive earthquake with 9.1 rector scale caused unexpected tsunamis, which affected people's livelihood and damage Southeast Asia drastically. The estimation was that 1.5 million people evacuated and 2, 30,000 individuals protected.

Another tsunami was deadly crisis in past records (Hyndman, Hyndman, & Catto, 2008). After that one more example is Hurricane Katrina was a major terrible disaster in the east of New Orleans. This storm caused huge damages and loss. The 80% city submerged (Graumann, Houston, Lawrimore, Levinson, Lott, McCown, et al., 2005). Katrina intensity was approximately the size of England, total damage and financial crisis are \$81 billion (2005 USD). This was most deadly disaster in the history of US. Furthermore, the Hurricane Katrins is fifth massive hurricane that strikes the US (Knabb, Rhone,& Brown, 2005). According to the research report the Federal Response to Hurricane Katrina Lessons Learned (Townsend, 2006: p. 65), we must be prepare for more disasters and crisis, such as Katrina Hurricane, and may be worse from this disaster, the imagining though was described by many researchers. (Quarantelli, 1993; Mileti, 1999).

The crisis and disasters of 21st century are difficult to manage efficiently. The disaster management organizations and government have certain limitations, so they have to work with extraordinary skills and competencies. The difficulties of crisis can be categorized with three aspects. First of all on time response, secondly manage multiple task, and thirdly correct prediction and assessment of the hazard. An analysis of changing impact of disasters was defined. It creates certain limitations and difficulties for future disasters (Beck, 1986).

In 1984, an unexpected Bhopal crisis was affected many individuals and caused lots of deaths of more than 2000 individuals in the beginning of Bhopal Crisis. Another misfortune is that after Bhopal incident many individuals died due to intoxication. The total number of deaths are still not identified, but some estimation is more than 20,000 deaths. In past and all over the history it was a major industrial crisis. The Bhopal Hospital research investigates that 120,000 survivors, who are sick and not physically fit still they need proper medical aid and treatment. They are in bad shape, due to illness and disorders function approximately 30 individuals are dying monthly (Dinham & Sarangi, 2002).

On 14th November, 2004 this major issue was discussed on media, BBC Radio that after this shocking incident Bhopal city is still affected due to toxic waste of chemicals. Which is causing an alarming condition for Bhopal city. On 10 July, 1976 one more crisis of Seveso disaster, which shows terrible

consequences. A research was estimated that there were no deaths of individuals but unfortunately, the kids who born in Seveso zone are suffering from lifelong body damage and brain-ambridge due to this pollution disaster (Baccarelli, Giacomini, Corbetta, Landi, Bonzini, Consonni, et al., 2008). Another massive crisis on 25 April, 1986, a nuclear reactor due to overheat was blasted in Chernobyl Nuclear Power Plant. A huge graphite fire blast that converted in massive radioactive particles and released in the environment. This shocking blast was affected mostly Northwest, Northern and European country. This accident caused unexpected deaths of minimum 30 power plant team members and other members who were working over there. After the Chernobyl crisis, researchers analyzed the multiple types of new unexpected disasters (Birkland, 1997). The consequences of current new crisis can have substantial outside spillover consequences, to a certain degree far away from the actual place of crisis (Perrow, 1999b; Mongillo & Zierdt-Warshaw, 2009).

The global trend is growing rapidly, more interconnected network is establishing for social set-ups, such that service provider system, transportation and information system. Due to advance technologies and practices, the IT system makes our lives more easy and comfortable. We are more depending on these technologies, so these system may cause risk and convert them in a big crisis (Quarantelli, 1996; Smith, 2005). Furthermore examples are electricity power failure crisis in Southern Brazil in March 1999. This crisis affected 97 million individuals due to huge power failure crisis. The complexity factor is most crucial, it is related with unexpected and unidentified crisis (Lagadec, 2009b). On September, 2001 another example is 9/11 terrorist attack. No one can visualized that American World Trade Center and a part of Pentagon can be attacked and destroyed. Many people died and killed. Americans has lost their security and safety (Braiker, 2002).

During previous history the societies and individuals has developed a mechanism for emergency management. Some processes and methods were defined. Mitigation and preparedness procedures were designed (Kirschenbaum, 2004), a system was designed for emergency management with time management, response activities, specialized and skilled work force to cope with the crisis effectively. Since II World War a team of experts was designed for disaster management to manage emergency crisis and disasters (Quarantelli et al., 2006). The performance of emergency management organization was classified that organization should know about the mission, short term and long term future goals. For accomplishment of task the coordination and collaboration process is most important to overcome the risk and hazard. Risk has different types, such as technical failure of system, fraud, bribery, no governance, lack of resources and political problems, thus we can called this as internal and external risk. These problems makes hurdles in

objectivity. When organization has to perform efficiently then organization has to face certain challenges and compromises, we can say that organization is facing crisis and disaster (Richardson, 1994; Davies & fgk Walters, 1998; Leysen & Van Nuffel, 2007).

After examining different trends and evolution a DI&C model was designed for crisis and disaster management. A crisis management and disaster management research scholars of Belgian Royal Military Academy were proposed a model for disaster management to estimate the impact and complexity. A process was designed, the features of this process are Estimation, Feedback, Talk and Estimation (EFTE). A collaborated Delphi process, which was revised after many discussion and meetings (Nelms & Porter, 1985).Major concentration on Disaster Life Cycle of Crisis Management (National Governor's Association, 1979), it is identified for stability in processes and manage the risky factors. The scholars has given two major factors of modern crisis, the impact of disaster and complexity of crisis. The Disaster Impact & Complexity process and Disaster Management Complexity process.

Disasters are causing damages, destructions and creating hurdles for communities, institutions and business organizations. A model on disaster relief actions and humanitarian process described by Paul D (2012), this issue is related with life and death. Disasters are affecting extremely overall the world and livelihood of people. Humanitarian Disaster Relief Supply Chain (HDRSC) was introduced with broader perspective. It distinguish the difficulties and challenges of supply chain management with changing environment. This paper defines the major issues related with post-disaster actions, problem identification, and synchronization of supply chain, growth & development, needs and wants that are essential according to the situation. Due to natural forces the overall world has faced many disasters and crisis since January 2010. The Haiti earthquake (January 12, 2010), Chile earthquake (February 27, 2010), Japan tsunami and earthquake March 11, 2011) and Thailand flash floods (July to December 2011). These crisis has caused severe damages and financial crisis. The Haiti affected at least three million in which 2, 30,000 people loss and expire. The Thailand floods has affected more than 12.8 million individuals. Due to these disasters the worldwide business affected drastically and financial damages and loss are not estimated.

The HDRSC is new evolution in management sciences field, there is a little work on Humanitarian Disaster Relief Supply Chain Management (HDRSCM). The HRDSC activities are highlighting the aspects of well-developed community systems to cope with the consequences of disasters. Disasters might be with different types extreme and normal. First important

issue is on time response and other is the nature of crisis (Van Wassenhove, 2006). The HDRSC research is helpful in risk uncertainty, changes in organizational structures, new evolution, different needs and requirements of the crisis. The United Nation is governing and leading. The main challenge is the availability and allocation of resources for pre-disaster and post-disaster activities. The disaster relief effort is based on charity organizations, who are providing goods and services to affected people. The paper specified post-disaster activities regarding shelter, medical aid, food and water supply are the main responsibilities of service providers. (Kovacs and Spens (2009), Apte (2009) and Tatham and Spens (2011).

The HDRSC is concentrating on time factor, needs and requirement of affecters, charities and relief activities during and post-disaster crisis. Due to lack of relevant field, knowledge and system some information may not easily accessible. If some information is accessible then may not appropriate and accurate which is required by organization to determine the consequences Tatham and Spens (2011), Day, Junglas and Silva (2009) and Bharosa, Lee and Janssen (2009). Many scholars described HDRSCs is diverse because it is focusing on Supply Chain Life Cycle. It starts from pre-planning approach to termination / transformation approach. On each phase, desired needs and requirements change according to the situation (Van Wassenhove 2006; Apte 2009).

New developed organizations are working for disaster relief mission. Coordination, communication, logistics and sustainability and no pre-planned activities are main causes in disaster relief activities. The donations, government assistance and resources problem are creating instability in SCM. (Holguin-Veras, Perez, Ukkusuri, Wachtendorf and Brown 2007). Not only HDRSC are convergent but many organizations are playing major role in disaster management. In case of any major incident the response activities convert in recovery activities. Recovery comprises on many factors. First make appropriate recovery plan, which can help in pre-disaster activities to post-disaster activities.

A limited work on supply chain for humanitarian / disaster relief has been done under the humanitarian logistics with a wider scope and perspective (Tatham and Spens 2011). An irrelevant difference has identified between humanitarian/disaster relief logistics and humanitarian/ disaster relief SCM (Tatham and Spens 2011). This system is appropriate for operating, organizing and designing, the major procedures for present and future humanitarian/disaster crisis. It is also managing coordination, monitoring the consequences and desired results furthermore processes integration. The Bloomberg Business Week editors described that in past decade disasters

prediction and damages were awful estimation was not identified on 5 September, 2011 (Greeley 2011). The critical issue is prediction, what needs to adopt and what are the measures to take. We cannot make long term prediction due to intensity of disasters. For best results the warning messages, notices and alarms process was defined. This awareness was created from the research and study of Knight (1921). Pre-planning aspect is most important for disaster management. It termed as must ensure and for short period of time/ projection of life for disaster management strategies Preparedness and pre-planning both are most crucial for crisis management.

2.16 A MODEL FOR ACCESSING ECONOMIC DAMAGE DUE TO NATURAL DISASTERS

Mampe Hayashi (2012) published about a system to access economic loss and damages due to natural disasters. Japan is a natural disaster prone country. The incidence of a natural disaster, is imperative, as well as intellectually confusing, to estimate the cost of economic damage. From a real-world point of view, assessment needs to be finished in the middle of an on-going crisis, where shortest time period available as well as on time response required. In review, it must be directed for best policy methods for future extenuation. Yet, as Cochrane (2004) says in relation to the 9/11 event in New York, 2001, regarding the vulnerability factors, we note Weichselgartner (2001) specified that the thought of vulnerability contains pre-existing activities such as preparedness, prevention, and the after disaster response and repossession. Toya (2009) has shown that the post-disaster community resources cause reduction in last year disaster devastation. Therefore, the volume of disbursements which local government financed in the post-disaster recovery platform in the past is predictable to diminish economic loss in the present year.

Recent disasters have emphasized on problems and types of failures that are related to hazards. Thus, clarity is essential in communication process that how scientific principles can applied to manage the disaster activities. A proposed model of past disaster lessons, the risk and failure of disaster related activities was developed by Daniel A (2012). If we look upon in the United States, a huge disaster may be any natural unpleasant crisis that transforms into a disaster includes cyclone, hurricane, thunderstorm, high flow of water, wind-driven water, tidal wave, tsunami, earthquake, landslide, mudslide, snowstorm, drought, fire or blasts, in any part of the United States that causes damages. The disaster relief organizations and local governments are alleviating the destruction and loss (C. Dickey, personal communication, August 4, 2011). A disaster can also be defined as the failure of engineers, construction engineers,

architects, developers, and other for an environmental variation. It is definitely a warning that engineer builders must be conscious about the appropriate standards of their profession: to grip on primary aspects of safety measures, wellbeing, and welfare of the community, as expressed by the National Society of Professional Engineers (2003).

The difficulty of a disaster affects organizations and decision making procedures regarding future disasters. For example, acid rain and climate change may be treated as disasters even though the damage has not yet extended disaster thresholds. So that protective measures should take even if some cause-effect-construct relationships are not established logically. The concept was first acknowledged in 1992 as a consequence of the Earth Summit in Rio de Janeiro, Brazil (United Nations General Assembly 1992). Plans are need to cope with specific type of hazards and extreme situations. It is important when design plans then broad network of expertise required for instructions. Risk perception is a vital component of the public perception about disaster. Time and scenario visualization are crucial elements.

2.17 EARTHQUAKE EVACUATION PLANNING FRAMEWORK

Umma Tamima (2012) presented a case study on evacuation framework. In Canada the Disaster management planning is directed and lead by government. All disaster related responsibilities are divided amongst central, regional, and local government. The Plan of Civil Emergency describes procedures and task responsibility during disasters. It delivers an outline for strategic management cycle. It includes on communication, coordination activities between several decision centers. Though, the proper evacuation planning process has not been defined by government. For Montreal it recognize the need for evacuation process for planning, this paper recommends a three-dimensional framework for earthquake evacuation planning. (1) Community demographics and vulnerability assessment of the environment, (2) Evacuation route planning procedure and accommodation process, and (3) Evacuation charts for preparation. The paper also discussed the community evacuation plans.

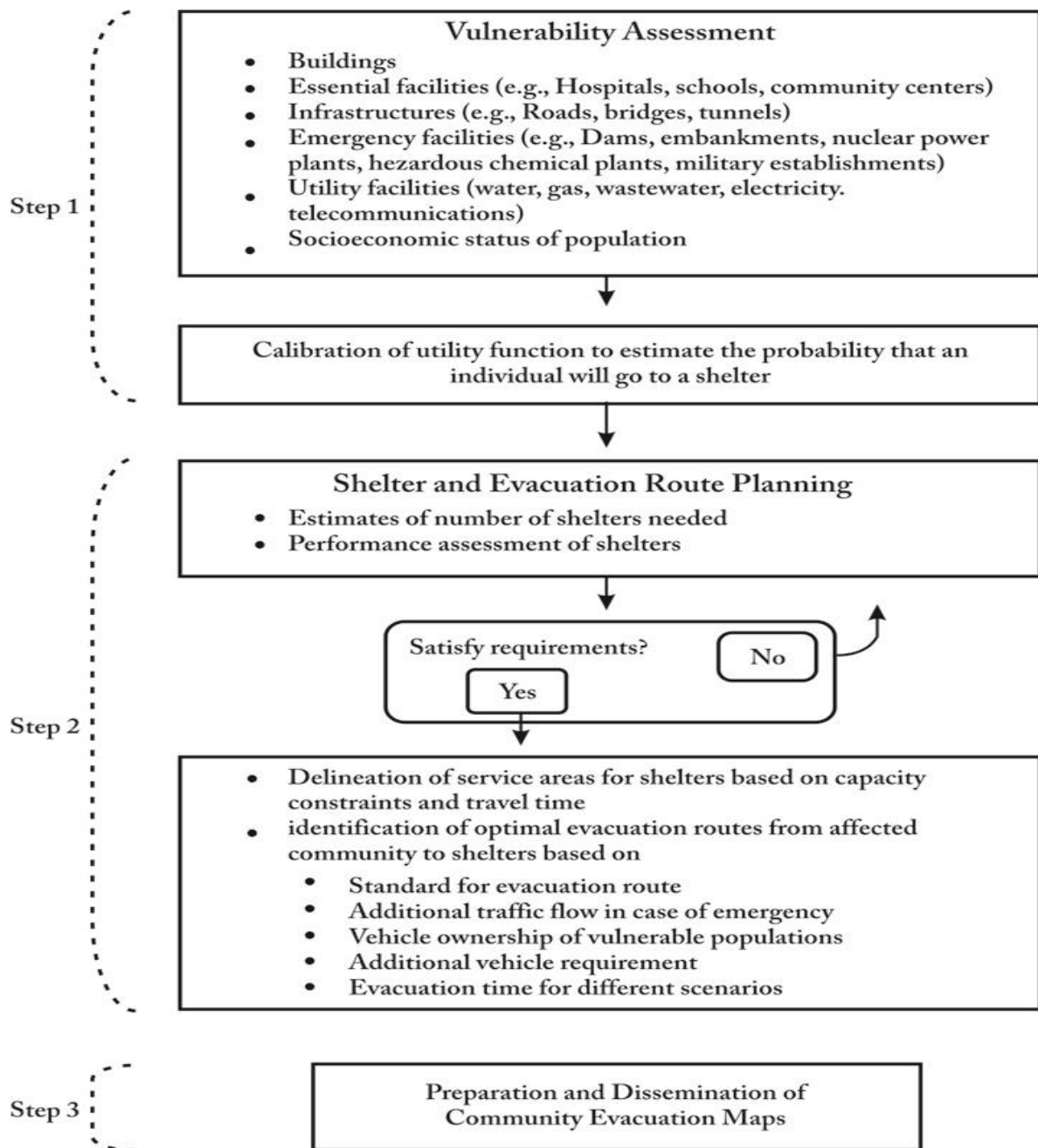


Fig. 2.11: Earthquake Evacuation Planning Framework (Umma Tamima, 2012)

Evacuation planning for the aftermath of a disaster is tough to visualize in Montreal. A community that has not often practiced a natural or man-made disaster. The most recent disaster strikes the Montreal district, which was a major ice storm in January 1998. Damage due to the ice storm calculated above \$C3 billion, and 30 victims suffered due to this event (Quebec (Province) 1999). Furthermore, all infrastructures were disturbed (electricity, telecommunications, water filtration), and 3½ million people were directly suffered by power blackouts. Several thousand individuals needed shelter and

other appropriate accommodations with family and friends. Hazards may change into disasters without proper disaster management planning. Although it is not possible to prevent or forecast natural hazards such as earthquakes, their adverse effects can be decreased through several measures and policies. A model of contingency planning and evacuation planning was presented. Such planning systematically essential to facilitate people with good expertise, and resources. (1) The broadcast of evacuation warnings systems and directions (mandatory before evacuation), (2) evacuation supervision and methods (required during evacuation), and (3) evacuation centers (shelters, required after the evacuation process) (Xu 2007).

The hazards literature recognizes various mechanisms of vulnerability evaluation (Mustaafa 1998; Cutter 1996; Cutter et al. 2000; Chakraborty et al. 2005), in addition it is problematic to describe that which mechanism impacts more significant results for unpredictable disaster and circumstances. Nateghi (2001) stated that dreadful vulnerability evaluations depend on landscape, geology, seismicity, geotechnical site conditions, structural performance, lifelines, emergency services, socioeconomic conditions, and search-and-rescue capabilities. Davidson (1997) considered corporate structure, inhabitants, financial and political framework, and disaster response and recovery aspects are analyzing the dreadful danger of cities.

In recent times, societies and organizations have used evacuation maps to create the community awareness about risks and improvement in disaster preparedness (United Nations International Strategy for Disaster Reduction 2001). Xu (2007) defined community evacuation maps for disaster preparedness phase. These plans are well-controlled, simplified, and sustained by both the government and societies. Disaster management planning is a collective procedure in which the central government they make emergency plans. Local government upholds the connection between different departments, as well as local governments implement action plans.

