Miami-Dade Emergency Operations Center
Field Research Report

A Report

Submitted to the Graduate School
of the University of Notre Dame
in Fulfillment of the

Zahm Travel Grant

by

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Grant Details

Background:
Hurricane Katrina was one of the most expensive and devastating natural disasters in American history. Over half a million people were affected by the hurricane, and the US energy infrastructure was severely damaged. Hurricane Katrina and other natural disasters clearly show the need for improvements in crisis management, especially in training and collaboration among federal, state, and local governments. Stemming from this need, in 2007, the National Exercise Division within FEMA's National Preparedness Directorate introduced and implemented the National Exercise Program. In our work, we are creating a socio-cognitive technical simulator and training facility for upper level emergency managers and a tool for cognitive scientists to study the decision making process under emergency conditions. Specifically, in our research, we are creating a virtual Emergency Operations Center (EOC). An EOC is secure location in which upper level managers gather together to coordinate and respond to emergency situations (e.g. earthquakes, tsunami's and hurricanes). In order to accomplish this, we are working closely with one of the foremost Emergency Operations Centers in the USA - the Miami-Dade County EOC in Miami-Dade County, Florida. We are collaborating with Emory University and Florida International University (FIU) as well.

Research Goals:
I went down to Florida last Spring to study emergency management, emergency procedures within the EOC, critical decision-making at the EOC, and the culture and customs of emergency managers. A secondary goal of this research was enhanced collaboration with our collaborators at Florida International University and Emory University.

Travel Dates: May 12 – November 12, 2009 with an extension through February 2010

Budget:
The main budget requirement was housing. The total housing expenses for this trip were 9 months of rent at $850 per month for a total cost of $7650. The approved Zahm budget for this trip was $4000. I have assumed responsibility for the cost difference.

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Abstract

Because of their location and experience with hurricanes, the Emergency Operations Center (EOC) in Miami-Dade County, Florida, is considered one of the top EOC's in the country and an ideal location for field research. For the past 9 months, I have been conducting field research with Miami-Dade County. I went down to Florida last Spring to study emergency management, emergency procedures within the EOC, critical decision-making at the EOC, and the culture and customs of emergency managers. A secondary goal of this research was enhanced collaboration with our collaborators at Florida International University and Emory University. In this report, I describe my experiences and results as a field researcher with the Miami-Dade Emergency Operations Center in Miami, Florida.

Introduction

An Emergency Operations Center is a secure location where upper-level emergency officials gather to prepare for, manage, and coordinate the response to an incident (e.g. tsunami, earthquake, hurricane, pandemic). In day-to-day operations, emergency management staff are involved in preparedness and mitigation strategies for future crises (ICS 1 2002). They are organized into Health and Human Services, Systems, Planning and Preparedness, Infrastructure and Recovery, and Personnel and Administration. See Figure 1.

When a disaster strikes, however, the emergency management staff drop their day-to-day roles and take on the role assigned to them by the Incident Commander. This role usually involves leading a section or branch of the incident command system or ICS (Johnson 2010). There are four main branches in accordance with ICS. The main sections are operations, planning, logistics, and finance/administration. Operations is further organized into four branches: Public Safety, Human Services, Infrastructure, and Municipal. Planning consists of Geographic Information Systems (GIS), the 311 Public Information Call Center, and three units to aid in incident planning and documentation. Finally, Logistics is divided into EOC Support and Disaster Resources. See Figure 2. The operations, planning, logistics, and finance/administration sections constitute the general staff. Leading the general staff and assuming responsibility for the incident is the Incident Commander. See Figure 2. The Incident Commander has additional support staff as well, called the command staff, which includes a public safety officer, a public information officer, and a liaison officer. (Irwin 1989). Figure 2.

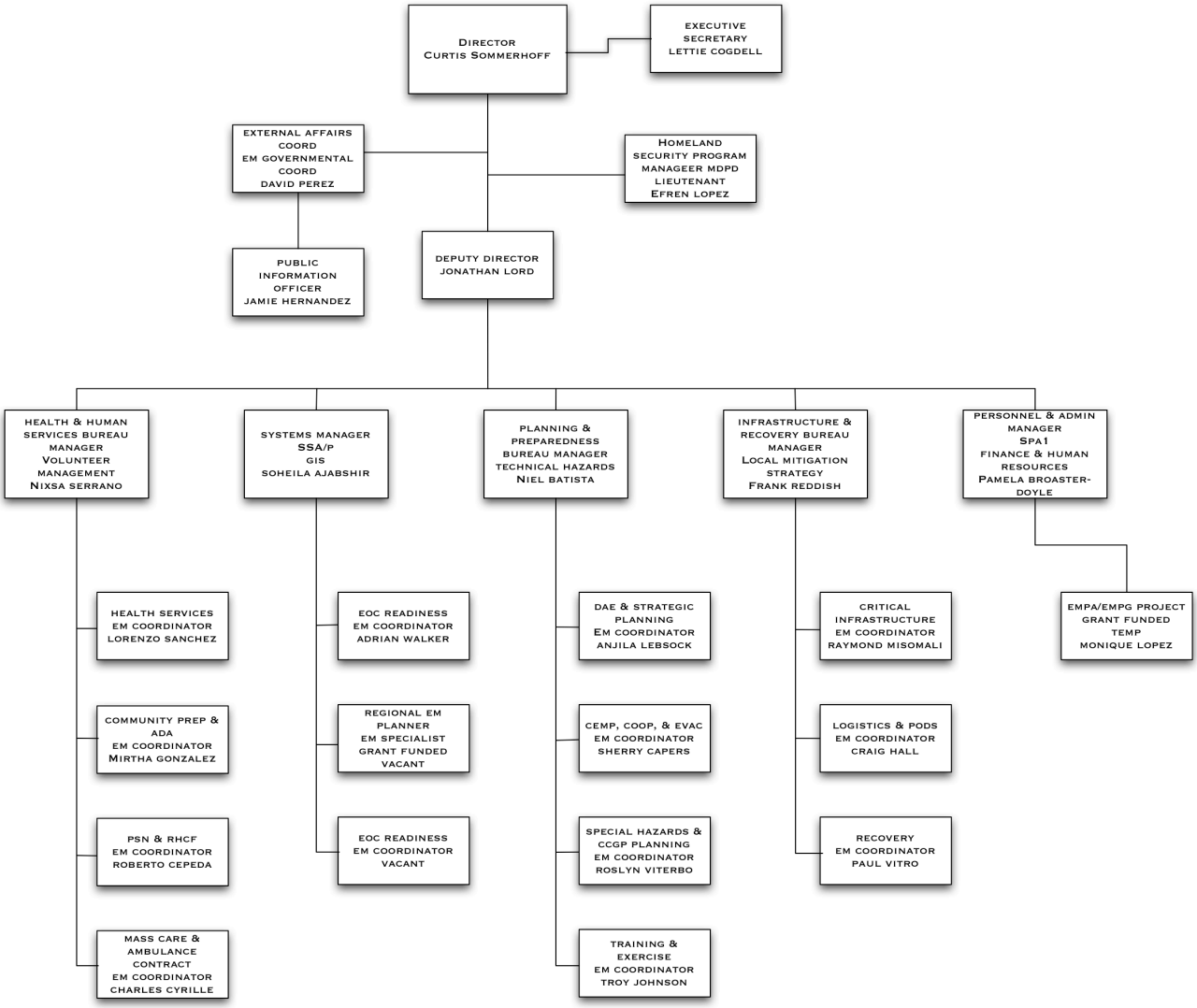


Figure 1: Department of Emergency Management organizational structure. This is the day-to-day structure of emergency management at the Emergency Operations Center.

