Application of Project Management Tools to Assist in the Process of Developing Emergency Exercises

by

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Thesis submitted to the Faculty of the
Virginia Polytechnic Institute and State University
in fulfillment of the requirements for the degree of

MASTER OF SCIENCE

in

Industrial and Systems Engineering

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December 8, 1993

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(ABSTRACT)

An emergency exercise is an important part of emergency management and helps prepare and test the emergency management system to face an emergency. Emergencies tested include those caused by earthquakes, hurricanes, tornadoes, and technological accidents--nuclear and chemical. This research focuses on emergency exercises for accidents at nuclear facilities. The aim of this research is to identify which project management tools emergency exercise development managers can use to assist them in developing emergency exercises. The project management tools selected were the stakeholder analysis, work breakdown structure, responsibility matrix, activity/ milestone list, progress diagram, Gantt chart, and activity network. A group of experts in emergency exercise development acted as a source of information on how project management tools could be used in emergency exercise development. This group of experts were given a hands-on workshop on using the seven project management tools. The experts developed an emergency exercise shortly after the workshop. These experts were asked for their opinions on how they could have used the tools to assist them in developing the exercise. The experts' opinions were gathered using open-ended and structured interviews. The interview data on analysis, revealed that of the seven project management tools, experts felt most comfortable with the stakeholder analysis, work breakdown structure, responsibility matrix, and activity/milestone chart. Analysis also revealed that further training was required before the group of experts felt comfortable with the project management tools. Hypotheses on the relationship between the group developing exercises and usage of project management tools are made. Exercise developers' suggestions on usage of project management tools are also provided.

ACKNOWLEDGEMENTS

I would like to express my apprecition to my committee co-chairmen: Dr. Harold A. Kurstedt and Dr. Gerold Patzak for their expertise and advise. I would also like to express my deepest gratitude to Dr. Elizabeth Koball for her expertise, encouragement, and assistance in helping me finish this thesis. Thanks are also due to Dr. Robert Dryden and Dr. Patrick Koelling for their time and expertise.

Special thanks are due to my dear wife Shashi for her support and in the last six months her assistance in helping me complete this thesis. Without her support and constant encouragement, this thesis would not have been possible. I also want to thank my parents Meena and Srinivas Rama Swami for helping me develop high ideals, a philosophy of seeking knowledge, and always willing to learn something new.

Thanks are also due to members of the Emergency Management Group at Management Systems Laboratories and B. Eichorst for giving me the opportunity to work with the group. I would also like to thank my colleagues George Stiles and John Merritt for their assistance with the pilot study.

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INTRODUCTION

Problem Statement

The aim of this research was to observe, identify usage patterns, and document the activities in an emergency exercise development process in which project management tools are used and to interpret what external forces and distinguishing characteristics of the emergency exercise development process stimulate the need for the use of specific project management tools.

The project management tools selected for use in emergency exercise development were to be used in developing an actual exercise. The intention was to obtain feedback from exercise developers on usage of the project management tools in a real-world environment. The group that was to use these project management tools in an emergency exercise development project did not use the tools. Therefore, I obtained the group members' opinions on the possible use of the selected project management tools in an emergency exercise development project and reasons for not using them. Since the tools were not used, I was unable to document activities in exercise development along with project management tools used. I was also unable to determine the influence of the external forces on exercise development.

Relevance of the Study

An emergency exercise is an important part of emergency management (Federal Emergency Management Agency (FEMA), 1984, 1989). Emergency exercises are conducted for two purposes: 1) to prepare the emergency management system (EMS) to face an emergency and 2) to test the emergency management system (FEMA, 1984, 1989). Emergency exercises are used to prepare for and test the EMS for emergencies caused by hurricanes, tornadoes, earthquakes, and technological accidents--nuclear and

chemical (FEMA, 1986). I focussed on emergency exercise development for a facility involving nuclear materials. Emergency exercises not only help test and prepare for an emergency, but also help ameliorate the fears of people with respect to the high risk technology (FEMA, 1984, 1989; McDaniels, 1988). A full scale emergency exercise also acts as a simulation used for training and preparation and can generate new information that could be used to lessen fears about incidents (Belardo et al, 1983; McDaniels, 1988). An exercise can be thought of as a simulation wherein experiments are conducted directly on the system. By definition, a simulation is "the process of conducting experiments on a model of a system in lieu of either 1) direct experimentation with the system itself or 2) direct analytical solution of some problem associated with the system" (Turner et. al, 1989). An experiment is defined as "the process of observing the performance of either the system or its model under certain conditions" (Turner et. al, 1989). An emergency exercise is therefore a direct experiment simulation.

During an exercise, various parts of the EMS are tested. Four important aspects of the EMS and the exercise include 1) communication, 2) coordination, 3) resource allocation, and 4) assignment of responsibility (FEMA, 1984, 1989; Foltman et. al, 1988). These aspects are also important during an emergency and thus there is a need for testing. In addition, the four aspects are also important in exercise development (DOE, 1990).

Providing project management tools and techniques to exercise development managers to assist them in the process of developing an emergency exercise will allow them to address the four aspects discussed above. Developing an exercise is a project. Various tools and techniques are available in project management that assist project managers in attaining their goals and objectives. These project management tools and

techniques can be used by exercise development managers to address the four important aspects in exercise development.

This research examines which project management tools are most useful and address the four aspects in exercise development. This information was obtained through observation (of an emergency exercise developed in 1992) and interviews (of an emergency exercise developed in 1993 similar to the one developed in 1992).

Who Will Use this Research

This research will provide new knowledge on the dynamics of emergency exercise development in relation to the use of project management tools. This knowledge could be used by emergency exercise developers in developing emergency exercises.

Research Question

A research question is what the research aims to answer. By answering the research question, my work can contribute to the academic body of knowledge. My research question is: Given the understanding of project management tools and techniques, in what activities, in developing an emergency exercise, will developers perceive a need to use those project management tools and what will be the stimuli?

The project management tools selected for use in emergency exercise development were to have been used in an exercise development project. The group that was to use these tools in developing an actual emergency exercise did not use them. Therefore, I also determined why the group of exercise developers did not use the selected project management tools that were supposed to assist them in developing the exercise.

Research Purpose

The research purpose answers the question: Why am I doing this research? The research purpose is generally stated as a general overriding reason. The purpose of this research was to help exercise developers develop exercises easier, quicker, and with fewer gaps and overlaps by finding out which project management tools emergency exercise developers choose and use, where, and why.

The group of emergency exercise developers who were to use the selected project management tools in developing an emergency exercise did not use them. I therefore obtained their opinions on which project management tools they would use to assist in developing an emergency exercise.

Research Objective

The research objective answers the question, what will be the results of my research, or, what can be learned from my research? The objective resembles an output, but is not as tangible as an output. The objective of this research was to develop a relationship between activities in the emergency exercise development process, specific project management tools, and how they relate to distinguishing features and forces that stimulate the need for the tools.

Since the group that was to use the project management tools in developing an emergency exercise did not use them, I obtained their opinions on possible use of the selected project management tools.

Premises and Delimitations

1. I did not demonstrate performance improvement.
2. I did not modify the project management tools selected for use in this research.

3. I have selected seven project management tools from the vast number of tools available. I selected the seven tools for their simplicity and the fact that they seem most suitable for use in exercise development (rules for selection are provided in the next chapter).
4. I am not studying how to modify the tools.

Conceptual Model

My conceptual model shows how the various elements in my research influence each other. Figure 1 shows my conceptual model in which a set of project management tools addresses needs that arise out of activities in the exercise development process.

On the lower part of the model, I have shown the exercise development process as being made up of various activities. Each of these activities has attributes or characteristics. The attributes stimulate a need for simplification that can be addressed in some way. Addressing this need will help address the attributes of the activity.

This need for simplification that arises out of the attributes of the activity is also influenced by another force. I have called this the "external force." The external force is a crisis aura. This crisis aura is manifested in two ways. It is seen through the pervasive attitude of the developer and also through the influence of external stakeholders. The crisis aura is shown in the upper portion of the figure. The crisis aura of exercise development differentiates it from other projects. I discuss the differentiation further in the body of knowledge chapter.

A set of project management tools addresses the need that arises out of the attributes and external force. These tools address the need due to their inherent properties or characteristics. (I will discuss these in detail in the literature review section.)

Addressing this need results in a pattern of usage of the set of project management tools in exercise development.

There is an additional factor that influences the pattern of usage of the project management tools. This factor is the user's familiarity with the project management tools. I have shown this familiarity on the right hand side of my conceptual model.

The set of project management tools identified for use are: 1) stakeholder analysis, 2) work breakdown structure, 3) responsibility matrix, 4) progress chart, 5) activity or milestone chart, 6) bar or Gantt charts, and 7) activity networks. I chose these tools using the five rules listed below. Though networks can be complex, they were used in their simplest form in this research.

Rules for selecting the set of project management tools are:

1. address stakeholder identification and possible influence as stakeholders influence exercise objectives and expectations,
2. address planning requirements,
3. address coordination requirements,
4. address resource allocation, and
5. address responsibility assignment.

These five rules reflect the characteristics of planning, coordination, communication, resources, and responsibilities for emergency exercise development that I interpreted from the literature in my literature review The body of knowledge section provides additional details on the characteristics of emergency exercise development and also how the project management tools selected address the characteristics.

The external force resulting from a crisis aura is based on my observations of the team of exercise developers that I used to test the tools.

