X24 MEXICO: DESCRIPTION OF A MULTI-NATIONAL NATURAL DISASTER EXERCISE AND ANALYSIS OF PARTICIPANTS’ EXPERIENCE

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DEDICATION

This thesis is dedicated to my parents Antonia and Eliezer Ramirez, my sister Daisy, and Jack who have supported and guided me on my way to achieving my educational, professional and personal goals. Thank you!
Each of us human beings has a responsibility to reach out to help our brothers and sisters affected by disasters. One day it may be us or our loved ones needing someone to reach out and help.

—Michael W. Hawkins, American Red Cross
ABSTRACT OF THE THESIS

X24 Mexico: Description of a Multi-National Natural Disaster
Exercise and Analysis of the Participants’ Experience
by
Marilu Ramirez
Master of Science in Homeland Security
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United States Homeland Security concerns include emergency response to natural and man-made disasters. Natural disasters like Hurricane Katrina and the earthquakes in Haiti and Japan have taught us hard lessons about emergency response and recovery. Consequently, this requires the dedication of continuous research in the area of humanitarian assistance and disaster relief (HADR). At San Diego State University’s Immersive Visualization Center (Viz Center) a series of exercises called Exercise 24 dedicated to HADR have helped to better prepare agencies and organizations to coordinate response through a simulated environment and thus save lives and money when the next real disaster occurs.

In an event of a natural disaster, the ever strengthening economic and cultural bonds between the United States and Mexico mean that events that affect one country affect the other. It is therefore important that the two countries learn to work together and help each other in times of crisis. Hence, emergency response training should be encouraged on a bi-national level through simulated exercises. Subsequently, an important element of simulation exercise is the collection and evaluation of qualitative information regarding participant experiences and social relationships during the exercise. Qualitative information regarding participant experiences was collected during X24 Mexico as part of this study to better understand the process of development of collaborative HADR relationships. Qualitative information is a valuable because it showcases participants’ opinions, thoughts and feelings which are important in the development of best practices.
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CHAPTER 1

INTRODUCTION

United States homeland security concerns include emergency response to natural and man-made disasters. This requires the dedication of continuous research in the area of humanitarian assistance and disaster relief (HADR). San Diego State University’s Immersive Visualization Center (Viz Center) is one such place where research in conducted in the area of HADR by training and educating people with natural disaster exercises. These exercises help facilitate the execution of coordinated and comprehensive plans that will ensure effective disaster recovery. Natural disasters like Hurricane Katrina and the earthquakes in Haiti and Japan have helped teach us many difficult lessons about emergency response and recovery. Many of these lessons are needed because of the challenges with the lack of communication and difficulties with coordination during and after disasters.

Learning how to best collaborate between agencies and organizations across a multitude of jurisdictions and affiliations is extremely important. Doing these collaborations internationally is difficult but has the greatest potential to assist those in need during a disaster. It is valuable to liaison with agencies and one example of such a partnership is between the United States and Mexico. The economic and cultural bonds between these countries means that events like natural disasters that affect one country will unavoidably affect the other. The impacts can be political, social, and most importantly economic because of the strong relationship with trade. It is important that the two countries learn to work together as effectively as possible prior to disasters so that they are ready to help each other during and after times of major crises.

Therefore, emergency response training should be encouraged on a bi-national level through natural disaster exercises between the United States and Mexico. Justifications for cross-border disaster preparedness training include: (1) the need to strengthen the bi-national relationship between countries, (2) the need to enhance the capabilities of both countries to respond to and recover from disasters, (3) the need to utilize new technological tools especially those that are affordable and scalable in both countries, (4) the need to provide
wider reaching social media and communication tools with the expectation of the public for near real-time response, and (5) the need to provide an effective venue for better understanding the potential of natural disasters and solutions that could potentially help both nations.

It is the premise of this thesis that simulated multi-national disaster exercises like Exercise 24 (X24) Mexico can help educate people, decrease the number of lives lost, and enable rapid recovery in the case of a natural disaster. An additional important element of this thesis is that such natural disaster exercise should collect, evaluate, and review qualitative data and information regarding participants’ experiences and their assessment of the working relationships that develop during the exercise. One of the goals of this thesis was to collect data that allowed for evaluation of the effectiveness of the natural disaster exercise through the eyes of its participants. Individual experiences are unique and valuable because they showcase what participants learned through the disaster exercise process. For example, such exercises are meant to enhance learning how to innovatively solve complex problems, learning how to adapt to meet complex and unexpected challenges, and learning how to communicate and work together using a multitude of tools and networks.

During the X24 Mexico event, disaster response capabilities of both Mexico and the United States were tested. This exercise in HADR included a notional earthquake offshore near Colima, which triggered a tsunami and an eruption from Popocatepetl near Mexico City. A part of the exercise implementation was the use of social media tools like Twitter. Twitter was used as the primary communication tool for the response effort. Twitter is a tactical tool with a single tweet taking only a few seconds to go from the originator to the audience (one to many). This rapid action of very small amounts of information has become one of the most widely used tools in disasters because it rapidly shares data and provides situation awareness of the disaster to others away from the disaster.

The purpose of this study is to provide an in-depth review of the exercise and explore the venue of qualitative information that can help shine a light on the thoughts and feelings of participants and the value of bi-national natural disaster exercises. By discussing the importance of the relationship between the United States and Mexico, the intent of this thesis is to demonstrate why keeping the relationship strong will benefit both countries and their citizens. Furthermore, understanding the science behind many natural disasters and lessons
learned from past examples will help identify the issues and opportunities for interaction that should be addressed through natural disaster exercises. The assessment of X24 Mexico through the eyes of its participants helps demonstrate the significance of exercise as understood by those actually participating in the effort.

This thesis highlights the bond between Mexico and the United States and the importance of developing working relationships in a positive environment such as shared disaster response. This template for international sharing can then be shared globally as best practices for one country helping another with appropriate tools, protocols, and solutions.
CHAPTER 2
THE U.S.-MEXICO CONNECTION

The bilateral relationship with Mexico will always be significant because of various ties between the two countries. These ties are economic, social, and political and arise from trade along the shared border and many cultural connections. It is in the national interest of the United States to have a prosperous and democratic Mexico as a neighboring country just as it is in the national interest of Mexico to have the United States economically and politically strong.

Mexico is the United States’ third-largest trading partner, while the United States is, by far, Mexico’s largest trading partner. Mexico ranks third as a source of U.S. imports, after China and Canada, and second, after Canada, as an export market for U.S. goods and services. The United States is also the largest source of foreign direct investment (FDI) in Mexico. (Villarreal 1)

The implementation of the North American Free Trade Agreement (NAFTA) in 1994 eliminated many obstacles to the effective trade between Mexico and the United States. The agreement removed most of the barriers for trade and investment among the United States, Canada and Mexico; “all non-tariff barriers to agricultural trade between the United States and Mexico were eliminated” (United States, Dept. of Agriculture, Foreign Agriculture Service). Though the majority of the tariffs were eliminated immediately, some were to phase out in five- to fifteen-year periods, which allowed for an orderly adjustment. Prior to NAFTA, “Mexico had followed a strong protectionist policy until it began to unilaterally liberalize its trade regime in the late 1980s” (Villarreal 1). Mexico’s trade liberalization efforts, economic conditions, and currency fluctuations played a role in Mexico’s trading process but NAFTA may have accelerated the ongoing trade and investment trends and prompted Canada, the United States, and Mexico to begin the process for NAFTA because of the trade potential and benefits it would hopefully help create.

Mexico is the United States’ second largest foreign supplier of petroleum. Moreover, it is a major destination of state exports from twenty-two American states. In 2010, United States legal exports to Mexico comprised $163 billion in U.S. dollars and United States legal
imports from Mexico were $229 billion. In 2011, the United States exports to Mexico were $197 billion and United States imports were $264 billion (United States, Dept. of Commerce, Census Bureau; Figure 1).

![U.S. & México Trade](image)


Currently, there are ongoing efforts to address economic prosperity and regulatory economic cooperation because of the economic disparity between the two countries. Mexican President Calderón emphasized the “need for increased cooperation in North America to increase competitiveness of the region, focusing on economic growth” (Villarreal 1). During numerous joint meetings, United States President Obama (and his predecessor, President Bush) and Mexican President Calderón vowed to enhance efforts to create jobs, promote economic recovery and expansion, and encourage prosperity across all levels of society for both countries. These ongoing efforts emphasize the economic bond between Mexico and the United States. Just as these economic ties demonstrate an interdependence in economics, promoting strong working relationships in disaster response is important primarily for creating bi-national exercises for emergency response to simulate future disaster events.
involving both countries. Without strong relationships to coordinate, communicate, and practice emergency response and recovery ideas, the ongoing efforts for economic growth will be affected by natural disasters that may occur in Mexico or the United States.

The Mexico-U.S. border extends 1,969 miles from California to Texas. It is one of the busiest, most economically important borders in the world, with approximately one million legitimate travelers and billion dollars of goods legally crossing the border each day (United States, Dept. of Commerce, Census Bureau). A local incident in the border region or at an important trade and financial area can quickly become a binational incident. For example, in the scenario for X24 Mexico, the earthquake offshore near Colima impacted the west coast ports in Mexico. This hypothetical situation could have resulted in the rerouting of international trade routes, resulting in enormous losses for west coast shippers, as well as potential catastrophic domino effect of lost production and global output.

Extreme weather events such as hurricanes, floods, tornadoes, wildfires, earthquakes, and mudslides do not respect administrative boundaries . . . the U.S. [and] Mexico . . . must attempt to coordinate their response to natural disasters with their neighbors across the border . . . . (The Good Neighbor Environmental Board)

Encouraging a strong relationship between these two countries will most likely reduce issues such as coordination through formal and informal channels.