2.18 RISK COMMUNICATION & EVACUATION PROCESS

Sverre Kjetil Roda, (2012) highlighted on evacuation guidelines. Many researchers have predicted that in the future, a mudslide wave sound may cause a tsunami that rise above the level of ocean as 269 feet in Norway. This research demonstrates the preparation of the community to follow evacuation instructions before a natural crisis strikes. Approximately 3000 individuals placed in a tsunami hazard region on the west coast of Norway. The most horrible case scenario, a tsunami is expected 269 feet above the shoreline in the community of Hellesylt five min after the rockslide. Most of the urban

areas, a local school, and an older-age home center might be underwater. After five minutes, the tsunami will attack the UNESCO a visitor's community of Geiranger with a wave, submerged minimum one school, day care centers and commercial institutions. The potential waves that may disturb 10 regions that are predictable to be 13 m (42 feet) in Tafjord and 13 feet in Fiora. A related but less severe mishap called the 'Tafjord disaster' struck these two societies in 1934, resultant in 40 death toll.

Sattler et al. (2000) suggests that there is an association between disaster preparation and disaster practices. The Individuals and public who live in zones where natural disasters happen frequently are more expected to follow the evacuation forewarnings than those who may never have been exposed to such hazards (Drabek and Boggs 1968, Sattler et al. 2000). Risk managers hardly focus on how the risk information flow to people in accurate way because people have with their own different characteristics (Lemyre et al. 2009). This article states the gap between these two views. There is a well-established research that specifies 'at risk' individuals tend to neglect health warnings (Lindell and Perry 2000, Rohrman 2000, Heller et al. 2005). Such non-protective responses may be clarified by denial, aspiring thinking, and passivity is communication. (Grothmann and Reusswig 2006). Otherwise, the cause may be related with poor communicator skills, vague risk information, specific distinctiveness of the people, such as socio- demographics, past practices, individual dissimilarities, interactions with experts and impact through informal societal links, the news bulletin and broadcasting (Fischhoff 2000, Rohrman 2000, Slovic 2000, Heller et al. 2005).

Fundamentals of social measures derive from clusters that are connected appropriately (Dawnay and Shah 2005). When assessing risks, experts theoretically explain it technically in terms of likelihoods that a hazard of assumed magnitude will happen at a certain location within a specified time frame (Kaplan and Garrick 1981; Jardine et al. 2009). They also specify the expected problems of the hazard on people, societies and organization's substructure (Sandman 1993).

The Queensland Floods Commission of Inquiry (QFCOI) established in 2011 was given broad expressions for its examination. It comprised on floodplain managing, national and formal government planning, mining industry problems, and the presentation of private brokers, on time emergency response and dam management problems. To improve the community resilience Jim McGowan (2012) emphasized about some features of flood examination of Queensland. The December 2010 and 2011 the flash floods relief and resources used to cope with hazards, droughts. The consequences were terrible. No one can believed that people and their families could be

sweep away by a flash floods and killed. Nine operational executors died to overcome the disastrous floodwaters. Some cities totally submerged into flood water and isolated for weeks. Thousands of homes destroyed and many people has lost (QFCOI Interim Report 2011).

Table 2.1
Risk and Impact Model of Disaster Management
and Investment Priorities

Potential Threat	Risk Calculation	Most Likely Impact	Investment Priority through Policy
Terrorism Threats (human-induced)	Low (perhaps medium on occasions)	Localised to widespread/extensive Minor to catastrophic	Investment mainly in <i>preparation and prevention</i>
Natural Disasters (Physical phenomena)	High (repeated events almost inevitable)	Localised to widespread/extensive Minor to catastrophic	Investment overwhelmingly in response and recovery

In the aftermath of any natural disaster, it is important to identify what work has done, what didn't and what could have been enhanced to better formulation for next disaster? In many cases, these reviews are comparatively low internal processes evaluation, the response of organizations assume police services, firefighters, State Emergency Services (SES) and other disaster services workforce and volunteers. Other service such as local governments and the other utilities like electricity power, telecommunications and water suppliers services are critical important during a natural disaster frequently adopt a similar method. The disaster management framework has established this examination practice with the local and district disaster management groups in Queensland.

For community development and on time response a, more organized planning and controlling framework is essential to enhance the system more efficient. For accomplishment of task the resilience required accountability and information is shared across the societies. The responsibility is shared among people, governments and disaster management societies. The Victorian Bushfires Royal Commission (2010) stated in his final report that collective responsibility transformed into their own self-responsibility. It increased the responsibility for all nationwide agencies, public committees, societies, individuals and all families require taking greater accountability for their own safety. Monash Injury Research Institute has reviewed past disaster response. The Queensland Floods Commission was not aware of legal and strategic procedures and policies (Goode et al. 2011).

2.19 PREPAREDNESS, RESPONSE AND RECOVERY MODEL FOR RISK ASSESSMENT

Yacov Y (2012) shed the light on preparedness, response, and recovery from Natural and Human-Made Disasters. This article speculates that the communication process is very complicated and structural. The communication process is related with onetime response, rescue and preparedness activities to handle skillfully in a pleasant way in natural or man-made disasters. This is related with communication, organizing of activities and risk evaluation process. These process must identify the states of the system. The societies organize central structure to create simulations. The physical structure of organization and society's response is related with the element of time. Time frame is crucial factor in risk examination and preparedness, risk may be multidimensional. A versatile approach is used for recovery, on time response and preparedness is termed as decision tree analysis.

The time frame and the states of a system are essential features for preparedness and risk analysis. For conciseness, preparedness also proposes response and recovery, and risk examination implies risk assessment management, and communication. This paper highlights the complexity of measuring the multidimensional risk from natural and man-made events to systems of systems. Which are usually interconnected and intra and interdependent subsystems consisting of communities and infrastructures, with several tasks, procedures, and shareholders. The growing and vibrant nature of systems of systems essentially concentrates their models. So the risk management is quiet brief and feasible. The process of risk modeling, risk evaluation, management, and communication must be holistic, broad, and recurrence, and it must be identifying that the states of the system establish essential building blocks of modeling. Thus the importance of time frame in modeling and risk is substantial. Furthermore other many states are working on time is crucially important.

Strategic preparedness defines guidelines, rule, strategies, and supportive structure that are executed before natural disasters occur to reduce hostile results for example on time response / retrieval time and budget and / or consequence possibilities to a certain level considered adequate. These possibilities of risk are managed through the decision makers acceptance of several risks plus trade-offs (Haimes et al. 2008). In risk assessment, we try to answer the following set of questions offered by Kaplan and Garrick (1981): (1) what can be a mistaken? (2) What are the prospects? (3) What are the results? At this point, they add further (4) what is the time frame? Correspondingly, in risk management they attempt to answer the following

questions raised by Haines (1991): what is the need to do and what are the options that are available? What trade-offs regarding all expenditures, risks and damages and what are the consequences of contemporary decisions on upcoming decisions? Readiness defines a decision process for future predicted events with predictable likelihoods of happenings and of subsequent results, in which decisions and their actions are performed before a natural or human-made disaster to reducing disaster consequences suppose response / recovery time and cost to levels considered acceptable.

2.20 STRATEGIC PREPAREDNESS FOR RECOVERY AND RISK MODEL

Yacov Y (2012) proposed a model for recovery from disasters / hazards named strategic Preparedness model. Man-made or natural crisis affect the organizations in several ways due to intrinsic interdependence among social, cybernetic, and corporate set-ups, are most important aspects. Organizations depend on the capability of individuals with their expressive measures and directional skills. These cannot be demonstrated positively with a single model, all integration through shared states. The focus of this article is: (i) the significance of the states of a system in modeling; (ii) the effective part of integration states in modeling systems of systems, in recognition, and in the meta-modeling of systems of systems; and (iii) these procedures for strategic preparedness, on time response, and recovery from disastrous hazard to such systems. Strategic preparedness indicates a decision-making process and its related actions. These must be: executed before an early manmade or natural crisis to reduce the causes and this mechanism should promising to adequate.

A system of system is defined as the integration of different organization and societies with their human interaction and corporate infrastructure. These integration creates systems of systems. This system has five features declared by Maier, First is independent operation of each system, second is decision making independence of the system, third is territory allocation, fourth is changing in evolving behavior, fifth is growth development. These subsystems work independently even their interconnectivity and inter-dependencies are combined; but, each is inclined to face unique hostile situations.

Crowther et al. stated strategic preparedness as A Decision Making Procedure and further operations should be apply before natural or man-made disasters to reduce the consequences. Strategic preparedness therefore indicates activities accomplished before a disaster. This may reduce intensity of danger. These stages required for balance in disaster related activities and

control the threat level. The evolving characteristics of the system direct and command the whole procedures regarding on time response, recovery and strategic preparedness. The evolving properties of the system cannot planned early but can create on the basis of some multiple events that creates motivation and timely response develop in the system.

The American Society of Civil Engineers held a conference on diminishing natural catastrophes with the supports of the United Nations Decade for Natural Disaster Reduction in 1996. Mostly research in the published reports and consultation remains significant today. Disaster cause and affect the individuals, service providers organizations suppose DMO's and the community. The public and crisis related organizations present as a complex system of subsystem. The shared processes and their integration with these subsystems that establish a modeling phase, intrinsic inter-connection and inter-dependencies.

2.21 THE 5 Rs MODEL FOR RELIABLE POST-DISASTER EXPOSURE ASSESSMENT

A Post-disaster experience with evaluation was presented by Daniel A (2012). Risk represents danger and intensity of disaster. A disaster, much focus on probable hazards, such as flammable materials, syndrome courses, and poisonous materials. But, real danger is related with past experience of such hazards, if no past experience then no risk. This paper proposes that how assessment of experience varies during a disaster. The 5 Rs model is rescue, reentry, recovery reconstruction and rehabilitation. Every disaster and crisis tracks this structure. The temporal extent, three-dimensional affect, and nature of disaster and crisis to human well-being, security, long-term threat to ecosystems determine how an experience assessment must be conducted. Engineers are risk managers. They applied expertise in order to prevent and solve problems. This expertise means they are appropriately right to lead and manage efforts to assess damage created by disasters, to design systems to address this damage, and to advise on how disasters can be avoided in the future. When engineering performance is assessed, the major query is whether the response affected or might be cause undesirable risk.

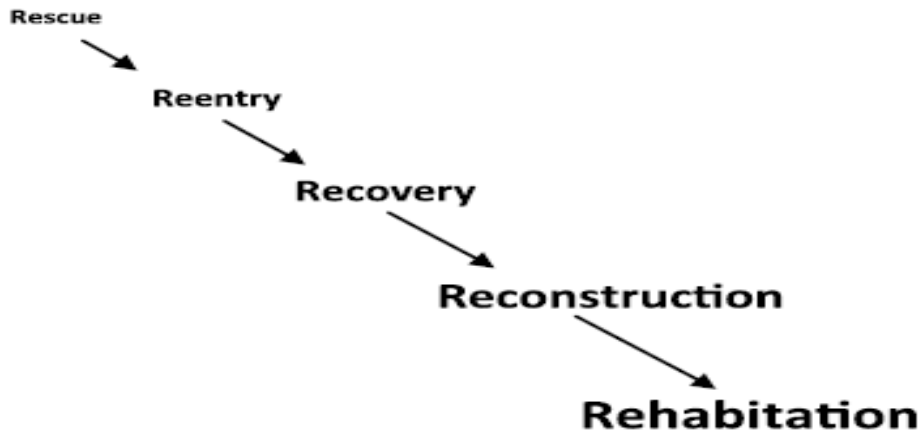


Fig. 2.12: The 5 Rs Model for Reliable Post-disaster Exposure Assessment (Daniel, 2013)

(ALARP), an idea created by the U.K. Health and Safety Commission (1998). An appropriate risk standard for disaster response and expectation is whether the risk is “as low as realistically appropriate”.

To overcome the risks includes balance the replacements. Generally, no any particular solution is available due to ecological problem which is fluctuating. Risk can be identified with a process of decision making steps and implement the actions. These measures can decrease the level of hazard consequences, at minimum, to minor the risk of adverse consequences will happen (Royal Society 1992). People wants a lesser amount of risk, all further effects actuality equivalent. Derby and Keeney (1981) proposed that “The risk possibility is related with the best available alternative options, not with the best of the possibilities which we desired to have accessible”.

Risk considers as a factor of threat and disaster. The crisis of World Trade Center (WTC), the impact of Hurricane Katrina, the outflow of crude oil with deep-water crisis in the Gulf of Mexico. It describes effective learning abilities to engineers for measure the coverage and select best possible option to decrease massive hazards. 1. Rescue: a location unrestricted from imprisonment or forthcoming danger by rapid strong action; 2. Recovery: the recovery of something missing or unavailable, which in a disaster can include the bodies of victims; 3. Reentry: a return to the places affected by a catastrophe to evaluate destruction and determine the further step forward in creating a plan for restoration; 4. Reconstruction: the return of tools or a resource to operational status after maintenances or replacement; the return of a community or wide area to full-scale procedures after a disaster; and 5. Rehabilitation: the arrival of people back to resume operations in a society, construction, or capability to recover situation demolished or damaged during a disaster.

2.22 QUALITY INDICATORS FOR CRISIS COMMUNICATION MODEL

Pauliina Palttala (2012) defines crisis communication structure for emergency management. Crises are complex in nature and it are constantly creating troubles in communication process. The major components of this issue may be on time response, public awareness, manage the difficulties, obligation, and consequences (Stephens, Malone, & Bailey, 2005). The purpose of this research is to establish a structure to measure the performance indicators for crisis communication. It forms a plan for civil service. Such application enhances the organizational learning processes. This model has not been presented for crisis communication.

Crisis communication is emerging field of study and it helps in crisis management (Lehtonen, 2002). The main Purpose, is to examining crisis situations that are a most important aspect towards effectiveness in organization of crisis communication (Bradford & Garrett, 1995), that generate freedom in decision making process by communication specialists (Huang & Su, 2009; Grunig, Grunig, & Dozier, 2002). Communication professionals increase professional knowledge for preparedness procedures. They form training and enhance communication level to maintain a strong bonding with main shareholders (Lee, Woeste & Heath, 2007).

The communication organizations are facing difficulties in crisis management due to weather issues and strategic structures. It has been stated that a specific and applicable communication process should be selected wisely according to the present crisis situation and the expectation of stakeholders (Coombs, 2006). The actual crisis communication must be applicable before any crisis occurs. It should be started immediately after the disaster. The crisis communication focus on pre-crisis protection, preparedness plans, a timely response to post-crisis activities and implementation of policies (Fearn-Banks, 2004 in Dardis & Haigh, 2009). A well-defined framework of planning and protective processes are desirable to cope with all types of disasters.



Fig. 2.13: Quality Indicators for Crisis Communication (Pauliina Palttala, 2012)

But the attitude to solve unexpected complications increasing quickly are vitally important (Demuth, 2002). The decision making process should be flexible in critical conditions, as we know that disasters can be unpredicted in magnitudes and it required accurate decision making process (Seeger, 2002). Crises normally follow similar sequential stages (Pearson & Mitroff, 1993; Stephens et al., 2005). The major factors in disaster management are disaster relief assistance, prediction, alarms systems, reformation and restoration as well as the activities comprises on modification, preparation, on time response, and retrieval (Moe & Pathranarakul, 2006). The research proposes that crisis communication process should be considers essential during the pre & post crisis phase, for any crises condition, and the consequences of the disasters (e.g., Ulmer et al., 2007; Coombs, 2007). Reynolds and Seeger (2005) describe a process model of five phases. The Crisis Emergency and Risk Communication (CERC) focusing on communication procedures. The model establishes pre-crisis risk communication and preparation to develop understanding of consequences. Second phase is to reduce primary incident uncertainty and encouragement to comfort emotions and visualization of the scenario development. Third phase is to support individual response and informed decision making by the community, gather response from affected people, and facilitate collaboration with response activities. Fourth phase is to resolve updates and consultations about transformation process; as well as fifth phase are assessment and conversation of appropriateness of response and significances of lessons learned. The record stipulates communication process

for crisis management. Later on the model was revised again with strong communication procedures for disaster crisis (Veil, Reynolds, Sellnow, & Seeger, 2008) and it has been evaluated in real situations.

King-wa Fua (2012) established a contrast between china government and USA government activities about emergency response. Based on a relative method, this examines news articles about shocking upheaval that happened in Sichuan State. Almost six Chinese newspaper identified that Chinese government emergency response activities had more similar with USA media about Hurricane Katrina 2005. Main focus was on control the situation and monitor the activities like watchdog media culture during disasters. It is the liability of government to monitor all activities that is quiet premature in China. Chinese local media may be less formalized by the central government. With a strong government policies china can improve their media. Countries who are being unprotected with external hazards they supposed to act well on time and explain exact information from disaster management foundations. In order to make informed decisions with quick responses, to maintain high level of individual security and wellbeing. The World Health Organization has generated guidelines for effective media communication, in which the authorities are capable to spread the information to the public (World Health Organization 2005).

Sichuan earthquake On 12 May 2008, was a massive earthquake, on the Richter scale of 8, happened in Sichuan province, China. According to the figures released by the Sichuan provincial government, 68,712 people were killed and 17,921 were lost. Almost 46 million people were injured and affected. The total financial damage was estimated more than US\$30 billion. However, the Chinese government's immediate reaction to the media, Sichuan earthquake, was severely different from the past heavy-handed approach. The Chinese government permitted international and local media to visit the earthquake regions and prepare a detail reports on the destruction.

Table 2.2
Sichuan Earthquake and Government's Media Policy

Covering disaster using attribution of responsibility framing
Media framing has been extensively used to investigate the ways in which media structures news. Such framing serves to select some aspects of a perceived reality

A chronology of events in relation to the media reports on the Sichuan earthquake and the government's media policy.

Date	Event
12 May, 14:28	An earthquake occurred at the Sichuan province with epicentre at Wenchuan county.
12 May, 14:29-14:44	Uncounted messages about the earthquake were posted online.
12 May, 14:46	The Xinhua News agency issued a press release for the earthquake.
12 May, 14:50	The CCTV broadcast the rolling news about the earthquake.
12 May, afternoon	The Propaganda Department issued a directive to restrict journalists from heading to Sichuan.
12 May, evening	China's Premier Wen arrived in Sichuan. Many Journalists disregarded the government's directive and rushed to the scene.
15 May	The Propaganda Department ordered the media to stop reporting the incidents of school collapse.
15 May	China's President Hu visited the devastating scenes in Sichuan.
19-21 May	National Memorial Days.
22 May	The central government requested establishing guidance of public opinion.

According to emergency management theory (McLoughlin, 1985, Burkhart 1991), the integrated mechanism was introduced with four elements need for crisis management. These elements are recovery, preparedness, response and mitigation (McLoughlin, 1985). The mitigation actions decline the intensity of long time period vulnerability to social lifespan. The possessions from natural or man-made disasters; Preparedness used to enhance operative competences for responding to a crisis; Response comprises on the quick actions taken as early as possible before, during, or after a crisis that protect lives of people, minimize finance loss or retrieve the recovery; Recovery is intended for short-period of time that restore normal routine life and support the systems with minimum operational activities.