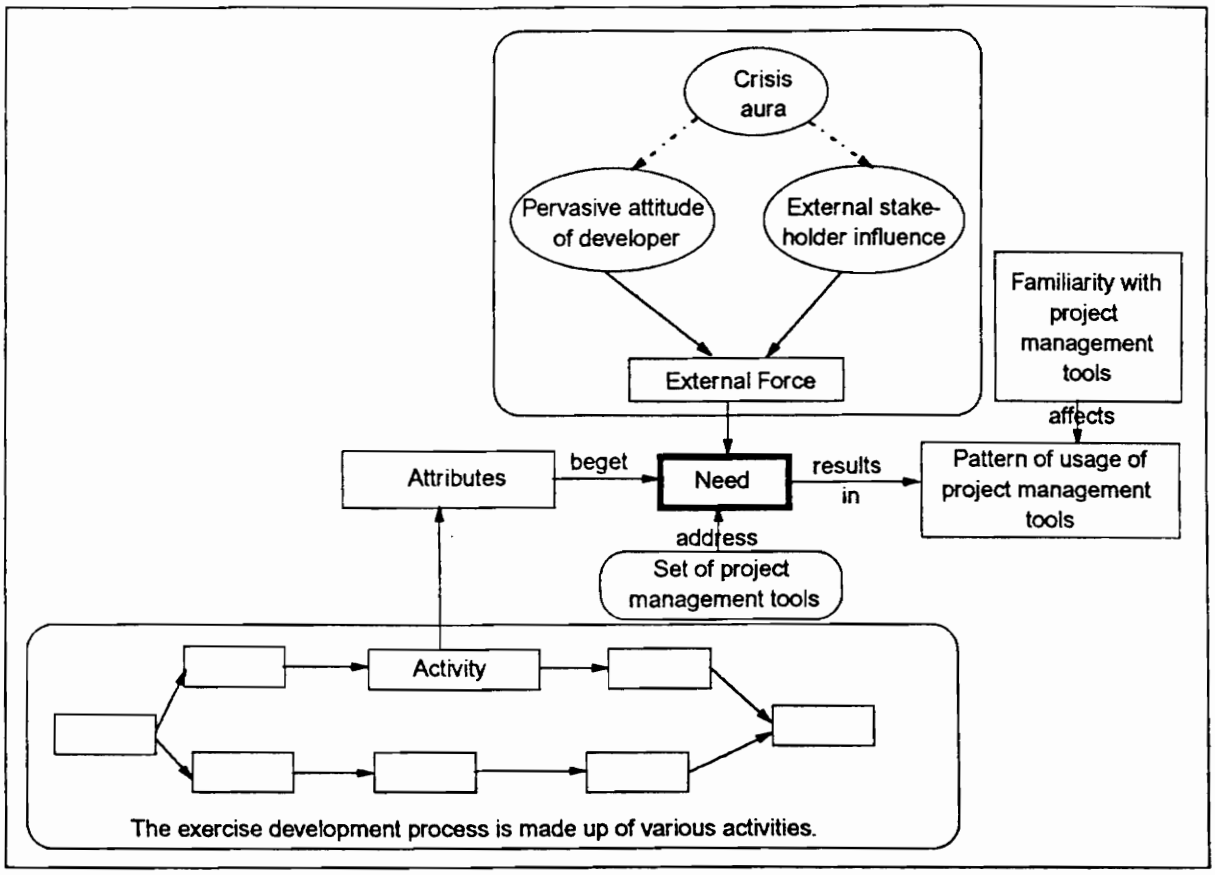

Figure 1: Conceptual Model
A Set of Project Management Tools Addresses a Need that Arises out of an Activity in Emergency Exercise Development

Sub-Problems

Sub-problems divide the problem statement into pieces. The partition is as seen in the conceptual model. My sub-problems are as follows:

1. Determine which of the seven project management tools are most used.
2. Determine the specific attributes (characteristics) of the activities in the exercise development process that the most-used project management tools address.

3. Determine how the external force acts as an influential force in determining the needs of activities in the exercise development process.
4. Determine why the project management tools were not used in an emergency exercise development project.

Outputs

Outputs address the question: What tangible results come from addressing the sub-problems? The outputs are:

1. A set of matrices summarizing emergency exercise developers' comments on the probable uses for the selected project management tools in emergency exercise development;
2. A matrix summarizing emergency exercise developers' comments on which of the selected project management tools would address the characteristics of emergency exercise development; and
3. Hypotheses of why emergency exercise developers did not use the selected set of project management tools in an emergency exercise development project.

Research Propositions

As this research is a qualitative study, I do not have any testable hypotheses. I do have a set of propositions. These propositions describe the relationship between project management tools and emergency exercise development.

Here are my research propositions:

1. Based on project management and emergency exercise development literature, I propose that the selected project management tools will function in a similar manner in

an emergency exercise development project as they do in a traditional project.

2. Based on project management and emergency exercise development literature, I propose that the selected project management tools will address the characteristics of emergency exercise development.

Definition of Terms

Activity: a process actually or potentially involving a mental function.

Attribute: inherent characteristic

Crisis aura: a subjective unstable or crucial atmosphere in which a decisive change is impending, especially one with the distinct possibility of a highly undesirable outcome.

External force: an outside influence that compels through natural or logical necessity.

External stakeholder influence: the force exerted by an outside interest (person/organization)

Need: a lack of something requisite, desirable, or useful.

Pattern of usage: the mode of using that has a natural or chance configuration.

Pervasive attitude of developer: the all-encompassing mental position of the one who develops.

LITERATURE REVIEW

My review of the body of literature covers 1) Emergency management, 2) Emergency exercise development, and 3) Project management.

The literature in emergency management provided information on the need for, definition of, and importance of emergency exercises. I also developed characteristics of emergency exercises based on the literature.

The section on emergency exercise development details the process of developing an emergency exercise, including its benefits and advantages. I also have included a time line of the development of Joint Response 1992 - a full-scale emergency exercise. I have also provided a description of the tools recommended for use in emergency exercise development.

I reviewed literature in project management that pertained to project management tools. The literature provided information about the usage of the tools. The literature also provided various definitions of project management and its characteristics. The literature helped me determine the common ground between projects, project management, and emergency exercise development and its management.

I will discuss the literature on qualitative research in my methodology section.

Emergency Management

Introduction

Tornadoes, fires, earthquakes, hurricanes, and technological accidents (chemical and nuclear) create emergency situations. In a typical year, in the United States, tornadoes will kill 100 people, floods will cause $2 -$3 billion in damage, and fires will kill more than 6,000 people (McLoughlin, 1985). Further, there are 9,000 high-hazard dams in the U.S., four billion tons of hazardous materials are transported each year, 39 states face the risk of earthquakes, and 22 metropolitan areas are prone to hurricanes (McLoughlin, 1985). Added to all this is the fact that nuclear power is viewed as an extreme example of technology where risks are highly dreaded, not well known, severe, uncontrollable, and involuntary (McDaniels, 1988). These examples show the need for and importance of emergency management.

Emergency management is complex for a variety of reasons (Siegel, 1985). As stated earlier, there are many kinds of accidents. The rational handling of each kind requires different understandings about cause-effect nexuses, appropriate technology, planning, changes of key actors, and action depending on whether it is before, during, or after the disaster (Siegel, 1985). The Federal Emergency Management Agency's (FEMA) Integrated Emergency Management System (IEMS) stresses an integrated approach to the management of emergencies including natural disasters, technical disasters, and possible attack. There are problems with IEMS due to the technical demands, which add to the complexities of managing emergencies (Godschalk & Brower, 1985). We therefore see that emergency management is complex and needs an integrated approach. This necessitates training and preparation to face emergencies (Seigel, 1985, Godschalk and Brower, 1985).

"Emergency management comes into action immediately before and after a disaster.

Its focus is on improving disaster operations by providing an emergency coordination and decision system to cope with the disaster" (Godschalk & Brower, 1985). Emergency management, therefore needs effective tactical skills which include communication, command, and control (Godschalk and Brower 1985).

An adequate, comprehensive emergency management program involves four phases, which occur sequentially (Comfort, 1985; McLoughlin, 1985; FEMA, 1983). The four identifiable phases are: mitigation, preparedness, response, and recovery. Each phase, as defined by FEMA's Emergency Planning Student's Manual (1983), is described as follows:

"*Mitigation*: activities that eliminate or reduce the probability of a disaster's occurrence.

Preparedness: activities that focus on essential disaster response capabilities through development of plans and procedures, organization and management of resources, and training and education of people.

Response: activities that provide emergency assistance for casualties and help reduce further damage or help speed recovery operations.

Recovery: activities, both short and long term, that help return conditions to normal or improved levels. Actions are also taken to minimize recurrence. Each of these stages requires careful planning."

Emergency Planning

Since the Three Mile Island accident, the nuclear industry has paid more attention to

radiological emergency planning (Foltman, et al, 1988). Planning and organizing in anticipation of disaster events is important (Siegel, 1985). Behavior in planned situations is efficacious and purposive (Siegel, 1985). Planning for an emergency is also complex. There are many people in diverse categories with numerous requirements, who must be coordinated (FEMA, 1983).

Emergency planning is important, complex, and absolutely necessary to prepare for an emergency. The emergency plan incorporates the four phases of emergency management. Each of these phases represents a dynamic set of actions flowing into the next phase (FEMA, 1983). Comprehensive plans include emergency management both in peacetime and war. These plans consider all types of situations--natural disasters, war related incidents, nuclear related accidents, and the risks of hazardous materials used in the nuclear industry. (Title III of the Emergency Planning and Community Right to Know Act of 1986 addresses planning for such emergencies.)

Emergency Exercises

According to Webster's (1983) dictionary, an exercise is defined as "active use or operation or an activity for the purpose of training or developing the body or mind." Here are some specific definitions of an exercise as used in emergency management.

"An emergency exercise is a scheduled and planned large-scale activity that tests the integrated capability and most aspects of an emergency management program." (Department of Energy (DOE), 1991)

"An emergency exercise helps maintain the highest level of preparedness by validating emergency response capabilities and training for emergency personnel." (Management Systems Laboratories (MSL), 1987).

"An exercise is an activity designed to promote emergency preparedness; test or evaluate emergency operations, policies, plans, procedures or facilities; train personnel in emergency management duties; and demonstrate operational capability." (FEMA, 1989).

Federal agencies working with SARA (Superfund Amendment and Reauthorization Act of 1986) Title III define an exercise as "a maneuver or simulated emergency condition involving planning, preparation, and execution carried out for the purpose of testing, evaluating, planning, developing, training, and/or demonstrating emergency management systems and individual components and capabilities, to identify areas of strength and weakness for improvement of emergency operations plans." (Emergency Management Institute (EMI), 1990).