Immigration into the United States is a complex demographic phenomenon that has been a major source of population growth and cultural change. Therefore, another tie between Mexico and the United States is the social relationships amid the people and their descendants. Strong bloodlines, emotional and educational aspect ties, cultural diversity, and intertwined histories form unbreakable bonds. Family bloodlines that connect families in Mexico to families in the United States are and will always be strong. Family reunification and jobs account for a huge amount of legal immigration to the U.S. every year. “Mexico is the leading country of origin of the legal permanent residents (LPR) population and unauthorized migrant population in the United States” (Villarreal 9). As a result, Mexico benefits from migration in two ways: it is a “safety valve” that dissipates the political discontent that could arrive from higher unemployment in Mexico and it is a source of remittances by workers in the United States to families in Mexico.
Those that come for jobs and leave their families in Mexico significantly add to the economy in Mexico (Figure 2). Remittances are the second-highest source of foreign currency for Mexico, after oil and tourism (Villarreal).

![Changes in Remittances to Mexico](image)


For a number of years, remittances were considered a stable financial flow for Mexico as workers in the United States made efforts to send money to family members, especially to regions of the country experiencing economic crises or natural disasters. The remittance is concentrated in the poorest states of Mexico covering general consumption and/or housing, food, clothing, health care and household expenses. (Villarreal 10)

The United States and Mexico share many common interests related to trade, investment, and regulatory cooperation. It is important the United States to maintain an active interest in Mexico on issues related to cross-border trade between the two countries, economic conditions in Mexico, migration, counternarcotics, and border issues because it benefits the United States (Villarreal). With a prosperous Mexico, the issue with poverty can be reduced.

Poverty has been one of Mexico’s more serious and pressing economic problems for many years. The government has made progress in its poverty reduction efforts over the last ten years, but poverty continues to be a basic challenge for the country’s development. (Villarreal 15)
With the strengthening of economic ties, the United States can help implement change that would benefit both countries.

In recent years, security issues have also played a role in the relationship between Mexico and the United States. The United States has largely supported Mexican President Felipe Calderón’s campaign against drug trafficking organizations (Seelke). The support against drug trafficking benefits the United States because

Mexico is a major producer and supplier to the U.S. market of heroin, methamphetamine, and marijuana and the major transit country for as much as 90% of the cocaine sold in the United States. A small number of Mexican drug trafficking organizations, often referred to as “drug cartels,” control the most significant drug distribution operations along the Southwest border. U.S. government reports have characterized Mexican drug trafficking organizations as representing the “greatest organized crime threat” to the United States today. (Seelke 5)

A stronger Mexican economy means better jobs for the people which will help with the poverty issue. If the people in Mexico don’t have good jobs to support their families, they will either migrate to the United States or live in poverty and be more susceptible to corruption and control of the drug cartels.

A major natural disaster in either country would inflict social, economic, and security problems on both countries. Binational disaster preparedness and response plans would help alleviate or at least reduce these impacts significantly. Recent natural disasters such as the 2005 Hurricane Katrina, the 2010 Haiti earthquake and cholera attack, and the 2011 Japanese earthquakes and tsunamis are excellent examples of the devastating regional and global impacts of natural disasters and their recovery challenges. Some of the challenges include energy shortages, transportation disruption, scarcity of food, water, shelter, and medical resources. Other challenges include population concentration in large regions, settlements in and industrializations of extremely exposed regions, and the susceptibility of modern societies and technologies to natural hazards (Hoeppe). The recent natural disasters have shown that the impacts and challenges are not limited to the nation where a disaster originates, but are felt and also positively impacted by the involvement of people globally.

The severity of the impact of some of the recent natural disasters has encouraged many countries to implement best disaster preparedness and response plans to mitigate the devastating effects of possible disasters (Abbott 8). In regards to Mexico and the United States, mitigation and disaster preparations require a collective approach that needs to be
cross disciplinary and cross-cultural in nature. X24 Mexico explored the nature and science of natural disasters to make it as productive and constructive as possible. The participants themselves shared their knowledge and experience with natural disasters and HADR efforts. This sharing of information involved many experiences and important lessons learned from past disasters.
CHAPTER 3

UNDERSTANDING NATURAL DISASTERS AND
THE LESSONS LEARNED FROM PAST EVENTS

Exercise 24 (X24) was created to assess response capabilities and provide solutions for emergency preparedness. Better solutions are evident when the science of hazards is integrated in the discussions. In the X24 simulation, HADR efforts were considered for a combination of disasters such as an earthquake, volcanic eruption, and a tsunami. A natural disaster involves people and natural earth processes. Any disaster may result in financial losses, human losses, and environmental changes. Yet the outcomes depend upon the vulnerability of the affected location and knowledge of the population to resist the disaster. Because natural disasters are inevitable, knowledge about them can reduce the effects and limit the scope of any potential disaster.

EARTHQUAKES AS AN EXAMPLE OF UNDERSTANDING THE SCIENCE OF NATURAL DISASTERS

An “earthquake” is a term used to describe the complex vibrations that occur when the Earth’s crust moves in a rapid release of energy, often along a discrete fault or fault zone. The fault is a crack, break, or dislocation in the Earth’s brittle crust where movement occurs causing “stresses [to] build up near-surface rocks until the stress is so great that the rocks fracture and shift along a fault” (Abbott 8). The energy that the earthquake generates is dispersed both as heat and seismic waves that radiate away from the hypocenter or point of fault rupture beneath the Earth’s surface. The imagery point on the surface above the fault rupture is known as the epicenter and is used to locate the fault in relationship to surface features like cities and man-made infrastructures.

Generally after an earthquake, people use the Internet to go to global sites that show the earthquake details including location, size, and shaking intensity. These were all used in X24 Mexico as examples of the use of the Internet cloud linking instruments to people globally. One person tweeting the location of the U.S. Geological Survey (USGS) shake map is often one of the most direct ways people have of sharing information. The shake map for
The Oaxaca earthquake in the spring of 2012 was very similar to the actual X24 Mexico scenario (Figure 3).


Earthquakes are generally considered to be one component of the overall tectonic movement of the Earth with its brittle crust and fluid interior. People cannot control the motion of the Earth’s crust especially in regions that are considered mobile and active as different plates and fluid interactions of the Earth’s interior move with respect to each other (Abbott). From studying earthquakes and other tectonic events, it is clear that there are several different types of faults that have different implications for natural disasters in their impact and intensity. Most of these faults can be described in a general fashion in relation to
their plate tectonic boundaries such as divergent, transform, and convergent faults. The fault types are different depending on the type of motion and stress.

- **Divergent faults:** crust pulls apart and extends, generally resulting in faults that collapse or lower the Earth’s surface and take relatively little energy to initiate.
- **Transform faults:** crust slides laterally or horizontally but generally with bends that also drop down or lift up portions of the faults.
- **Convergent faults:** crust compresses and shortens, generally requiring more energy and producing greater impacts on people and man-made structures.

As the relatively brittle composition of the Earth’s outer crust moves above the more fluid interior of the Earth, plates collide (collision zones) and produce mountains. Generally one plate descends beneath the other, effectively melting the descending (heavier) plate, most of which are composed of denser oceanic rocks versus lighter continental rocks (Abbott). As the descending plates move via earthquakes, both heat and seismic waves are generated. The plates descend to hotter depths in the fluid crust that melts and lighter material rises as magma toward the surface, erupting in many places as volcanic eruptions. This continual motion of one plate beneath the other produces plate convergence at margins like the west coast of Mexico that are generally in the shape of arcs, as portions of the outside of the Earth descending downward will almost always produce an arc shape, much like the Aleutian Islands, Japan, the Philippines, and other arc areas in the world. This convergence also produces volcanic material, which is called “arc volcanic rocks” (Abbott); represented by the “Ring of Fire” around the Pacific Ocean, which is almost completely surrounded by convergent margins.

This plate tectonic activity is matched in the Atlantic Ocean by extension at the mid-ocean ridges, but because extensions take less energy to initiate a fault, these extensional faults have little impact on forming natural disasters. Thus volcanoes and arcs are related to major convergent fault motion and, therefore, equate to causing major natural disasters. The Pacific Ocean is rimmed by such convergent margins and thus the Western U.S. and Mexico share a common danger of volcanic activity and convergent-margin faults. The U.S. also has major strike-slip motion along the San Andreas Fault system that is distinctly different than Mexico, so Mexico is geologically more dangerous than the U.S. In Mexico, the south of Baja sits above a major plate activity causing “subduction zones [Figure 4] which produce the largest number of earthquakes” (Abbott 75).
Figure 4. The workings of plate tectonics. Source: Divener, V. “Subduction Zone.” Myweb.cwpost.liu.edu. Long Island University, n.d. Web. 6 May 2012.

VOLCANOES AS AN EXAMPLE OF UNDERSTANDING THE LINKED NATURE OF NATURAL DISASTERS

For X24 Mexico, the natural Earth processes of the Mexico regions helped establish the overall exercise scenario. Because the portion of Mexico south of Baja is along an active convergent margin, it is impacted by a subduction of the oceanic plate beneath the country of Mexico, which is largely composed of rocks produced by melting of magma formed in the subduction zone. This subduction beneath Mexico of earthquake after earthquake and then melting of subducted material to produce magma and volcanic eruptions was the overarching scientific background for preparing for future events with a realistic scenario. Because such activity is part of the identity of western Mexico, the X24 Mexico scenario used the valid geologic setting to establish likely events in the future for which the U.S. and Mexico could prepare. This included eruption of the major volcano near Mexico City, Popocatepetl. This
included the emissions of major ash into the atmosphere, landslides of volcanic material, and major disruption of the infrastructure and water supply of nearby Mexico City and Puebla.

Volcanoes can produce overwhelming amounts of energy no human can survive, particularly if they are gaseous and erupt explosively as many volcanoes in Mexico are able to do. “Most volcanism occurs above hot spots” (Abbott 188). Volcanoes related to hot spots burning through the crust like Hawaii erupt very differently and lavas that flow as liquids rarely explode because they have very little gas captured in the magma. Volcanoes like those in Mexico are composed of much higher amounts of silica and therefore have long silica chains that capture gas fluids and retain them, thus making it possible for them to be explosive and dramatically more disruptive than volcanoes in Hawaii. Because of their specific chemistry and ability to retain gases, classic volcanoes like Popocatepetl are built by the deposits of ash and lava erupting often explosively from the volcano above the subduction zone (Figure 5).