The results indicate that few Chinese media have effectively served to the government's emergency response. The major part is generally performed by Americans equally during disasters (Barnes et al. 2008). The Chinese media have communicated with the general public about various issues for instance human damages and demolition by the disaster furthermore the government's emergency responses and activities during the aftermath of the Sichuan quake. This communication process was intended to support the public to make up-to-date decisions during crisis. For improvement, a de-emphasis on the government's disaster preparedness efforts (Barnes et al. 2008).

While America and China have different political structures, emergency plans, and practices. They share similarities in the role of media in distributing emergency information. However, media have strong differences in government's responsibility to manage disaster and its consequences. Public health officers and emergency response managers have acknowledged the 'watchdog' role of the media in monitoring government bodies during an emergency period. (World Health Organization 2005). But this media 'watchdog' role may unintentionally trigger unwanted consequences during disasters, reinforcing public perception of risk (Kasperson et al. 2003) or diverting public attention to focus on the disaster intensity (Liu 2009).

A model established for protection of community with a multi-framework presented by Michael K (2012). The results of this model were generated from the response of community regarding crisis and hazards. The Protective Action Decision Model generates information flow from community and ecological factors. This message transfers through communication networks. The PADM classifies three critical pre-decision processes (receiver, thoughtfulness, knowledge of forewarning system, clarification of ecological factors / societal indications). The defensive action of social response, situation monitoring and decision making process was suggested. This research describes three applications (growth of hazard communication plans, framework of evacuation, and implementation of long lasting hazard amendments) also examines unsolved problems which need to be identified.

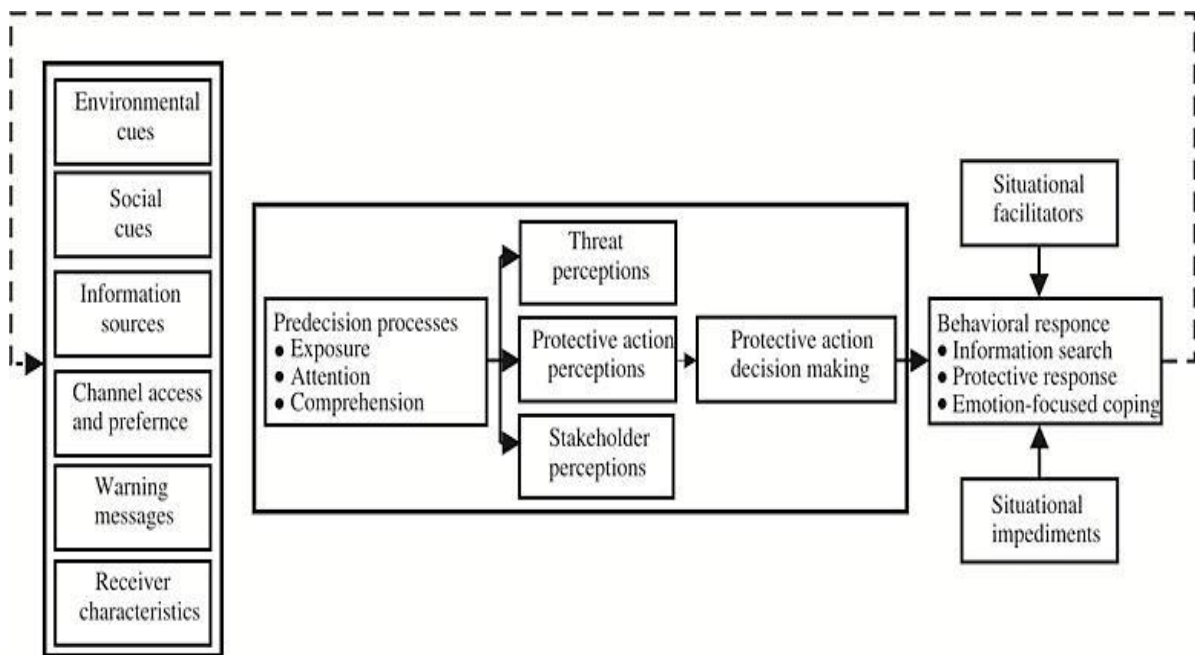


Fig. 2.14: Protective Action Decision Model (Michael, 2012)

Risk communication during the volume of increasing number of disasters or disaster response activities are related with each other. A realistic communication process is needed for growth. These programs should be organized and well developed for hazards. The human participation and resources are limited when any disaster strikes. The resources and human effort should be in collaboration for disaster management. Time constraint is normally short in crisis event. Without proper and appropriate planning risk communication can create difficulties regarding failures.

All regions are in trouble due to natural hazards for example droughts, quakes, extreme high weather temperature, floods, land sliding, hurricanes and wildfires are disturbing developed areas. Under develop countries people focus on un-natural impact of natural hazards. A description of natural disasters with un-natural impacts on society was delivered by Alex Julca (2012). It extends the current dissimilarities inside and outside the countries. The paper examines the realistic indication of disasters. After that evaluate the causes why disaster risk are focusing on certain people, zones and countries. It designs a theoretical framework on the intensity of danger and weakness. It impacts to recognize the multiple dimensions of disaster effects. It increases the challenges for countries to overcome on the weather variation issues. Worldwide, the yearly average number of disasters has manifold during the last decade. The number of droughts that tripled two times between 1970–1979 and 2000–2009. The United Nations (2008) highlights that although geologic disasters can cause huge damages, hydro-meteorological disasters creates a greater danger of becoming large scale disasters and disasters in the past two decades informed disasters trends are increasing. The average number of people affected and killed per disaster has been on decreasing trend. Leaving the average number of deaths each year from disasters more or less persistent. At the same time, the higher frequency of natural disasters has increased maximum cost of damages to disaster affected.

In undeveloped and poor countries the natural hazards risks will be more life threatening. A mainly unambiguous difference is the 130,000 victims affected by cyclone Nargis in Burma in 2008 related to just 30 victims during a similar strong whirlwind, Hurricane Charley, in the United States in 2004. Due to droughts, tsunami and hot weather problems in Africa and Asia thousands of people missed. With this aspect the flashfloods, weather variations and lower income problems are stressful. Regionally and for the period 1970–2009, over 70% of all disasters have occurred in well developed areas. The average figure of people loss and killed 100,000 is 8 times greater than urban areas. Australia and New Zealand whose average is higher than Africa, Latin America and the Caribbean, and Oceania. This is generally due to the major

rise in incidence of environmental hazards in Australia and New Zealand such as hot weather temperatures, hurricanes, and wildfires since the last 20 years.

Many emerging countries do not have the adaptive capabilities to face greater natural hazards because they are vulnerable by several risks, as well as economic uncertainty, political clash, and absence of technical capabilities. Generally, poor healthiness, communications and housing infrastructures including water and sanitation systems and lack of support for capacity growth are the main constraints behind the failure of poor countries to address disaster risk. Recent changes in the natural environment have already shifted growing seasons, threatened water sources, and exacerbated food shortages, with dreadful consequences in the poorest regions. The various impacts of a changing natural environment in poor countries is the destruction caused by the 2010 floods in Pakistan.

Junji Urata (2012) focused on Japan massive disasters and the methods of evacuation systems. By managing the relation of human as a network. For effective evacuation planning there is a need to establish a cooperative behavior among inhabitants. The inhabitant's evacuation behavior was examined in tsunami and nuclear disaster crisis. This analysis showed the importance of cooperation attitude between residents. A cooperation behavior is required to manage the network. This network is shared for disaster response planning for disaster management. Generally, people make behavioral decisions during disasters on the basis of information available about the hazard. This danger recognize through the mass media, disaster radio and neighbors and assessment of their ability to evacuate and travel. The success of mass evacuation frequently relies on cooperation behaviors among residents for example, information exchange about dangers, safe places and mutual assistance, particularly to aid individuals with low mobility.

In Japan, local governments develop and promote local evacuation plans to guide resident's behavior and promote cooperation. Implementing a cooperative evacuation plan is difficult, however, because one cannot know where and when a disaster will occur, and not all residents are sufficiently familiar with the plan before the disaster. To increase the effectiveness of evacuation plans, modeling can be used to provide a practical understanding of the formation of cooperation behaviors. Studies of disaster evacuation have focused on resident's evacuation decision-making behaviors and information acquisition (Katada et al. 2005; Oikawa et al. 2005; Okumura et al. 2001; Yamada and Tazawa 2006). Great East Japan earthquake and describe resident's evacuation experiences during the causing nuclear and tsunami disasters. The Network Formation Model was introduced, considering cooperation behaviors among groups of residents as the networks. Command

and control evacuation has the advantage that most residents can evacuate almost simultaneously. Not all evacuees were able to live in the same site, so selection of an evacuation site for the long term until reconstruction is often the main problem for evacuees and local governments. Evacuees must rebuild their lives, working with local government and neighbors.

Michio Naoi (2012) discussed about the mitigation response activities of Japan. The tsunami in 11 March, 2011 has created awareness about preparation activities. The research focus on the consumer perception and response towards disaster. The results were positive about the individual preparedness for natural crisis even in lower income community. After 11 March, the specific actions taken for mitigation process. A gap was analyzed between rich communities and poor communities. 11 March, 2011, a huge earthquake with 9 Rector scale affected the north Japan. It demolished many Tohoku districts, villages and oceans, as well as a huge loss of human life with physical accidents. Tokyo was extensively damaged and not definable. An understanding is required for mitigation and resilience process. Japan has faced several disasters as compared to other countries. Japanese government and disaster organizations are more prepared than other countries for any disaster.

The present study shows that lack of efforts in policy decision making, many economical and non-economic issues, which are related to the future are the main factors. By media coverage the human losses and physical accidents in Tohoku may change the perception of individual about disaster and mitigation response (Naoi, Seko and Sumita 2009). Indian tsunami in December, 2004 caused damages in Asia Pacific areas. The organization's resource based view create challenges of SIHRM & MNPEs. The value of human resources and the human resource organizations manage resources. Resources are the critical features of an organization's disaster management. A research designed by Elizabeth S (2012) on challenges of tsunami. The 2004 Indian Ocean tsunami caused massive damage across numerous countries. It highlights the problems of Strategic International Human Resource Management (SIHRM) in Multinational Enterprises and the Multinational Nonprofit Enterprise (MNPE).

In this paper, four broad research objectives, first, this research brings an SIHRM emphasis to analyze the impact of the 2004 tsunami on MNNPEs in order to expand the base of investigation from a universal growth application (Cosgrave 2005; Telford, Cosgrave and Houghton 2006; Murray and Clarke 2008). Second, aforementioned research focused only on MNNPEs that were part of the tsunami relief response. Our research aims to canvas the influence of the tsunami on MNNPEs that operate generally in the relief and

development industry, whether or not? They directly contributed in the relief response to understand the inferences for the larger industry. Third, extending earlier investigation, we not only examine how, but similarly why the tsunami produced challenges. Fourth, this research studies the nature of resource problems during a specific event that contextualize organization research (Rousseau and Fried 2001).

Since the past 30 years there has been a substantial growth and importance of MNNPEs, mostly in relief and development area (Lindenberg 1999; Teegen 2003). MNNPEs channel billions dollar of funds through all over the world (Anheier and Themudo 2005). The aftermath of the tsunami highlighted the consequences of internal and external features of the MNNPEs. It describes the ability to respond efficiently in disastrous situation. Reports recommended insufficient, at times, inadequate local response, to survivors. It decline the organization morals (Ossewaarde et al. 2008). External factors pressurize for international integration whereas internal factors related with local responsiveness. With a large amount of external resources, the power shifts to external factors. First World donors increase the difficulties for the organizational capacity of MNNPEs. It decrease the efficiency of responses. As tsunami provides an example to improve the understanding of the internal and external frameworks of SIHRM in MNNPEs.

Jennifer Jordan (2012) shed the light on corporate response to crisis situation. Disaster management organization plays a vital role in the natural disasters. In 2004, in the case of Indian tsunami the United States corporations helped \$600 million for relief assistance. United States organizations spent huge amount for japan tsunami and earthquake problems (White & Lang, 2012). Though these signs are positive to be encouraged, by humanitarian concerns. Corporate relief activities can also create a public satisfaction for the response organizations, with skills and powers of the corporations (Aaker, Vohs, & Mogilner, 2010). At the same time organizations are representative for assistance with societal difficulties, the anticipation that they will support to resolve these problems on high level. A McKinsey Survey describes that above 70% people assumed that government and organizations both are liable for social problems (Bonini, McKillop, & Mendonca, 2007).

If we analyze this matter, we estimate that how issues and problems can complex in a corporation's early response to a natural disaster. It affects the perception of handling the task and proposed activities. From the corporation aspects, a natural disaster is outward crisis, in which organizations are not directly responsible for the destruction nor the resultant human trouble. This situation is different from internal crises like safety and quality problems, which identify organization's accountability (Diermeier, 2011; Pearson &

Clair, 1998). This lack of ultimate responsibility would seem to be decline the views that it has an obligation to support those who affected with the disaster; and it may seem that doing anything in response to an outward crisis can only develop the community views about the organization and corporation.

Andra's Tilcsik¹ (2013) described that how massive and huge disasters can affect corporate Humanity in United States? This research highlighting the impacts of geographical communities in which any type of crisis can rarely effect the existence of organization. The nature of disaster depends upon the destruction level and other impacts. The huge disasters has destructive impact and small scale disasters had a constructive impact on communities. The past humanitarian history and community's unified network creates stability to alleviate certain impacts. Natural disasters attacks terribly, creating difficulties in monetary losses, destruction of infrastructures, loss of victims and casualties.

The national institutes play a major contribution in life-threatening crisis. Many researchers have predicted great level of interconnection between societies and post disaster actions. A broad phenomena called as "post-disaster fundamental activities," "principled public phase," or "after crisis assistance" (Erikson, 1976; Kaniasty and Norris, 2004). If societies work collaboratively in relief and rebuilding activities then problems can be solve competently. Team motivation spirit effects positive results in donations and other charitable activities. As Crampton and Patten (2008), pointed out, that main headquarter in a public society forms an "intellect association between agencies and organization that supports affected people by catastrophe," which leads to "force the organization to respond immediately. Disasters cause of substantial physical infrastructure and economic loss may bind the Philanthropic activities of local organizations. Cramton and Patten, (2008) proposed that corporate philanthropic activity is most difficult due to economic crisis. In consequences the national organizations tends to be more aware about disasters aftermaths, charity response activities and operational procedures as we have seen the activities during Katrina. (Muller and Kraussl, 2011).

A study on Sandy Hurricane and impact analyzed by Chris Piotrowski (2013). The field of disaster studies has grown-up rapidly over the past 30 years. The knowledge base of the field is currently quite massive (Rodriguez et al., 2007). However, research on the impact of hurricanes on human life is a modern phenomenon in social sciences. In 2005 Hurricane Katrina, represents huge loss and low growth failure of disaster research across all the social sciences disciplines. In 30 October, 2012 the Sandy Hurricane was a huge

storm, which created several damages in US east coastline, more in New Jersey and large scale destruction in New York seaside regions.

Mark Skidmore (2013) delivered the impact of natural disasters. In recent years, many emerging countries have required to implement more decentralized government structures. Even though struggles toward fiscal federalism, evaluation of decentralized actions has been disturbed by lack of continuous cross-country measures of efficiency. Since governments play a dominant role in the management of disastrous events. Disaster effect data provide a prospect to evaluate whether government structure is important in preventive disaster victims. The relationship between decentralization and disaster losses; countries with more decentralized governments practice fewer disaster-induced fatalities. It is normally assumed that as country grows up, it allocates more resources for safety measures, execute protective methods intended to decrease the impacts of natural disasters. The present frequencies of storms / cyclones, quakes, and tsunamis, as well as shocking people and financial impacts, has create more awareness to determine the consequences of disaster. The previous research (Anbarci, Escaleras, and Register 2005; Kahn 2005; Toya and Skidmore 2007; Kellenberg and Mobarak 2008) and regulate the pattern between destructions and financial growth examination. In addition the study focus on disaster management and response activities, Wildasin (2008) determines that specific organizational structure with financial analysis may create motivation to government and help in strategic planning.

Toi and Leek (1999) and Burton, Kates, and White (1993) also deliberate the prospective to decrease susceptibility as income growth level rises. Burton, Kates, and White (1993) presented a modest reverse association between deaths due to natural disasters. Toi and Leek (1999) identified that, there is an evolution between protected and unprotected and creates a transformation procedure. In recent massive disasters, government criticized for lack of preparedness and response activities. The results of Hurricane Katrina the disaster management organizations were complained for not operative flood control procedures. The most relevant study to date is that of Escaleras and Register (2012), who conduct a similar analysis to determine the role of decentralization for protecting inhabitants from natural disaster events.

Coordination and communication is a big issue, a framework was developed by Richard C (2013). Coordination difficulties rise-up when government has to work on inter-organized judicial policies. Coordination is most important factor for crisis management, when the task becomes complicated due to mutual actions, strategies and rules are critical. Broad selection of activities is required for coordination, therefore a unified command and control mechanisms are most important aspects (Andrew &

Kendra, 2012; Maser, 1998). The local institutions may coordinate their decisions through different mechanisms such as informal setups, provincial societies, officials or contractual networks that relates with crisis management performers. These performers hold acute info or shaped a weak-collaborative association process (Feiock, Lee, & Park, 2012; Shrestha, 2010, 2012). Acute information or form “weak-tie” relationships (Feiock, Lee, & Park, 2012; Shrestha, 2010, 2012). Risk measures difficulties rise examination expenditures, check and monitor, coordination process, implementation of task becomes more difficult when we cannot analyze the results (Ferris & Graddy, 1986; Hefetz & Warner, 2012; Warner, 2012). By encouraging bureaucrats to participate in activities of public, these decisions, designed by specific organizations at national level (Bae & Feiock, 2013; Choi, Feiock, & Bae, 2013; Clingermayer & Feiock, 2001; Zhang & Feiock).

2.23 CRITICAL BRIEF ASSESSMENT OF LITERATURE REVIEW

If we take a look and have a quick review on the above mention Models and their importance. The research contribute understanding of Disaster Management Systems for crises management. A vital component is "Disaster Response", because it is the first component which needs activation. Before going further we need to understand various factors of disaster repose. So PDCA represented for quality & control and further SHORs Model” introduce for military operations, it involves option creation, evaluation and refinement with highly imperfect information. After that a model introduced for improved control system. It introduces three types of reasoning first is rule based reasoning, second is knowledge based reasoning and third is skill based reasoning. Decision making is most important aspect so, OODA presented for C2 architecture and decision making.