Background

Training and exercise are critical to the success of emergency management at the EOC: "Building essential response capabilities nationwide requires a systematic program to train individual teams and organizations – to include governmental, nongovernmental, private-sector, and voluntary organizations – to meet a common baseline of performance and certification standards. Professionalism and experience are the foundation upon which successful response is built. Rigorous, ongoing training is thus imperative." (National Response Framework 2008)

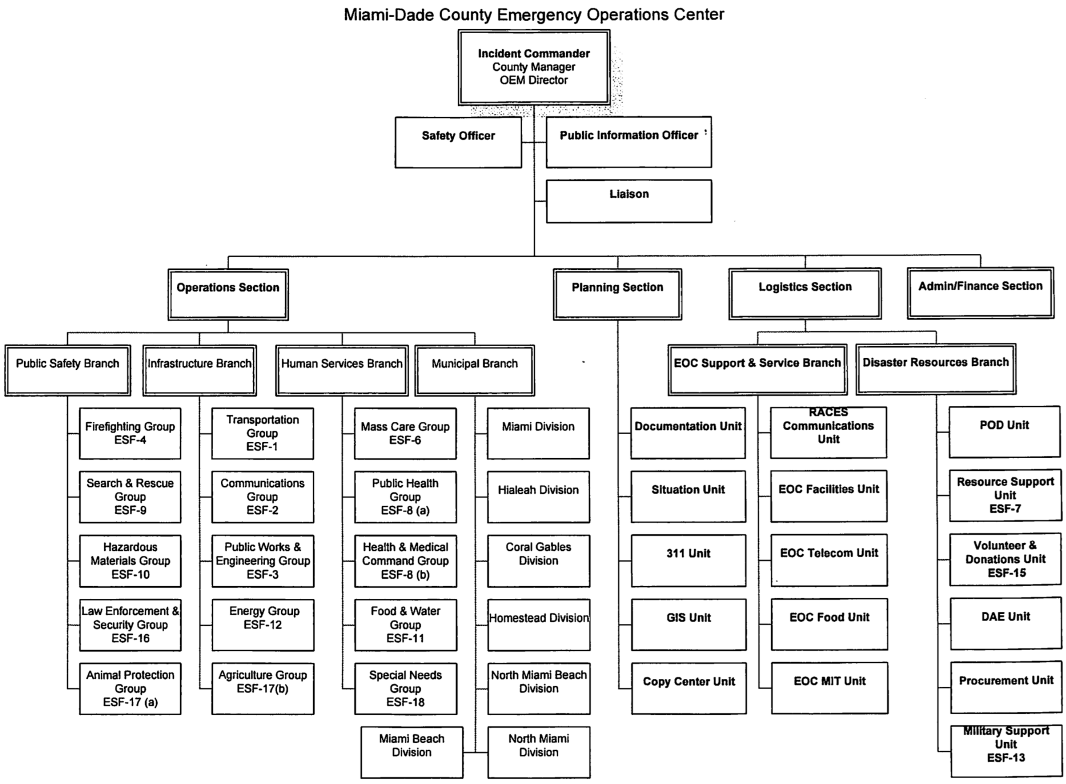


Figure 2: Incident Command System (IS-100.a 2008). The command staff, the general staff, and the agency liaisons assist the incident commander during an emergency.

In the current crisis management arena, much of the training is conducted via live or face-to-face exercises. (Agrait et al. 2004) There are a number of limitations, however, to current training solutions. First, crises, by definition, are rare events, and therefore they do not enable extensive training. Moreover, in the middle of a crisis, few organizations have the time or resources to train new personnel; Their foremost concern is on stabilizing the crisis, not on training individuals. (Sniezek et al. 2002) Another limitation of face-to-face solutions is that there are few experts available, and each expert is inherently constrained by limited time, experience, and perspective. (Sniezek et al. 2002) In addition, there is the difficulty of training teams, training selective components of the incident command hierarchy, and training upper-level managers. (Green 2001, Sniezek et al. 2002) In fact, while there are multiple computer-based solutions available for first responders, current research identifies a general lack of computer-based training that targets upper-level emergency managers. (Agrait et al. 2004) Moreover, the training that does take place can be ineffective because most instructors use subjective measures and usually end up emphasizing outcomes over decision management processes. Finally, in face-to-face and instructor-centric solutions, there are usually inherent time delays in the feedback as experts analyze the student's progress, compare the student's actions and outcomes to the expected actions and outcomes, and tailor the feedback to the individual. (Sniezek et al. 2002)

Computer-Based Solutions to Emergency Management Training

Computer-based solutions to training, on the other hand, can adequately address these limitations. Computer-based training allows emergency managers to train new personnel without being in the middle of a disaster. Moreover, computer-based training allows personnel to train more frequently than they otherwise would be able to in live and face-to-face exercises. In addition, they enable distributed access to data, resources, communication, and training. Computers also enable teams to train selective portions of the emergency management hierarchy. Finally, whereas feedback has delays in non-computer solutions, feedback can be immediate in a computer-based system.

Crisis Information Management and Training System

Recognizing the need for computer-aided training and incident management, Miami-Dade, along with several other counties in the region and throughout the state of Florida, began using WebEOC earlier this year. WebEOC, a product released by ESi Acquisition Inc., is a web-based crisis information management system that enables agencies and staff within the EOC to share real-time information in a secure manner. (DuVal 2008) One of the main features of WebEOC is that anyone with proper administrative rights can create a board, which is the main vehicle for collaborating and sharing information. Boards are interfaces with various views that enable individuals with proper access rights to input, modify, and view data that is stored in a backend database. Administrators assign various levels of access rights for each board and each registered user. See Figure 3.