![Figure 5. View of Popocatepetl from Puebla, Mexico. This was taken on April 18, 2012 showing the ash layers ascending from volcano and covering large area. Source: Casta, Jose. “Popocatepetl Volcano in Mexico Rumbles as Authorities Raise Alert Level.” PhotoBlog. MSNBC, 18 Apr. 2012. Web. 6 May 2012.](image)

Popocatepetl was chosen as the focus of X24 Mexico because it is an active volcano and it has millions of people who can see it from their homes in Mexico City and Puebla.
These people can be impacted by it if it erupted. A volcano is generally considered active if it has erupted in historic time. Scientists generally consider a volcano “active if it is currently erupting, or exhibiting unrest through earthquakes, uplift, and/or new gas emissions” (Camp). Popocatepetl has erupted numerous times, so the scenario considered something that is distinctly possible, including the ash, the lava, and other aspects of what would take place in a real eruption.

**TSUNAMIS AS AN EXAMPLE OF THE RESULT OF EARTHQUAKES, OFTEN IN CONVERGENT MARGINS**

Another natural disaster that was utilized for X24 Mexico scenario was the possibility of a phenomenon known as a “tsunami,” occurring after a major earthquake in the offshore subduction region. A tsunami is defined as follows:

Series of traveling ocean waves of extremely long length generated by disturbances associated primarily with earthquakes occurring below or near the ocean floor. Underwater volcanic eruptions and landslides can also generate tsunamis. (United States, Dept. of Commerce, National Oceanic and Atmospheric Administration, *Tsunami: The Great Waves*)

Tsunamis are a threat to life and property to anyone living near the ocean in regions susceptible to such waves and near enough to the water level to be negatively impacted. As an example, the 1960 Chile Earthquake generated a Pacific-wide tsunami that caused widespread death and destruction in Chile, Hawaii, Japan, and other areas in the Pacific. Large tsunamis have been known to have waves that rise over 100 feet, while tsunamis 10- to 20-feet high can be very destructive and cause many deaths and injuries (United States, Dept. of Commerce, National Oceanic and Atmospheric Administration, *Tsunami: The Great Waves*). The largest known tsunami was in 1958 in Alaska and generated a wave over 1,720 feet tall from a rock fall in Lituya Bay (“World’s Biggest Tsunami”).

About two-thirds of the Earth is covered by water of four oceans, the Pacific, Atlantic, Arctic, and Indian Oceans, which are interconnected and can enable tsunami waves to pass from one ocean to another (United States, Dept. of Commerce, National Oceanic and Atmospheric Administration, *What Causes Tsunamis*). Seismic waves generating a tsunami can thus travel very long distances through these oceans impacting coastal areas far from the site of the earthquakes, much like the recent Japanese earthquake, which sent tsunami waves that reached Chile nearly halfway around the world (Figure 6).
Since the waves are marked by constructive and destructive interference patterns such as modeled and observed in the Japanese earthquake and tsunami, the impact of the tsunami waves can be highly heterogeneous. In addition, the ocean bottom shape and geometries can accentuate or dissipate the tsunami waves coming from certain directions, so the impact of the waves on other regions is a complex science of geometries, size, and tidal conditions. These features were collectively considered and a moderate tsunami was simulated for the region near Colima, Mexico as a component of the X24 Mexico scenario.

**LEARNING FROM PAST DISASTERS AND THE EXERCISES TO PREPARE FOR THEM**

Knowledge of natural disasters is important in order to understand the effects they may cause. Also, knowledge of the issues from past examples is valuable because it hopefully allows people to prepare for disasters in advance and avoid mistakes experienced in the past. The issues, obstacles, and challenges of many past disasters help shape the
development of X24 Mexico for many different reasons, both scientifically and politically. As an example, Hurricane Katrina greatly impacted the New Orleans and nearby region in ways that had been exercised with a simulated hurricane called “Hurricane Pam,” but the results of this exercise did not really translate into effective preparation for the region, organizations, and people actually impacted which Hurricane Katrina would later impact. Similarly, the earthquakes in Haiti and Japan and the lessons learned helped shape the development of X24 Mexico scenario and what was attempted in terms of collaborations of agencies to help build actual capability in Mexico and the U.S. Those involved included groups like U.S. Northern Command (NORTHCOM), whose area of responsibility is Mexico. Building cooperation between NORTHCOM and Mexican authorities on the basis of lessons learned from Hurricane Katrina, the Haiti and Japanese earthquakes and other events formed the basis what was exercised in X24 Mexico.

A simple metric of past disasters was the economic loss associated with recent disasters provided the compelling encouragement to pursue future ideas, solutions, and collaborations. The first six months of 2011 saw an economic loss of $265 billion above the previous record of $220 billion set for all of 2005, which was when Hurricane Katrina struck the U.S. (Llanos). In 2011, Japan's earthquakes and tsunamis accounted for the biggest economic loss with $210 billion, as well as most deaths recorded (Llanos). Japan had plans and had exercised prior to the event, but still things went wrong. X24 Mexico sought to improve on this so that Mexico might avoid losses like these in the future. The year 2010 was also a costly year globally, but “natural disasters made 2011 the costliest on record in terms of property damage” (Llanos).

**HURRICANE KATRINA AS AN EXAMPLE OF NOT BENEFITING FROM PRE-DISASTER EXERCISES**

One good example of a past natural disaster that had been planned for, exercised for, but not prepared for was Hurricane Katrina. Because the city of New Orleans is kept dry and habitable by a series of levees managed by the US Army Corps of Engineers (USACE), it is very dependent on its safety by the integrity of the dikes. Planning for what might happen if the dikes did not hold was done, but the city and many of its government agencies were not prepared for the reality of what was exercised.
The USACE reported that the levies in New Orleans were unlikely to hold during . . . a storm event. Approximately 80% of the City of New Orleans sits below sea level, sandwiched between the Mississippi River to the south and Lake Pontchartrain to the north. (Clark University)

In 2004, New Orleans found itself in the path of a hurricane that had speeds of 150 mph but the hurricane veered to the right and came ashore 100 mi to the east, which favored New Orleans. There were lessons to learn from the active season of hurricanes but relatively little was done to prepare past what had always been done. Therefore, by 2005 another hurricane was headed for New Orleans of similar strength and it didn’t quite miss. It also veered to the right. The unexpected collapse of several levees made a disaster from the flooding outside of the dikes that could have been prevented or the difficulties largely reduced. “The costliest natural disaster of 2005 was also the costliest disaster in US history” (Abbott 2). The huge size of the hurricane covered areas of the Mississippi, Louisiana, and Alabama coastline. The failure of the New Orleans levees took the focus of the damage, even though other areas like the southern Mississippi coast were much more physically damaged by the hurricane itself. “[It] was not a single disaster, but three—a storm that wiped away miles of the Gulf Coast, a flood caused by breaches in the New Orleans levees, and an outbreak of violence and lawlessness in the city” (Bush 293).

When the levies failed, the city was flooded. The water pushing to the east several miles inland in Alabama and Mississippi caused the worst damage. In New Orleans, “the pressure of [the] huge volume of water caused the levees to fail along canals, the Mississippi River, and Lake Pontchartrain, allowing water to flood much of New Orleans with some neighborhoods being submerged 20 ft deep” (Abbott 4). The local, state, and U.S. government response to the disaster was slow, off target, and immediately criticized, as the Bush administration did not include the New Orleans area in its state of emergency declaration. Local and state government leaders responded poorly and did not appropriately call in the collaborations of federal authorities who are in support of natural disaster response, but do not lead them. The Coast Guard and other disaster response organizations readied for the approaching destruction that Katrina could cause, but the government failed to recognize that the real disaster occurred after the hurricane had left the area as rising waters flooded large areas of the city.
Blame for the poor response was shifted everywhere and largely ended up on Federal Emergency Management Agency (FEMA) and the federal government, though the long-term local and state decisions and inappropriate actions are probably the most directly to blame. Lack of collaboration and preparation for all the parties involved contributed to the enormity of the problem. Collaboration across agencies and millions of people reduced the devastation from being far greater—but these positive aspects of aiding in the solution are remembered less than the brokenness of the government response.

During the aftermath of Hurricane Katrina, an important meeting took place on Air Force One with Governor Kathleen Blanco, Mayor Ray Nagin, FEMA Director Mike Brown, Senator Mary Landrieu, and others to discuss who would be in charge of the response but there was no clear cut authority.

By law, state and local authorities lead the response to natural disasters, with the federal government playing a supporting role . . . state and local responders were in command of the Katrina response in Alabama and Mississippi . . . but four days of chaos after [Hurricane Katrina], it was clear the authorities in Louisiana could not lead. (Bush 292)

The lack of communication was one of the issues faced during Hurricane Katrina. Communication is a major component of response and recovery because without it, there is no clear authority, guidelines, or coordination. The shock and enormity of a major disaster do not create a fruitful environment for collaboration, as many people were already seeking to divert blame from their agency. Solving the difficulties become more monumental as it was difficult to produce a “unity of effort” when people were struggling to invent a “unity of command” or disunity of blame.

If there arises no effective communications, there generally can be no effective response. Non-existing partnerships or relationships generally translate into no coordination. Issues with communications can be explored and enhanced in exercise simulations, so that when a disaster strikes everyone knows who to call and how to coordinate, not just who to blame. Too little attention had been paid to the levees that surrounded New Orleans because “attention” equated into resources, which were focused on other priorities. When the disaster hit, the poorly maintained levees were a reality and metaphor for the unprepared government (local, state, federal) and the lack of real preparation despite having exercised this very event. Only after the real event occurred did many of the leaders realize how extremely vulnerable and subject to collapse they were. If there had been communication, the levees would have
been updated and the damage could have been less. Better disaster communications would have revealed sooner the hazards from slowly rising water and the disaster that resulted because people were trapped and could not get out (Figure 7).