These definitions suggest that an emergency exercise is used to test and train emergency personnel and the capability of the emergency management program to respond to and manage an emergency. The exercise simulates a realistic situation, which is useful for training and preparation (Belardo et al, 1983). Experimentation helps learning (Nystrom & Starbuck, 1984). An exercise may be thought of as a direct, controlled experiment, which can be used to help emergency managers learn. Therefore an exercise is an effective way of determining whether an emergency management system functions satisfactorily. By observing performance during an emergency, simulated by the exercise, the ability of the emergency management system to manage effectively the response to and resolution of an emergency can be determined. Krikorian (1987) recommends that an emergency plan be practiced and rehearsed to determine response times and whether or not all the people directly involved clearly understand their responsibilities and how to perform them. Therefore an exercise is an important part of emergency management.

There are four types of emergency exercises (MSL, 1987; DOE, 1991; FEMA, 1989; 1984):

1. *Full Scale Exercise or Operational Field Exercise*: an exercise designed primarily for the purpose of validating the integrated emergency preparedness capability of the facility, state, and local jurisdictions in an operational environment.

2. *Emergency Operations Simulations (EOS)*: an exercise for the Emergency Operations Center (EOC) staff with all field response simulated, used primarily to demonstrate the effectiveness of centralized operations in an EOC or interim EOC facility which simulates the use of available resources.

3. *Tabletop*: an exercise in which key officials and agency representatives are presented with a series of simulated problems based on a scenario. Problems are presented through questions. This exercise is moderated to control play and may be formal or informal. The tabletop is accomplished in real-time, but is controlled to allow single answers which promote a common understanding by all participants of roles and responsibilities.

4. *Drills*: a training activity used to perfect response skills, especially by regular practice. This type of exercise limits play to specific components of the emergency response team.

The components of an exercise are: objectives, scenario, major sequence of events, detailed sequence of events, prescribed messages, and contingency messages (MSL, 1987; FEMA, 1989; DOE, 1991). Objectives identify response activities to be demonstrated. The scenario is the component from which the exercise is to be built.

The sequence of events is an outline of the major events of the exercise. The detailed sequence of events lists, in detail, exercise inputs based on the key events outlined in the major sequence of events. Prescribed messages are the backbone of the exercise and are based on the detailed sequence of events. Contingency messages are inserted into the exercise as needed.

Importance of an Exercise

Nuclear power is typically viewed as an extreme example of technology where risks are highly dreaded, not well known, severe, uncontrollable, and involuntary (McDaniels, 1988). An exercise can be used to ameliorate this impression. Also exercises, used as simulations for training and preparation, could generate new information that could be used to lessen fears about incidents (Belardo, et al,1983). Large-scale joint exercises have four advantages (Foltman, et al, 1988):

1. The workability of the emergency plan is assessed,
2. Practice in response roles and in working as a team is provided,
3. Confidence of responders in their ability to do their jobs is enhanced, and
4. Credibility of the response organization in the eyes of the off-site population is enhanced.

To obtain full advantage of an exercise, four principles must be followed (Foltman et al 1988):

1. Objectives must be established well in advance by all parties,
2. All exercise play must be driven from an on-site accident scenario,
3. The exercise must involve as many of the emergency response organizations and personnel as possible, and

4. Arrangements must be made for independent evaluation.

We thus see that an exercise is important and should be designed to follow the four principles stated above.

Characteristics of Emergency Exercises

The above paragraphs detail a background about emergency management, planning, and exercises. Based on this background, I will now list exercise characteristics. These characteristics will provide areas of commonalty between emergency exercises and project management.

Coordination is a problem in emergency response (Siegel, 1985; Drabek, 1985). Siegel (1985) provides a list of the various possible organizational relationships and emergency management states. This list shows local government, public utilities, medical services, relief agencies, federal departments, contractors, federal disaster agencies, insurance agencies, media, and others being a part of the whole emergency management process. According to this list, seventeen agencies are involved in some way with response activities. The large number of agencies involved poses a coordination problem.

Communication is an important part of emergency response (Sorensen, 1984; Comfort, 1985; Drabek, 1985). Sorensen (1984) refers to the Three Mile Island incident and infers that uncertainty of information led to excessive evacuation. Uncertainty of information suggests the need for better communication. Drabek (1985), through interviews, found that communication was perceived as the greatest weakness and hence the source of most difficulties. Also emergency conditions place extraordinary demands upon personnel for accurate, timely information to make optimum use of resources (Comfort, 1985). Generating this information during an emergency depends

on effective communication (Comfort, 1985).

FEMA's (1983) student manual for emergency planning stresses the need to *identify resources and responsibilities* for emergency preparedness planning. The APELL (1985) (Awareness and Preparedness for Emergencies at Local Level) document, developed by the U.N.'s Industry and Environment Office, suggests that the basic elements for successful emergency preparedness includes hazard analysis, organizational structure, communication, and resources. Organizational structure, as a basic element for successful emergency preparedness, can be used to assign responsibility.

Walker and Middleman (1985), FEMA (1983), and APELL (1985) suggest the need for *planning*. Walker and Middleman state that no mechanism exists to ensure that players pay the right kind of attention to plans and procedures at the same time as they will have to in an emergency, during an exercise. Incorporating the importance of activities in the planning stage can help players give the proper attention to specific parts of the plans and procedures during an exercise. FEMA (1983) and APELL (1985) strongly suggest the need for planning in preparing for emergencies. The need for planning is highlighted through the need for the involvement of a number of agencies and organizations in emergency management.

From the above paragraphs, I infer that an emergency exercise has the following characteristics:

1. It requires careful *planning*.
2. It requires *coordination*.
3. *Communication* is important.
4. *Resources* need to be identified.
5. *Responsibilities* must be assigned.

Further, the emergency manager is invariably responsible for planning and preparation for disaster operations and also coordinating emergency operations during a disaster (Labadie, 1984). The emergency manager's duties include identifying, organizing, and applying community resources to problems caused by disasters (Labadie, 1984). Thus, the job of the emergency manager is complex. Providing the emergency manager tools and techniques to assist in carrying out these tasks would allow him or her to concentrate more on making priority decisions (Labadie, 1984).

Emergency Exercise Development

The purpose of this section is to introduce the reader to emergency exercise development. I shall begin with a short summary of the definition of an exercise and then go on to discussing how an exercise is developed.

An exercise has a specific definition in emergency management. Federal agencies working with SARA Title III define an exercise as a maneuver or simulated emergency condition involving planning, preparation, and execution carried out for the purpose of testing, evaluating, planning, developing, training, and/or demonstrating emergency management systems and individual components and capabilities, to identify areas of strength and weakness for improvement of emergency operations plans (EOP). Conducting exercises is the primary method of testing and validating hazardous materials contingency plans and training programs (EMI, 1990; FEMA, 1989; DOE, 1991). I discussed the benefits of an exercise in the previous section, I will now proceed to discuss how an exercise is developed.

Exercise Development Process

Here is a description of the exercise development process (based on DOE, 1991; FEMA, 1989; EMI, 1990).

Before an exercise is designed, the following must be done:

1. Review current contingency plans.
2. Conduct a needs assessment.
3. Assess the capability to conduct an exercise.
4. Define the scope of the exercise (including what agencies will participate and to what degree, type of people needed from each agency, the type of hazard, a logical geographical area, and the degree of realism).
5. Identify any limitations or disadvantages such as cost or liability.

After the above steps are carried out, an exercise can be designed. This involves the following steps:

1. Type and purpose: The first step is to decide on the type of exercise and its purpose.
2. Objective: The next step is to select objectives of the exercise.
3. Scenario: A scenario is the background detail against which an exercise is conducted. The scenario describes what has happened up to the time the exercise starts. The scenario should be succinct and should set the stage for the actions that will occur during the exercise. The scenario should provide information related to the emergency, as well as provide challenges to motivate participants during the exercise. A scenario can include:

a. a general statement of the problem, such as " a tractor-trailer jackknifed on a slippery road, rolled down a hillside, and spilled its contents onto the ground near a large sewer;
b. types and numbers of containers involved;
c. type(s) of hazardous materials involved and quantities;
d. weather conditions; and

e. number and type of injuries.

4. MSEL: The Master Sequence of Events List (MSEL) provides a schedule of predetermined events and actions. The MSEL is developed from research of emergencies and review of contingency plans. In addition to schedule times, and the predicted events that will occur at those times, the MSEL contains actions the controller will take that will be based on decisions and/or actions of the participating response groups. Messages and problems are also inserted to the keep the exercise moving. Messages are given to participants during the exercise to force them to make decisions.

5. Orientation seminars: Orientation seminars are meetings to review the contingency plans and to clarify the responsibilities of each person or agency. Background readings or assignments may be given to participants to increase their readiness for the exercise. These advance seminars do not include any information about the scenario.

6. Scheduling an exercise: As disasters know no seasons, the effects of weather must be taken into account when scheduling an exercise. In addition, availability of equipment, personnel, and other resources need to be considered.

7. Preparing for an exercise: Preparations for an exercise should begin at the same time as exercise design--three to six months before the exercise is scheduled to occur. The facility and resources used for exercises should be the same as used for actual incidents. Using equipment or personnel that will not be available during an emergency defeats the purpose of an exercise.

8. Exercise staff: Selecting knowledgeable personnel to staff the exercise can be critical to the success of the exercise program. The controller, who leads the exercise program, is chosen first. There may be a number of controllers, who will "control" or guide the exercise.

9. Level of play: Controllers ensure that the level of play is adequate and challenging to participants, but not beyond their capabilities. Continual evaluation of the level of

play will allow controllers to modify messages and problems, which changes the complexity of the action.

10. Exercise evaluators: Exercise evaluators record events and decisions as they occur without being intrusive. They also observe the exercise in order to critique the actions and decisions following the exercise.

11. Post-exercise critique: The post-exercise critique is conducted immediately after the exercise is completed. The critique consists of a participant critique and an evaluator critique. Typically, participants answer a questionnaire which asks for their perceptions about events, decisions, and actions taken during the exercise. Participants also comment on the exercise during an exit interview, talk about their feelings about the exercise, and make recommendations about how future exercises might be improved.

12. Evaluator critique: Evaluators present issues to the players that they observed during the exercise.

13. Exercise evaluation report: to adequately implement lessons learned from an exercise, it is important to publish an exercise evaluation report that includes an exercise summary, an evaluation of issues, and a summary of recommendations for changes to the contingency plans or training. Participants should be allowed to review issues and recommendations presented in the report once it is finished.