As decision making is most critical consequently a model of recognized prime decision making, it involves identify each evaluation option, weightage each option then score and select option with highest weightage score, to analyze the broad spectrum and a big picture view a model of situation awareness was established. In Pakistan and other countries there is a problem regarding rational decision making and retrieve the information about the dynamic situation. So we need situation awareness to analyze the “big picture” of situation. Commanders and their staff has to maintain situation awareness.

Organizations are more complex in nature, a model of VSM proposed that helps for handling the complexity of situations for decision making. After that another VSM model was designed and discussed about collective behavior and structure of organizations to diagnose the structural mechanism of

communication and coordination. Brien introduced a model according to climate variation, focused on restructure the activities to achieve better results. A model for National Incident Management Systems for transformation in C2 applications. The model focused on the time period that what response is needed during first 72 hour of disaster that is most critical.

Incident Command Model was used for check and monitor disaster management activities, also intended for cross organization collaboration, coordination, and communication and situation analysis. After that another framework highlighted that cognition shows effective results with 3Cs communication, control and coordination between activities. Due to the complexity of crisis a model for Decision Support system for complex situations was intended.

Resources are important and play a major role in crisis situation, a Natural Disaster Management Communication System helps to facilitate the procedure of allocating and distributing the resources. We should have Workflow Management System to manage emergency plans before and during disaster. Main objective is to support and facilitate the staff in execution process. It was defined that emergency plans should modeled as workflow. Delphi Decision System acknowledged for crisis management for time critical decision making. Temporal coordination highlights cross organization coordination with minimum response time and reduce forecasting difficulties.

A communication and Decision support system models was introduced to retrieve correct and accurate information according to the hazard. Social vulnerability index was designed for disaster management, a disaster cycle established and focused on recovery, response, mitigation and preparedness processes. Communication gap in disaster management was designed. Communication process was integrated with planning, this planning involve before, during and after disaster. Coordination contingency framework was designed from contingency perspective. National Response Framework was designed. The purpose of this system is to check that how system can collaborate with different agencies and actors.

A consular emergency management was designed that how government overcome the crisis situation and what support and facilitation government should provide to affected people. A model for communication and planning was design for warning messages related to the hazard and alarms system introduced. After that Disaster Complexity and Impact model was establish for 21st century crisis, in which emergency and preparedness plans were suggested to strengthen. Earthquake evacuation planning framework was created for strategic planning. Different types of assessment were defined community

vulnerability assessment, evacuation route planning and evacuation charts for disaster management preparedness.

Strategic preparedness for recovery and risk model was introduced for integration processes, integration through states, importance of states, effective role of integration in modeling activities, strategic preparedness, meta modeling, rescue, recovery and on time response factors highlighted. 5 Rs model stated for recovery of activities, re-entry procedure, rescue people, reconstruction of buildings and other issues, recovery period and rehabilitation process. Societies and national institutes plays a major role in disaster management. A unified network is required for collaboration between different agencies and organizations. Coordination mechanism for disaster management was designed. It helps in check and monitor the activities and processes. Unified command and control approach was highly recommended.

CHAPTER 3

PROPOSED C2 FRAMEWORK

Organization performance and enhancement in emergency operations is becoming more challenging for disaster management organizations. The disaster management organizations learning practices and development of new processes with efficiency can improve their quality of task accomplishment. This research will investigate the issues regarding task accomplishment. We are integrating two models to improve the processes of disaster management organizations. This process implementation will identify, design and execute the process effectively. It will also design decision making plans as well as analysis of contemporary environment, and provide feedback during strategic planning.

The consequences of Hurricane Katrina, crisis was severely criticized regarding preparedness and response activities of national and local authorities (CRS Report to Congress, 2008). Other issues identified were emphasis on the expanses of other dangers (Flynn & Prieto, 2006), the problem is to clarify the roles of the several actors and actions in response activities (Parker et al., 2009), and a multi-purpose disaster management system was established (Wise, 2006). The problem with this research was that some part of this research, is still incomplete at the time of the disaster (Daniels et al., 2006). The perception of strategy development between DHS organizers is missing (White House, 2007). The NRP was revised by a new document includes past lessons learned from the Katrina disaster called the NRF in January 2008 (CRS Report to Congress, 2008).

3.1 EVALUATION OF DMS IN PAKISTAN AND INTERNATIONAL LEVEL

Pauliina Palttala (2012) has discussed about crisis management. However, from many years the communities and societies, have neglected the communicative aspects of crises in the area of disaster management. The crisis communication did not create itself as a self-determined investigation area till afterwards the disaster Chernobyl in 1986 (Nohrstedt & Admassu, 1993). The tsunami and Katrina are creating troubles due to greatest number of hazards and the intensity. The public blame on government about crisis communication. Government should have to create more consideration about crisis communication. In crises governments and people meet with threats

conditions, they require a quick on time response from those who are accountable (Ulmer, Seeger & Sellnow, 2007) to manage the activities. They need decision making plans under short time period. We can categories disasters in different types, such as workplace crisis with violence, non-governance, disruption and violence.

An accidental crisis may be viral diseases, unexpected technical difficulties, and disasters (Ulmer et al., 2007). In public association crisis communication plays a crucial role with their own perspective. It deals with the strategies and focus on the views of communities to accomplish the task. It requires right description of any unpleasant event and specific hazard, to evaluate the conclusion and consequences, furthermore it provides harm decreasing information to affected regions and community (Reynolds & Seeger, 2005).

The communication organizations are facing difficulties in crisis management due to weather issues and strategic structures. It has been stated that a specific and applicable communication process should be selected wisely according to the present crisis situation and the expectation of stakeholders (Coombs, 2006). The actual crisis communication must be applicable before any crisis occurs. It should be started immediately after the disaster. The crisis communication focus on pre-crisis protection, preparedness plans, a timely response to post-crisis activities and implementation of policies (Fearn-Banks, 2004 in Dardis & Haigh, 2009). A well-defined framework of planning and protective processes are desirable to cope with all types of disasters.

Different disasters threats take diverse forms, leads with different prospects regarding communication (Pauchant & Mitroff, 1992). Several communication methods exist, but most useful approach be determined by on shareholder's views and thoughts about the conditions and cause factors (Coombs, 1995, 2004). The nature of modern disasters have created troubles to those organization who managed them; initially government participating players, such as army forces, police, disaster emergency services, and military, they have to worked for several worldwide community, government for normal hazard or huge crisis (Visuri, 2003). For multiple type of hazards The National Crisis Communication defined the policies and challenges of their mission statement. If we compare the risk communication then we can analyze that the receivers generally have short time period to explore and process information flow.

Consequently, for organization growth and development risk education is necessary and enhanced policies are required to improve the ease of

understanding of crisis messages (Quinn, 2008). The crisis relates with the cultural aspects that how individuals describes the intensity of disasters. Therefore how they will manage and cope with the crisis situation (Berkelaar & Dutta, 2007)? In crisis communication and risks, many scholar's findings shows about culture dissimilarities. Berkelaar and Dutta (2007) briefly described that culture can be constantly change, regenerate, indigenous and lively, through communicative bodies. Smillie and Blissett (2010) described that risk communication policy is crucial for the core strength of culture by Hofstede (2002; Hofstede & Hofstede, 2005).

The past examples mentioned above in literature and theoretical models explain about new processes that are required to enhance past decision theories for disaster management organizations and institution. Wrong decision may conflict with the risk management. The process is related with the current situation and the views of individuals. Individual handling tasks may contradict the situation and no stability between the actions.

Many scholars has defined disasters as 21st Century Disasters or mega/extreme crisis (Rosenthal, 1998; Boin & Lagadec, 2000). (Rosenthal, 2009) described societies and organizations not only have to deal with normal crisis but should be prepare for unexpected diverse situation. This was named as a new ball game. Disasters and hazards must be handle with thoughtfulness. Main issues are lack of information systems and processes. The new approaches and trends have designed disaster resilient approach that can balance the decision making models. This will enhance the operational procedure and identify the real world problem to manage the disasters, hazards and life threatening crisis.

3.2 EVALUATION BY REPORT 2006 & 2011

Voluntary organizations include National Disaster Management Authority, Active Learning Network for Accountability & Performance and Pakistan Red Crescent Society plays a vital and crucial role in providing the services after disaster.

3.2.1 The Legal Framework for Disaster Management

A legal framework is required for country to handle and overcome the disasters and protect the community.

3.2.2 National Calamities (Prevention and Relief Act) 1958

This act was introduced for protection and relief activities. The Provincial Relief Commissioner provides high level of safety and regulate the law for community. It specifies resource deployment, construction issues, and availability of machinery and equipment, donors and relief camps. This facilitation is helpful for affected people from flash floods, tsunami, and earth quake disasters and it reduces damages, losses and protect the people. This facilitation process is formulated by team work, staff management and on sub district level.

3.2.3 Emergency Services Ordinance 2002

This act was design for emergency services to cope with a specific type of disaster. A national committee was formalized to handle the crisis situation with check and balance of these services. Government roles were defined for implementation. Two type were defined provincial and district government.

3.2.4 Local Government Ordinance 2001

This ordinance provides certain rules and regulations for decision making activities.

3.2.5 Pakistan Red Crescent Society (PRCS)

PRCS has designed institutional framework from relevant practices and knowledge. October, 2005 earthquake, PRCS has passed a notification for resources from the global Red Cross network. It has contemporary relevance but lacking in operations. It need to be collaborate the procedures with proper guidance and control for an effective disaster response players.

3.2.6 Civil Defense Services of Pakistan

Civil Defense Service in Pakistan has established by British Administration. These services organized at country level.

By evaluation of these reports we can analyze the facts and determine the cause in task accomplishment. Evaluation of these two reports identifies the weakness in disaster response mechanism regarding on time response,

recovery problems, and relief activities. By evaluation remedial activities can be frame properly. An expert and skilled system is required for system development need to focus on workshops, training, and advance standards to meet the task competently. In evaluation most common factor is lack of planning and on time response. This report highlight the factor of forewarning systems and planning strategies needs to be enhanced. Every disaster management organizations have their competent strength and weaknesses. For better accomplishment of mission disaster management practices should improve.

3.2.7 National Disaster Management Authority

National Disaster Management Authority formulate a strategy for crisis management. NDMA focus on synchronization of different activities and execute the task. It formulates coordination and national plans for disaster management. The suggestions from different organizations to prepared disaster management plans and enhance response activities. Educational level and processes should formalized. Disaster Management Ordinance provide a mechanism for crisis response organization but still there is a need to improve procedures.

3.2.8 Rescue Services 1122

Due to old rules and regulations the procedures and policies are not only inappropriate, but they lack professional supervision. The trouble is also due to overlap in actions, lack of leading agencies in a local surroundings and inadequate government policy. Though the best operational services have given assistance to the leaders who are working in the absence of an integrated structure leaves much to be desired. In Pakistan the Government of Punjab has introduced a well-economic emergency service availability, which is identified as 'Rescue 1122'. So the present services are with lack of resources need to be integrated for effectiveness and sustainability. Besides all such agencies need to do periodic joint work exercises to test both their operating procedures and equipment in order to be effective in a real disaster situation. These regular work exercises should define a policy so, that in such emergencies the residents can be helpful in times of natural calamities.

3.2.9 Eidhi Services

A man who created a free charitable emergency relief service in Pakistan, The service organizer name Abdul Satar Eidhi popular all over the Pakistan. He has shown remarkable results in contributions. He leads neither through his performance and actions nor with arguments. Eidhi Ambulance service is working with excellence in Pakistan, where government performance services are completely unsatisfactory. The purpose of Eidhi Service is saving life of people and creates operational measures of emergency evacuation.

3.2.10 Emergency Relief Cell & Other Agencies

Emergency Relief Cell is responsible to monitor the disaster activities and create a framework for disaster support mechanism. The traditional Relief Commissioner constructed provincial Disaster Management designs that are now being adapted for National Disaster Management Authority procedures. In Punjab, Relief Commissioner is responsible for immediate disaster response and restructures the activities. By making effective plans and policies, we can improve our decision making processes. In terms of action planning NDMA has early warning systems, strength to handle the crisis response phenomena. Much work is pending in Pakistan regarding disaster management, but in a promising way UNDP (United Nation Development Program), ISDR (International Strategy for Disaster Reduction), and OCHA (Office for the Coordination of Humanitarian Affairs) are supporting very well.

3.3 STRENGTHENED C2 MODEL

The proposed model comprises on two models. We are integrating two models to enhance the performance of Disaster Management Organizations. The integration provides a new multidisciplinary approach for disasters and also enhance the methods for disaster response. Due to the nature of this domain. Model integration framework not only develops a new effective model from existing subroutines but also adaptively reacts to the needs of the environment as well as disaster scenario. Integration of both can facilitate the better and remarkable results in disaster management as well as in performance management. By integrating of two models we can improve processes of disaster management organizations and others crisis related organization. First model is OODA, we are using OODA fro time critical decision making. OODA works as a base layer and VSM works for outer layer at external level. VSM is using for strategic planning and coordinating the

activities. OODA will focus on current situation, variation in the situation and VSM works at high managerial level with five sub systems. Each system is viable and recursive in nature and will adopt the change according to the environment. VSM use for effectiveness to cope with the specific type of disaster. This delivers a good level of abstraction to manage the task and situation efficiently. In nature human organizations are more complex due to communication and coordination aspects. Organization worked as a shared and combined network, each system is viable itself and well organized independently.

By accumulation of OODA and VSM we can improve Command and Control (C2) architecture. C2 architecture mend the scenario development for decision making. For development of Disaster Management, C2 architecture is the vital constituent from every aspect. This work is on organizational level and other discipline for command and control. Controlling actions execute more distinctively by augmentation in C2 architecture. This delivers a good level of abstraction to cope with the specific type of disaster.

3.4 INTEGRATION OF OBSERVE ORIENT DECIDE ACT MODEL AND VIABLE SYSTEM MODEL

Stafford Beer is the one of the popular researcher in the field of cybernetics. He has highlighted about machine, rules and regulation of a system, principles about organisms and organization standardize processes to maintain their identity and how they accomplish their task. Cybernetics process applied further rules and regulations, for which nervous system of human and animals balance the control over its activities, how to maintain their identity within the ecosystem. From broader aspects how organizations maintain their identity and existence in market? Beer designed a framework named as Viable System Model for identification of the problems practically. Organizations and their performance are important features. Organizations should focus on effective functionality of the procedures. Stafford Beer belied that for efficiency in processes independence role should maximize to fulfill the mission and objective with some rules and regulations. He suggested that cybernetics application is useful to design the organizations.

VSM is to identify and analyze the problem effectively and identify relevant procedures to re-establish the organization. The reestablishment of this process needs more experience, expertise to support organization for objectivity, like a nervous system. Any lay person can imagine and think that how the system work and what are the measures needs to adopt for enhancement? Why the organization is facing so many challenges in task

accomplishment or objectivity? Why still organization is facing crisis consistently? Why organization not enhance their procedures for better improvement?

The VSM is real and effective model for organizations to cope with the specific problems? This delivers a good level of abstraction to manage the situation. Human organizations are complicated and difficult in nature Human organizations are more complex, such as the control and communication process in animals and machine (Norbert Wiener 1948). Organization worked as a shared network, each system is viable itself and self-organized independently.

VSM derives from system thinking. The Whole, self-organizing systems and the designs of relationships. VSM developed by Stafford Beer during the 1950's while he was a manager in the UK steel industry. It enables you to diagnose problems and to come up with solutions. VSM use to solve the complex problems and manage the operations. According to Beer brain and nervous system control nervous system and organs. How to accomplish the goals in changing environment? Beer was observing with cybernetics.

Viable system adapts to survive and attain its goals in the context of unpredictable situation. So the connection and interaction with the environment must be at the heart of any model of viability. And make loop work, information must be as close to real time. Viable system works together for mutual advantage. In every organization three basic elements involve. Operational units which defines the system. An environment which operates and control the activities and operations.

Viable System Model is consist of different procedures, each process is linked with the major management functions, such as planning, organizing, controlling and leading, each process work independently. If we say that human body is working with a different organs such as heart, intestines, lungs, liver, etc. If we look at human systems suppose digestive system, respiratory system and nervous system, etc. these systems are working independently.

Consequently organizations have multiple systems with certain departments for operational processes. Organization is interconnected so the information and communication flow coordinated between different departments. These processes should be coordinated, remain viable, and balance their identity. In human system, each system is coordinated with each other, but work independently, such as signals connection with nerves. Nervous system and brain is controlling all functions and systems of the human body. Moreover, the thought of the viable system can refer to any

organization and firm. Viable organizations are able to survive as a result of transformation. A viable system is composed of five interacting subsystems which may be mapped onto aspects of organizational structure.

System-1 – in a viable system contains several primary activities. Each System 1 primary activity is itself a viable system due to the recursive nature of systems. These are concerned with performing a function that implements at least part of the key transformation of the organization.

System-2 – represents the information channels and bodies that allow the primary activities in System 1 to communicate between each other and which allow System 3 to monitor and co-ordinate the activities within System 1. Represents the scheduling function of shared resources to be used by System 1.

System-3 – represents the structures and controls that are put into place to establish the rules, resources, rights and responsibilities of System 1 and to provide an interface with Systems 4/5. Represents the big picture view of the processes inside of System 1.

System-4 – The bodies that make up System 4 are responsible for looking outwards to the environment to monitor how the organization needs to adapt to remain viable.

System-5 – is responsible for policy decisions within the organization as a whole to balance demands from different parts of the organization and steer the organization as a whole.

In addition to the subsystems that make up the first level of recursion, the environment is represented in the model. The presence of the environment in the model is necessary as the domain of action of the system and without it there is no way in the model to contextualize or ground the internal interactions of the organization.

System one consists of core operational systems. System one can have several core operational units and each of them consists of main activities to support the organization's identity and local management structure to manage the operational unit. System Two provides the coordination functions for System One. It intends to reduce the instability produced as the result of possible conflicts between the core operational units of System One. System Three needs to ensure that the organization achieve its objectives. This is done by checking the performance of the main operations against the policy set by the upper management. Briefly, System Three needs to translate the organizational policies and objectives into lower level procedures to manage

the lower level operations. System Four reports on external development and opportunities to benefit the advancement of organization.

It needs to collect and analyze current and updated information. From the analysis, it should propose new plans or changes to make the organization adaptive to external demands. System Five need to set organizational policies. Its main function is to balance between emphasizing System Three functions and System Four functions. This means it needs to set priorities between focus on the internal or existing operations and looking for changes from external demands to implement new or enhanced operations.

Boyd's Observe-Orient-Decide-Act (OODA) loop is a decision-making model which created by observing jet fighter pilots in combat. Over the passage of time, OODA has been implemented other military services. Boyd was himself an outstanding fighter pilot. OODA application is for crisis and emergency management, in IT for interruption and detection system and in dynamic risk management for fraud control. OODA has become a well-known business process model for military Command & Control (C2). OODA loop focus on tempo and decision cycle time period.