![Figure 7. Hurricane Katrina. This is the failure of the levees in the region and how it affected communities. Source: Johnson, Morieka. “Making an Emergency Plan for Your Pets.” CNN.com. Cable News Network, 20 Sept. 2011. Web. 1 Apr. 2012.](image)

In the summer of 2004, FEMA had run a disaster exercise in which a hurricane named Pam would hit New Orleans, mentioned earlier. This exercise was executed prior to Hurricane Katrina. The purpose for this exercise was to help FEMA and local authorities in hurricane-prone areas to prepare for future disasters. The scenario focused on “thirteen parishes in southeast Louisiana.” The scenario involved a hurricane with “winds of 120 mph, up to 20 inches of rain in parts of southeast Louisiana, and storm surge that topped levees in the New Orleans area. According to the exercise, more than one million residents were evacuated and Hurricane Pam destroyed 500,000-600,000 buildings” (United States, Dept. of Homeland Security, Federal Emergency Management Agency). The results for the exercise were the following:

- The group identified the resources necessary to support 1,000 shelters for 100 days. They planned for staff augmentation and how to include victims in shelter management.
- The search and rescue group developed a transportation plan for getting standard residents out of harm’s way.
• They discovered the vulnerability of the levees.
• Planners identified lead and support agencies for search and rescue and established a command structure that would include four areas with up to 800 searchers. (United States, Dept. of Homeland Security, Federal Emergency Management Agency)

Hurricane Katrina proved to be a powerful disaster but one that could be overcome. What made it overwhelming was the fact that it struck an area that is largely below sea level. It was clear that none of FEMA’s lessons from the exercise had been implemented prior to Hurricane Katrina. Collaboration among the agencies responsible for the safety and security of New Orleans obviously failed, especially given the fact that the people were aware of the building of relationships. They had gone through the development and execution of the imaginary Hurricane Pam exercise that duplicated what would happen in the future. The exercise thus was largely that, simply an exercise. How such exercises can be more motivating to the actual leaders has been one of the driving forces for X24 Mexico; especially trying to bring people together and really practicing the reality of what could take place.

The response to Katrina had major issues, disorder, incompetence, and the sense that the government let down its citizens, as well as some of the citizens of New Orleans behaving poorly (Bush). All these issues can be addressed in exercise simulations that will prepare leaders for effective responses, but at the same time, these lessons need to be implemented. The experiences of trainers would help promote better ways in which training and exercises can be implemented to respond and avoid issues like those in Hurricane Katrina. FEMA’s Hurricane Pam exercise was an excellent start, but one step is learning from the experience and another is making sure the implementation is complete, especially if there are recommendations that required immediate attention, such as the levees did. The exercise was not sufficiently motivating enough to spend resources on the levees. What occurred after the Hurricane Pam exercise was a distressing prediction of the disaster itself, not just an exercise.

**Haiti’s Earthquake as an Example of Needing Plans for Response by Outside Agencies**

In 2010, Haiti was hit with a catastrophic 7.0 magnitude earthquake (measured by the damage from the extremely poor construction and dense population) near the town of
Léogâne, which is about 16 miles from Port-au-Prince, Haiti’s capital. The earthquake occurred on January 12. By January 25, Haiti had experienced at least fifty-two aftershocks measuring between 4.5 or greater. It was estimated that the earthquake affected three million people and one million were made homeless, 300,000 were injured, and 316,000 people died (“Breaking World Haiti News”). The quake severely damaged residences and commercial buildings. Even though this was not a huge earthquake as measured in most urban areas, the poor construction and masonry without reinforcement gave credence to the saying “earthquakes don’t kill people, buildings do.” The building conditions were symbolic of the brokenness of Haitian society. The government functionality disappeared after the earthquake that most of the response and recovery efforts were done by others who were acting out of compassion to assist an extraordinarily broken situation. Plans for how to help Haiti were plans put together by entities outside the country like the U.S. military, the World Bank, and hundreds of Non-Governmental Organizations (NGOs) and others such as private citizens, general aviation organizations, and groups such as that of Sean Penn, who focused donations on solutions in the country.

Many countries responded to Haiti’s earthquake with humanitarian aid. The countries sent funds, rescue and medical teams, engineers, and support personnel, but due to the damaged communication systems, air, land, and sea transport facilities, and electrical networks, much of the rescue and aid efforts were hampered. The aid was concentrated in one place, which became an issue because certain areas weren’t getting the necessary aid and this caused civil unrest among the population. The people moved into shelters in order to provide a roof over themselves (Figure 8). Places like the morgue in Port-au-Prince were overwhelmed with bodies, which were buried in mass graves. Property damages were great because the majority of buildings were built on insufficient foundations and with poor structural integrity—all reflections of the government regulations and enforcement of earthquake safety. The city is built near the major fault that offsets the southern most part of the island well to the west, producing the long spine extending out into the ocean on the southwest side of Haiti.
JAPAN’S EARTHQUAKES AND TSUNAMIS AS EXAMPLES OF GLOBAL COLLABORATIONS AND NEW TOOLS

In 2011, a very large earthquake occurred in the Pacific coast of Japan. It was a magnitude 9.0M earthquake with an epicenter forty-three miles east of the Oshika Peninsula of Tokyo and the hypocenter at a depth of twenty miles. This earthquake was considered the most powerful one to hit Japan in recent times. It was strong enough to trigger powerful tsunami waves that reached heights of up to sixty feet though the heights as the waves traversed urban constrictions were higher in other areas. The tsunami caused a nuclear accident and level seven melt downs at three nuclear power plant reactors. Many electrical generators were taken down, and at least three nuclear reactors suffered explosions due to hydrogen gas that had built up within outer containment buildings after cooling system failure (“Japan: 3 Nuclear Reactors Melted Down”). The earthquake and the tsunami caused severe structural damages to roads and railways and killed most of the 16,000 victims (Figure 9).

During the disaster in Japan, social media and tools such as YouTube videos proved to be exceedingly effective tools and recorders of the actual events. One example of how social media was people using Facebook, Twitter, email, YouTube, and other tools to determine if family and friends were OK. People from other countries who were in Japan, for
example, were contacted by the diplomatic posts from each of the countries in Japan—and then communicated back to the families in the original countries, like many American studying and working in Japan who had registered with the State Department or other organizations about where they were working or studying.

The people at the U.S. Embassy and Consulates helped pull together information from calling, social media, and other means in order to help American citizens in distress. Most people worked to make safety known to the U.S. Embassy in Tokyo while the status of others was reported to the State Department by family and friends.

It [is] much more of a challenge . . . in towns and villages where the damage was heaviest. [They] relied on phone calls, emails, and checks of public and consular records to determine where people [were]. [They] learned that one of the most effective tools for locating people in 2011 is social networking media. (Clark)

Alan Clark, a Consular Officer at the U.S. Embassy in Beijing, China, was temporarily assigned to help out in Japan during the disaster. He stated that an incredibly useful tool was Facebook, which he personally used to close four cases of missing people who were in the most damaged areas of Japan. “Having a name and sometimes a photo of the person made it relatively easy to locate their Facebook profile. [He] would send them messages from [his] own Facebook account [and to his amazement]; he would get responses
very quickly” (Clark). His experience with the use of social media helped him see the effectiveness and power of social networking in times of need because it keeps people connected. Social media has been a dynamic channel of communication for global dialogue and digital storytelling during disasters and relief efforts for victims, government, agencies, media, and non-profit organizations.

Disasters like Hurricane Katrina, Japan, and Haiti have proven that there are still issues to resolve; issues with communication, coordination, and preparedness, but they also explored new venues such as social media during the earthquake in Japan. Natural disaster exercises can be developed to explore such issues and together find solutions. The exercises can help build relationships and partnerships, by creating the environment for interaction and to test new technologies. There isn’t anything more valuable than coming together and finding solutions to improve upon the weakness of our systems of preparedness, response, and recovery.
CHAPTER 4

EXERCISE SIMULATIONS

The ability to deal with a crisis situation is largely dependent on the structures that have been developed before chaos arrives. The event can in some ways be considered as an abrupt and brutal audit at a moment’s notice, everything that was left unprepared becomes a complex problem, and every weakness comes to the forefront.
—Patrick Lagadec, a French Crisis Management Academic

A RECENT LESSON IN PREPAREDNESS: THE SAN DIEGO BLACKOUT OF 2011

When a natural disaster occurs that we are not prepared for, we often look back to determine why we were not prepared. On September 8 and 9, 2010, nearly the tenth anniversary of 9/11, the California-northern Baja region had a major electrical blackout and many residents of the region weren’t adequately prepared. The widespread outage led to frustration throughout San Diego County, Baja California, and part of Arizona leaving about five million people without electricity. This occurred around “3:38 pm after a 500-kilovolt high-voltage transmission line from Arizona to California failed, triggering a cascade of events that . . . knocked the San Onofre nuclear power plant offline” (Gustafson). According to the San Diego Gas and Electric Company (SDG&E), 1.4 million of its customers in San Diego and Orange counties were affected. The blackout led to “schools and business closures, suspended water services, flight cancellations, blacked-out traffic lights, silent radio stations and trapped elevator passengers” (Gustafson).

One of the issues many people discovered in this situation was that they didn’t have any available cash because most people rely on credit and debit cards. Yet, without electricity, most businesses were unable to accept credit or debit cards and most ATMs did not work. Another problem was that many people were low on gasoline and unable to purchase more because nearly all the stations closed because they did not have electricity and could not pump gas or easily charge for it. Another widely experienced difficulty was that people didn’t, and I didn’t have enough food or water supplies to last for more than two days, and the stores certainly did not have stockpiles to last more than a few days. The power
outage made most people realize how unprepared most people actually are for even small emergencies. There were lines at the gas stations, people left their vehicles on the highways because they were out of gas, and many didn’t have cash to purchase supplies. The few that were able to purchase food had to wait in lines and the essentials like water, canned foods, batteries, and flashlights were quickly purchased. “The power failure threw a wrench in the everyday life of a modern society that is heavily dependent on electricity” (Gustafson).

It isn’t until most people are in such situations that people realize how vulnerable we make ourselves. We always see and hear about natural disasters on the news but for some reason we believe it wouldn’t happen to us. There are many organizations, public or private, and many government agencies that encourage people to prepare, but few people actually prepare until motivated by some event. Many people also don’t prepare because preparations normally require additional resources past those needed for daily survival; many people don’t feel the luxury to prepare as they are simply trying to survive paycheck to paycheck.