14. Identify who and when: To ensure recommendations are implemented, it is vital to identify the agency designated to take an action and to identify an estimated completion date for the action. Once a recommendation has been implemented, the responsible agency should note the accomplishment in writing. Since following up on exercise recommendations and lessons learned is all too often neglected, assigning specific responsibilities and then holding that agency accountable is a good management tool.

Joint Response '92: the Development Process

The above section detailed steps involved in developing, preparing for, and conducting an exercise. I will now discuss how the Emergency Management Group at MSL went through each of the 14 steps outlined above to develop Joint Response '92, a full scale emergency field exercise conducted at the Department of Energy's facility, managed by the Westinghouse Environmental Management Company, at Fernald, Ohio, in September 1992.

The contract for Joint Response '92, a full scale field exercise, was awarded to the EMG group at MSL on April 20, 1992. The entire exercise was to be developed in 163 days. This included a critique report after the exercise. Here is a step by step description of the process along with the approximate days on which each step was carried out. I obtained this information from interviews of group members and an internal calendar of events.

Day 0: Contract awarded by Westinghouse Environmental Management Company (WEMCO) to the EMG group at MSL to develop a full scale emergency exercise. WEMCO had decided earlier that they would have a full scale exercise. Therefore the process of figuring out the type of exercise was not needed. An initial meeting with WEMCO was held on the day the contract was awarded.

Day 10: Subcommittee meetings were held on this day. The purpose was to work out details for testing various parts of the emergency response system at WEMCO.

Day 16: EMG reviewed the emergency plans of WEMCO to locate discrepancies. A report of discrepancies was produced and delivered on day 25.

Day 28: EMG reviewed the radiation response portion of the emergency plans of WEMCO and also the Fernald County plans. A radiation response section for the emergency exercise was then drafted. This draft was delivered to WEMCO on day 30.

Day 31: Another set of subcommittee meetings was held. The purpose was to go over what had been developed until day 31 and to set targets for the next steps.

Day 32: Development of a timeline for a dry run of Joint Response '92 began. The dry run was to test whether things would work as they should. The timeline for the dry run was ready on day 37.

Day 37: Timeline development for Joint Response '92 began on this day.

Day 44: The radiation response section draft was worked on to incorporate changes.

Day 49: The second version of the radiation response draft was mailed out on day 49. Subcommittee meetings for the city emergency plans were held. The meetings were to review what had been done until this day and to set targets for next steps.

Day 65: Development of a draft plan for the dry run began on this day.

Day 67: EMG began reviewing the county plans and drafting plans for the county's responsibilities for Joint Response '92.

Day 71: Another set of subcommittee meetings were held to review what had been done up to day 71, to meet personnel at WEMCO and the county to go over the emergency plans, and to check on the next steps to take.

Day 72: The county plans were reviewed and changes were made.

Day 78: The final plan for the dry run of Joint Response '92 was drawn up.

Day 79: County plans were mailed out to WEMCO.

Day 81: EMG began reviewing plans and materials to train county personnel for the exercise.

Day 85: Draft plan for Joint Response '92 was developed

Day 86: The lesson plans for county personnel were mailed.

Day 88: Training material for county responders was worked on.

Day 92: Another set of subcommittee meetings were held to review work done until then and also to work out details for next steps (training).

Day 95: The final plan for Joint Response '92 was developed.

Day 101-109: County emergency responders were trained by EMG personnel at the WEMCO site.

Day 112: Lesson plans for training controllers and evaluators were developed.

Day 122 Controller and evaluator training for the dry run of Joint Response '92 was carried out.

Day 123: Dry run for Joint Response '92 was conducted.

Day 133: A critique report for the dry run was completed and delivered.

Day 134: Subcommittee meetings were held to go over the dry run critique and work on next steps.

Day 144: Controllers and evaluators were trained for Joint Response '92.

DAY 145: JOINT RESPONSE '92 EXERCISE was held at DOE's Fernald, Ohio, facility, managed by WEMCO.

Day 163: The final critique report for the exercise was delivered.

Tools Used in Emergency Exercise Development

The following is a description of tools recommended for use in emergency exercise development (based on DOE, 191991; FEMA, 1989, 1984).

1. To conduct a needs assessment, exercise developers use a table to check whether a particular portion of the emergency plans is new, updated, exercised, used in an emergency, or not applicable. The needs assessment helps decide which portions need to be exercised.

2. Questionnaires are used to assess the capability of the organization to conduct an exercise.

3. To develop the scope of an exercise, an analysis of operations, agencies involved,

personnel, hazards, geographical area, and degree of realism is carried out. To help in developing the scope, a questionnaire is used.

4. In selecting the exercise type, a tool detailing each type of exercise's characteristics is used. The tool shows the exercises and their characteristics in tabular form.

5. To address costs and liabilities (insurance etc.) a form is used, which details all parts of the exercise development process and the resources required.

6. A checklist is used to show deadlines for completing various stages toward developing an exercise.

7. Gantt charts are used to plan for the exercise and show time along with tasks to be accomplished.

8. A work plan is also used as a planning tool. It shows a brief narrative of what will be accomplished during the specified period of time.

9. To develop the simulation of an emergency, a diagram is used to assess who will participate.

10. A checklist is used to develop the scenario narrative.

11. To develop the master sequence of events list, a listing of events and expected actions is used. The goal is to link simulation to action.

12. An Expected Actions Planning Sheet is used to detail who will carry out various

actions during the exercise. It shows the participating agency across the horizontal axis and details of actions to be carried out along the vertical axis.

13. A chart is used to plan the flow of messages during the exercise. This chart details specific agencies and the time line. By checking off each agency in conjunction with the timeline, those to whom messages should be conveyed can be identified. Knowing which messages need to be conveyed to whom helps in scenario development.

The above paragraphs list the tools used in developing an exercise. The next section will deal with project management, tools and those that can be applied to exercise development.

Project Management

Introduction

Project management literature may be classified into four groups (Bubshait, 1984). These are: 1) development of techniques or tools--literature in this area is primarily associated with mathematical models; 2) "how to" or a list of steps involved in achieving certain purposes; 3) survey application of quantitative management techniques, including project management techniques; and 4) application of project management techniques only. My literature review covers groups two and three listed above. Specifically, my review includes definitions of project management, characteristics of project management, purpose of project management, techniques, and tools of project management. I have also included how some of the tools of project management may be used in emergency exercise development.

Definitions of Project Management

"Project management is a set of principles, methods, and techniques for effective planning of objectives oriented work; thereby establishing a sound basis for effective scheduling, controlling, and replanning in the management of programs and projects" (Sethi, 1980).

"Project management is the planning, organizing, directing, and controlling of company resources for a relatively short-term objective that has been established to complete specific goals and objectives. Furthermore, project management utilizes the systems approach to management by having functional personnel (the vertical hierarchy) assigned to a specific project (the horizontal hierarchy)." (Kerzner, 1984).

Projects involve deadlines, particular results, budgets, and ambiguity; therefore requiring coordination between a number of people and innovation in solving problems (Randolph and Posner, 1988; Niwa and Sasaki, 1983). Project management generally involves temporary work that is irreversible and non-repetitive in addition to being subjected to time constraints (The project has a finite and well defined life span.) and scarce resources (Navarre and Schaan, 1990; Martin, 1976). Successful project management involves managing and directing the timing and quantity of resources, skills, and knowledge to complete an endeavor in an orderly, economical manner and thereby meet established objectives in time, dollars, and technical results (Jenett, 1973). The definition of project management implies the use of multidisciplinary human resources to develop innovative solutions to problems faced during the course of the project. Members of this multidisciplinary team are drawn from various line and functional units of the hierarchical organization, forming the "matrix project organization." (Galbraith, 1979).

Projects are of great importance to organizations as they are the means by which many organizations cater to their customers' complex, advanced-technology products, or system needs (Archibald, 1976). To cater to the complex requirements of customers, projects need to be properly controlled to assure completion on schedule and within budgets (Kerzner, 1984; Archibald, 1976). The above definitions of project management show that it is a specialty by itself and has certain characteristics.

Characteristics of Project Management

Project management is an outgrowth of systems management that involves the integration and unification of scientific information across many fields of knowledge (Kerzner, 1984). A system may be said to be a conglomeration or collection of heterogeneous parts that come together and function as one to achieve a common objective (Bertalanffy, 1968). Systems may be open or closed and may have feedback (Stuckenbruck, 1981; Prentis, 1989). The project management process is a closed-loop system, using inputs by way of objectives (time, task, cost), providing outputs, accomplishments (time, task, cost), and using feedback through an information system that utilizes actuals (Stuckenbruck, 1981). Project management uses the expertise of specialists within sub-systems, integrating their knowledge to solve problems and attain set objectives, by looking at the total picture (Kerzner, 1984; Bertanlanffy, 1968). We thus see that project management is characterized by a "systems" or "total" view towards attaining goals and solving problems.

Project management involves project planning and monitoring (Kerzner, 1984). Project planning involves defining work requirements, quantity of work, and resources needed. Project monitoring involves tracking progress, comparing actual to predicted progress, analyzing impacts, and making adjustments (Kerzner, 1984; Jenett, 1973; Prentis, 1989). Project management as defined earlier includes planning, organizing, coordinat-

ing, controlling, and directing (Izanhour, 1982; Kerzner, 1984). These activities may be broadly classified under three heads: planning activities, implementation activities (organizing, coordinating, directing), and controlling activities (Shroeder, 1970). A matrix organization structure is used to carry out these activities due to inter-organization involvement and cross co-ordination (Stuckenbruck, 1979, Taylor and Watling, 1970).

Planning may be defined as the determination of the tasks to be done, their necessary sequence, and their resource requirements to achieve the project objectives (Martino, 1968; Prentis, 1989). The project plan establishes the project duration, the resources needed for each activity, and the necessary sequence for performance of the activities--that is the what, how, why, where, and when (Martino, 1968; Silverman, 1988; Prentis, 1989). Controlling begins with setting project objectives and is seen in all phases of the project. Controlling can be formal or informal (Silverman, 1988). Controlling provides management the ability to respond to any situation that might arise (Martino, 1968). Controlling and directing are carried out through monitoring (Jenett, 1973). Control here is carried out through indirect means through persuasion and encouraging self control at the lowest supervisory level (Jenett, 1973). Monitoring provides feedback, which helps determine whether changes in the plans are required (Prentis, 1989). Change in a project is inevitable and continual iteration through planning, monitoring progress, and controlling is required (Prentis, 1989).