This makes it a leading for the operational view of C2 systems architecture. Observe identify the current situation and the intensity of hazard, Orientation defines the big picture of the situation, it depends upon the way we analyze and take action, Decide is the process of selecting best possible option, the selection among different options, Decide is linked with internal feedback, Act represents the implementation of selected option and execute it, it receives internal feedback from Observe and also receive guidelines from Observe. It gives internal feedback. OODA application is useful for crisis and disaster management. OODA is using as C2 Architecture for emergency management.

3.5 COMPARISON OF IMPROVED C2 MODEL

The purpose of this research is to compare different models with OODA and VSM, also compare strength and weaknesses of past models and research. By integration of two models we, can improve the processes of disaster management organizations and institutes. This model will highlight the importance of C2 systems. OODA highlight the aspect of tempo, a decision cycle time period, such as a consistent flow in processes, a rhythm required in procedures. OODA creates interaction between different processes. OODA can be used for large scale operations but this application needs to be developed for large scale crisis and other emergencies, because OODA has no collaboration in decision making processes. This model is not applicable for

higher level organizations. Keus (2002) states that the processes should be formalized, there is a need to enhance OODA for information flow, analysis of contemporary situation, team management, redevelop the process, authority and direction. Dehn (2004) identifies the shortcomings of OODA loop, the main problem are situation awareness, memory issue and cognition.

Planning process, organizing, recall and store are major shortcomings and should include in OODA. Many researchers proposed that planning should consider as a fifth process in OODA. (Biundo et al., 2003) said that planning process should be integrated in OODA. These issues must be considered for further development in this model.

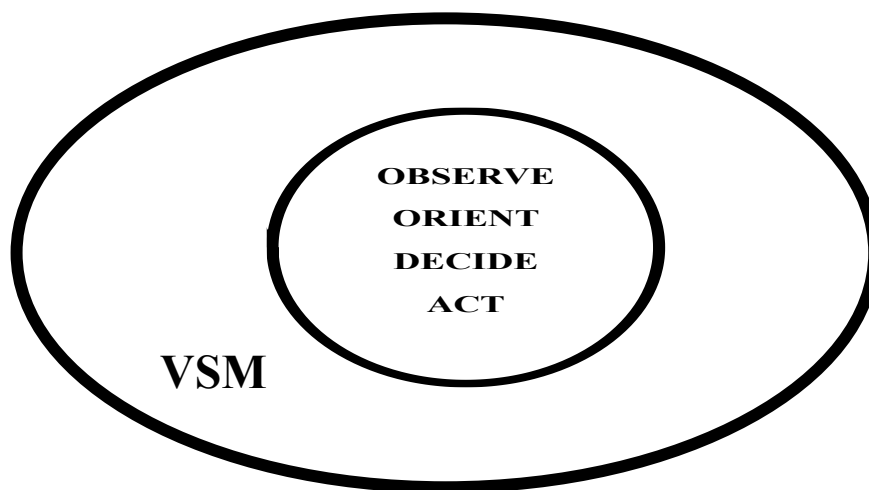


Fig. 3.1: Integration of OODA & VSM

In disaster management, one vivacious aspect is the response activities and respective relation dependences on inter and intra-organization level. It consists of many parameters like centric activities, precise coordination, and short response time, on spot decision making, management of unpredicted activities and cross organization coordination. These all are key components for decision making process.

The proposed used of two systems that can facilitate emergency response operations during ongoing crisis. The first system provides direction to global world regarding the best integration mode. It comprises on C2 architecture and decision making nodes that are positioned at specific location also deliver information related to the hazard. The stimulus outcome exemplifies that the decision support system improve the consequence of disaster management by synchronization of C2 architecture operations and decision making. In future further parameters can be added, such as forecast of the blocking and the dynamic dissemination of a hazard and examine the impact of framework features, such as interruption, information demolition,

and exact presentation of the system. The proposed model is efficient and will give all desired information to design and implementation of disaster management planning and processes.

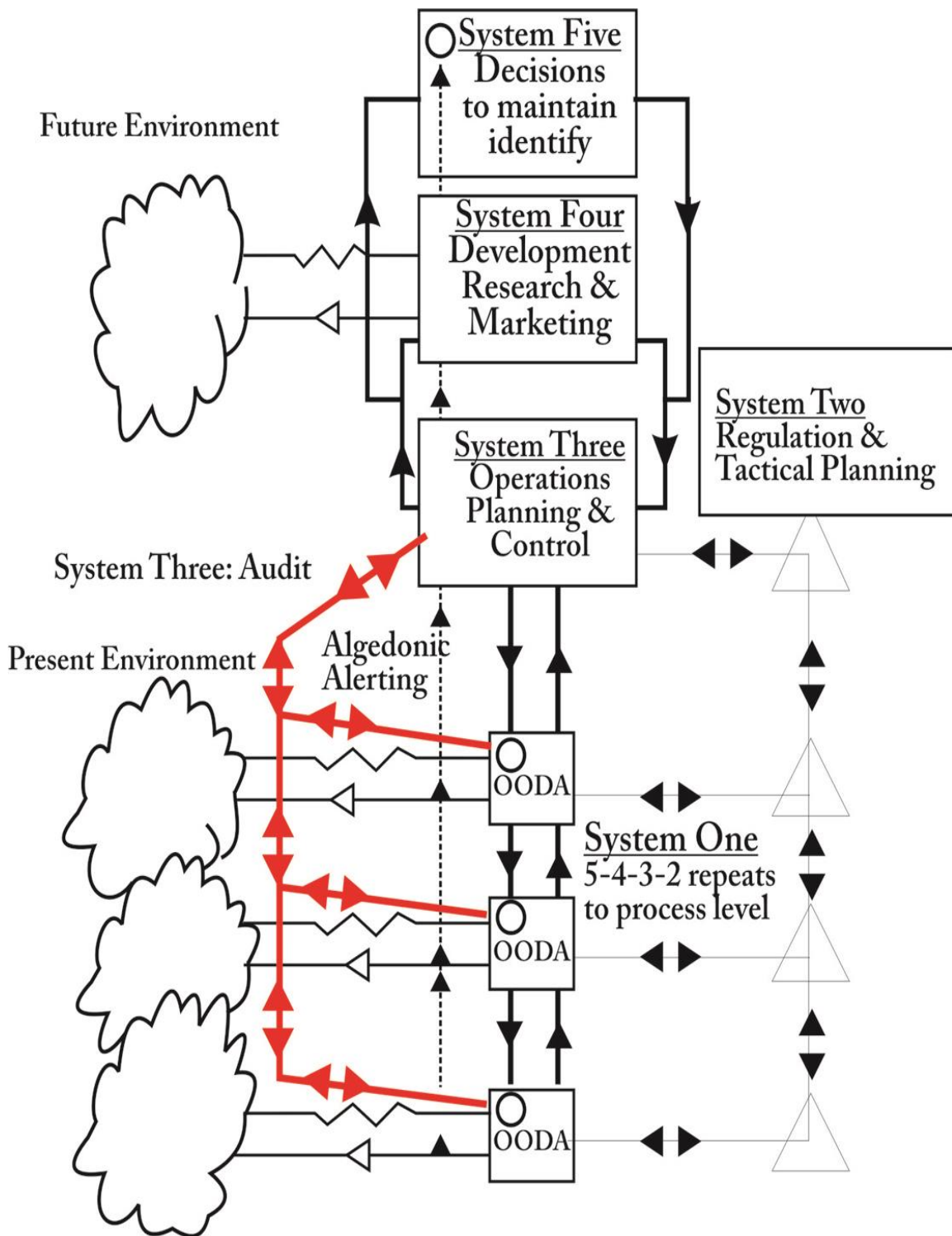


Fig. 3.2: Proposed C2 Approach for Disaster Management

3.6 COMPREHENSIVE COMPARISON OF MODELS

By analyzing previous models with proposed C2 approach, we can determine the consequences. A comprehensive framework is required for C2 Architecture. The detail analysis of VSM systems with other models. VSM has five subsystems. Each system work separately. The comparison of models will identify the strength and weakness of the system. This research will determine the empirically review of past models and creates the results. In each models all five systems are not working presently. Every system indicates some shortcomings. Five systems are essential for an organizations to work efficiently. System 1 is present in NIMS and VSM but not in other models. System 2 is present in VSM, HTGC, DSS and OODA. System 3 is present in VSM, PDCA, SA, WfMS, DSS and OODA. System 4 is present in VSM, PDCA and WfMS. System 5 is present in VSM, SHOR, HTGC, PDM, SA, DSS, NIMS and OODA.

All five systems are present in proposed C2 approach. By Strengthening C2 architecture we, can improve Disaster Management systems. By integration in operations can improve decision making and planning elements. The proposed C2 approach provides identification of problem statement, guidance, control and monitor the situation. This model specifies the feasible approach for current needs and wants of disaster management. It provides feedback, execution and implementation of planning process and decision making. This framework provides full support to crisis management organizations, NGOs and other disaster management organizations.

This proposed system will focus on new processes and trends in a dynamic situation; it includes optimization to respond effectively with minimum time period and different learning processes to enhance future processes by VSM and OODA.

Table 3.1
Meta-Analysis of Different Frameworks

Models	Proposed C2	VSM	PDCA	SHOR	HTGC	PDM	SA	WfMS	DSS	NIMS	OODA
System 1	Yes	Yes	No	No	No	No	No	No	No	Yes	No
System 2	Yes	Yes	No	No	Yes	No	No	No	Yes	No	Yes
System 3	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	Yes
System 4	Yes	Yes	Yes	No	No	No	No	Yes	No	No	No
System 5	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes

The table mentioned below specified a detail analysis of models. In comparison C2 models is efficient and effective from all other systems and models (OODA and VSM). C2 is closest to VSM. By integration of both models we can enhance our systems. OODA is the primary model for execution. OODA has four processes. These processes provide solution at primary level. OODA provides situation analysis and implementation of actions for organizations. By integration of OODA with VSM proves remarkable and good results for Disaster Management organizations. VSM provides complete framework for organizations. It provides strategic development mechanism. It incorporates new methods and processes. It also provides feedback, planning, communication and guidance to whole system. This integration reduces the risk at operational level. It provides best possible solution for organizations for task accomplishment. The proposed approach gives help in analysis and evaluation. It is responsible for decision making activities.

The proposed C2 approach and VSM are focusing on providing first aid services. The information gathering process is determined by Proposed C2 model, VSM and OODA. After collect and gathering the details and information the details provided to system-2, similarly proposed model, VSM and OODA is providing detail information. The information order flow received from system-2 is present in C2 model and VSM. In proposed C2 model, VSM, NIMS and OODA are receiving information from system-1. Coordination process is present in proposed approach, VSM, DSS, WfMS, and NIMS. The proposed model, VSM, NIMS and OODA are providing specific role and task to system 1.

The proposed model, VSM, PDCA, DSS, WfMS, NIMS and OODA are providing stability factor. Except HTGC all comparison models are intended for handle and monitor complex situations as well as structure and control an un-expected situation. After that overview of the system is present in proposed C2 but not present in HTGC model, but present in all other models. Only WfMS are managing resources and accountability, none of any model is analyzing this factor. The feedback is present in proposed C2, and all systems but not in PDCA, WfMS, DSS and NIMS. The resources and accountability are present in proposed C2, VSM and WfMS but not in other models. Proposed C2, VSM, SHOR, HTGC, RPDM and OODA are giving feedback. Proposed C2, VSM and WfMs are considering future planning aspect. PDCA, RPDM and DSS models have no vision. SWOT is present in proposed C2 model but not in all comparison models. HTGC and OODA are not considering decision making process and all other models are considering decision making process. Proposed C2, VSM and SHOR considering rules and regulations for decisions; so in above mentioned analysis VSM is closest to proposed C2 approach.

Table 3.2
Detail Analysis of C2 Models by Meta-Analysis

System & Their Regularities	Proposed C2	VSM	PDCA	SHOR	HTGC	RPDM	DSS	WFMS	NIMS	OODA
System 1										
Provide First aid Services	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO
Gather Information	YES	YES	NO	NO	NO	NO	NO	NO	NO	YES
Provide Inform to System 2	YES	YES	NO	NO	NO	NO	NO	NO	NO	YES
Receive Information Order from System 2	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO
System 2:										
Receive Information from System 1	YES	YES	NO	NO	NO	NO	YES	NO	YES	YES
Coordinate Mechanism	YES	YES	NO	NO	NO	NO	YES	YES	YES	NO
Roles to System 1	YES	YES	NO	NO	NO	NO	NO	NO	YES	YES
Provide Stability	YES	YES	YES	NO	NO	NO	YES	YES	YES	YES
System 3:										
Handle & Monitor Complex Situation	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES
Structure & Control the Situation	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES
Over view of the system	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES
Resources & Accountability	YES	YES	NO	NO	NO	NO	NO	YES	NO	NO
System 4:										
Feedback	YES	YES	NO	YES	YES	YES	NO	NO	NO	YES
Future Planning	YES	YES	NO	NO	NO	NO	NO	YES	NO	NO
Vision	YES	YES	NO	YES	YES	NO	NO	YES	YES	YES
SWOT	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO
System 5:										
Decision Making & Provide	YES	YES	YES	YES	NO	YES	YES	YES	YES	NO
Authority	YES	YES	NO	YES	NO	NO	NO	YES	NO	NO
Rules & Regulations	YES	YES	NO	YES	NO	NO	NO	NO	NO	NO

CHAPTER 4

RESEARCH METHODOLOGY

4.1 META-ANALYSIS

The contemporary issue is that how system is coordinated between different actors and agencies? The terrorist attack of September 11 has shown negative results due to coordination and response problems between central government and local organizations (Perrow, 2007; 9/11 Commission, 2005).

Erik Battberg (2012) stated some facts about communication and coordination. If we look at large scale disasters Hurricane Katrina, in August, 2005 strikes the Gulf coast. The preparedness plans and response has shown failure in results due to inadequacy in procedures (Cooper & Block, 2006; Daniels, Kettl, & Kunreuther, 2006; Parker, Stern, Pagila, & Brown, 2009). Hurricane Katrina showed difficulties in decision making and a major issue was collaboration between local, central and national organizations regarding information. Lack of governance, implementation difficulties, no effective strategic planning among official organizations (Perrow, 2007; Cooper & Block, 2006).

Coordination tends to be more challenging aspect for organizations, institutions and societies due to lack of integration systems. Due to this difficulties of integration portraying the American federal system needs to define more challenges for coordination (Kaufman, 1960; Peters, 2006). Since 1960 the growth level of coordination has decreased at international organizations and central government. These encounters are getting worse due to complex mission statement for safety and protection measures (Kettl, 2003a, 2007).

The role of federal government assistance has been insufficient for preparedness in emergencies and resources allocation before a huge disaster. The objective is to deliver recovery and on time response after any type of crisis when local resources are shattered (Lindsay & Sometimes referred to as 'The Philosopher's Stone of Public Administration) (Seidman, 1998). In public organizations coordination is a major issue (Morris & Morris, 2007) and it is particularly difficult to determine (Helsloot, 2008).

The crisis management organization researchers have deliberated that this is possible to regulate the system with complexities by government till

then the accurate formation of coordination strategy is designed (Seidman, 1998.O'Hanlon, 2002; Sauter & Carafano, 2006).

For immaculate coordination we required to divide the task and responsibilities within the organization for operational coordination, for inside coordination require to check and monitor the activities of single department or units rather than between different distinct workforces. (Morris & Morris, 2007). The contradiction with this assessment, contemporary network system indicates coordination and association between numerous self-dependent organizations, but current organizations who are not collaborated. (Chisholm, 1992; O'Toole, 1997; Wise, 2002; Wise, 2006).

We are establishing a proposed conceptual framework for disaster management organizations. The framework consist of two levels, one is internal layer and other is external layer, or we can say upper and lower layer. The current research focus on developing a conceptual understanding of disaster management framework with the help of OODA and VSM by addressing specific tasks, transforms and leads to organization's effectiveness. Qualitative approach is using in this research. This framework will be applicable in all disaster management organization, institutes and work efficiently.

The literature review and critical analysis of different frameworks are being used to develop this conceptual model. The main objective is to explain different frameworks, latest research has to review organizational performance, processes, and enhances the conceptual model through different literature review, disaster management research reports. Meta-analysis provides a logical approach for critically evaluation of different research and models.

Dourandaish (2007) highlighted that preparation and implementation of major crisis event's protection and evacuation procedures are very difficult. Command and Control (C2) of major events can be observed as universal accomplishment of shared assembly, organization and investigation of facts, preparation, decision-making, synchronization, implementation and sustainment of actions and events carried out by several agencies directed by diverse authorities. Thus, it seems that cross agencies communication; coordination, association and integration are important factors for a fruitful C2 of major events. Collective situation awareness, shared intent, trust on teams, communication and information sharing policies are key enablers for major events C2 efficiency.

This research focuses on conceptual ideas and remains generally in a qualitative domain. By critically evaluation of past frameworks and report we

can analyze the results. The process model for the Command and Control is developed based on vigorous literature review. In addition to the study of evidence based and scholarly research, documents relating to Disaster Management Systems (DMS) deployed around the world have and will continue to be critically analyzed, before proposing a formal architecture.

Various agencies working on ground in Pakistan with professional & historical records in this field intend to be engaged to help in this matter, and their experience reviewed to help identify gaps in the present system. Lastly, this research seeks and will be attempt to help and propose recommendations to improve the current systems in our country.

The Framework integration provides a highly structured approach for planning, organizing and analyzing the situation. Framework integration is an empirical approach to handle unexpected crisis and disasters. Both levels are clearly defined with their work routines, in which process is working separately and dimensions are defined, which may be used to map problem identification and nature of crisis and create link between different processes. OODA works at internal layer and VSM works at outer layers as a broad spectrum. If we compare different models then we can estimate the strength and weakness of these models. By critically evaluate the model we can analyze the results.

The collective approach of two models will focus on efficiency of organizations and certain environmental variations. C2 approach will help in planning and decision making processes that are essential for organizations. C2 is analyzing the factors of crisis intensity, needs and requirements of response mechanism. By accumulation of OODA and VSM, the process will be more enhance and well-developed for the decision making. It will provide help to make a change in the disaster management organization performance.

We are using meta-analysis approach for estimation and identification problems. The problem is that how disaster management organizations can enhance their processes? What techniques needs to adopt? How decision making and planning can improve the processes? Operational planning and on time response are most crucial for disaster management. Disaster response mechanism required experts and skilled workforce to manage the disaster situation effectively to meeting the standards. Disaster Management organizations have their weaknesses and strengths. By shared and improved application we can enhance crisis management procedures.

CHAPTER 5

CONCLUSION & RECOMMENDATION

5.1 CONCLUSION & RECOMMENDATION

The objective of the research is to analyze the consequences between disaster management practices and organization performance. Disaster management organizations can improve their learning capabilities and processes. The direct impact of disaster management processes and performance of these organizations has been discussed.