**PREPAREDNESS**

Preparedness in an emergency can best be defined as a “state of readiness to respond to a disaster, crisis, or any other type of emergency situation” (Haddow, Bullock, and Coppola 97). This state of preparedness amounts to the capacity to respond and recover from emergency and disaster events. It is developed through planning, training, and exercising. Preparedness is not just focused on saving lives, but also on protecting property because the majority of the world’s populations tend to live in vulnerable areas. Essential government services in the aftermath of a disaster need to be ensured so that the community will receive certain vital services—businesses and markets, social services, medical services, and community services like policing and firefighting.

Preparing for an emergency now, provides the best chance of survival in an event of a natural disaster. Emergency preparedness should always be considered in the home and workplace because you never know where you may be and need to respond to unexpected events. When families promote a step-by-step approach to emergency plans by exercising family scenarios, they are more likely to know how to react and what they may need to survive. Taking preparatory action can assure a measure of control event. Recent events have
left many concerned about the possibility of future events, but whatever the case may be our
awareness of the importance of emergency preparedness has risen.

LEARNING WITH SIMULATED EXERCISES

When responding to natural disasters, practice may not be perfect, but looking at
simulations as a rehearsal is an effective approach to learning. An exercise is designed to
assess, enhance, and evaluate preparedness. According to the National Oceanic and
Atmospheric Administration, these exercises are scenario-based crises customized to meet
situations and learning objectives. It is a practice activity that places participants in a
simulated situation requiring them to function in the capacity expected of them in a real
event, which promotes preparedness by testing policies, plans, personnel training, emerging
technologies, relationships, and tools. The easy way to look at exercises is that they are
conducted for a purpose: to evaluate an organizations ability to execute one or more portions
of its response and because many successful responses to emergencies are attributed to
previous simulated exercises. There are different types of simulation exercises, for example:

- **Orientation Seminar**: purpose to familiarize participants with roles, plans,
  procedures or equipment. Can be used to resolve questions of coordination
  and assignment of responsibilities.

- **Drill**: a coordinated, supervised exercise activity normally used to test a single
  specific operation or function. There is no attempt to coordinate organizations.
  Usually conducted in schools. It is the practice of a small part of a response
  plan.

- **Tabletop Exercise**: facilitated analysis of an emergency situation in an
  informal stress-free environment; designed to elicit constructive discussions as
  participants examine and resolve problems based on existing operational plans
  and identity where plans need to be refined. Success is determined by group
  participation and problem identification.

- **Functional Exercise**: a fully simulated interactive exercise that tests the
  capability of an organization to respond to an event. Tests multiple functions
  of the organization’s operational plan. A coordinated response to a situation in
  a time pressured, realistic simulation.

- **Full-Scale Exercise**: simulates a real event as closely as possible. Designed to
  evaluate the operational capability of emergency response. Conducted in a
  stressful environment that simulates actual response conditions. Requires the
  mobilizations and actual movement of emergency personnel, equipment, and
  resources. (United States, Dept. of Commerce, National Oceanic and
  Atmospheric Administration, “Tsunami Evacuation”)
These types of exercises provide many benefits, including individual training, system improvements, and the benefit from actually practicing and evaluating; mostly following through with recommendations that come from the after-action reports developed after the exercise. By promoting individual training, it allows people to practice their roles and gain experience without an actual disaster. In addition to the training, organizations can improve upon their systems for managing emergencies.

It is important for an exercise to always focus on locating and eliminating problems in preparedness and response prior to the actual emergency. In order to achieve effective coordination, relationships must be established, plans written and tested, and procedures agreed upon because this cannot be achieved during the chaos of an actual event. If people are gathering contacts during an actual disaster, it is already too late. It is paramount that governments and organizations exercise their plans and procedures so they are better prepared to react in any event. The more trained, prepared and ready they are the better they are able to perform their duties because people generally respond to an emergency in the way they are trained. Conducting exercises allows for the following:

- Clarifying roles and responsibilities
- Improving individual performance
- Gaining recognition and support of officials
- Satisfying regulatory requirements
- Training personnel
- Testing and evaluating plans
- Revealing plan weaknesses
- Revealing gaps in resources
- Improving organizational coordination. (United States, Dept. of Commerce, National Oceanic and Atmospheric Administration, “Tsunami Evacuation”)

No country, community, or individual is immune to the impacts of disasters. They do not stop at borders; they encompass all of their surroundings and more. People of all nations face risks associated with the natural disasters. Civilizations have the ability to adapt to their surroundings increasing the likelihood of survival (Abbott). As societies develop they become more organized and response efforts improve on local, national and regional levels. “Response capacity of individual nations can be linked to several factors propensity of disaster, local and regional economic resources, government structure, and availability of
technological, academic, and human resources” (Abbott 200). With an increase in natural
disasters affecting entire regions, a call upon global response is important.

When disasters occur binationally or internationally (multiple nations), the difficulties
tend to multiply for a variety of reasons. For example, two or more languages, two or more
sets of laws, regulations and procedures, lack of formal avenues of cooperation, lack of
access to emerging technologies, and most importantly lack of established relationships for
which we can share information, resources, equipment, assets, and supplies. Therefore,
establishing strong relationships enables countries to execute effective efforts to cooperate
with one another, especially when it comes to natural disasters that transcend borders. When
countries like Mexico and the U.S. share a border of 1,969 miles, there has to be ways to
establish relationships and emergency response coordination, which will improve response
and recovery because disasters will occur somewhere along that extensive border sometime
in the future.

The Good Neighbor Environmental Board recommended the following to the U.S.
officials in their annual report:

- Prevent or minimize the impacts of natural disasters through appropriate
  zoning codes, building codes, landscape requirements, watershed
  management, and municipal strategic planning.
- Build capacity at the local, state, regional, and tribal levels to effectively
  manage natural disasters, including cross-border coordination.
- Better integrate current disparate preparedness and response management
  systems and practical exercises so as to cover all types of emergencies,
  including natural disasters.
- Expand existing domestic and bi-national agreements to incorporate U.S.-
  Mexico . . . specific measures related to natural disasters, including measures
tailed to specific natural features and human settlements. (“If Natural
  Disaster Strikes along the U.S.-Mexico Border”)

A natural disaster can become binational depending upon the size and scope. It is
essentially driven by a number of factors such as: severity of hazard consequences, the
availability of economic resources, the comprehensiveness and appropriateness of responder
training, the built-in resilience of infrastructure, the actual ability and the public impression
of the government’s ability to manage the situation, and availability of specialized assets
(Haddow, Bullock, and Coppola). Issues of coordination can be dealt with in an effective
matter when there are strong relations. If there is a relationship with the people within an
agency, department or organization either governmental or non-governmental, the process of
request for assistance is much faster because there is an understanding that the other may not intercede in domestic matters without the guaranteed consent of the ruling government. The combined capabilities and organizational capacity of international emergency management are vital for both the preparation and mitigation of hazard risks, and the response and recovery of natural disasters.

It is crucial to establish relationships among our neighboring countries so that together we can prevent, mitigate and overcome disasters and difficult situations. Establishing trust among collaborating partners provides the pathways that we can traverse together. Collaborative partnerships should be cultivated. An environment for such constructive exercises exists at the SDSU Viz Center, where many events of X24 Mexico took place in coordination with other major players such as NORTHCOM and Mexican government offices.

**SDSU Viz Center**

The Immersive Visualization Center (Viz Center) at San Diego State University, directed by Professor Eric Frost, is such a place that largely represents relationships between people and organizations collectively attempting to positively impact the world of HADR, community resilience, search and rescue operations, and aid emergency responders and Homeland Security. The best component of the Viz Center is that the people who work there understand the importance of establishing relationships. The people of the Viz Center also assist the community, region, and nations with responding to difficult situations by providing critical information, knowledge, and decision-support tools.

The Viz Center is a physical place but also a sense of shared relationships by people who come together, including this author, to seek and find collaborative solutions to difficult problems, many in Humanitarian Assistance Disaster Relief. By enabling students, staff, faculty, visitors, and friends to collectively work together, the Viz Center helps provide pathways and toolsets to actually help during disasters. By helping others, especially internationally, the students are able to learn from others and learning that many times there are no answers for the difficulties that arise in global disasters response. However, one of the most compelling parts of the Viz Center is that it is possible to join with others to find answers and assist others who are in need of help, functionally making compassion
actionable. As a component of Homeland Security, the approach of solving problems, building relationships, and actually exercising the solutions is making a significant impact on both disaster response and also on the students, staff, faculty, friends, and agencies involved in the effort.

For the first time, on September 24-25, 2010, the Viz Center hosted a virtual HADR event called “Exercise X24” which involved 12,500 people from seventy-nine nations and ninety U.S. government, non-government organizations, and public/private partners in a collaborative environment using crowd sourcing, social media, and cloud computing applications (“Exercise X24 Mexico”). As a result of such collaboration, a second exercise, X24 Europe, was held in March 28-31, 2011. This exercise transcended all “expectations in its ability to form a collaborative bridge between individuals, communities, and nations with over 49,000 participants from ninety-two nations” (“Exercise X24 Mexico”). For X24 Europe, the focus was in the Balkans region with a seismic event that generated a tsunami in the Adriatic Sea. According to “Exercise X24 Mexico,” “seventy-eight percent of the participants were from Croatia, Macedonia, and Bosnia and Herzegovina.”

Therefore, Exercise X24 Mexico (X24), which is the third iteration of a primarily virtual, open-invitation, HADR exercise was developed to help our southern border friends. It has real-world functional components. The exercise participants ranged from the United States, Dept. of Health and Services, Office of Health Affairs, NORAD-NORTHCOM, US Customs and Border Protection, Global Borders College, Mexican Army and Navy, and Mexico’s Federal Police to National Defense University and Red Cross among others. The goals for X24 Mexico were the following:

1. Demonstrate the use of no/low-cost, off-the-shelf social media, crowd sourcing, and collaboration web tools to gather, coordinate, and share actionable real-time information to build situational awareness to help victims of a natural disaster and help save lives;
2. Establish dialogue and build relationships between all partner nations, international organizations, and public/private partners regarding the use of online tools;
3. Test online tools to measure effectiveness, and streamline cyber information sharing in preparation for the next real-world crisis;
4. Address the virtual flow of information and activities of international organizations during a natural disaster and a terror attack utilizing biological weapons of mass destruction/ effect; and
5. Encourage all formal and informal groups to actively participate or observe the exercise. (“Exercise X24 Mexico”)

X24 Mexico virtually took place in México for reasons previously stated. Furthermore, one of the areas most affected was Mexico City with an eruption from Popocatepetl. México City was chosen due to its importance in the world economy. Mexico City was originally built on an island of Lake Texcoco by the Aztecs in 1325 as Tenochtitlan and considered an important center for political, economic, and social relationships (Barroqueiro). It was officially named La Ciudad de México (Mexico City) in 1585. The history of Mexico City as an important center still continues today.