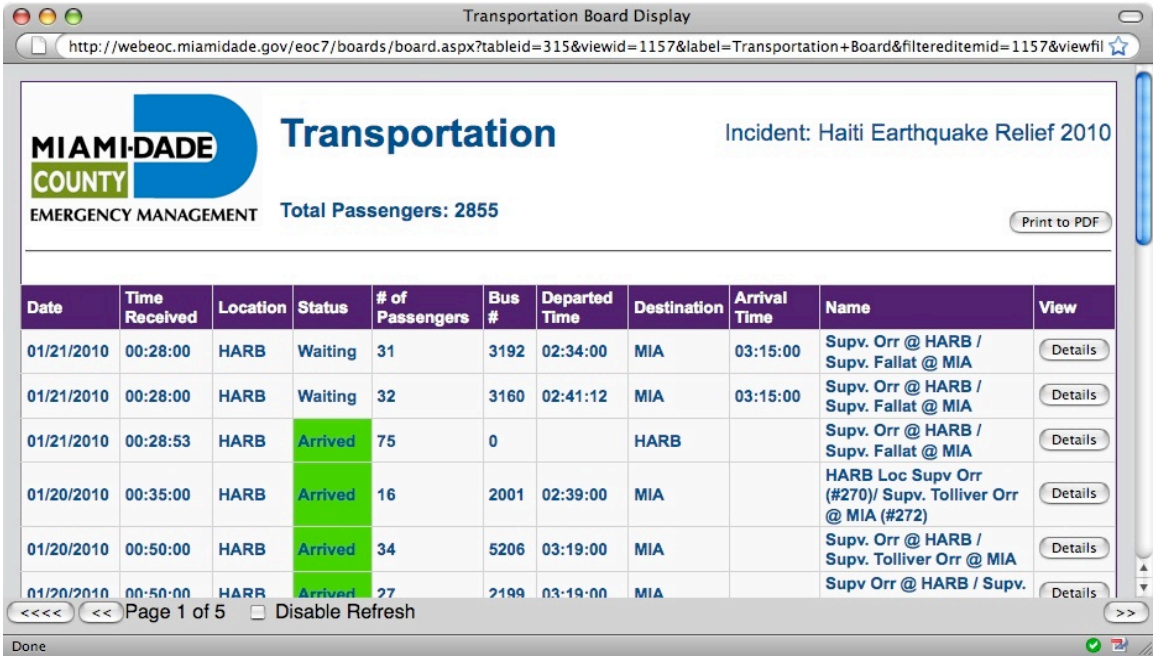


Figure 3: A WebEOC status board.

Another feature of WebEOC is a training simulator. The simulator, however, is not user-friendly, and it is cumbersome to set up and run exercises. Setup involves going through hundreds or thousands of entries from various boards and modifying them to create the simulation. See Figure 4.

Because of this, and because of the lack of current training tools, Miami-Dade county invited me down to Miami to conduct this research and to collaborate with them on this tool.

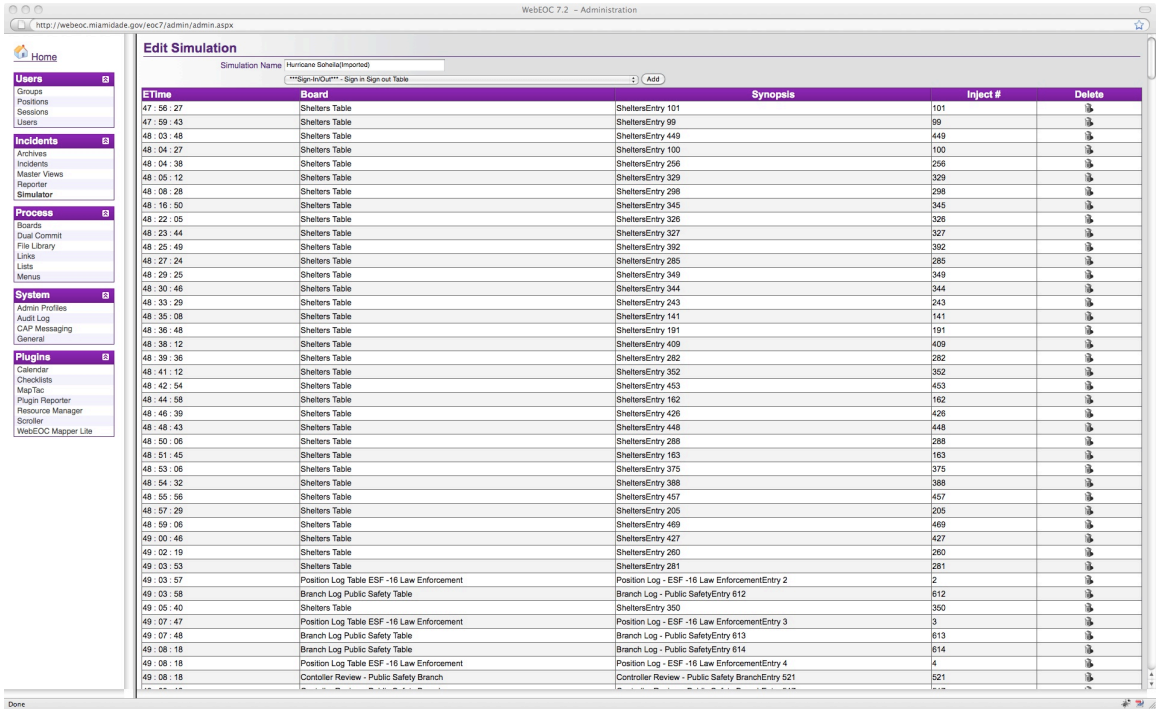


Figure 4: An example simulation in WebEOC. In this case, the user has to configure hundreds of injects for the exercise. In addition, if the structure of the boards have been changed since the original gathering of the data, then the injects may not reflect this change (WebEOC Administrator Manual 2009).

Project Ensayo

In this research, I am designing a socio-technical emulator and training facility for upper-level emergency managers. This tool is important because it enables emergency managers to train under crisis conditions in a virtual arena. There are several key features of this software. First, it targets upper-level emergency managers, hereafter referred to as emergency managers. Second, it allows emergency managers to access databases, to coordinate emergency response, and to train in a virtual environment. Since our system is web-based and distributed, it allows mangers to train from anywhere from any computer that has a web browser. Second, this system has special feedback mechanisms that tell the emergency manager the effects of his/her decisions. These mechanisms take the form of charts and graphs of critical data that vary depending on decisions made. Another aspect that makes this system unique is that individuals are still able to train even if all personnel are not present at the EOC. In particular, we augment the environment with artificially intelligent agents to facilitate training even if all of the trainees are not available.

In addition to a training facility, this system also servers as a research tool for cognitive scientists to study the decision-making process under emergency conditions. This tool is important because current research practices in emergency management consist of waiting for a crisis to occur, and then questioning the emergency responders as to their decisions and actions during the situation. This process is extremely time consuming and subject to survey and responder biases. With Ensayo, on the other hand, we can log and analyze each decision and as well as its effects. (Becerra-Fernandez et al. 2007; Becerra-Fernandez et al. 2008; Madey et al. 2009; Nikolai et al. 2009)

Field Research in Miami-Dade

Due to the recession, Miami-Dade County has been undergoing severe budget constraints. (Office of the Mayor 2009) Subsequently, several positions were eliminated, including the EOC Readiness position (see Figure 1). Part of these responsibilities were assumed by the Systems Management Group, and this is where I filled-in on a day-to-day basis. Under the direction of Soheila Ajabshir, the Information Technology Systems and Support leader and GIS Unit Leader at the EOC, I had a variety of responsibilities, including creating and maintaining an inventory of the EOC equipment, helping to tweak the implementation and to administer WebEOC, keeping equipment up-to-date and software up-to-date with patches, and working with various information technologies to make processes more efficient and effective. At the same time, I was conducting field/action research. I set out to study emergency management and the organizational structures and processes of the EOC.