This study presents efficient strengthening C2 architecture model for decision making, it recognizes the need to provide a supportive framework for disaster management. This study is to develop a framework for Disaster Management Organizations to enhance the procedures for organizations at national and international level. This research provides a comprehensive institutional system for emergency and disaster related organizations. The main objective is to manage whole spectrum of disasters by applying C2 applications for decision making procedures to enhance the disaster preparedness, response and recovery time.

Disaster management systems should enhance and structured. The disaster management organizations and societies has faced many challenges with unexpected crisis. The new trend requires responsive organizational structures that facilitate collaborative and decision making activities. Command and control system is for further improvement in Disaster Management procedure.

Communication and coordination are two most important aspects for decision making frameworks. This model is for enhancing the effectiveness and efficiency of operational procedures. C2 architecture plays a vital role for crisis management, because it provides balance and stability between activities. This model provides a good level of abstraction to cope with specific type of disaster. However, this specifies the ability to manage different types of disasters.

Command and Control framework provide integration in processes. The integrated processes are for decision making in the organization that will help to bring transformation in the organization to understand the mechanism for disaster management organization, like strategic planning, communication,

coordination and decision making. Quick and on time response can reduce damages. It is however, challenging to make a right decision according to the nature of the hazard.

5.2 CONTRIBUTION OF THE STUDY

This research is highlighted to evaluate the performance of Disaster Management Organization's processes. The impact of this research is real and significant for Disaster Management Organizations and Institutions who are managing the crisis operations and procedures. The study is based on conceptual and theoretical foundations and newly emerging concepts. Pakistan is facing disasters from last decade. Organizations should update the techniques and enhance their procedures. Command and Control is getting focus in recent years. It involves the complex procedures to handle. C2 is efficient tool for communication, coordination and cognition. The integration will improve the disaster management strategies, plans, decision making, information flow, analysis, monitoring and control the situation that will enhance efficiency and effectiveness for goal accomplishment.

5.3 PRACTICAL IMPLICATION

The study emphasizes the needs to improve the processes according to the situation. Coordination and communication both are useful for decision making process. Organizations are facing challenges in task accomplishment. The organizational structures should be developed efficiently, as in Pakistan the organizations are facing difficulties to overcome the disastrous situation. Many issues are related with financial crisis, non-governance, knowledge sharing, skills and expertise. It also creates awareness for organization about emergency operations and response activities. The study develops a theoretical framework that will help to enhance disaster management processes to formulate strategies. By accumulation disaster management organizations can achieve desired outcome and high level of organization performance.

The study will be beneficial for organizations, and it helps to evaluate current processes of organization to enhance overall organization efficiency through diverse perspective. The main objective is to create competitive advantage for organizations. No duplication in disaster related practices and procedures. The practical implication of the study is to reduce extra efforts and resources. The organizations can improve their weakness.

5.4 FUTURE RESEARCH

The organizations need to redesign and enhance the processes to manage the complexities and disasters. The model integration framework can facilitate the organization to achieve their mission. As time passes the disasters are becoming more complex due to changes in environment and other factors. An operational framework for Disaster Management should be implemented with communication and coordination between different organizations and institutions.

As the trends and technologies are changing rapidly, so the processes need to be enhance and balance the activities with innovation and creativity. There is a need for cross-cultural contrast of Disaster Management Practices and knowledge flow process in organizations. Future research may explore different parameters and develop some new processes for organizations.

REFERENCES

1. Aaker, J.L., Vohs, K.D. and Mogilner, C. (2010). Non-profits are seen as warm and for profits as competent: Firm stereotypes matter. *Journal of Consumer Research*, 37(1), (224-37).
2. Afifi, T.D. and Afifi, W.A. (2009). *Uncertainty, information management, and disclosure decisions: Theories and applications*. New York: Routledge.
3. Afifia, W.A., Felixb, E.D. and Afifia, T.D. (2011). The Impact of Uncertainty and Communal Coping on Mental Health Following Natural Disasters: *Anxiety, Stress & Coping. An International Journal*, 25(3), 329-347.
4. Ambrose, E., Marshall, D. and Lynch, D. (2010). Buyer Supplier Perspectives on Supply Chain Relationships. *International Journal of Operations and Production Management*, 30(12), 1269-1290.
5. Amendola, A. (2004). Management of change, disaster risk, and uncertainty: An Overview. *Journal of Natural Disaster Science*, 26, 55-61.
6. Anbarci, N., Escaleras, M. and Charles A. (2005). Earthquake Eatalities: The Interaction of Nature and Political Economy. *Journal of Public Economics*, 9(10), 1907-1933.
7. Andrew, A. and Jered, B. (2012). Mitigating Uncertainty and Risk in Planning for Regional Preparedness: The Role of Bonding and Bridging Relationships. *Urban Studies*, 40(4), 709-24.
8. Anheier, H.K. and Themudo, N. (2005). *The Internationalization of the Non-profit Sector*, in the Jossey-Bass Handbook of Non-profit Leadership and Management. (2nd ed.). San Francisco: Jossey-Bass.
9. Apte, A. (2009). Humanitarian Logistics: A New Field of Research and Action. Foundations and Trends in Technology. *Information and Operations Management*, 3(1), 1-100.
10. Ariosto, D. (2012). *First Irene, then Sandy: Jersey City Recovers, Again*. <http://edition.cnn.com/2012/11/14/us/new-jersey-irene-sandy/>
11. Bae, J. and Feiock, R. (2013). Forms of Government and Climate Change Policies in U.S. Cities. *Urban Studies*, 50(4), 776-88.

12. Bae, Jungah and Richard C. (2012). Managing Multiplexity: Coordinating Multiple Services at a Regional Level. *State and Local Government Review*, 44(2), 162-68.
13. Baltimore, M.D., Parker, C.F., Stern, E.K., Pagila, E. and Brown, C. (2009). Preventable Catastrophe? Hurricane Katrina Disaster Revisited. *Journal of Contingencies and Crisis Management*, 17(4), 206-220.
14. Bammer, G. and Smithson, M. (2008). *Uncertainty and Risk: Multidisciplinary Perspectives*. London: Earthscan.
15. Barbara J. and Nicolai, K.P. (2009). Research Design for a Natural Disaster Management Communication. *Journal of Information Sytem Applied Research*, 2(3), 1-10.
16. Barnes, M. (2008). Analysis of media agenda setting during and after Hurricane Katrina: Implications for emergency preparedness, disaster response and disaster policy. *American Journal Public Health*, 98(1), 604-610.
17. Barry E. and Flanagan, E.W. (2011). A Social Vulnerability Index for Disaster Management. *Journal of Homeland Security and Emergency Management*, 8(1), 1-24.
18. Beck, U. (1986). *Risk Society: Towards a New Modernity*. London: SAGE Publications.
19. Berkelaar, B.L. and Dutta, M.J. (2007). A Culture-Centered Approach to Crisis Communication. Paper Presented at the *Annual Meeting of the NCA 93rd Annual Convention*, Chicago: TBA.
20. Bharosa, N., Lee, J.K. and Janssen, M. (2009). Challenges and Obstacles in Sharing and Coordinating Information during Multi-Agency Disaster Response. *Information Systems Frontiers*, 12, 49-65.
21. Birkland, T.A. (1997). *After Disaster: Agenda Setting, Public Policy and Focusing Events*. Washington, DC: Georgetown University Press.
22. Bland, S., Leary, E., Farinaro, E. and Trevisan, M. (1996). Long-term psychological effects of natural disasters. *Psychosomatic Medicine*, 58, 18-24.
23. Boin, A. and Lagadec, P. (2000). Preparing for the Future: Critical Challenges in Crisis Management. *Journal of Contingencies and Crisis Management*, 8, 185-191.

24. Boin, A., van Duin, M. and Heyse, L. (2001). Toxic fear: The management of uncertainty in the wake of the Amsterdam air crash. *Journal of Hazardous Materials*, 88, 213-234.
25. Bonini, S.M., McKillop, K. and Mendonca, L.T. (2007). Business and Society: Special Report. *McKinsey Quarterly*, 2, 6-17.
26. Bradford, J.L. and Garrett, D.E. (1995). The Effectiveness of Corporate Communicative Responses to Accusations of Unethical Behaviour. *Journal of Business Ethics*, 14(11), 875-892.
27. Braiker, H. (2002). *The September 11 Syndrome: Seven Steps to Getting a Grip in Uncertain Times*. Columbus: McGraw-Hill.
28. Brattberg, E. (2012). Coordinating for Contingencies: Taking Stock of Post-9/11 Homeland Security Reforms. *Journal of Contingencies and Crisis Management*, 20(2), 77-89.
29. Brehmer, B. (1987). *The Psychology of Risk: Risk and Decisions*. New York: Wiley.
30. Brien, O.G., Keefe, O.P. and Rose, J., Wisner, B. (2006). *Climate Change and Disaster Management*. Overseas Development Institute, 30(1), 64-80.
31. Broughton, E. (2005). The Bhopal disaster and its Aftermath: A Review. *Environmental Health: A Global Access Science Source*, 4(6). Doi: 10.1186/1476-069X-4-6.
32. Burkhart, F. (1991). *Media, Emergency Warnings and Citizen Response*. Boulder, CO: Westview Press.
33. Burton, Ian, Robert W. and Gilbert F. (1993). *The Environment as Hazard*. (2nd ed). New York: Guilford Press.
34. Castells, M. (1996). *The Rise of the Network Society*. Oxford: Blackwell Publishers Ltd.
35. Chakraborty, J., Tobin, G.A. and Montz, B.E. (2005). Population evacuation: Assessing spatial variability in geophysical risk and social vulnerability to natural hazards. *Nat. Hazards Rev.*, 6(1), 23-33.
36. Cheung, Y.K.F. and Rowlinson, S. (2011). Supply Chain Sustainability: A Relationship Management Approach. *International Journal of Managing Projects in Business*, 4(3), 480-497.

37. Chisholm, D. (1992). *Coordination without Hierarchy: Informal Structures in Multi-organizational Systems*. Berkeley: University of California Press.
38. Choi, Geun, C., Richard, C.F. and Jungah, B. (2013). The Adoption and Abandonment of Council-Manager Government. *Public Administration Review*, 73(5), 727-736.
39. Choi, Y. and Lin, Y.H. (2007). *Communicating Risk: The Effects of Message Appeal and Individual Difference on Risk Message Processing*. International Communication Association, (1-40).
40. Chris, P. (2013). Disaster Research for the Hurricane Sandy Impact Area: A Select Bibliography. *Journal of Instructional Psychology*, 39(3), 192-196.
41. Christian Sell, I.B. (2009). Using a Workflow Management System to Manage Emergency Plans. *Proceedings of the 6th International ISCRAM Conference* (pp. 1-7). Gothenburg, Sweden: J. Landgren and S. Jul, eds.
42. Christopher, M. and Tatham, P. (2011). *Humanitarian Logistics: Meeting the Challenge of Preparing for and Responding to Disasters*. London: Kogan.
43. Clingermayer, J. and Richard C.F. (2001). *Institutional Constraints and Policy Choice: An Exploration of Local Governance*. New York: SUNY Press.
44. Cochrane, H. (2004). Economic Loss: Myth and Measurement. *Disaster Prevention and Management*, 13(4), 290-296.
45. Comfort, L.K. (2007). Management in Hindsight: Cognition, Communication, Coordination and Control. *Journal of Public Administration Review on Crisis University of Pittsburgh*, (189-197).
46. Commission, (2005). *9/11 Commission Report: Final Report of the National Commission on Terrorist Attacks Upon the United States*. New York: W.W. Norton & Company.
47. Coombs, W.T. (1995). Choosing the Right Words: The Development of Guidelines for the Selection of the 'Appropriate' Crisis-Response Strategies'. *Management Communication*, 4, 447-476.
48. Coombs, W.T. (2004). Impact of Past Crises on Current Crisis Communication: Insights from Situational Crisis Communication Theory. *Journal of Business Communication*, 41(3), 265-289.

49. Coombs, W.T. (2006). The Proactive Powers of Crisis Response Strategies: Managing Reputational Assets during a Crisis. *Journal of Promotion Management*, 12, 241-259.
50. Coombs, W.T. (2007). *Ongoing Crisis Communication: Planning, Managing and Responding*, Thousand Oaks: Sage.
51. Cooper, C. and Block, R. (2006). *Disaster: Hurricane Katrina and the Failure of Homeland Security*. London: Times Books.
52. Cosgrave, J. (2005). *Tsunami Evaluation Coalition: Initial Findings*. Tsunami Evaluation Coalition.
53. Cox, L.A., Jr. (2012). Community Resilience and Decision Theory Challenges for Catastrophic Events. *Risk Analysis*, 32(11), 1919-1934.
54. Crampton, W. and Patten, D. (2008). Social responsiveness, profitability and catastrophic events: Evidence on the corporate philanthropic response to 9/11. *Journal of Business Ethics*, 81, 863-873.
55. Crowther K.G., Haimen Y.Y. and Taub, G.E. (2006). Systemic valuation of strategic preparedness through application of the inoperability input-output model with lessons learned from Hurricane Katrina. *Risk Analysis*, 27(5), 1345-1364.
56. CRS Report to Congress (2008). *The National Response Framework: Overview and Possible Issues for Congress*. Washington DC: Congressional Research Service.
57. Cutter, S.L. (1996). Vulnerability to environmental hazards. *Progr. Hum. Geogr.*, 20(4), 529-539.
58. Cutter, S.L. (2005). *Pragmatism and Relevance: What is a Disaster? New Answers to Old Questions*. Philadelphia: Xlibris Cooperation.
59. Cutter, S.L., Mitchell, J.T. and Scott, M.S. (2000). Revealing the vulnerability of people and places: A case study of Georgetown County, South Carolina. *Ann. Assoc. Am. Geographers*, 90(4), 713-737.
60. Daniels, R.J., Kettl, D. and Kunreuther, H. (2006). *On Risk and Disaster: Lessons from Hurricane Katrina*. Philadelphia: University of Pennsylvania Press.
61. Dardis, F. and Haigh, M. (2009). Prescribing Versus Describing: Testing Image Restoration Strategies in a Crisis Situation. *Corporate Communications: An International Journal*, 4(1), 101-118.

62. Davidson, R.A. (1997). *An Urban Earthquake Disaster Risk Index*. Stanford University: Stanford.
63. Dawney, E. and Shah, H. (2005). *Behavioural Economics: Seven Principles for Policy Makers*. London: New Economics Foundation.
64. Day, J.M., Junglas, I. and Silva, L. (2009). Information Flow Impediments in Disaster Relief Supply Chains. *Journal of the Association for Information Systems*, 10(8), 637-660.
65. Demuth, J. (2010.05.01). *Countering Terrorism: Lessons Learned from Natural and Technological Disasters*, National Academy of Sciences. <http://www.nap.edu/catalog/10414.html>.
66. Derby, S.L. and Keeney, R.L. (1981). Risk analysis: Understanding 'how safe is safe enough? *Risk Anal.*, 1(3), 217-224.
67. Dervin, B. (1998). Sense making theory and practice: An overview of user interests in knowledge seeking and use. *Journal of Knowledge Management*, 2(2), 36-45.
68. Diermeier, D. (2011). *Reputation Rules: Strategies for building your company's most valuable asset*. New York: McGraw-Hill.
69. Dinham, B. and Sarangi, S. (2002). The Bhopal Gas Tragedy 1984 to? The Evasion of Corporate Responsibility. *Environment & Urbanization*, 14, 89-99.
70. Dourandish, R., Zumel, N. and Manno, M. (2007). Command and Control during First 72 Hours of a Joint Military Civilian Disaster Response. *Twelfth International Command and Control Research and Technology Symposium adopting C2 to the 21st Century*, Rhode Island, USA, (pp. 19-21).
71. Drabek, T.E. and Boggs, K. (1968). Families in disaster: Reactions and relatives. *Journal of Marriage and the Family*, 30, 443-451.
72. Drabek, T.E. and McEntire, D.A. (2003). Emergent Phenomena and the Sociology of Disaster: Lessons, Trends and Opportunities from the Research Literature. *Disaster Prevention and Management*, 12(2), 97-112.
73. Drennan, L.T. and McConnell, A. (2007). *Risk and Crisis Management in the Public Sector*. London: Routledge.

74. Economist Intelligence Unit (2005). *Special Report Asia's Tsunami: The Impact*. The Economist Intelligence Unit.
75. Erikson, K. (1976). *Everything in Its Path: Destruction of Buffalo Creek*. New York: Simon and Schuster.
76. Escaleras, M. and Charles, R. (2012). Fiscal Decentralization and Natural Hazard Risks. *Public Choice*, 151(1), 165-83.
77. Eshghi, K. and Larson, R.C. (2008). Disaster: Lessons from the past 105 Years. *Disaster Prevention and Management*, 17, 62-82.
78. Falkheimer, J. (2008). Globalizing Public Relations and Crisis Communication: Bridging Gaps of Trust in Multicultural Societies, in Zerfass. *Public Relations Research: European and International Perspectives and Innovations*.
79. Farber, D.A., Chen, J., Verchick, R. and Sun, L. (2010). *Disaster Law and Policy*. (2nd Edition). California: University of California Press.
80. Feiock, R.C. (2013). The Institutional Collective Action Framework. *The Policy Studies Journal*, 41(3), 133-142.
81. Feiock, R.C., Won, L. and Hyung, J.P. (2012). Administrators and Elected Officials' Collaboration Networks: Selecting Partners to Reduce Risk in Economic Development. *Public Administration Review*, 72, 58-68.
82. Feiock, R.C., Won, L., Hyung, J.P. and Keon H.L. (2010). Policy Networks among Local Elected Officials: Information, Commitment and Risk Aversion. *Urban Affairs Review*, 46(2), 241-62.
83. Ferris, J. and Elizabeth, G. (1986). Contracting Out: For What? With Whom? *Public Administration Review*, 46, 332-344.
84. Fischhoff, B. (2000). *What forecasts mean, Judgment and decision making: an inter-disciplinary reader*. (2nd ed). New York: Cambridge University Press.
85. Flanagan, B.E., Gregory, E.W. and Hallisey, E.J., Heitgerd, J.L. and Lewis, B. (2011). A Social Vulnerability Index for Disaster Management. *Journal of Homeland Security and Emergency Management*, 8(1), 1-24.