Mexico City, capital of Mexico and seat of the federal powers of the Mexican Union, is the country's largest city as well as its most important political, cultural, educational, and financial center. Estimated by the United States Central Intelligence Agency to have a population of around 20 million, Mexico City is also one of the most important financial centers in North America, the largest metropolitan area in the western hemisphere. This alpha city represents the country’s economic and political power and it represents the relationship with the United States. An alpha city is generally considered an important node in the global economic system. The concept comes from the idea that globalization facilitates strategic locales according to order of importance of finance and trade.

When the exercise took place at the Viz Center in February 2012, many things had been taken care of beforehand such as the planning, organizing, communications, the development of a dashboard, coordinating students who participated and the collection of important informational links, review of possible natural disasters to choose the best fit for the scenario, and the reasons why Mexico were chosen.

Part of one specific database used in the exercise, thirty-two participants and observers registered to be part of X24 Mexico in an open forum. This did not include those who did not register but followed the exercise through UStream, a live interactive broadcast platform or the hundreds who interacted within the exercise in other ways. According to Google Analytics developed for X24 Mexico; the exercise attracted participants from forty-three countries within sixty hours. An exercise goal articulated by one of the participants was that “when something happens, you’re all connected to each other. You can create a shared vision to cohesively respond to a disaster. Everyone knows the role they have to play [in the exercise and they are ready to respond]” (Marshall). It is much more valuable to overcome
problems during an exercise then having to deal with them during an actual disaster. Failures in an exercise do not cost lives. Having such connections and relationship prior to a real disaster is imperative to effectively and efficiently solving real-time problems. Exercise 24 is the beginning of a great concept for HADR efforts. X24 Europe and X24 México are the continuation of an idea that can go beyond borders to improve response and recovery.

Dr. Eric Frost and Dr. George Bressler, who lead the X24 effort, commented that if you’re exchanging business cards when the disaster happens, you’ve already lost. It’s already way too late (Marshall). He is correct because relationships and connections need to be established before a disaster strikes because you will know that you can count on that agency or individual to get things done in a timely manner, you understand each other’s weaknesses and strengths and you know you can trust that person. Trust is one of the components of relationships. It creates the reliance in one another. Through the X24 Mexico process, participants were able to establish long-term relationships for the future. It is good to know that when a disaster happens, you have someone to count on in a time of need.

However, just as we established the reasons for why Mexico-U.S. connection is important, understanding natural disasters and the challenge from past examples, and the importance of exercise simulations, one fundamental aspect is that of the data collected, and evaluated during and after simulated exercises. In this case it is the qualitative information gathered in X24 Mexico.
CHAPTER 5

METHODOLOGY, THE VALUE OF QUALITATIVE DATA

The research methodology utilized in this thesis is qualitative. An important aspect of qualitative research is that it allows analysis of complex textual descriptions of peoples’ perspectives, behaviors, beliefs, opinions, emotions, and relationships. Hence, qualitative research methodology will allow for the review and the assessment of information regarding personal experiences and social relationships collected during natural disaster exercises. It will allow assessment of simulations through the eyes of those involved. This type of analysis will provide valuable human information on these exercises, and will empower participants to voice their thoughts and feelings. Qualitative analytics will facilitate evaluation of exercise simulation beneficial value per participant opinion.

Qualitative research methodology is utilized in many different professional and academic disciplines. Norman K. Denzin and Yvonna S. Lincoln suggest that qualitative research involves an interpretive approach, meaning that qualitative researchers study things in their natural settings. They attempt to make sense of, or to interpret the phenomena in terms of the meanings people bring to such settings (Denzin and Lincoln). This approach to information gathering would be beneficial to reviewing the effectiveness of natural disaster exercises because this methodology allows for the collection of information regarding human behavior, the reasons that govern such behavior, and the meaning and purpose of the behavior. Qualitative research methodology gained momentum due to the insight it provides into the human factor of research.

Gary D. Shank defines qualitative research as “a form of systematic empirical inquiry into meaning” (5). What Shank means, according to Ospina, by systematic is “method, planned, ordered, and public.” By empirical, Shank means that inquiry is grounded in the world of experience; understanding, and making sense of experiences (Ospina). This type of research collects information via a variety of sources, including interviews, group discussions, observations, reflection fields, and various texts, pictures, surveys, online
surveys and other materials. Depending on research requirements, some or all source collection venues may be utilized. Both definitions by Shank and Denzin and Lincoln of qualitative research fit the purpose of this thesis study.

Given this qualitative approach to evaluate simulated exercise effectiveness, qualitative research and quantitative research methods differ primarily in:

- Their general framework [Table 1]
- Their analytical objectives [Table 2])
- The types of questions they pose
- The types of data collection instruments they use
- The forms of data they produce
- The degree of flexibility built into study design [Table 3]. (Family Health International)

| Table 1. General Framework Differences between Qualitative and Quantitative Data Collection |
|-----------------------------------------------|-----------------------------------------------|
| Quantitative | Qualitative |
| Seek to confirm hypotheses about phenomena | Seek to explore phenomena |
| Instruments use more rigid style of eliciting and categorizing responses to questions | Instruments use more flexible, iterative style of eliciting and categorizing responses to questions |
| Use highly structured methods such as questionnaires, surveys, and structured observations | Use semi-structured methods such as in-depth interviews, focus groups, and participant observation |


| Table 2. Analytical Objectives for Qualitative and Quantitative Data |
|-----------------------------------------------|-----------------------------------------------|
| Quantitative | Qualitative |
| To quantify variation | To describe variation and to describe individual experiences |
| To predict casual relationships | To describe and explain relationships |
| To describe characteristics of a population | To describe group norms |

### Table 3. Degree of Flexibility

<table>
<thead>
<tr>
<th>Quantitative</th>
<th>Qualitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study design is stable from beginning to end</td>
<td>Some aspects of the study are flexible (for example, the addition, or exclusion, interview questions)</td>
</tr>
<tr>
<td>Participants’ responses do not influence or determine how and which questions researchers ask next</td>
<td>Participant responses affect how and which questions researchers ask next</td>
</tr>
<tr>
<td>Study design is subject to statistical assumptions and conditions</td>
<td>Study design is iterative, that is, data collection and research questions are adjusted according to what is learned</td>
</tr>
</tbody>
</table>


The collected information points for this thesis research included: participant observation and viewpoint, and non-participant observations and viewpoints (Appendix A).

The following are the areas analyzed:

- Participants’ goals and objectives;
- Language effect on exercise outcome;
- Cultural differences encountered by participants;
- Issues experienced by participants during exercise;
- Participant suggestions regarding exercise improvement;
- Relationships or partnerships established by participants during exercise. (Ramirez)

The information collected will be performed per anonymous surveys accessed via a website created for the exercise. Information evaluation will assist future program development, and allow assessment of human interactions and responses during simulated exercise. If properly implemented and utilized, this data collection and analysis plan may contribute to future methodologies where accurate and up-to-date information will be tracked during exercises in order to develop better tactics, resources, information systems, and strengthen attempts to better train engaged individuals.
CHAPTER 6

X24 MEXICO AND PARTICIPANT GOALS/OBJECTIVES

In X24 Mexico, the participants’ goals and objectives varied depending upon the organization, agency, or industry they represented. As was evidenced in recent disasters in Haiti and Japan, a coordinated effort is required for HADR. Exercises promote relationship building, inclusion of new technologies and an environment to test ideas. One of the things noticed during X24 Mexico was the importance of meeting people. This was one of the primary goals of the participants. People understand the importance of establishing and nurturing relationships that can potentially be beneficial to HADR operations (Appendix B). For example, some participants’ objectives, which were gathered by the online survey, were the following:

- Appreciate the collaborative efforts required for response to disasters;
- Understanding the political considerations when conducting multinational operations and the capability needs/shortfalls required for successful joint operations;
- Assist with Tribal and Mexican relations;
- Get a better understanding of how we can potentially participate in the future and what potential issues we can address with our own solutions;
- See how multi-agencies work together, whether a natural command and control structure happens and how this does occur with no prompting. (Ramirez)

A stepping stone of the exercise wasn’t just to bring people together, but to have the people come up with solutions together by learning from one another and understanding each other’s capabilities. Many wanted to learn how social media would benefit emergency management and response activities because the massive growth of information and communications technology and the mass ownership of receiving devices have enabled graphic descriptions and images of human suffering in disasters to be disseminated throughout the world with minimal delay. “Along with mass communications, rapid global travel has enabled the international community to respond quickly . . . to disasters when they
occur” (Alexander). Thus, the online survey provided the following information from the participants:

- Observing the exercise to learn how social media is used and what are the benefits and challenges as well as potential benefits of having the ability to establish a network quickly.
- Observation of scenario and social media integration and gaining further understanding of the maturity and availability of information systems in support of emergency management/incident response activities: from the ground up to the highest level of command.
- Observe use of cloud-based systems in civilian context; determine how the open-source validation process works, especially for spatial data; determine if open standards can enable exchange of operational data across multiple agencies.

New technologies can enhance the way people do emergency response and recovery. It is especially important when technologies or software are open-source so that they can scale globally. Social media and information-sharing tools, like the news feeds, Twitter, Facebook, Google+, dashboards, cloud computing, and crowd sourcing have played major roles in natural disasters. How each of these tools can be linked and utilized effectively in international collaboration was a major research aspect of X24 Mexico.