Research Methodology

I began my field research as an ethnographic study of emergency managers. First, I began with a literature review and following the ethnographic methodological recommendations of Fetterman (Fetterman 2010), I began my ethnography in May 2009 when I embedded myself in the Miami-Dade EOC. I conducted informal and formal interviews and observed key personnel participating in training, exercises, workshops, and real activations. I also worked side-by-side with emergency managers. From mid-May through the end of December, I volunteered at the EOC for three days a week. The other two days, I devoted to advancing my software development and analyzing my experiences and findings from the week. In addition, I collected and analyzed key documents from the EOC, including past situation reports, after action reports, and exercises documents. In the process of this ethnography, however, I had to change my style to field research, and from this, I have discovered several insights.

Lessons Learned and Insights Gained

1. ***Take time before beginning to review ethnographic procedures***

   When doing an ethnographic study, it is imperative to take enough time to develop goals and a plan of action. I recommend at least two weeks of ethnographic literature review prior to engaging in the ethnography.

2. ***Do not underestimate the time it takes to get adjusted to the environment.***

   In this research, I was fully immersing myself in the emergency operations center,

and I underestimated the time it would take for me to adjust to the environment and to establish social networks.

3. ***You never know when something good will come up, and I stress the importance of carrying several tools on you at all times.***

For me, these tools were a voice recorder and a camera. For much of my time at the EOC, events were relatively routine. This year in particular, was especially routine because neither a hurricane nor a tropical storm threatened southern Florida. Even if a hurricane were to occur, there would be ample warning of the impending tropical depressions before they strengthened into hurricanes. The earthquake that struck Haiti on January 12, however, came with little warning. Suddenly, I found myself in the midst of an activation, and I did not have my camera with me. Luckily, my cellular telephone had a built-in camera that I was able to use on the first day of the activation. Otherwise, I could have missed much of the important action that happened that first day. This lesson taught me that I needed to have my camera with me at all times.

4. ***Be careful not to get too close to the people you are studying***

Due to economic constraints, budgets were being severely cut, personnel were losing their jobs, and the individuals who were remaining had to pick up the corresponding workloads. Amidst this environment, I found it more and more difficult to extract myself from "working" in order to interview personnel and observe emergency procedures. I had acquired vital skills that were critical to the operation of the EOC, and toward the end of my research, the people at the EOC began to see me as an emergency manager and not as a researcher.

5. ***Take several weeks to adjust when you get back and write up your reports and ethnographic results.***

Writing items while they are fresh in your mind and in your notes are important to completing the study, especially before you start getting re-caught up in your research. In addition taking time to adjust upon return and make sense of your notes and analyses is just as important when returning as when beginning an ethnographic study.

Results

From this experience, I gained several important results:

1. ***Perspective on what emergency management encompasses, both in day-to-day and in emergency operations.***

I gained perspective on the organizational structure and processes of the emergency management staff in day-to-day operations as well as in emergency situations.

2. ***Certified WebEOC administrator***

I gained an excellent insights into WebEOC, the crisis information management system in use in 36 US states (WebFusion Regional Meeting 2010). I went to three advanced training seminars on WebEOC, and by the time 6 months had passed, I had

enough knowledge and experience to pass the WebEOC administrator certification examination. (Certified WebEOC Administrators 2010)

3. Federal Emergency Management Agency (FEMA) Independent Study Programs

I completed 16 FEMA Independent Study Courses.

- IS-00001 - Emergency Program Manager An Orientation to the Position
- IS-00100.a - Introduction to the Incident Command System, ICS-100
- IS-00100.HE - Introduction to the Incident Command System ICS-100 for Higher Education
- IS-00120.A - An Introduction to Exercises
- IS-00130 - Exercise Evaluation and Improvement Planning
- IS-00139 - Exercise Design
- IS-00200.a - ICS for Single Resources and Initial Action Incidents
- IS-00230.a - Fundamentals of Emergency Management
- IS-00235 - Emergency Planning
- IS-00240 - Leadership & Influence
- IS-00241 - Decision Making & Problem Solving
- IS-00242 - Effective Communication
- IS-00244 - Developing and Managing Volunteers
- IS-00800.b - National Response Framework, An Introduction
- IS-00820 - Introduction to NRF Support Annexes
- IS-00821 - Critical Infrastructure and Key Resources Support Annex

I also completed the FEMA Professional Development Series (FEMA Website 2009).

4. Gathered and analyzed various documents that were needed to complete my project

I gathered various documents that will assist in creating the virtual Emergency Operations Center:

- National Weather Service Updates/Advisories
- DEM&HS News Releases
- H1N1 Related Information/Updates
- County Employee Newsletters
- Drill/Exercise Messages
- Drill/Exercise Handbooks
- Drill/Exercise Inject Lists
- Photographs
- Staff Meeting Notes
- After Actions Reports
- EOC Process Documents (e.g. CEMP and staff checklists and Debris removal plan)
- GIS maps and base files
- Situation reports
- Staff checklists/continuity files

5. Established strong connections at the EOC and with my collaborators

I established strong connections with the personnel at the EOC so that I can contact them in the future for questions and system validation.

6. Experience assisting in a real crisis and two routine activations – the Haiti Earthquake and the Probowl and Superbowl.

In addition to participating in two functional exercises (Hurricane Suiter 2009; Operation Cassandra 2009) and a public learning exercise (Storm Zone 2009), I had the privilege of assisting with the relief operations for the Haiti Earthquake of January 2010. (USGS 2010, Nikolai et al. 2010) I also assisted in the Probowl and Superbowl, which both were held in Miami this year.

7. Published and presented a discussion paper in the International Community on Information Systems for Crisis Response and Management (ISCRAM)

I published and presented this paper at the ISCRAM Conference in Seattle in the May 2010. (Nikolai et al. 2010)

8. More insightful development on my virtual Emergency Operations Center.

I changed my perspective and my entire model of my virtual Emergency Operations Center.