86. Flynn, J., Slovic, P. and Mertz, C.K. (1993). Decidedly Different: Expert and Public Views of Risks from A Radioactive Waste Repository. *Risk Analysis*, 13, 643-648.
87. Flynn, S.E. and Prieto, D.B. (2006). *Neglected Defense: Mobilizing the Private Sector to Support Homeland Security*. New York: Council of Foreign Relations Special Report.
88. Franke, J., Charoy, F. and Ulmer, C. (2010). A Model for Temporal Coordination of Disaster Response Activities. *7th International Conference on Information Systems for Crisis Response and Management ISCRAM*, (1-11).
89. Fu, K.W., Zhou, L., Zhang, Q., Chan, Y.Y. and Burkhart, F. (2012). Newspaper coverage of emergency response and government Responsibility in domestic natural disasters: China-US and within-China Comparisons. *Health & Risk Society*, 14(1), 71-85.
90. Gheyntanchi, A., Joseph, L., Gierlach, E., Kimpara, S., Housley, J., Franco, Z.E., Beutler, L.E. (2007). The Dirty Dozen - Twelve failures of the Hurricane Katrina response and how psychology can help. *American Psychologist*, 62(2), 118-130.
91. Goode, N., Spencer, C. and Archer, F., McArdle, D., Salmon, P. and McClure, R. (2011). *Review of Recent Australian Disaster Inquiries*. Monash Injury Research Institute. Australia: Monash University Accident Research Centre.
92. Granot, H. (1998). The Dark Side of Growth and Industrial Disasters since the Second World War. *Disaster Prevention and Management*, 7, 195-04.
93. Grant, T. and Kooter, B. (2005). Comparing OODA and other Models as Operational View C2 Architecture. *10th International Command and Control Research and Technology Symposium The Future of C2*, (1-14).
94. Graumann, A., Houston, T. and Lawrimore, J., Levinson, D. and Lott, N., McCown, S. et al. (2005), *Hurricane Katrina, A Climatological Perspective*, New York: American Management Association.
95. Greeley, B. (2011). The God Clause: *Bloomberg Business Week*, (pp. 58-73).

96. Grothmann, T. and Reusswig, F. (2006). People at risk of flooding: Why some residents take precautionary action while others do not. *Natural Hazards*, 38(1), 101-120.
97. Grunig, J.E., Grunig, L.A. and Dozier, D.M. (2002). *Excellent Public Relations and Effective Organizations: A Study of Communication Management in Three Countries*. Mahwah: Lawrence Erlbaum Associates.
98. Guitouni, A. and Wood, D. (2010). Command and Control Concepts and Solutions for Major Events Safety and Security: Lessons Learned from the Canadian Experience with Vancouver and G8/G20 Events. *A Review of Procedures and a Generic Collective Response Model presented in 6th International Command and Control Research and Technology Symposium*.
99. Haimes, Y.Y. (2012). Strategic Preparedness for Recovery from Catastrophic Risks to Communities and Infrastructure Systems of Systems. *Society for Risk Analysis*, 32(11), 1834-1835.
100. Haimes, Y.Y. (2012). Systems-Based Approach to Preparedness for, Response to and Recovery from Natural and Human-Made Disasters. *Leadership and Management in Engineering*, 12(4), 288-298.
101. Haimes, Y.Y., Crowther, K.G. and Horowitz, B.M. (2008). Homeland security preparedness: Balancing protection with resilience in emergent systems. *Syst. Eng.*, 11(4), 287-308.
102. Handmer, J. and Dovers, S. (2007). *The Handbook of Disasters and Emergency Policies and Institutions*. London: Earthscan.
103. Harden, B. (2005). *A shared uncertainty: Hurricane unites evacuees on both sides of New Orleans's divide of race and class*. The Washington Post: A1.
104. Hayashi, M. (2012). A Quick Method for Assessing Economic Damage Caused by Natural Disasters: An Epidemiological Approach. 72 *International Atlantic Economic Society*, 18(1), (417-427). Washington, DC: Asia Pacific Institute of Research.
105. Hefetz, A. and Mildred, E.W. (2012). Contracting or Public Delivery? The Importance of Service, Market and Management Characteristics. *Journal of Public Administration Research and Theory*, 22(2), 289-317.

106. Heir, T. and Weisæth, L. (2008). Acute Disaster Exposure and Mental Health Complaints of Norwegian Tsunami Survivors Six Months Post Disaster. *Psychiatry: Interpersonal & Biological Processes*, 71(3), 266-276.
107. Heir, T., Rosendal, S., Johannesson, K.B., Michel, P.O., Mortensen, E.L., Weisæth, L., Andersen, H.S. and Hultman, C.M. (2011). Tsunami-Affected Scandinavian Tourists: Disaster Exposure and Post-Traumatic Stress Symptoms. *Nordic Journal of Psychiatry*, 65(1), 9-15.
108. Heller, K. (2005). Social and Personal Factors as Predictors of Earthquake Preparation: The role of support provision, network discussion, negative affect, age and education. *Journal of Applied Social Psychology*, 35(2), 399-422.
109. Helsloot, I. (2008). Coordination Is a Prerequisite for Good Collaboration, Isn't It? *Journal of Crisis Management and Contingencies*, 16(4), 173-176.
110. Hodgson, R.W. (2007). Emotions and sense making in disturbance: Community adaptation Dangerous Environments. *Human Ecology Review*, 14(2), 233-242.
111. Hofstede, G. (2002). Hofstede Model of National Cultural Differences and Their Consequences: A Triumph of Faith - A Failure of Analysis', *Human Relations*, 55(1), 89-118.
112. Hofstede, G. and Hofstede, G.J. (2005). *Cultures and Organizations: Software of the Mind*. London: McGraw-Hill.
113. Holmes, C.E. (2011). *Queensland Floods Commission of Inquiry Interim Report*. Queensland: Queensland Flood Commission of Inquiry.
114. Huang, Y.H. and Su, S.H. (2009). Determinants of Consistent, Timely and Active Responses in Corporate Crises. *Public Relations Review*, 35, 7-17.
115. Hunter, L.M. (2004). *Migration and Environmental Hazards*. University of Colorado: Boulder, CO.
116. Hyndman, D.W., Hyndman, D. and Catto, N. (2008). *Natural Hazards and Disasters*. Toronto: Nelson Education Ltd.

117. Jardine, C., Boyd, A. and Furgal, C. (2009). Gender and place influences on health risk perspectives in Northern Canadian aboriginal communities. *Gender, Place & Culture: A Journal of Feminist Geography*, 16(2), 201-233.
118. Jensen, T.K., Dyb, G. and Nygaard, E. (2009). A Longitudinal Study of Posttraumatic Stress Reactions in Norwegian Children and Adolescents Exposed to the 2004 Tsunami. *Archives of Pediatrics and Adolescent Medicine*, 163(9), 856-861.
119. Johannesson, K.B., Lundin, T., Hultman, C.M., Lindam, A., Dyster-Aas, J., Arnberg, F. and Michel, P.O. (2009a). The Effect of Traumatic Bereavement on Tsunami-Exposed Survivors. *Journal of Traumatic Stress*. 22(6), 497-504.
120. Johannesson, K.B., Michel, P.O., Hultman, C.M., Lindam, A., Arnberg, F. and Lundin, T. (2009b). Impact of Exposure to Trauma on Posttraumatic Stress Disorder Symptomatology in Swedish Tourist Tsunami Survivors. *Journal of Nervous & Mental Disease*, 197(5), 316-323.
121. Jordan, A.E. (2010). Collaborative Relationships Resulting from the Urban Area Security Initiative. *Journal of Homeland Security and Emergency Management*, 7(1), 1-19.
122. Jordan, J., Diermeier, D.A. and Galinsky, A.D. (2012). The Strategic Samaritan: How Effectiveness and Proximity Affect Corporate Responses to External Crises. *Business Ethics Quarterly*, 22(4), 621-648.
123. Jorn Franke, F.C. (2010). A Model for Temporal Coordination of Disaster Response Activities. ISCRAM (pp. 1-11). USA: 7th International Conference on Information Systems for Crisis Response and Management.
124. Jose, H.V., Perez, N. and Ukkusuir, S., Wachtendorf, T. and Brown, B. (2007). Emergency Logistics Issues Affecting the Response to Katrina: *A Synthesis and Preliminary Suggestions for Improvement*, 2022(1), 76-82.
125. Julca, A. (2012). Natural Disasters with Un-Natural Effects: Why? *Journal of Economics Issues*, 46(2), 499-510.

126. Kahn, M. (2005). The Death Toll from Natural Disasters: The Role of Income, Geography and Institutions. *Review of Economics and Statistics*, 87(2), 271-84.
127. Kaimen, D. (2005). *The McGraw-Hill Homeland Security Handbook*. New York: Oxford University Press.
128. Kaniasty, K. and Norris, F.H. (2004). *Social support in the aftermath of disasters, catastrophes and acts of terrorism: Altruistic, overwhelmed, uncertain, antagonistic and patriotic communities*. Cambridge: Cambridge University Press.
129. Kaplan, S. and Garrick, B. (1981). On the quantitative definition of risk. *Risk Anal.*, 1(1), 11-27.
130. Kapucu, N., Garayev, V. (2011). Collaborative Decision-Making in Emergency and Disaster Management: *International Journal of Public Administration*, 34(6), 366-375.
131. Kasperson, J.X. (2003). *The social amplification of risk: Assessing fifteen years of research and theory*. Cambridge: Cambridge University Press.
132. Kaufman, H. (1960). *The Forest Ranger*. Johns Hopkins University Press.
133. Kellenberg, D.K. and Ahmed, M.M. (2008). Does Rising Income Increase or Decrease Damage Risk from Natural Disasters? *Journal of Urban Economics*, 63(3), 788-802.
134. Kersten, A. (2005). Crisis as Usual: Organizational Dysfunction and Public Relations. *Public Relations Review*, 31(4), 544-549.
135. Kettl, D. (2003a). *The States and Homeland Security: The Missing Link*. New York: Century Foundation.
136. Kettl, D. (2007). *Systems under Stress: Homeland Security and American Politics*. Washington DC: CQ Press.
137. Kirschenbaum, A. (2004). *Chaos Organization and Disaster Management*. New York: Marcel Dekker Inc.
138. Kletz, T.A. (1996). Risk - Two Views: The Public's and the Experts. *Disaster Prevention and Management*, 5, 41-46.

139. Knabb, R.D., Rhone, J.R. and Brown, D.P. (2005). *Tropical Cyclone Report Hurricane Katrina 23-30 August 2005*. National Hurricane Center, Miami, FL.
140. Knight, F.H. (1921). *Risk, Uncertainty and Profit*. (1st Edition). New York: Houghton Mifflin Co.
141. Kova'cs, G. and Spens, K. (2009). Identifying Challenges in Humanitarian Logistics. *International Journal of Physical Distribution and Logistics Management*, 39(6), 506-528.
142. Kraemer, B., Wittmann, L., Jenewein, J. and Schnyder, U. (2009). 2004 Tsunami: Long-Term Psychological Consequences for Swiss Tourists in the Area at the Time of the Disaster. *Australian and New Zealand Journal of Psychiatry*, 43(5), 420-425.
143. Kristensen, P., Weisaeth, L. and Heir, T. (2009). Psychiatric Disorders among Disaster Bereaved: An Interview Study of Individuals Directly or Not Directly Exposed to the 2004 Tsunami. *Depression and Anxiety*, 26(12), 1127-1133.
144. Lachlan, K.A., Westerman, D.K. and Spence, P.R. (2010) Disaster News and Subsequent Information Seeking: Exploring the Role of Spatial Presence and Perceptual Realism. *Electronic News*, 4(4), 203-217. doi:10.1177/1931243110387092
145. Lachlan, K.A., Westerman, D.K. and Spence, P.R. (2010). Disaster news and subsequent information seeking: Exploring the role of spatial presence and perceptual realism. *Electronic News*, 4(4), 203-217.
146. Lagadec, P. (2009a). A New Cosmology of Risks and Crises: Time for A Radical Shift in Paradigm and Practice. *Review of Policy Research*, 26, 473-486.
147. Lagadec, P. (2009b). The Mega-Crisis Unknown Territory. In Search of Conceptual and Strategic Breakthroughs, in *Magazine for National Safety & Security and Crisis Management*. Mega-crises in the 21st Century, 40-41.
148. Lagadec, P. and Carli, P. (2005). Crossing the Rubicon. *Crisis Response Journal*, 1(1), 39-41.
149. Larson, P.D., Davis, E.W. and Whybark, D.C. (2012). Disaster Relief Supply Chains: A Matter of Life and Death. *Journal of Supply Chain Management*, 48(2), 21-36.

150. Lee, J., Bharosa, N. and Yang, J., Janssen, M. and Rao, H.R. (2009). Group value and Intention to Use: A study of Multi-Agency Disaster Management Information Systems for Public Safety. *Journal of Decision Support System*, 50(3), 1-11.
151. Lee, J., Woeste, J.H. and Heath, R.L. (2007). Getting Ready for Crises; Strategic Excellence. *Public Relations Review*, 33, 334-336.
152. Lehtonen, J. (2002). *Julkisuuden Riskit, Mainostajien Liitto*. Helsinki.
153. Levchuk, G.M. and Pattipati, K.R. (2010). Design of Command and Control Organizational Structures: from Years of Modeling to Empirical Validation. *15th ICCRTS on the Evolution of C2*, (pp. 1-20).
154. Leysen, J. and Van Nuffel, L. (2007). An Integrated Approach to Risk and Performance Management. *Perspectives on Performance*, 5(1), 20-24.
155. Lindell, M.K. and Perry, R.W. (2000). Household adjustment to earthquake hazard. A review of research. *Environment and Behavior*, 32(4), 461-501.
156. Lindell, M.K. and Perry, R.W. (2012). The Protective Action Decision Model: Theoretical Modifications and Additional Evidence. *Risk Analysis*, 32(4), 616-632.
157. Lindenberg, M. (1999). Declining State Capacity, Voluntarism and the Globalization of the Not-For-Profit Sector. *Nonprofit and Voluntary Sector Quarterly*, 28, 147-167.
158. Lindsay, J.M. and O'Hanlon, M.E. (2002). *Protecting the American Homeland*. Washington DC: Brookings Institution Press.
159. Lindström, M. (2009). *Crisis Management in the European Union: Cooperation in the Face of Emergencies*. Berlin: Springer.
160. Littlewood, B., Bainbridge, I. and Bloomfield, R.E. (1998). *The Use of Computers In Safety Critical Applications*. Her Majesty's Stationery Office. London: U.K Health and Safety Commission.
161. Liu, B.F. (2009). An Analysis of US Government and Media Disaster Frames. *Journal of Communication Management*, 13, 268-283.
162. Loit, H.H., Vihalemm, T. and Ugur, K. (2012). Cultural Experience as a (Critical) Factor in Crisis Communication Planning. *Journal of Contingencies and Crisis Management*, 20(1), 26-38.

163. Lowrey, W., Evans, W., Gower, K.K., Robinson, j.a., Ginter, P.M., McCormick, l.c. and Abdolrasulnia, M. (2007). *Effective media communication of disasters: Pressing problems and recommendations*. Retrieved from <http://www.biomedcentral.com/1471458/7/97>.
164. Madey, G.R., Barabasi, A.L., Chawla, N.V., Gonzalez, M. and Hachen, D., Lantz, B. and Pawling, A., Schoenharl, T. and Szabo, G., Wang, P. and Yan, P. (2007). Enhanced Situational Awareness: Application of DDDAS Concepts to Emergency and Disaster Management. *Presented at ICCS*. Vol. (1), (pp. 1090-1097).
165. Maier M.W. (1998). Architecting principle for systems-of-systems. *Systems Engineering*, 1(4), 267-284.
166. McGowan, J. (2012). A Missed Opportunity to Promote Community Resilience? - The Queensland Floods Commission of Inquiry. *Australian Journal of Public Administration*, 71(3), 355-363.
167. McGowan, J. (2012). A Missed Opportunity to Promote Community Resilience? The Queensland Floods Commission of Inquiry. *Australian Journal of Public Administration*, 14(1), 87-99.
168. Mcloughlin, D. (1985). A framework for integrated emergency management. *Public Administration Review*, 45, 165-172.
169. Meissner, A., Luckenbach, T. and Risse, T., Kirste, T. and Kirchner, H. (2002). Design Challenge for an Integrated Disaster Management Communication and Information System: *The First IEEE Workshop on Disaster Recovery Networks (DIREN 2002)*, June 24, 2002, New York City, co-located with IEEE Infocom, (1-7).
170. Merlot, E.S. and Cieri, H.D. (2012). The challenges of the 2004 Indian Ocean tsunami for strategic international human resource management in multinational nonprofit enterprises: *The International Journal of Human Resource Management*, 23(7), 1303-1319.
171. Mileti, D.S. (1999). *Disasters by Design: A Reassessment of Natural Hazards in the United States*. Washington, DC: Joseph Henry Press.
172. Moe, T. and Pathranarakul, P. (2006). An Integrated Approach to Natural Disaster Management: Public Project Management and its Critical Success actors. *Disaster Prevention and Management*, 15(3), 396-413.

173. Mongillo, J. and Zierdt, W.L. (2009). *Encyclopedia of Environmental Science*. Santa Barbara: Greenwood Press.
174. Morris, J.C. and Morris, E.D. (2007). Reaching for the Philosopher's Stone: Contingent Coordination and the Military's Response to Hurricane Katrina. *Public Administration Review*, 67, 94-106.
175. Muller, A. and Kräussl, R. (2011). Doing good deeds in times of need: A strategic perspective on corporate disaster donations. *Strategic Management Journal*, 32, 911-929.
176. Murray, S. and Clarke, M. (2008). Improving the Capacity to Respond: Examining the Experiences of Short-Term Tsunami Relief Staff. *Journal of International Development*, 20, 466-480.
177. Mustaafa, D. (1998). Structural causes of vulnerability to flood hazard in Pakistan. *Economic Geography*, 74(3), 289-306.
178. Naoi, M., Miki, S. and Kazuto, S. (2009). Earthquake Risk and Housing Prices in Japan: Evidence Before and After Massive Earthquakes. *Regional Science and Urban Economics*, 39(6), 658-669.
179. Naoi, M., Seko, M. and Ishino, T. (2012). Earthquake Risk in Japan: Consumer's Risk Mitigation Responses After the Great East Japan Earthquake: *Journal of Economics Issues*, 46(2), 519-530.
180. Nateghi-A, F. (2001). Earthquake scenario for the mega-city of Tehran. *Disaster Prevention Management*. 10(2), 95-100.
181. National Hurricane Center: Post-Tropical Cyclone Sandy Update Statement: (2012, 10, 29). <http://www.nhcnoaa.gov/text/refresh/MIATCUAT3-shtml/292256.shtml>.
182. Natural Disasters: (2012, 10, 30). Counting the Cost of Calamities, supra note 6 at 60; Storm Leaves Trail of Snow, Ice, Power Outages, Freezing Temperatures, ABC News. <http://abcnews.go.comAJS/blizzard-2011-mega-snowstorm-pounds-midwest-snowice/>.
183. Natural Resources Canada (2012, 01, 21). *Earthquake zones in Eastern Canada*. <http://earthquakecanada.nrcan.gc.ca/zones/eastcan-eng.php>
184. Nelms, K.R. and Porter, A.L. (1985). EFTE: An Interactive Delphi Method. *Technological Forecasting and Social Change*, 28, 43-61.