Based on the definitions of a project, project management, and the activities carried out in project management, certain characteristics may be developed. These are:

1. A project has a *finite* time limit.
2. A project involves the use of a *"systems"* or "total" approach.
3. A project uses experts in various fields, drawn from the organization, forming a

"matrix" organization structure.

4. A project is *unique*.
5. A project is *important* to the organization.
6. A project is *delimited*, through the specification of clear objectives.
7. Project management involves careful *planning*.
8. Project management requires *control and coordination*.
9. Project management entails *monitoring*, to anticipate for and adjust to changes.
10. A project uses a *multidisciplinary* team.

Purpose of Project Management

Having defined project management and stated its characteristics, I will now go on to state its purpose. The purpose of project management is to provide sustained, intensified, and integrated management of complex ventures (Butler, 1973; Shroeder, 1970; Easton & Day in Stuckenbruck, 1981). This intensified and integrated management endeavor is focused towards attaining a specific goal (Prentis, 1989). This kind of management is appropriate when the goal to be attained is ad hoc, focused toward a single end product, is important for the organization, involves high risk and uncertainty, involves a high degree of interrelatedness between tasks of the effort, and has a strong relationship to future objectives of the firm (Izanhour, 1982).

To carry out sustained, intensified, and integrated management of complex ventures towards attaining a specific goal, certain tools and techniques are available. These are discussed in the next section.

Project Management Tools and Techniques

This section will provide a description of project management techniques and tools. The tools discussed will be a basic set. I shall begin with a discussion of seven key

techniques in project management. I will then discuss seven project management tools.

Techniques of Project Management

Taylor and Watling (1970) suggest that project management involves seven key techniques. These are:

1. Define the task;
2. Know what resources are required to perform the job;
3. Know the timescale in terms of all activities, events, and resources;
4. Know the quality and reliability requirements;
5. Know the project cost;
6. Make a continuous, conscious, disciplined approach to optimize the value; and
7. Measure project performance.

These seven techniques are highly interdependent and form a "system" of actions. Successful project management involves an integrated systems approach (Taylor & Watling, 1970).

Broadly, the seven techniques of project management fall under two categories (Bubshait, 1984; Jenett, 1973; Crowston, 1971; Izanhour, 1982; Sethi, 1980):

1. Planning/scheduling techniques, and
2. Control techniques.

The first five techniques fall within planning/scheduling and the last two fall under control. I will now discuss the tools of project management and describe in detail seven of these tools that will be used in this research.

Project Management Tools

Project management tools, as stated earlier, may be categorized under two headings, namely planning/scheduling and control. Here is a list of commonly used tools classified under these two headings (based on Bubshait, 1984; Webster, 1982; and Sethi, 1980):

Planning/scheduling tools

1. Work breakdown structure,
2. Bar/Gantt charts,
3. Milestone lists/charts,
4. Networks,
   a. activity on nodes,
   b. activity on arrows,
   c. precedence diagrams,
   d. Critical Path Method (CPM),
   e Program Evaluation and Review Technique (PERT),
   f. Resource Allocation and Management Planning System (RAMPS),
   g. Resource levelling/allocation, and
   h. Graphical Evaluation and Review Technique (GERT).
5. Linear responsibility charts/matrices,
6. Time/cost tradeoff analysis, and
7. Stakeholder analysis.

Control tools

1. Progress measures (charts),
2. PERT/Cost,
3. Meetings,

4. Line of Balance (LOB), and

5. Reliability Maturity Index (RMI).

I shall now describe seven of these tools in detail. These tools are designated to be used in this research endeavor. They were selected for their simplicity and applicability to emergency exercise development.

Project Management Tools Applicable to Emergency Management

The origin of project management can be traced to large-scale, multi-project environments where control is of great importance. Over the years, size and volume caused the emergence of complex methods to control these complex problems. Nevertheless, it is important to realize that the best and most workable approach to project management tools is to keep them simple and direct, so they are easy to use and understand (Bobrowski, 1974). I am therefore focussing on only those tools that are simple and easy to use. These tools, I believe, can address the needs of the activities in emergency exercise development. Here are the seven tools I have selected.

Stakeholder Analysis: Successful project management involves, in addition to satisfying cost, schedule, and quality criteria, satisfying stakeholders (Kerzner, 1989; Mallak et al, 1991; Patzak, 1982). Understanding the influence of all those who have a stake in the project is important to prepare for and satisfy them. Some of these stakeholders are very powerful and can influence the success of the project. It is important to ensure that stakeholders are identified, their power, and influence with respect to the project be analyzed. Cleland and King (1988) recommend a seven-step process to carry out the stakeholder analysis. The steps include: a) identifying stakeholders, b) gathering information on stakeholders, c) identifying stakeholders' mission (expectations), d) determining stakeholder strengths and weaknesses, e) identifying stakeholder

strategy, f) predicting stakeholder behavior, and g) implementing stakeholder management strategy. This analysis helps provide a way to analyze stakeholders and determine ways and means to satisfy them.

Work Breakdown Structure (WBS): The work breakdown structure is defined as "a family tree subdivision of a project, beginning with the end objective and then subdividing these objectives into successively smaller work packages. The work breakdown structure establishes the framework for: a) defining the work to be accomplished, b) construction of a network plan, and c) summarizing the cost and schedule status of a project for progressively higher levels of management." (Webster, 1982; Cleland & King, 1983). The work breakdown structure helps break down work into smaller elements, thereby increasing the probability that every major and minor activity will be accounted for (Kerzner, 1984). The WBS is thus a cornerstone of project management (Izanhour, 1982). The smaller elements that the WBS creates are called work packages, which are defined as "a specific job applicable to the work force involved" (Izanhour, 1982). The WBS can be product or process oriented, reflecting various processes or products (Cleland & King, 1988; Kerzner, 1984). The WBS is developed once the project objectives are set and assists in other project management activities such as scheduling, network development and so on (Shroeder, 1970; Kerzner, 1984).

Linear Responsibility Chart or Responsibility Matrix: This chart or matrix is helpful in determining whether responsibilities have been appropriately and adequately assigned (Webster, 1982). The responsibility matrix, sometimes called the linear responsibility chart, is useful for analyzing and portraying project responsibilities (Archibald, 1976) It helps determine who participates, to what degree, and also in what capacity--advisory, informational, technical, and specialty nature (Cleland & King, 1983). The responsibility matrix not only helps assign responsibility, but also helps in communication

(Archibald, 1976; Cleland & King, 1983). The matrix is more meaningful than the organization chart or job description, especially when it is filled in during a meeting of all concerned managers resulting in agreement on the job responsibilities (Stuckenbruck, 1979). The matrix shows responsibilities on the left and positions or persons across the top (Webster, 1982).

Bar or Gantt charts: The bar or Gantt chart is the most common type of display tool in project management and was developed by Henry Gantt (Kerzner, 1984; Webster, 1982). It is used to plan and control projects (showing planned versus actual performance), to show an explicit relationship between work and time, to show specific work required to accomplish an objective, and also to show project progress (Hoare, 1973; Izanhour, 1982; Webster, 1982; Kerzner, 1984). The chart shows simple activities or events plotted against time or dollars and includes activity durations, schedule dates, and progress-to-date (Silverman, 1984; Kerzner, 1984). An activity represents the amount of work required to proceed from one point in time to another. Events are described as either the starting or ending point for either one or several activities (Kerzner, 1984). Milestones (events), which have zero duration, can also be shown on the Gantt chart.

Milestone/activity lists or schedules: The project activity or milestone list or schedule shows major milestones and activities along with start and end dates (Kerzner, 1984). Deliverables or reports are also shown in this list. Showing deliverables is useful as the project manager can prepare for these. Milestones are often incorporated into the Gantt chart as small triangles and such charts are called Milestone charts (Webster, 1982). The milestone schedule can be developed in the early stages of planning, thereby providing the project manager a clear picture of deliverables (Prentis, 1989). The milestone list can also be used to show achievements (Silverman, 1984). Finally

the activity list can be used to show activity dependencies.

Progress diagram: Once a schedule for a project is accepted, it is necessary to track and show progress (Martino, 1968; Jenett, 1973; Patzak, 1982). Progress reports may be used for this purpose. Showing progress diagrammatically provides a better picture as well as makes it easier and quicker to assimilate. Developing the progress diagram entails plotting a single activity against time in the form of a graph. The progress diagram is the simplest of the progress tracking tools, easy to develop and use.

Networks: Gantt charts cannot show dependencies between events and activities. Knowing these interdependencies will help develop a master plan that shows up-to-date information about operations (Kerzner, 1984). These interdependencies are shown with the aid of networks (Kerzner, 1984; Izanhour, 1982). Networks aid management in planning and controlling a project, showing specific start and end times as well as the impact of late/early starts, and the cost of cutting down durations of activities (Hoare, 1973; Kerzner, 1984; Cleland & King, 1983). There are various network techniques such as the Program Evaluation and Review Technique (PERT), Critical Path Method (CPM), Metra Potential Method (MPM), precedence diagrams, Line of Balance (LOB), and so on. The earliest network was developed by a Polish engineer, Karol Adameicke, in the 1900s and was called a "harmonogram" (Webster, 1982). PERT was developed in the 1958 for the Polaris Weapon System project of the U.S. Navy (Kerzner, 1984). CPM was developed by E.I. duPont de Nemours Company in 1956 (Webster, 1982). PERT and CPM are the most common network techniques. Networks are systems of planning, scheduling, and controlling a project (Horowitz, 1967). The network shows the order in which operations must be completed--which tasks are to be carried out simultaneously and which sequentially (Horowitz, 1967; Izanhour, 1982). Networks are composed of events and activities; events are defined

as the starting or ending point; and an activity is the work to be done to move from one event to another (Kerzner, 1984). In PERT, circles are used to represent events and arrows represent activities (Kerzner, 1984). One disadvantage of the network is it does not visually show the time scale and does not facilitate rapid identification of a particular task (Hoare, 1973). These disadvantages can be remedied by using the Gantt chart (Hoare, 1973). Thus it is necessary to use the network and Gantt chart together to get a complete picture of the project and facilitate proper planning, scheduling, and controlling.