- ***Changed mental models of emergency mangers***

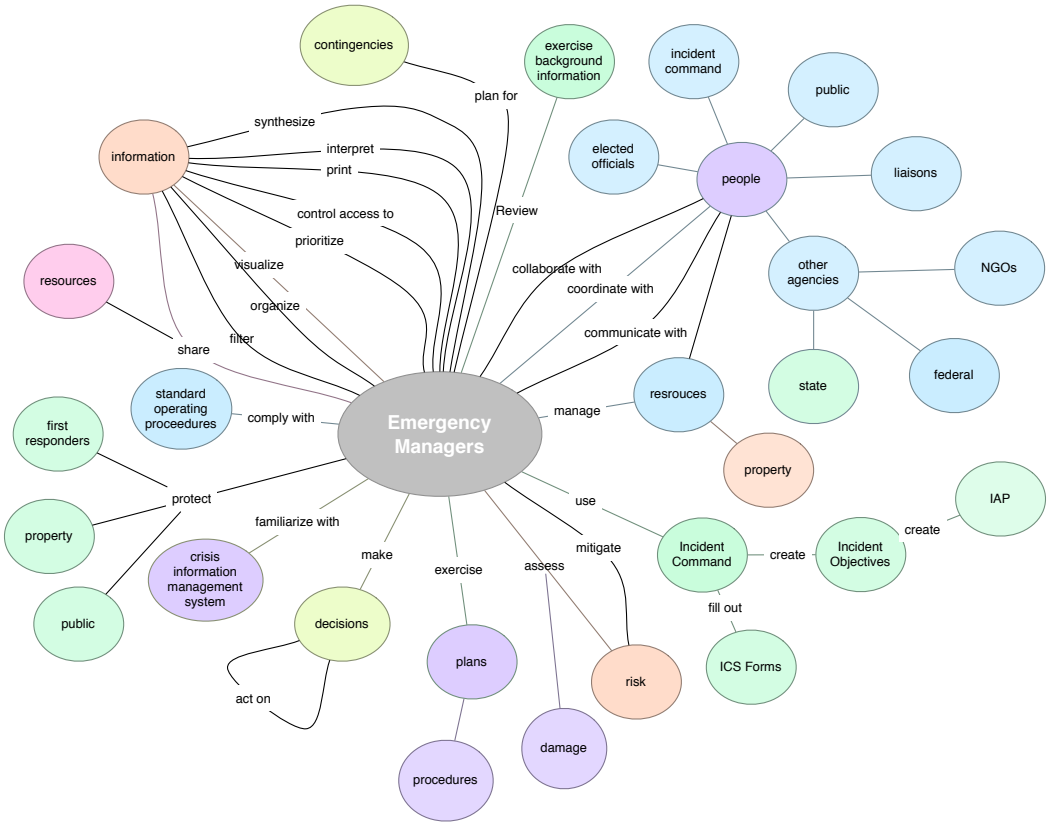


Figure 5: An emergency manager concept graph.

This concept map shows the various functions that emergency managers engage in on an on-going basis as well as during a crisis. The main activities center around both information and people.

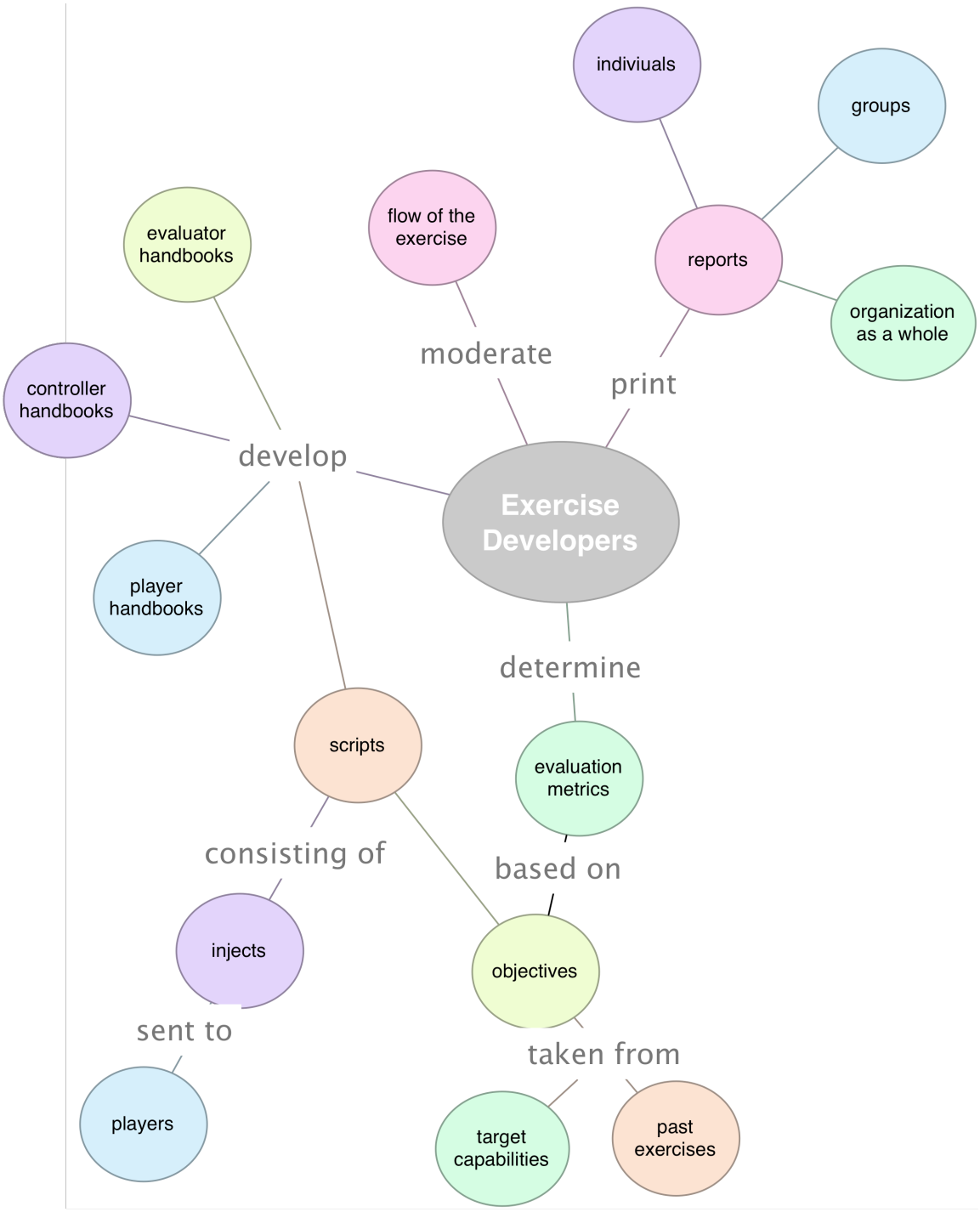


Figure 6: An exercise developer concept graph.

This concept map shows the various functions that exercise developers engage in when creating an exercise.