Twitter has now become an invaluable resource for disaster information sharing and can provide a real-time picture of the situation. Twitter is a real-time, micro-blogging site with hundreds of millions of users and hundreds of millions of messages every day, each delivered generally in a few seconds from the original source to the intended recipients (one to many). Twitter continues to evolve to meet the ever-extending needs of its users worldwide, including with an extraordinary array of value-added tools like Hoot Suite. It can be accessed on your computer, iPad, or other mobile devices. This type of social media is a “real-time information network that connects you to the latest stories, ideas, opinions and news about what you find interesting” (Twitter, “About”). Twitter works with up to 140-characters bursts of information that are called tweets, which are sent worldwide to those with which you are connected, generally by “following” someone so that their Tweets go to you (Twitter, “About”). By using a hashtag (#) in front of tweets, they become easily searchable. For example “#quake” would be a normal way for everyone tweeting about an earthquake would have access to the tweets without searching for them. The use of hashtags
and the pre-existing networks developed between agencies and individuals become one of the major tools in X24 Mexico.

In this small space used to send a message, everyone learns to maximize their words with standard abbreviations or by sending several messages. Messages that refer to URLs equal to more information or tools that include pictures, videos, locations, and many other types of content and media. As the recipients of the tweets, one is able to see photos, videos, direct messages and conversations. Since Twitter can be accessed through mobile devices by using free applications, Twitter in a sense is a form of SMS used in a one-to-many messaging, and basically provides an instant infrastructure for mobile communications (Twitter, “About”). This multi-use social media, like Facebook, is an excellent choice for rapid communications in disaster situations because of its one-to-many approach.

In natural disaster exercises, in which such emerging technologies are tested, participants want the opportunity to use real-life examples and incorporate what will work. The exercises are intended to demonstrate the ability of these tools to gather information, coordinate actions and provide assistance to help thousands of victims and save lives. The Haiti earthquake led to an international operation that tested communications and response to a natural disaster by international relief organizations, government agencies and militaries from all over the world. Because many of the communications were down due to the earthquake, “social media . . . made up for the lack of information from the affected area on what had happened and what was most needed. Twitter feeds gave an impressive picture of the . . . earthquake” (Bunz). Efforts from major news channels also incorporated social media in their news broadcasting. This has made reporting much more efficient. “BCC covered the event combining tweets from the area with the work of its reporter in Port-au-Prince” (Bunz).

Another news channel was CNN, who enriched their work with social media, by establishing iReports. It gave people the opportunity to be part of CNN’s coverage of the stories the people care about (“About CNN iReport”). The iReport section of CNN has a way to upload video material with contact information. This use of social media gave victims a voice and it helped not only the victims but also other people who wanted to find relevant information.

Cloud computing provides software applications, data access, data management and storage resources without requiring cloud users to know the location and other details of the
computing infrastructure done over a network usually the Internet. The information can be accessed through a web browser, desktop, laptop, or mobile applications from a remote location. Crowd sourcing is another way that a distributed network of people can solve problems from afar. These applications are just a few things that can be tested in simulated exercises. Important disaster simulated exercises are multi-national. The benefits of establishing exercises that transcend borders will be valuable to agencies, governments, and organizations.

During X24 Mexico, Twitter was the main source of communication used for the natural disaster scenario (Table 4). Some students were tasked with the duty of providing the tweets regarding the virtual-scenario taking place. A sequence of several hundred tweets was sent out as the storyboard was being played out. A tweet would be sent in English and another in Spanish to keep those involved with the virtual response aware of the events taking place. Since the scenario was focused on Mexico, making the tweets in both English and Spanish was both a necessity and also an opportunity to optimize dual-language tweeting. A simple aspect of this is that two or more languages don’t translate easily, especially with the normal abbreviations used in tweeting; for example, the number “4” or the word “for” or the abbreviations “ppl” for the word people. Finessing two sets of tweets raises a host of challenges with shortening them individually because translation tools are very ineffective in the shortened language format.

<table>
<thead>
<tr>
<th>Event Tweet-140 characters or less</th>
<th>Event Tweet in Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>#X24México-TEST NOT REAL: Shallow fault rupture along Mid-America Trench 5km depth under 6000ft of water 80km SSE of Manzanillo MX</td>
<td>#X24 México-PRUEBA NO ES REAL: Unaruptura superficial de la fallapor el Medio-Americano abreunazanja de 5km de profundidadbajo 6000 pies de agua 80km SSE de Manzanillo MX</td>
</tr>
<tr>
<td>#X24 México-TEST NOT REAL: Partial collapse of west terminal at México City airport poses problems</td>
<td>#X24México-PRUEBA NO ES REAL: El desplomeparcial de la terminal oeste del aeropuerto de México D.F. pose problemas</td>
</tr>
</tbody>
</table>

Once a tweet went out, students who represented the “response” part would respond or those followers who participated through Twitter. Not all the information on Twitter was
about the exercise; so several students were tasked with filtering out information not related to the exercise. Filtering “noise” from actionable information became a major task at different times as different topics and players were involved.

Once the tweet was sent out to the followers of the account, they are viewed by the public, especially if the hashtag (#) was used, such as “#Exercise24, #X24, or #UnoMexico.” These hashtags were used in X24 Mexico. Information flow is rapid and can be given to many people with one simple tweet. Though overcoming the language barrier between the United States was an obstacle, it was made easier with student participants who are fluent in Spanish. Students were able to translate the tweet for the storyboard. Twitter was able to help with translations. Twitter is used in many languages such as Chinese, Danish, Arabic, French, Korean, Russian, German, Spanish, Italian, Portuguese, English, Indonesian, and Hebrew, among others (Twitter, “Translation at Twitter”). Tweeting in other languages obviously requires being able to use the keyboard and type in these other languages, so the special characters used in Spanish are possible to type.

The students, who were able to translate during the exercise, were innovative in dual-language tweeting. By doing this, they are sending a tweet that targets both language users at the same time. For example, one of the best advocates of dual-language tweeting is Shakira, a multi-national recording artist. She tweets in Spanish, French, and English. Her tweets go to about fourteen million people (as of this writing). The U.S. government isn’t capable of that; President Barack Obama is the leading government officials and ranks 7th with about twelve million followers (Twitaholic). The major disaster organization, FEMA, has about 106,000 followers with one of the leading disaster people, Craig Fugate, who leads FEMA at 22,000 followers; the San Diego County Emergency Operations Center has only 6,400 following it which is used in a one-way broadcast mode. Most of the participants in X24 Mexico were impressed with the capabilities of social media because they were able to recognize the value it could bring to emergency response.

Participants in X24 México were brought together to test those capabilities. By doing so, they would understand the strengths and weaknesses of each other and the tools, help with implementing new technologies, and establish contacts not just with the agency but an individual within the agency and listen to different perspectives that can inspire bi-national ideas. The more these exercises are played out internationally, the more lessons are learned
and the better people involved in emergency services, public safety, public health, and international humanitarian assistance and disaster relief, are able to perform their duties and responsibilities to saving lives locally, nationally, or abroad.

Part of the planning process for X24 Mexico was the creation of a dashboard that was available to the public to help combine multiple Twitter feeds, maps, wiki, and video in one screen. It featured three separate Twitter feeds representing three different accounts where the information regarding the tweets that were being sent out by the students and the followers that were responding. Along with the Twitter feeds was a real-time map that pinpointed the areas in Mexico that were being affected with pictures developed by individuals at the Viz Center for the exercise. The dashboard made the emergency simulation much more understandable and easy to follow. On that same dashboard, participants and observers could select any tab like registration, survey, general information, scenario science, and documents for future references. According to the survey, participants really liked the implementation of the dashboard because it guided them through the scenario. They believe that future implementation of a dashboard in real natural disasters can help provide a full-scope of a natural disaster by utilizing social media and other ideas like cloud-computing and crowd sourcing.

Another group of participants that had an impact on the development of the exercise are the individuals in public health. For example, they were quite interested in the following objectives for the exercise:

- Add public health consequence management and interagency collaboration and keep up-to-date with crisis response technologies.
- Assist Mexican law enforcement personnel and medical personnel in better structuring of their medical examiner system, with emphasis on guidance during mass fatality events.

These are just a few of the goals and objectives provided by the participants who registered to share their experience in the exercise. The best part is that most of those who filled out the surveys achieved what they wanted from the exercise. They established the connections, learned about the integration of social media, and learned more about the science behind several natural disasters. Most importantly they learned about their own capabilities and those of others.
CHAPTER 7

WORKING RELATIONSHIPS IN A MULTI-CULTURAL ENVIRONMENT

We rarely take into account the numerous factors taking place in a minimal encounter. If conversations are our way to build relationships, then communication is an important factor that has to be established.

Communication is symbolic, a process involving the transmitting and interpreting of messages, involves the creation of meaning, takes place at varying levels of awareness, and makes predictions about outcomes, among others. (Gudykunst and Kim 10)

If we add another ingredient to this process such as culture, then we have multi-cultural communication and as the process develops, so will the strength of relationships. We speak with many people each and every day. It doesn’t matter if the relationship or interaction is casual, personal, or professional, the important aspect is that the human interaction will occur. Relationships and interactions are important for our personal and professional development. In order to succeed in what it is that we want, we establish relationships to help guide us and achieve our goals. What we make of those relationships and interactions is what we decide to do with them.

A relationship may be established for professional, personal, or casual reasons but are established nonetheless. Humans are social creatures and because of that we look to socialize with others. Everything we do requires a type of interaction, either it is personal, professional, social, or a combination of a few. Thus, we establish relationships in order to improve upon or accomplish a goal. The importance of relationships is simple: we need them. But when we need them for emergency situations they become much more valuable and necessary. This is why training and exercise simulations are important. These types of performances allow for the development of interactions and relationships for the betterment of a community, state, or nation. When you take into consideration everything that involves saving lives in a natural, technological, or man-made disaster whether it is local, national, or international, it becomes a complex system of process, regulations, and procedures.
In X24 Mexico, the participants had different responses when it came to building relationships. For example, one participant commented that relationships are the glue that allows for these types of exercise to succeed and improve. One participant also commented that they were able to establish seven new relationships including the Mexican Army and Navy. These relationships were important because they provide direct contact with individuals in Mexico who can assist in further incidents that affect both countries. Another participant made contact with private industry contacts such as AreoBridge to help them move container clinics in real disasters, which was very important to them because they didn’t have that capability themselves. At the same time, they also made contact with individuals in the response technology field for (HADR) efforts. Others were able to establish contact with the following participant and observers such as:

- Pacific Regional Disaster Preparedness Center
- American Red Cross
- Interworks Institute
- INMARSAT
- Council of Community Clinics
- R2 Emergency Technologies
- CalEMA
- San Diego State University
- Wamar Technologies LLC
- Mexican Army
- Mexican Navy
- Mexican Civil Protection
- NIUSR Walking Drum.