This section dealt with the seven project management tools I identified for use in emergency exercise development. The seven tools were chosen for their simplicity, ease of use and the fact that they have the potential to address the characteristics of tasks in exercise development. In the next section I will discuss what characteristics the seven project management tools address.

Project Management Tools and Characteristics of Emergency Exercise Development

Here are the seven project management tools I believe can be used in emergency exercise development along with how they address the various tasks in exercise development.

The Stakeholder Analysis is used to determine the stakeholders and their possible influence on the project. The tool shows the project and stakeholders in a graphical form. The project is represented by a rectangle and stakeholders are shown as circles surrounding the rectangle (project). Each circle (stakeholder) is connected to the rectangle (project) by a line. The convention followed is that the farther away a stakeholder (circle) is from the project (rectangle), the lesser the influence of that stakeholder on the project.

The stakeholder analysis can be used to determine the stakeholders in any exercise. The tool could be used to determine who has a stake in the exercise at the organization level and also within the organization. The tool could also be used to develop expectations of stakeholders in the exercise. Developing expectations of stakeholders will help exercise developers determine, in advance, what each participating agency will want from the exercise. Knowing what each stakeholder wants, in advance, is useful in developing exercise objectives.

The Work Breakdown Structure divides each task in a project into smaller doable portions. The tool helps identify the smallest independent tasks to be performed.
This tool is used in a different form in exercise development and is known as the work plan. The work plan is in narrative form, and may not be convenient to read and comprehend quickly. The work breakdown structure could be used to divide each step of the exercise development process into small, independent, doable tasks. Dividing each step into smaller doable tasks will help assign specific tasks to individuals or organizations participating in the exercise. The tool could also be used to assign individual tasks to the team developing the exercise. Assigning tasks would be of great use as each individual would know precisely what is expected and also exactly what he or she has to do.

The Responsibility Matrix is used to assign specific responsibility for various tasks to various members of the project team. The tool shows tasks along the y-axis and the titles of personnel across the x-axis.

The expected actions planning sheet used in exercise development is similar to this tool. This tool is used to determine who or which agency will be responsible for a particular action during the exercise. The responsibility matrix could be used to deter-

mine the responsibility of various members or participants in developing the exercise, rather than just for actions carried out during the exercise.

The Activity/Milestone List helps identify all activities to be performed and also their dependency on other activities. The tool is useful in scheduling activities.

This tool can be used in exercise development to sequence the various activities involved in developing the exercise. Having such a tool would help exercise developers schedule various activities in the proper sequence. The tool will also help in determining which activities can be performed in parallel and which are dependent on previous tasks.

The Progress diagram is the simplest of the graphic tools used to show progress. It shows a specific activity along the y-axis and time along the x-axis.

This tool could be used to track how long a task takes to be completed and thereby determine whether the task can be shortened or improved. Also, the tool helps keep track of the time to be spent on each task.

The Gantt chart is a scheduling and planning tool. The tool helps show, graphically, various activities associated with the project and when those activities will be carried out. The tool also shows milestones that need to be attained during the project. The tool thus also provides a means to monitor the project and gives an overall picture of the project.

This tool could be computerized to allow changes to be made quickly and also show "what if" situations almost instantly. These "what if" scenarios would help exercise

developers prepare for contingencies that could jeopardize the development of the exercise.

The Activity Network is used to show graphically the sequence of events in a project. The tool is also used to show activity duration, earliest start and end times. Knowing start and end times helps determine how long the project will take to be completed. The tool also helps determine the critical path of the project. This path shows the sequence of activities that have no slack time (that is to say that these activities have to proceed one after the other without an waiting period in between).

This tool can be used in exercise development to determine the critical path in the process. The critical path will help determine activities that are critical to the completion of the exercise development project Also, the tool will help determine slack time (the difference between the start of one activity and the end of the previous activity on which the activitity depends). Slack time will help plan for "breathing space" for delays.

Table 1 shows each project management tool and the degree to which I believe the tool addresses the five characteristics of emergency exercise development.

Table 1: Matrix Showing Project Management Tools and the Degree to which They Address the Five Characteristics of Emergency Exercise Development.

Project management tool	Planning	Coordination	Communication	Resource allocation	Assigning Responsibility
Stakeholder analysis	high	-	-	low	-
Work breakdown structure	high	-	-	low	-
Responsibility matrix	-	high	medium	medium	high
Activity/milestone chart or list	medium	-	-	-	-
Progress diagram	medium	-	-	-	-
Gantt chart	high	medium	-	-	-
Activity network	high	medium	-	-	-

This section of my literature review presented project management, its tools, and how they may be used in emergency exercise development.

Emergency Exercise Development and Project Management

Developing an exercise may be thought of as a project. Here are characteristics that make it a project.

1. Exercise development has a finite start and finish time.
2. There are milestones to be crossed.
3. Exercise development involves careful planning.
4. An exercise is unique in that it's purpose or focus is unique each time it is developed.
5. Exercise development uses a multidisciplinary team, drawn from the functional organization structure, to form a "matrix" organization structure.
6. Developing the exercise is important to the organization
7. The exercise developed is delimited in that exercise objectives are specific.
8. Exercise development involves control and coordination of the exercise development team to attain the desired goals.
9. Exercise development entails monitoring to ensure that scheduled milestones are attained.
10. Exercise development requires a "systems" approach as a number of organizations and sub-systems are involved.

Thus, developing an emergency exercise has the characteristics of a project. Developing an emergency exercise is nevertheless different from a traditional (for example building a house or developing a new automobile) project in the following ways:

1. There is no tangible end product as would be seen in a traditional project.
2. In a traditonal project, the project team is made up of members drawn from various parts of the parent organization. The team works on the project until completion and then breaks up. In an exercise development project, team members work on developing the exercise as well as other projects.

Thus exercise development is a project that does not have a tangible end product; and team members work on other projects too.

Summary

The body of literature in the area of project management is vast. A large part of the literature is focused on network planning and development, probably because this project management tool is extremely useful. I have tried to condense the vast body of literature to provide a synopsis that covers the broad spectrum of project management elements.

The literature in the area of emergency management is also vast. The literature focuses on general emergency planning and procedures and of course nuclear emergencies. The literature in emergency exercise development focuses on exercises for various types of emergencies.

Literature focusing on project management tool application in emergency exercise development is rather limited. FEMA (1984, 1989) and DOE (1991) guides to emergency exercise development are the only documents I found that refer to project management tools in exercise development. These documents focus on the Gantt chart tool. This research will fill some gaps in this area.

METHODOLOGY

This section will deal with my research model, research assumptions, and my research plan. I will begin with an introduction to qualitative research and the suggestions and work of proponents of this method of research.

Introduction to Qualitative Research

The purpose of this type of research is to:

- describe interactions,
- explore patterns,
- discover processes,
- interpret and understand,
- generate theory,
- define terms, and
- identify variables.

These purposes are seen in the work of Henry Mintzberg (1979, 1971) on the nature of managerial work.

This type of research addresses:

- what occurs?
- how does it occur?
- questions that require the exploration of a process not yet identified and not yet encompassed in theory (Marshall & Rossman, 1989).
- open and broad issues that allow for discovery (Strauss & Corbin, 1990).
- questions for which the goal is to develop pertinent hypotheses and propositions for further research (Yin, 1989).

Qualitative research may be defined as "any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification," (Strauss & Corbin, 1990). According to Marshall & Rossman (1989), mainstream qualitative research 1) entails immersion in the everyday life of the setting chosen for study, 2) values participants' perspectives, 3) views inquiry as an interactive process between the researcher and the participants, and 4) is primarily descriptive and relies on peoples' words as the primary data. I believe the methodology of qualitative researchers is as rigorous and systematic as that of other researchers. Qualitative research is vital and viable and is constantly in the process of being evaluated and refined. One of the most important ideas behind qualitative research is that there is no one right method; the method should match the study (Wilson, 1977).

As qualitative research is conducted within a more flexible framework of methodology than quantitative research, the researcher is obligated to create a design that establishes the truthfulness of "the study, its applicability, its consistency, and its neutrality" (Marshall & Rossman, 1989 in Strode, 1992). Strode (1992) cites Lincoln and Guba (1985) as proposing four criteria consistent with the assumptions of qualitative research and somewhat analogous to criteria for quantitative research: 1) credibility (validity), 2) transferability (generalizability), 3) dependability (reliability), and 4) confirmability (replicability). These criteria are particularly important to my study as I examined a process (exercise development) with a new perspective (applying project management tools and techniques) and therefore have no previous studies to guide the research design. Therefore the research course must be carefully charted, which I have done. I addressed the four criteria in the following manner: 1) I recorded data on tape (dependability--the data recorded are reliable because they are available on tape, confirmability--I transcribed data recorded on tape and have included these data in Appendix K), 2) I used the expertise of my research committee to evaluate my

research procedure (credibility), 3) I studied the development of a full-scale emergency exercise (transferability), and 4) I used direct quotes from interviews to support my findings (credibility--I used the comments of exercise developers to support my conclusions).

Principles of Qualitative Research

Here are some principles on which qualitative research is based (Whitt & Kuh, 1991):

1. Search for understanding: e.g., description and discovery that would lead to a better understanding of the process of adapting management tools to novel situations in novel ways.
2. Investigator proximity: e.g., by working directly with a group and through numerous interviews and observations becoming immersed in the setting gathering data on their thoughts and practices.
3. Inductive analysis: e.g., no attempt to describe the data in terms of an extrinsic theoretical framework, rather findings inform the research and the data analysis. Through this study I have provided insight on some hinderances to the application of project management tools to emergency exercise development. I also generated hypotheses from this study, based on observations.
4. Familiarity with the setting and phenomenon under investigation: e.g., being immersed in the setting or being a part of the situation itself.
5. An appreciation of the value-laden nature of the inquiry: e.g., focus on the views of the participants by their continuous feedback on the findings, recognize your own biases. In Appendix J, I have provided the biases I have with respect to my familiarity with project management tool usage and their applicability to emergency exercise development.