- **Built a model of logistical request processes**

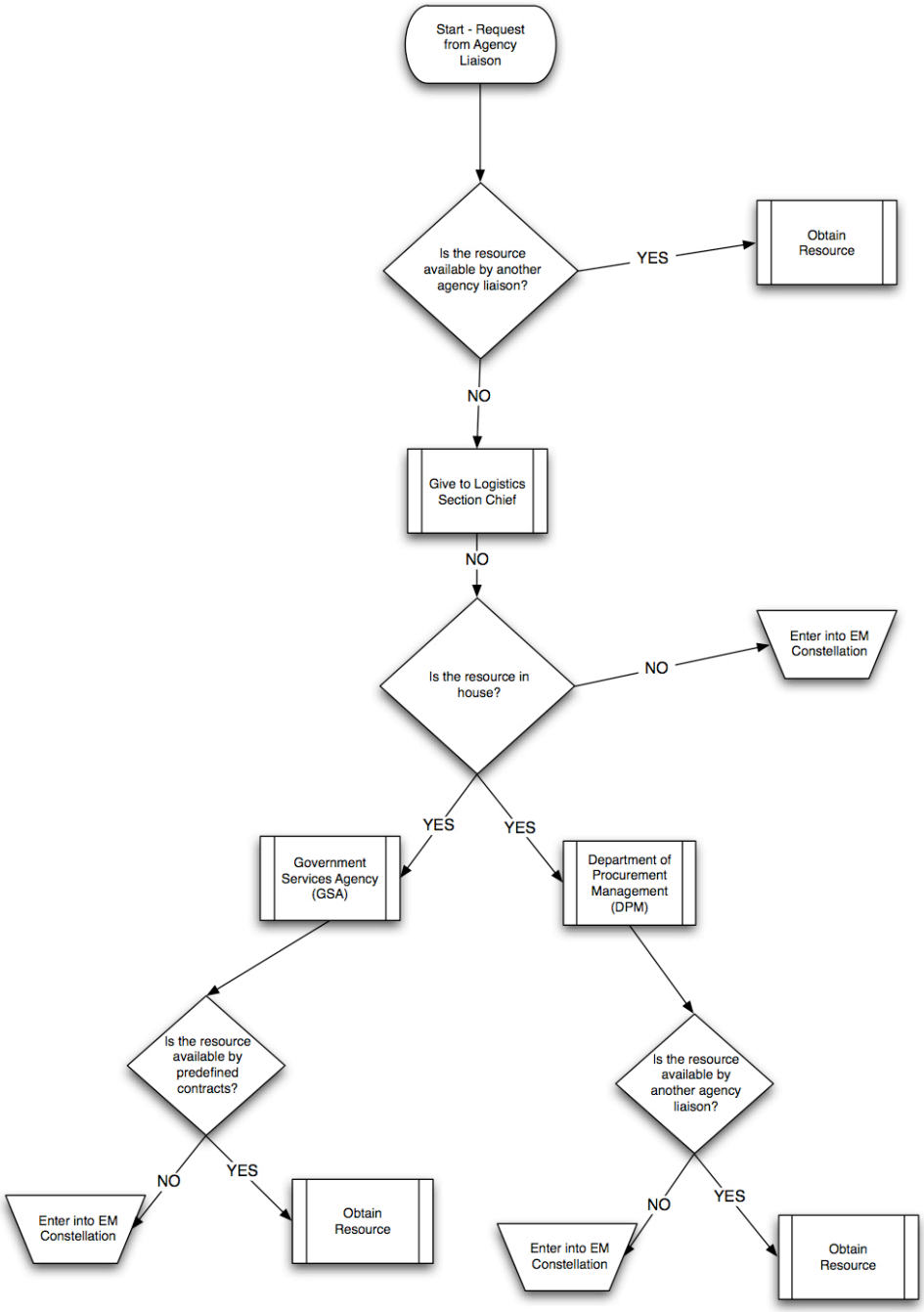


Figure 7: The logistics resource request process.

This process was obtained through interviews with Craig Hall, the Logistics section chief at Miami-Dade. This process outlines the roles of the Logistics Section Chief, the Government Services Agency, and Department of Procurement Management in obtaining

a resource. It also outlines how Miami-Dade county attempts to fill the request in-house first and then if this is not possible, it upchannels the request to the state (through the EM Constellation software program).