185. Nicolai, B.J., Puntillo, K. and Bilow, B. (2009). Research Design for a Natural Disaster Management Communication System:Local Indiana Government Agency model.. *Journal of Information Sytem Applied Research*, 2(3), 3-10.
186. Nohrstedt, S.A. and Admassu, T. (1993). *Communication and Crisis: An Inventory of Current Research*. Stockholm: National Board of psychological Defence.
187. O'Toole, L.J. (1997). Treating Networks Seriously: Practical and Research-based Agendas in Public Administration. *Public Administration Review*, 57(1), 45-52.
188. Office for the Coordination of Humanitarian Affairs (OCHA). (2006). *National Disaster Response Advisor: Evaluation of Disaster Response Agencies of Pakistan by OCHA*. Pakistan: National Disaster Management Authority
189. Ossewaarde, R., Nijhof, A. and Heyse, L. (2008). Dynamics of NGO Legitimacy: How Organizing Betrays Core Missions of INGOs. *Public Administration and Development*, 28, 42-53.
190. Pakistan Flood Commission (2011). Pakistan Floods 2010. *The December Real Time Evaluation Report*. Pakistan: National Disaster Management Authority.
191. Palm, J. and Ramsell, E. (2007). Developing Local Emergency Management by Co-Ordination between Municipalities in Policy Networks: Experiences from Sweden. *Journal of Contingencies and Crisis Management*, 15(4), 173-182.
192. Palttala, P. and VOS, M. (2012). Quality Indicators for Crisis Communication to Support Emergency Management by. *Journal of Contingencies and Crisis Management*, 20(1), 71-85.
193. Palttala, P., Boano, C., Lund, R. and Vos, M. (2012). Communication Gaps in Disaster Management: Perceptions by Experts from Governmental and Non-Governmental Organizations. *Journal of Contingencies and Crisis Management*, 20(1), 1-12.
194. Parker, C.F., Stern, E.K., Pagila, E. and Brown, C. (2009). Preventable Catastrophe? Hurricane Katrina Disaster Revisited. *Journal of Contingencies and Crisis Management*, 17(4), 206-220.

195. Pauchant, T.C. and Mitroff, I.I. (1992). *Transforming the Crisis-Prone Organizations*. San Francisco: Jossey-Bass Publishers.
196. Pearson, C. and Clair, J. (1998). Reframing crisis management. *Academy of Management Review*, 23, 59-76.
197. Pearson, C. and Mitroff, I. (1993). From Crisis Prone to Crisis Prepared: A Framework for Crisis Management. *Academy of Management Executive*, 7(1), 48-59.
198. Penrod, J. (2001). Refinement of the concept of uncertainty. *Journal of Advanced Nursing*, 34, 238-245.
199. Perrow, C. (1999a). *Normal Accidents: Living with High t-Risk Technologies*. Princeton: Princeton University Press.
200. Perrow, C. (1999b). Organizing to Reduce the Vulnerabilities of Complexity. *Journal of Contingencies and Crisis Management*, 7, 150-155.
201. Perrow, C. (2007). *The Next Catastrophe: Reducing Our Vulnerabilities to Natural, Industrial and Terrorist Disasters*. Princeton: Princeton University Press.
202. Perry, R.W. (1998). *Definitions and the Development of a Theoretical Superstructure for Disaster Research: What is a Disaster? Perspectives on the Question*. New York: Routledge.
203. Peters, B.G. (2006). *Concepts and Theories of Horizontal Policy Management: Handbook of Public Policy*. Thousand Oaks: Sage Publications.
204. Pidot, J.R. (2012). Deconstructing Disaster. *Academic Journal Article Brigham Young University Law Review*, 2(7), 12-43.
205. Quarantelli, E.L. (1993). The Environmental Disasters of the Future Will Be More and Worse but the Prospect Is Not Hopeless. *Disaster Prevention and Management*, 2, 11-25.
206. Quarantelli, E.L. (1996). The Future is not the Past Repeated: Projecting Disasters in the 21st Century from Current Trends. *Journal of Contingencies and Crisis Management*, 4, 228-240.

207. Quarantelli, E.L., Lagadec, P. and Boin, A. (2006). *A Heuristic Approach to Future Disasters and Crises: New, Old and In-Between Types*: Handbook of Disaster Research. New York: Springer Science & Business Media.
208. Queensland Reconstruction Authority (2011). *Rebuilding a stronger, more resilient Queensland*. Queensland Government.
209. Quinn, S.C. (2008). Crisis and Emergency Risk Communication in a Pandemic: A Model for Building Capacity and Resilience of Minority Communities. *Health Promotion Practice*, 9(4), 18-25.
210. Raggatt, P., Butterworth, E. and Morrissey, S. (1993). Issues in Natural Disaster Management: Community Response to the Threat of Tropical Cyclones in Australia. *Disaster Prevention and Management*, 2, 12-21.
211. Raholm, M.B., Arman, M. and Rehnsfeldt, A. (2008). The Immediate Lived Experience of the 2004 Tsunami Disaster by Swedish Tourists. *Journal of Advanced Nursing*, 63(6), 597-606.
212. Rasmussen, J. and Batstone, R. (1989). Why Do Complex Organizational Systems Fail? *Environmental Working Paper No 20*. Washington DC: World Bank.
213. Red, S.K., Botan, C. and Holen, A. (2011). Risk communication and the willingness to follow evacuation instructions in a natural disaster. Norway, USA: *Health & Risk Society* 14(1), 87-99.
214. Reynolds, B. and Seeger, M. (2005). Crisis and Emergency Risk Communication as an Integrative Model. *Journal of Health Communication*, 10, 43-55.
215. Reynolds, B. and Seeger, M.W. (2005). Crisis and Risk Communication as an Integrative Model. *Journal of Health Communication*, 10, 43-55.
216. Richardson, B. (1994). Crisis Management and Management Strategy - Time to "Loop the Loop"? *Disaster Prevention and Management*, 3, 59-80.
217. Roberts, L. (1990). Counting on Science at EPA. *Science*, 249(4969), 616-618.
218. Rodriguez, H., Quarantelli, E.L. and Dynes, R. (2007). *Handbook of Disaster Research*. New York: Springer.

219. Rohrman, B. (2000). A socio-psychological model for analyzing risk communication processes: *Australasian Journal of Disaster and Trauma Studies*, Vol. 2000-2. Online available at <http://www.massey.ac.nz/~trauma/issues/2000-2/rohrman.htm>
220. Rosenthal, U. (1998). *Future Disasters, Future Definitions: What is a Disaster? Perspectives on the Question*. New York: Routledge.
221. Rosenthal, U. (2009). 21st Century Mega-Crises: New Challenges to Crisis Management. *Magazine for National Safety & Security and Crisis Management*, 4-6.
222. Rousseau, D.M. and Fried, Y. (2001). Location, Location, Location: Contextualizing Organizational Research. *Journal of Organizational Behavior*, 22, 1-13.
223. Royal Society (1992). *Risk: Analysis, perception and management*. London: Royal Society Publishing.
224. Sandman, P.M. (1993). *Responding to Community Outrage: Strategies for Effective Risk Communication*. Fairfax: American Industrial Hygiene Association.
225. Sattler, D.N., Kaiser, C.F. and Hittner, J.B. (2000). Disaster preparedness: Relationships among prior experience, personal characteristics and distress. *Journal of Applied Social Psychology*, 30(7), 1396-1420.
226. Sauter, M. and Carafano, J. (2006). *Homeland Security: A Complete Guide to Understanding, Preventing and Surviving Terrorism*. New York: McGraw-Hill.
227. Scotter, J.R.V., Pawlowski, S.D. and Cu, T.D. (2010). An Examination of The Interdependencies Among Major Barriers to Coordination in Disaster Response. *International Journal of Emergency Management*, 8(4), 281-307.
228. Scotter, J.R.V., Pawlowski, S.D. and Cu, T.D. (2012). An Examination of the Interdependencies among Major Barriers to Coordination in Disaster Response. *Int. J. of Emergency Management*, 8(4), 281-307.
229. Seeger, M.W. (2002). Chaos and Crisis: Propositions for a General Theory of Crisis Communication. *Public Relations Review*, 28, 329-337.
230. Seeger, M.W., Sellnow, T.L. and Ulmer, R.R. (1998). Communication, organization and crisis. *Communication Yearbook*, 21, 231-275.

231. Sell, C. and Braun, I. (2009). Using a Workflow Management System to Manage Emergency Plans. *Proceedings of the 6th International ISCRAM Conference*, (1-7).
232. Sellnow, T.L. (1993). Scientific Argument in Organizational Crisis Communication: The Case of Exxon. *Argumentation and Advocacy*, 30, 28-42.
233. Sellnow, T.L., Ulmer, R.R., Seeger, M.W. and Littlefield, R.S. (2009). *Effective Risk Communication. A Message-Centered Approach*. New York: Springer Science + Business Media.
234. Shrestha, M. (2010). *Do Risk Profiles of Services Alter Contractual Behavior? A Comparison across Multiple Metropolitan Services*. New York: Cambridge University Press.
235. Shrestha, M. (2012). Internal Versus External Social Capital and the Success of Community Initiatives: A Case of Self-Organizing Collaborative Governance in Nepal. *Public Administration Review*, 73(1), 154-64.
236. Skidmore, M. and Toya, H. (2013). Natural Disaster Impacts and Fiscal Decentralization. *Land Economics*, 89(1), 101-117. doi:ISSN 0023-7639; E-ISSN 1543-8325.
237. Slovic, P. (1987). Perception of Risk. *Science*, 236(4799), 280-285.
238. Slovic, P. (2000). *Perceived risk, trust and democracy*. New York: Cambridge University Press.
239. Slovic, P., Finucane, M.L., Peters, E. and MacGregor, D.G. (2004). Risk as Analysis and Risk as Feelings: Some Thoughts about Affect, Reason, Risk and Rationality. *Risk Analysis*, 24, 311-322.
240. Smet, H.D., Lagadec, P. and Leysen, J. (2012). Disasters Out of the Box: A New Ballgame. *Journal of Contingencies and Crisis Management*, 20(3), 138-148. DOI: 10.1111/j.1468-5973.2012.00666.
241. Smillie, L. and Blissett, A. (2010). A Model for Developing Risk Communication Strategy. *Journal of Risk Research*, 13(1), 115-134.
242. Smith, D. (2005). *In the Eyes of the Beholder? Making Sense of the System(S) of Disaster(S)*. Philadelphia: Xlibris Corporation.

243. Stephens, K.K., Malone, P.C. and Bailey, C.M. (2005). Communicating with Stakeholders during Crisis. *Journal of Business Communication*, 42, 390-419.
244. Swedish Tsunami Commission (2005). *Swedish and the Tsunami. Review and proposals*. Stockholm: Swedish Tsunami Commission.
245. Tamima, U. and Chouinard, L. (2012). Framework for Earthquake Evacuation Planning: Case Study for Montreal, Canada. *Leadership and Management in Engineering*, 12(4), 222-230.
246. Teegen, H. (2003). International NGOs as Global Institutions: Using Social Capital to Impact Multinational Enterprises and Governments. *Journal of International Management*, 9, 271-285.
247. Telford, J., Cosgrave, J. and Houghton, R. (2006). *Joint Evaluation of the International Response to the Indian Ocean Tsunami Synthesis Report*. Tsunami Evaluation Coalition.
248. Thoresen, S., Tønnessen, A., Vibe Lindgaard, C., Lie Andreassen, A. and Weisæth, L. (2009). Stressful but Rewarding: Norwegian Personnel Mobilised for the 2004 Tsunami Disaster. *Disasters*, 33(3), 353-368.
249. Tilcsik, A. (2013). Punctuated Generosity: How Mega-events and Natural Disasters Affect Corporate Philanthropy in U.S: *Communities. Administrative Science Quarterly*. US: SAGE, 58(1), 111-148.
250. Tim Grant, B.K. (n.d.). *10th International Command and Control Research and Technology Symposium*. (pp. 1-14). Netherlands: Royal Netherlands Military Academy.
251. Tindall, K. (2012). Government's Ability to Assist Nationals in Disasters Abroad: What Do We Know about Consular Emergency Management? *Journal of Contingencies and Crisis Management*, 20(2), 102-114. DOI: 10.1111/j.1468-5973.2011.00659.x.
252. Toi, Richard and Frank L. (1999). *Economic Analysis of Natural Disasters: In Climate Change and Risk*. London: Routledge.
253. Townsend, F.F. (2006). *The Federal Response to Hurricane Katrina - Lessons Learned*. Washington, DC: U.S. Executive Office of the President.
254. Toya, H. and Mark, S. (2007). Economic Development and the Impacts of Natural Disasters. *Economics Letters*, 94(1), 20-25.

255. U.S. Studies (2013). *Forms of Government and Climate Change Policies in U.S. Cities: Urban Studies*. US: Banfield, Edward and James Q. Wilson.
256. Ulmer, R., Sellnow, T. and Seeger, M. (2007). *Effective Crisis Communication: Moving from Crisis to Opportunity*. Thousand Oaks: Sage Publications.
257. United Nation Secretariat. (2004). *Living with Risk. A Global Review of Disaster Reduction Initiatives, Inter-Agency Secretariat for the International Strategy for Disaster Reduction*. Geneva, Switzerland: United Nation Secretariat.
258. United Nations (2001). *United Nations International Strategy for Disaster Reduction. Targeting vulnerability: Guidelines for local activities and events*. Geneva: UN Press.
259. Urata, J. and Hato, E. (2012). Modeling the Cooperation Network Formation Process for Evacuation Systems Design in Disaster Areas with a Focus on Japanese Mega disasters. *Leadership and Management in Engineering*, 12(4), 231-246.
260. VA.A. (2005, 07, 21). *National Society of Professional Engineers*: <http://www.nspe.org/ethics/eh1-code.asp>.
261. Vallero, D., Hd, P., ASCE, M., Letcher, T. and Hd, P. (2012). Engineering Risks and Failures: Lessons Learned from Environmental Disasters. *Leadership and Management in Engineering*, 12(4), 199-209.
262. Vallero, D.A. and Liroy, P.J. (2012). The 5 Rs: Reliable Post disaster. *Exposure Assessment, Leadership in Management and Management in Engineering*. 12(4), 247-253.
263. Van Wassenhove, L.N. (2006). Blakett Memorial Lecture — Humanitarian Aid Logistics: Supply Chain Management in High Gear. *Journal of the Operational Research Society*, 57, 475-489.
264. Vastfjall, D., Peters, E. and Slovic, P. (2008). Affect, Risk Perception and Future Optimism after the Tsunami Disaster. *Judgment and Decision Making*, 3(1), 64-72.
265. Veil, B., Reynolds, B., Sellnow, T. and Seeger, M. (2008). CERC as a Theoretical Framework for Research and Practice. *Health Promotion Practice*, 9(4), 26-34.

266. Venette, S. (2008). Risk as an Inherent Element in the Study of Crisis Communication. *Southern Communication Journal*, 73(3), 197-210.
267. Victorian Bushfires Royal Commission (2010). *Final Report. State Government, Victoria: State Government Printing.*
268. Vielkind, J. and Cuomo, A. (2012). *Cuomo: We need to plan, rebuild for 'new reality'*. <http://blog.timesunion.com/capitol/archives/162636/cuomo-we-need-to-plan-rebuild-for-%E2%80%98new-reality%E2%80%99/>.
269. Vyner, H.M. (1988). The psychological dimensions of health care for patients exposed to radiation and the other invisible environmental contaminants. *Social Science and Medicine*, 27, 1097-1103.
270. Warner, M.E. (2012). Privatization and Urban Governance: The Continuing Challenges of Efficiency, *Voice and Integration*. 29(2), 38-43.
271. Weichselgartner, J. (2001). Disaster mitigation: the concept of vulnerability revisited. *Disaster Prevention and Management*, 10(4), 85-94.
272. Weick, K.E. (1988). Enacted sense making in crisis situations. *Journal of Management Studies*, 25, 305-317.
273. Weick, K.E. (1993). The collapse of sense making in organizations: The Mann Gulch disaster. *Administrative Science Quarterly*, 38, 628-652.
274. Weick, K.E. (2010). Reflections on enacted sense making in the Bhopal disaster. *Journal of Management Studies*, 47, 537-550.
275. Weick, K.E. and Sutcliffe, K.M. (2007). *Managing the Unexpected*. San Francisco: Jossey-Bass Publishers.
276. Weick, K.E., Sutcliffe, K.M. and Obstfeld, D. (2005). Organizing and the process of sense making. *Organization Science*, 16, 409-421.
277. White House (2007). *Report of the Homeland Security Culture Task Force*. Washington DC.
278. White, C., Turoff. and Hiltz, S.R. (2010). A Real Time Online Delphi Decision System, V 2.0: Crisis Management Support during Extreme Events. *Proceedings of the 7th International ISCRAM Conference - Seattle, USA, (1-5).*

279. White, S. and Lang, H. (2012). *Corporate Engagement in Natural Disaster Response*. Washington: Center for Strategic & International Studies.
280. Wise, C.R. (2006). Organizing for Homeland Security after Katrina: Is Adaptive Management What's Missing? *Public Administration Review*, 66(3), 302-318.
281. Wise, C.R. and Nader, R. (2002). Organizing the Federal System for Homeland Security: Problems, Issues and Dilemmas. *Public Administration Review*, 62, 44-57.
282. Wood, M., Kovacas, D., Bostrom, A., Bridges, T. and Linkov, G. (2012). Flood Risk Management: US Army Corps of Engineers and Layperson Perceptions. *Society for Risk Analysis*, 32(8), 1349-1368. Retrieved, from DOI: 10.1111/j.1539-6924.2012.01832.x.
283. Wood, M.M., Mileti, D.S., Kano, M., Kelley, M.M., Regan, R. and Bourque, L.B. (2012). *Communicating Actionable Risk for Terrorism and Other Hazards*. *Risk Analysis*, 32(4), 601-615. doi:10.1111/j.1539-6924.2011.01645.x.
284. World Health Organization (2005). *Effective media communication during public health emergencies*. Geneva: World Health Organization.
285. Xu, W. (2007). *Development of a Methodology for Participatory Evacuation Planning and Management: Case Study of Nagata, Kobe*. Ph.D. dissertation, Kyoto Univ., Kyoto, Japan.
286. Xu, Z., Yuan, Y. and Ji, S. (2008). A Decision Analysis Framework for Emergency Notification. *Proceedings of the 41st Hawaii International Conference IEEE on System Sciences*, (pp. 1-9).
287. Zhang, Yahong and Richard C.F. (2010). City Managers' Policy Leadership in Council-Manager Cities. *Journal of Public Administration*, 32(4), 601-615.