Strategy of "Direct" or Qualitative Research

Direct research involves first reading historical documents to develop chronologies and then using interviews to fill gaps in the chronology (Mintzberg, 1979). Mintzberg used observation and interviews to determine the nature of managerial work (Mintzberg 1979, 1971). His research was based on seven basic underlying themes (Mintzberg, 1979):

1. The research was as purely descriptive as possible;
2. The research relied on simple methodologies--he used just one sample;
3. The research was purely inductive;
4. The research was systematic;
5. The research was conducted in real organizational terms;
6. Systematic data are supported by anecdotal data; and
7. The research has synthesized and integrated diverse elements into configurations of ideal or pure types.

I have followed Mintzberg's themes in carrying out this research. The chronology of events described in Appendix A, show how the basic themes are incorporated in this research.

Research Process Model

My research process model outlines how this research was conducted. As this was a qualitative study, my model does not show variables and the relationship among them.

Figure 2 illustrates my research process model. Naturalistic studies, according to Lincoln and Guba (1985), are virtually impossible to design in any definitive way before the study is actually undertaken. They do nevertheless have a characteristic pattern of flow or development. Here is a description of the terms in the research

model. Naturalistic inquiry is carried out in a natural setting, since context is so heavily implicated in meaning. This contextual inquiry *demands* a human instrument. The human instrument builds upon his or her *tacit* knowledge as much as if not more than upon propositional knowledge and uses appropriate methods of humanly implemented inquiry: interviews, observations, document analysis, unobtrusive clues, and so forth. Once in the field, the inquiry goes through successive iterations of four elements: purposive sampling, inductive analysis of the data obtained from the sample, development of grounded theory based on the inductive analysis, and projection of next steps in a constantly emergent design. The iterations are repeated until redundancy is achieved, the theory stabilized, and the emergent design fulfilled to the extent possible in view of time and resource constraints. Throughout the inquiry, the data and interpretations are continuously checked with respondents who have acted as sources. The information is then used to develop a case report or case study. The case study is primarily an interpretative instrument for an idiographic construal of what was found there. The case study may be tentatively applied to other, similar contexts, if empirical comparison of the sites seems to warrant such an extension. The entire study is bounded by the nature of the research problem, the evaluand, or the policy option being investigated. Finally, the case study's trustworthiness is tested by four naturalistic analogues to the conventional criteria of internal and external validity, reliability, and objectivity, which are: credibility, transferability, dependability, and confirmability respectively. This research model was derived from Lincoln and Guba's description of naturalistic studies (1985).

My research procedure mirrors the model discussed above (discussed later in this section under the research plan).

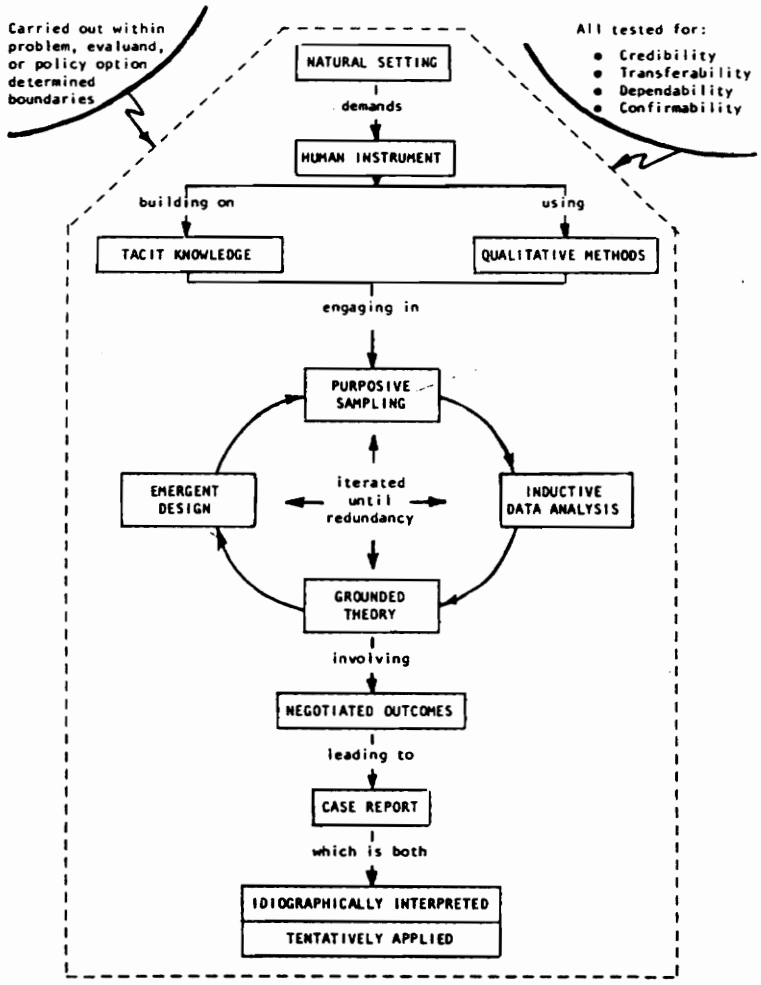

Figure 2: My Research Processs Model Shows the Flow of Naturalistic Inquiry. (Source: Lincoln and Guba, 1985, pg 188.)

Research Assumptions

I am making the following assumptions for my research:

1. Each activity in emergency exercise development has certain attributes that beget a need.
2. Activities in emergency exercise development are influenced by external forces.
3. There are certain characteristics of emergency exercise development that make exercise development different from a traditional project.
4. There are certain characteristics or attributes of exercise development that can be addressed by project management tools, resulting in a pattern of usage of the tools.

Research Plan

In this section, I discuss the subjects for my research, the log I developed (Appendices B and C) and piloted (Appendix I provides transcriptions of interviews with pilot study subjects. Appendix C shows the memory jogger log after changes were made based on pilot study subjects changes.) and how I collected and analyzed my data. Appendix A provides a detailed chronology of events that led to this research, providing a background.

Subjects

I used the full-time members of the Emergency Management Group (EMG) at Management Systems Laboratories as my subjects. The group is made up of five full-time personnel and students. One of them is the secretary and the four others are professionals with different educational backgrounds and varying experience in emergency management. All five, including the secretary, participate in the development of emergency exercises.

This group has developed exercises previously, and are familiar with the emergency exercise development process. I gave this group a 1.5 hour seminar/workshop on project management tools. I did this to familiarize them with the seven project management tools selected for use in this research. (Appendix G provides an evaluation summary of the seminar. Appendix H provides a personal evaluation of the project management seminar.)

I followed up the seminar with informal discussions with the group to inquire whether they felt comfortable with the tools. One member expressed a desire to learn more about project management software. I provided the person with material about the software along with a sample copy of the software. One of the members also attended a seminar on project management conducted by a project management consulting firm. I used a questionnaire before and after the project management workshop I conducted to determine whether the group members had become familiar with the project management tools. (Appendix G summarizes the results obtained from the questionnaires administered before and after the seminar. Appendices E and F detail the evaluation forms I used to obtain the group members feedback.) I believed the group was familiar with the first four project management tools after the workshop I gave them. I based my conclusion on the fact that all the members answered they were familiar with the project management tools in the evaluation questionnaire I administered after the workshop.

The Memory Jogger Log

I developed a memory jogger log before I conducted the workshop on project management tools for the EMG. I piloted this log during the workshop (conducted in March 1993) to test whether the log would serve its purpose. The log I developed was to be used to record activities along with project management tool(s) used in those

activities. This log was to be used by all members of the EMG during the development of Joint Response '93--a full-scale emergency exercise. (Joint Response '93 was held in June 1993 and the EMG began developing this exercise in May 1993.) I intended to use these logs to interview each member of the EMG, after Joint Response '93, about the project management tools used during the development of Joint Response '93. The logs were meant to act as simple memory joggers so interviewees could recollect the various activities they performed and the project management tools they used. During the project management seminar I conducted, I piloted this log using two subjects knowledgeable in project management. I interviewed one subject two days after the project management seminar and the other subject about a month after the seminar. I interviewed both subjects a month after the seminar as I intended to interview the EMG about three months after they developed Joint Response '93. The intention of interviewing one of my pilot study subjects a month after the seminar was to determine whether the memory jogger log helped the interviewee remember where, why, and how he or she used project management tools. The first subject provided some suggestions for improvement in the log. I made these changes. Appendix B shows the log before changes and Appendix C shows the log with changes. (Note that the EMG members used two project management tools while developing Joint Response '93. I discuss this further in my results and conclusions sections.)

Data Gathering

As my research was a single case qualitative study, I used interviews to gather my data. Here is my procedure.

1. I distributed the "memory jogger" logs just before the EMG began work on Joint Response '93. Each member got a sufficient number of the logs so they would have

one for each day.

2. The EMG members were to use the logs to record their activities on a daily basis.

3. I interviewed the EMG members in November 1993. My interview consisted of two parts. The first part was open-ended. The second part consisted of specific questions pertaining to what each member said about the project management tools. The purpose of the second part was to clarify points made in the open-ended interview and to gather further information on the where the project management tools could be used.

4. Interview procedure: I used the following procedure when interviewing the EMG members:

1) Interview protocol:

Note: As the EMG did not use project management tools in developing Joint Response '93, I asked them why they would have used the project management tools. I used the phrase 'would have used' in my question because the EMG members stated up-front that they did not use the project management tools in developing Joint Response '93.

"Good morning/afternoon_____how are you? I would like you to tell me which project management tools you would have used, for what activities, and how you would have used them in developing an emergency exercise"

2) Members I interviewed:

I interviewed the five full-time members of the EMG. I did not interview the student members of the group as their role is to provide support services (word

processing) to the group. I used a tape recorder to record each interview.

3) Length of interview:

Each interview did not exceed one hour in length.

4) Transcribing the interviews:

I transcribed each interview using a word processor on an IBM PC. I transcribed each interview word for word. I also verified transcribed data with interviewees.

Data Conversion and Analysis

Once I transcribed the interviews, I manually analyzed the data obtained. I also used the software *RightWriter and ASKSam* to check the interview data. Here is a description of how the two software packages work. (Sample outputs are provided in Appendix M.)