- **Improved vEOC Architecture**

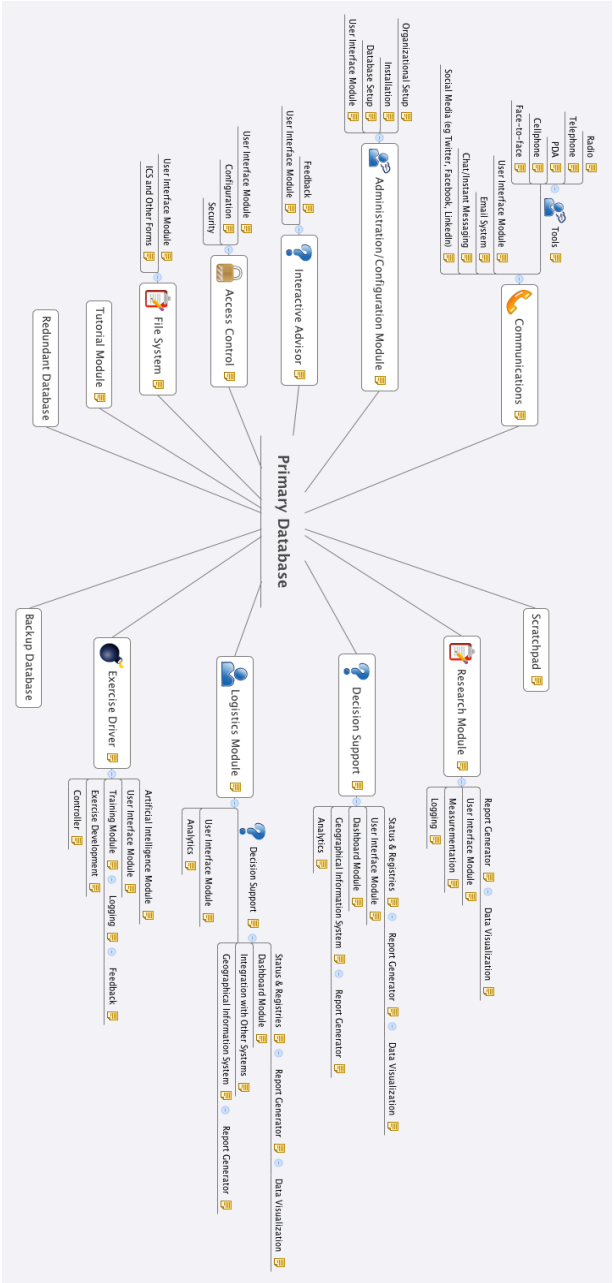
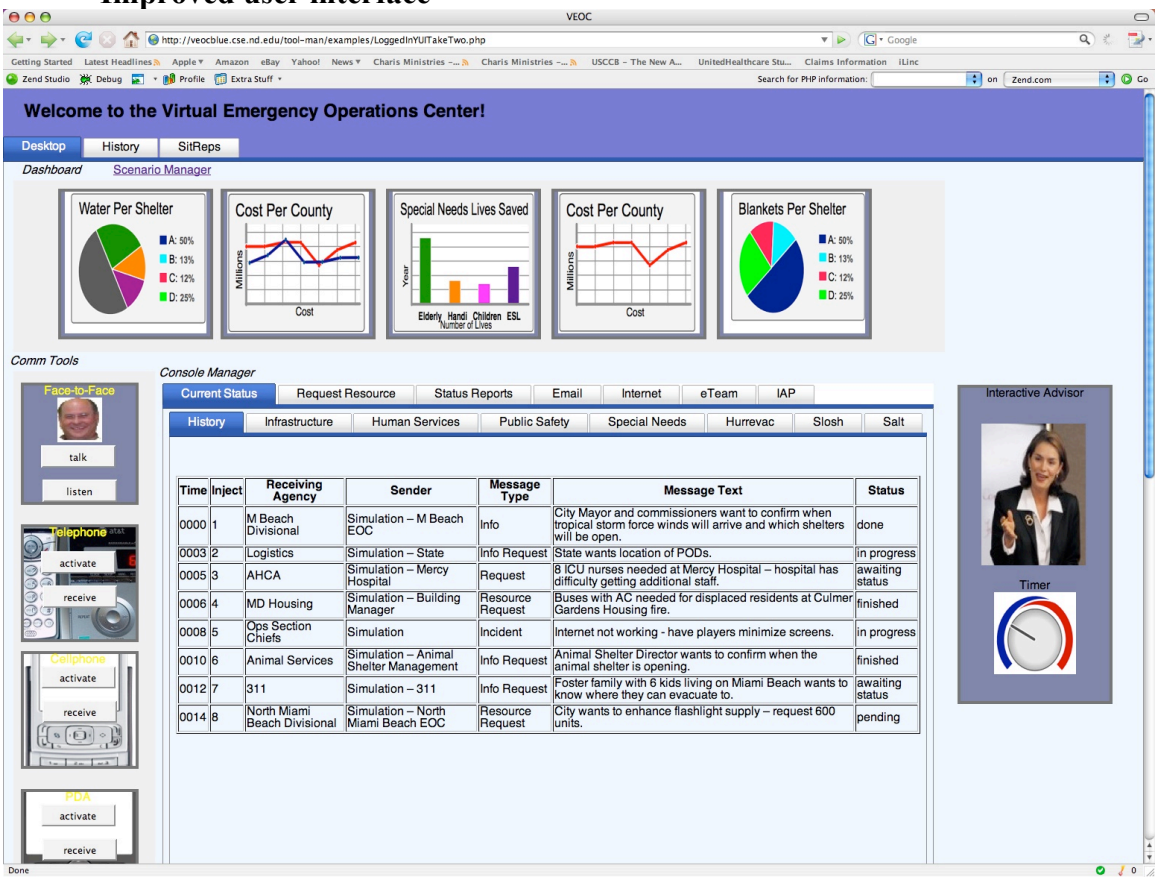


Figure 8: Improved vEOC architecture. The architecture has 13 main modules.

Due to my experiences in Miami-Dade, I discovered incomplete elements of the previous architecture. Some of these elements include a decision support system and the need for backup and redundant databases. This new architecture reflects these changes.

- **Improved user interface**



Time	Inject	Receiving Agency	Sender	Message Type	Message Text	Status
0000	1	M Beach Divisional	Simulation – M Beach EOC	Info	City Mayor and commissioners want to confirm when tropical storm force winds will arrive and which shelters will be open.	done
0003	2	Logistics	Simulation – State	Info Request	State wants location of PODs.	in progress
0005	3	AHCA	Simulation – Mercy Hospital	Request	8 ICU nurses needed at Mercy Hospital – hospital has difficulty getting additional staff.	awaiting status
0006	4	MD Housing	Simulation – Building Manager	Resource Request	Buses with AC needed for displaced residents at Culmer Gardens Housing fire.	finished
0008	5	Ops Section Chiefs	Simulation	Incident	Internet not working - have players minimize screens.	in progress
0010	6	Animal Services	Simulation – Animal Shelter Management	Info Request	Animal Shelter Director wants to confirm when the animal shelter is opening.	finished
0012	7	311	Simulation – 311	Info Request	Foster family with 6 kids living on Miami Beach wants to know where they can evacuate to.	awaiting status
0014	8	North Miami Beach Divisional	Simulation – North Miami Beach EOC	Resource Request	City wants to enhance flashlight supply – request 600 units.	pending

Figure 9: Old User Interface. A tab-based approach.

While at Miami-Dade, I discovered the need to restructure the user interface for the emergency managers. In the original prototype, the system used a tab-based approach and stored the information in the client's web-browser. (see Figure 9) Because there is a lot of information that emergency managers need some of the time, tabbed interfaces can waste space and become overloaded. An alternative to tabs, in a windows-based approach, each menu item creates a new pop-up window. This allows individuals to have more information readily available and to easily switch between various statuses. I also discovered the need to embed and store data in server side databases rather than in the client's web-browser, where I was storing data in the initial prototype.