Like any exercise or training, everything is a work in progress and, therefore, lessons are learned to make events like Exercise 24 better. Building the relationships allowed for open channels of communications to work together and avoid bureaucracy. According to the information collected from the surveys, the following are the rating results of experience and relationships. On a scale of 1-5, one being not good and five being exceptional, the average for experience was 4.2 and the average for relationships was 4.4 (Figure 10). Figure 11 is a graph of the established relationships during X24 México according to the responses from the survey. Both graphs display the information gathered by the participants after the exercise.

Other aspects that play roles in international disaster coordination are cultural diversity and language. Language was definitely one of the major components because if the
Figure 10. Rating of X24 Mexico. The results for the ratings given by the participants regarding experiences and relationships were both high. The scale to calculate the ratings was 1-5 (1=not good, 5=really good). Source: Ramirez, Marilu M. “X24 Mexico Survey.” Cloudrelief.org. SDSU Viz Center, 18 Dec. 2011. Web. 15 Feb. 2012.

Figure 11. X24 Mexico and relationships. The graph displays a few of the relationships established by the participants. The calculations ranged from 0-12 relationships per participant. Source: Ramirez, Marilu M. “X24 Mexico Survey.” Cloudrelief.org. SDSU Viz Center, 18 Dec. 2011. Web. 15 Feb. 2012.
participants weren’t able to communicate, then there would have been an issue with establishing any type of relationship. Many participants and observers didn’t have issues with language and translations. Many were able to communicate both in English and in Spanish. There were translators available and this made the experience much more easy and enjoyable for the participants because they were able to communicate and share ideas that would benefit each other. One of the things that were taken into account is the importance of being bilingual. Many commented that being able to communicate in more than one language is a huge asset because it opens doors and directly facilitates success when working in bilingual settings.

Since this exercise was multi-national, it was essential to take into account the concept of cultural diversity. Culture is a set of norms that set standards for a society of what is acceptable behavior. Cultural diversity is the quality of diverse or different cultures. Because of this, X24 Mexico enjoyed a richness, not available in other exercises because it misses this component. Cultural diversity makes our country richer by making it a more interesting.

Cultural diversity also makes a country stronger and better able to compete in the new global economy. People from diverse cultures bring language skills, new ways of thinking; create solutions to difficult problems and negotiating skills. (“What Is Cultural Diversity?”)

With globalization, the world is far more interconnected and more cultures are merging together. The ability to learn from others that may have a different perspective is very valuable.

In every culture there are basic standards for social interaction such as personal space, distance, eye contact, amount of body language displayed in public, negotiating style to name a few, there wasn’t any visible issues during the exercise. Personally, in America we tend to stand about eighteen inches apart when engaged in normal conversation depending upon the relationship. One who has been born with both cultures, like the American culture and the Mexican culture, which are on the opposite scale when it comes to personal space, can automatically tell how to stand when engaged in conversation with individuals from different cultures. In America, direct eye contact is preferred, negotiations are direct and we are always asking the other party for their “bottom line.” Other cultures may stand “closer or father than we are comfortable, may view direct eye contact as rude, [and] be more or less
open to displaying body language” (“What Is Cultural Diversity?”). However, this part in X24 Mexico didn’t seem to cause issues because people understood the standard for social interactions.

**ANALYSIS OF RESULTS**

Since the experiences in X24 Mexico helped explore the importance of working relationships and cultural diversity as well as knowing the goals and objectives, it has allowed us to gather information and summarize results. Just like there are successes; there are also things that need improvement. The participants rated X24 Mexico a success, regardless of needed improvements. Technically, X24 Mexico created a foundation on which we could construct a new paradigm.

According to George Bressler and Michael Fernandez, the survey illuminated some areas that could be improved:

- Too many things going on at the same time.
- There were separate clusters where some were not involved.
- There needs to be more incident exercise response interaction between the information being placed on tweets and the participants at the exercise.
- More contact with participants who were part of the exercise but not at the exercise site.

A few issues that were faced by the participants should be easy to address. At the end of the exercise participants were able to voice their opinions and set recommendations for “Exercise 24 NEXT,” the continuation of Exercise 24, X24 Europe and X24 Mexico. Some of the recommendations as noted by Bressler and Fernandez were the following:

- During the planning process, there should be a timely delivery of information to prepare injects.
- Creation of a landing page that points where to go and summarizes everything.
- Inviting faith-based NGOs.
- It would be useful to have a pop-up of an image in between tweets.
- Organizations, industries, any other player needs to submit objectives and goals a few weeks prior to the exercise and identify a representative and their capabilities.
- Mapping tweet locations to establish statistics and incorporating non-social media parts for those that can’t text or use a mobile phone.
There are many benefits that come from exercises. The participants and observers themselves identified what were their main goals and objectives. Exercises can provide an amazing benefit by building relationships, preparing for future natural disasters, and establishing new ideas in which systems and procedures can be approached to save lives. There was one common thread among participants which was that they all had come together to save lives in future events. What more can we ask for than the ability to prepare and respond to disasters that will help improve our ways and take advantage of the new technology and tools such as social media.

If the scenario for X24 Mexico is a virtual approach to saving lives and testing out new ways of preparedness and response, the best that can be done is learn from the experiences and prepare for “Exercise 24 NEXT.” The exercise is an example of what can be done to improve response and recovery during disasters. Participants’ experiences gave us a new way of exploring usable information for a complete after-action report; one that includes not only the quantitative data but also the qualitative information which relates to peoples’ feelings and attitudes.

X24 Mexico is just the first of many simulated exercises in which qualitative information is considered and explored because it provides an in-depth understanding of what is really happening during the exercises and how that helps to develop a positive working environment. It is an innovative approach to bring people together to learn from their capabilities for response and recovery efforts in natural disasters. X24 Mexico is a great example of the effectiveness of exercises because it connects people as they discover each other’s personalities, attitudes, opinions, and behaviors. In this positive working environment, people are able to voice their perspectives to make things better. This exercise is the first step in a process of establishing bi-national level exercises between Mexico and the United States. Exercises that will help alleviate impacts and challenges that both countries will potentially face in the future.

**CONCLUSION**

In order to become a more resilient nation, both Mexico and the United States need to prepare for emergency disasters to be able to effectively and efficiently respond to and recover from such events. Once the importance of developing emergency plans is
understood, they can therefore be tested through exercise. Through natural disaster exercises response capabilities are improved and prepared. One of the best aspects of exercise is relationship building between various organizations, agencies, and industries. This collaboration enables participants to explore solutions. Most importantly, learning from the experiences of the participants helps improve the execution of future simulations and future real world disasters. This thesis explores important aspects of preparedness through disaster exercises. There are several conclusions that can be drawn:

- Natural disasters resulting from hazards can overwhelm our human system. They are not pre-determined and not all hazards become disasters; therefore, information sharing, awareness, education and hazard training can reduce the level of impact. The more we know, the less effect natural hazards will have on local communities, regions, and nations.

- Hard lessons from past disasters have taught us that emergency preparedness is essential for proper response and recovery. Effective communication and coordination makes a difference to adequately perform individual responsibilities.

- Due to the proximity and connection of Mexico and the United States in the political, economic, and social realm, we need to keep the relationship strong. Therefore, working relationships are important. Cross-cultural understanding and interactions facilitate the ability to respond to natural disasters in Mexico and the United States.

- Natural disaster exercises are an effective way to learn about emergency response and recovery because they provide a positive environment in which failure is a positive. The mistakes we make in an exercise can be corrected and improved.

- Qualitative information is a valuable asset to an after-action report on exercises. It allows the participants to voice their opinions, thoughts and feelings. The research into this type of analysis will provide something more than just statistical data.

- Feelings of empowerment and confidence make a difference in the area of emergency response. It allows for a paradigm that is constructed through collaborative analysis on a multi-national level which creates innovative solutions.

Therefore, encouraging natural disaster exercises between Mexico and the United States will strengthen the relationship they currently have. Furthermore, implementing a qualitative analysis will provide an in-depth view of what coordinated emergency response and recovery between Mexico and the United States can establish. Further research efforts to define relationships, cross-cultural cooperation, and emergency response through natural disaster exercises are important. This type of research will provide more in-depth results for best practices and approaches to emergency response.
WORKS CITED


APPENDIX A

X24 MEXICO ONLINE SURVEY
X24 México
Anonymous Online Survey

1. Organization Name
2. What you hope to accomplish
3. Did you achieve your objectives?
4. Did language/translation play a role in the exercise?
5. Did you need a translator to make contact with participants?
6. Was there cultural difference that your organization, as a participant or observer, faced?
7. What are the best resources used so far? Why?
8. What were the issues that you experienced as an organization/participant?
9. How can those issues be improved?
10. What relationships/partnerships have you established? With who?
11. How many relationships/connections did you establish?
12. Were some of the relationships/connections important to your organizations? If so, why?
13. What do you considered most important during the exercise?
14. Anything that you would like to share? (Additional Comments)
15. Rate your experience (1=poor, 5=excellent)
16. Rate your interactions/connections (1=none, 5=important)
APPENDIX B

PICTURES OF X24 WORKERS
Figure 12. X24 Mexico participants waiting to launch the exercise.

Figure 13. The participants listening in on a presentation on assistance and response.
Figure 14. Dr. Robinon giving the first news update for X24 Mexico on the sciences behind the exercise.

Figure 15. Participants collaborating and discussing their approach to the scenario according to their organizations.