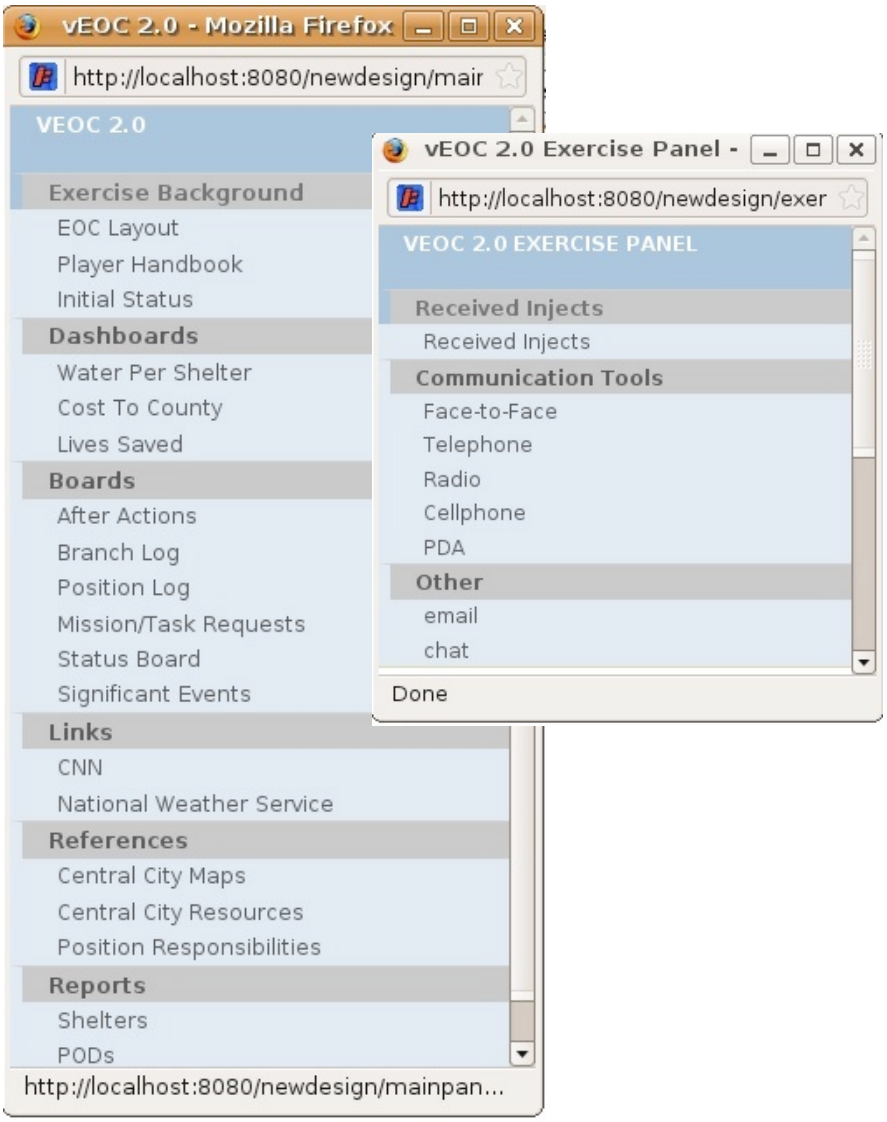


Figure 10: Improved user interface – a windows-based approach.

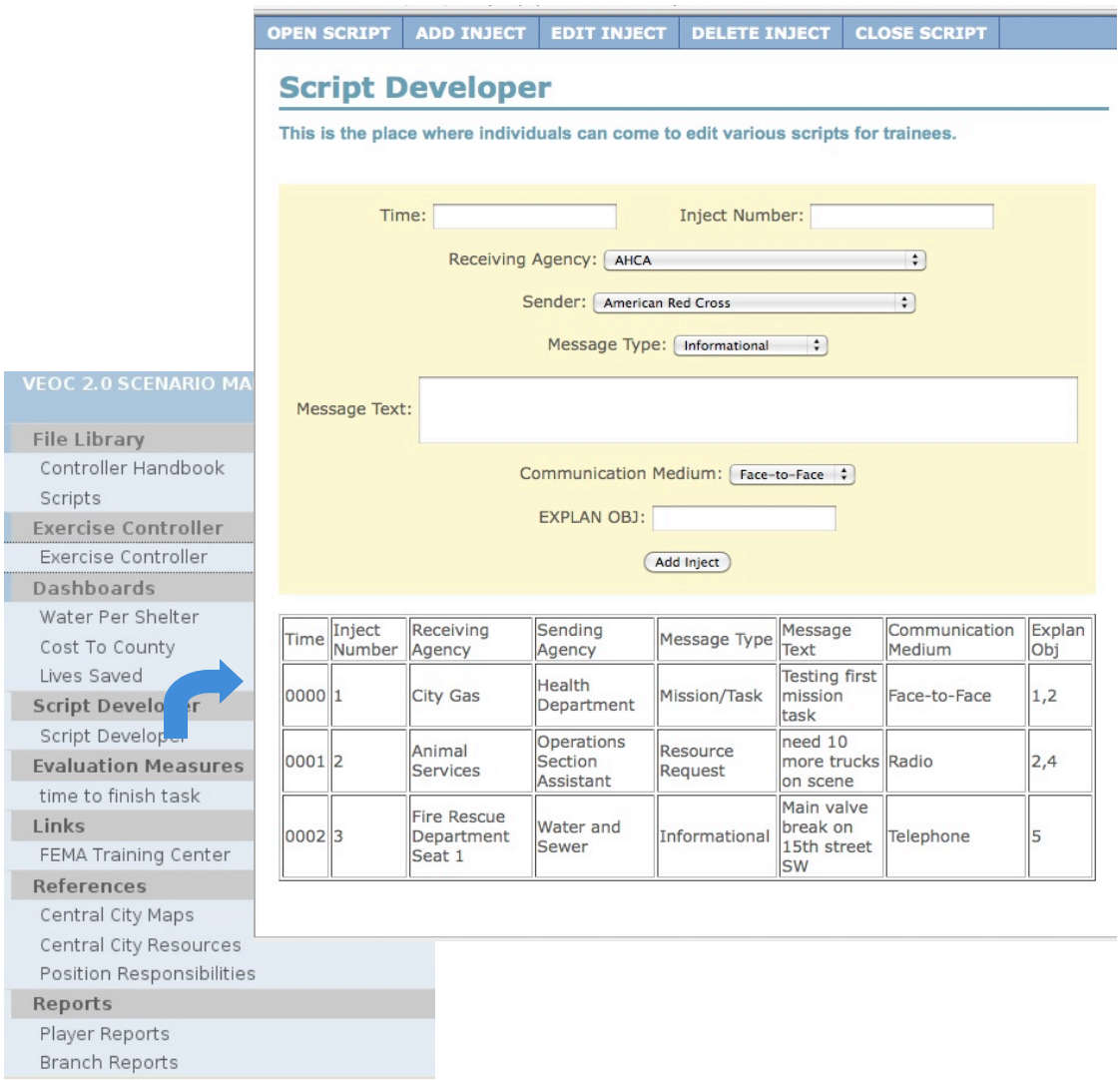


Figure 11: New user interface script developer console. This is where individuals develop exercise scripts and injects to send to the trainees.

Conclusion

In conclusion, for the last 9 months, I have been conducting field research with the Miami-Dade Department of Emergency Management. This research proved invaluable to me for several reasons. I was able to study emergency management, emergency procedures within the EOC, critical decision-making at the EOC, and the culture and customs of emergency managers. In particular, some of the benefits gained include an increased awareness and a more accurate mental model of what emergency mangers do on a day-to-day basis as well as what activities they engage in emergency situations. I learned about the crisis information management software in use at the EOC and what individuals like and dislike about it compared with other software. I gathered various documents that will assist me in creating the virtual emergency operations center. I established strong connections with the EOC and also with my fellow collaborators. I gained experience in a real activation and two fully-functional exercises. Finally, I

gained feedback on the prototype and improved project Ensayo's architecture and user interfaces.

Acknowledgements
I would like to thank the Miami-Dade EOC for their generous support of this project and inviting me into their emergency management lives. I am especially grateful to Troy Johnson, Soheila Ajabshir, Roslyn Viterbo, Craig Hall, Jonathan Lord, Frank Reddish, Curtis Sommerhoff and all the personnel at the EOC. I also thank the University of Notre Dame Zahm Research Travel Fund, the National Science Foundation (Award Number CNS-0855164), and the U.S. Department of Education (GAANN Fellowship Award Number P200A090044) for their support of this research as well.

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