RightWriter: this software is a grammar checker and also counts the number of words in a document. The unique feature of the software is that it counts the number of words used and provides a list of unique words used along with the frequency of usage. (See Appendix M.) From this list, the common words can be removed and the unique words retained. The list of unique words used in the interview provide a means to look for themes in each interview.

ASKSAM: this software carries out a search string to help locate the context of usage of words. The software highlights selected unique words, which helps see the context in which they are used. Knowing the context in which a unique word is used helps determine a theme or pattern of usage of the word--say for example the word "useful" along with "work breakdown structure."

I began my data conversion and analysis by manually examining each interview. I wrote down comments made by each member about each of the seven project management tools. I assigned each comment (a sentence or phrase describing a project management tool) or "unit" to a category. Each category was one of the seven project management tools. Once all "units" or comments were assigned, I looked for common themes. These themes pertained to what the interviewees said about each of the project management tools. I came up with four themes: 1) where could the tool be used, 2) what need will the tool address, 3) whether it helps improve quality, and 4) whether it helps cut down time spent. I then arranged each of the "units" made under each category (tool) under each of the themes. Having the units under categories within each theme provided a means to look for themes across interviews. I then used RightWriter and ASKSAM to check whether I had obtained all comments made about each of the project management tools. This procedure acted as a verification step. I developed this procedure based on the work of Kotnour et. al. (1993) and Weber (1985). I recorded the "units" or under each theme within each category (project management tool) in matrix form. These matrices are shown in the results section.

Pilot Study

I conducted a pilot study of my "memory jogger" log and the first part of my interview procedure. The purpose of the pilot study was to uncover flaws in the log and the interview procedure. The subjects for my pilot study were two graduate students from Management Systems Laboratories. Both are familiar with project management. They attended the project management seminar I gave and used the "memory jogger" log to record the activities they performed and the project management tools they used. I interviewed one of my pilot study subjects two days after the seminar. The subject used the memory jogger log to help him recollect where, how, and for what purpose he had used the project management tools. The

purpose of my pilot study was to determine whether the log helped the subject recollect activities and tools used during the seminar. I used open-ended questions during this interview. I interviewed both pilot study subjects once again about a month after the seminar. (The seminar was held on March 8 1993.) I interviewed the pilot study subjects a month after the seminar to determine whether the memory jogger log helped them recollect what they did a month earlier. The purpose was to determine whether the memory jogger log would help the interviewee recollect where, why, and how he or she used the project management tools. I interviewed the EMG members about three months after they completed developing Joint Response '93 (a full-scale emergency exercise). Joint Response '93 was held on June 26, 1993. I transcribed the interviews of my pilot study subjects word for word using a word processing software on an IBM PC and then used RightWriter and ASKSAM to separate out key words and phrases and their context of usage.

Interpretation of Data

I used the results from the data analysis to determine whether the attributes, need, and external forces in emergency exercise development affect the pattern of usage of project management tools. From these results I have made suggestions on how emergency exercise developers may use project management tools. I discuss my suggestions in the conclusions section.

RESULTS

As I discussed in the methodology section, I used interviews to gather data. I then analyzed these data manually to obtain themes across interviews. I used the software packages RightWriter and ASKSAM to check my manual analyses.

When I began this research, I intended to have a group of emergency exercise developers use selected project management tools in developing an exercise. Towards this purpose I gave a group of emergency exercise developers a short seminar on using the selected project management tools. I also developed a "memory jogger" log to help them record activities as they developed the emergency exercise. The group used two project management tools in a rudimentary form.

As the group had not used five of the project management tools, I decided to obtain their opinions on where, why, and how they could have used the project management tools in an emergency exercise development project. Here are the results I obtained from the interviews.

The Emergency Management Group (EMG) at Management Systems Laboratories (MSL) was to have used the selected project management tools in developing Joint Response '93, an emergency exercise. They used two project management tools--the responsibility matrix and the activity/milestone chart.

Here are six tables summarizing the comments made by each of the five members of the EMG. EMG members felt that the Progress Diagram tool was similar to the Gantt chart and therefore did not express any opinions about it. I therefore have their opinions on six of the seven tools. The comments are grouped within four themes

under each tool. The four themes are: where could the tool be used; what need will the tool address; will the tool help improve quality; and will the tool help cut down time spent. The members of the EMG considered the progress tracking tool to be a part of the Gantt chart tool as the progress tracking tool served the same purpose. They therefore did not comment about the progress tracking tool.

Table 2: Summary of Comments of EMG Members on the Stakeholder Analysis Tool

EMG Member	Where could the tool be used	What need will the tool address	Will it help improve quality?	Will it help cut down time spent	Why didn't you use the tool?
Member 1	- Planning/Scenario development	- identify relationships among participants - ensure that exercise objectives cover all needs of all stakeholders - obtain buy-in of stakeholders to the scenario - help identify hidden agendas	- Yes	- Yes	- Did not have time
Member 2	- Stakeholder identification in planning	- identify stakeholders - determine who could influence or help the project	- Do not know	- Do not know	- Did not have time
Member 3	- Stakeholder identification	- determine stakeholder influence	- Do not know	- Do not know	- Did not have time
Member 4	- Beginning of project (planning stage)	- determine who stakeholders are and their level of influence - would have helped focus on developing the exercise and involve all parties (stakeholders) required	- No	- No	- Did not have time
Member 5	- Before developing scenario (beginning of project)	- identify stakeholders, their special interests, and how this influences the project - help identify political interests in developing scenario	- Yes	- Yes	- Did not have time

Table 3: Summary of Comments of EMG Members on the Work Breakdown Structure Tool

EMG Member	Where could the tool be used	What need will the tool address	Will it help improve quality?	Will it help cut down time spent	Why didn't you use the tool?
Member 1	- Planning	- help determine "doable" parts of tasks - help in figuring out deadlines and sequencing - identify tasks to do on a day-to-day basis - help in identifying who can do the job - helps to think about slack time in a qualitative sense - helping members learn tasks by allowing tasks not familiar to them be assigned to them	- Yes	- Yes	- Did not have time
Member 2	- Beginning of the project (planning)	- allow breaking down of the many large tasks	- Yes	- Yes	- Did not have time
Member 3	- Beginning stages of project (planning)	- help with deliverables - provide more control over staffing and thereby improve efficiency	- Yes	- Yes	- Did not have time
Member 4	- Project planning	- help in breaking down work into manageable pieces - help clearly define goals and tasks	- No	- Yes	- Did not have time
Member 5	- Planning (upfront)	- helps with deliverables - help provide a clearer picture of what exactly has to be done - help in clearly organizing tasks - help in making division of labor more visible - helps point out important tasks	- Yes	- Yes	- Did not have time

Table 4: Summary of Comments of EMG Members on the Responsibility Matrix Tool

EMG Member	Where could the tool be used	What need will the tool address	Will it help improve quality?	Will it help cut down time spent	Why didn't you use the tool?
Member 1	- Planning	- help in having control over the project - would help in deciding how to distribute labor and use it efficiently - help in getting "buy-in" to the project as everyone would have a responsibility and stake in the project - would help in knowing who is responsible for what task	- Yes	- Yes	- Used this tool in a rudimentary fashion
Member 2	- Planning	- help determine who is responsible for various parts of the project	- Yes	- Yes	- Used this tool
Member 3	- Planning	- would be useful to help in knowing who we are delivering what to - would help in understanding responsibilities as it would be formalized	- Yes	- Yes	- Used this tool
Member 4	- Project planning	- would be useful in clearly defining responsible parties and showing approval authority - would help define tasks, areas of responsibility, and accountability	- Yes	- Yes	- Used this tool in a rudimentary fahsion
Member 5	- Planning	- make responsibilities formalized, visible, and concrete - would be useful in knowing who is responsible, reviews, executes, or has to be consulted.	- Yes	- Maybe	- Used this tool

Table 5: Summary of Comments of EMG Members on the Milestone/Activity Chart Tool

EMG Member	Where could the tool be used	What need will the tool address	Will it help improve quality?	Will it help cut down time spent	Why didn't you use this tool?
Member 1	- Planning	- would help in figuring out actual dates on which some delays can be allowed - would allow one to see where deadlines were not met - different milestone charts, over a period of time could tell us whether our estimate of time was correct	- Yes	- Yes	- Used this tool
Member 2	- Planning	-help in scheduling based on milestones	- Do not know	- Do not know	- Used this tool
Member 3	- Planning	- help in developing a set of milestones to organize work activity	- Do not know	- Yes	- Used this tool
Member 4	- Project planning and throughout the project	- help show deliverable due dates - assist in ensuring that project/contract requirements are met and plan work accordingly	- Yes	- Yes	- USed this tool
Member 5	- Planning	- help in portraying milestones and activities graphically - would help maintain focus on the project, in projects of longer duration	- Yes	- Maybe	- Used this tool

Table 6: Summary of Comments of EMG Members on the Gantt Chart Tool

EMG Member	Where could the tool be used	What need will the tool address	Will it help improve quality?	Will it help cut down time spent	Why didn't you use this tool?
Member 1	- Portray project	- help in portraying the project	- Do not know	- Do not know	- Did not have time
Member 2	- Do not know	- Do not know	- Do no know	- Do not know	- Did not have time
Member 3	- Do not know	- Do not know	- Do not know	- Do not know	- Did not have time
Member 4	- Portray project	- show where we are in the project - would be helpful in showing corresponding activities	- No	- No	- Did not have time
Member 5	- Portray project	- help in graphically portraying the project	- Do not know	- Do not know	- Did not have time

Table 7: Summary of Comments of EMG Members on the Network Tool

EMG Member	Where could the tool be used	What need will the tool address	Will it help improve quality?	Will it help cut down time spent	Why didn't you use the tool?
Member 1	- Do not know	- Do not know	- Do not know	- Do not know	- Did nt have time
Member 2	- Do not know	Do not know	- Do no know	- Do not know	- Did not have time
Member 3	- Do not know	Do not know	Do not know	Do not know	- Did not have time
Member 4	- Planning	- help show dependencies and critical path	- Yes	- Yes	- Did not have time
Member 5	- Planning	- help show priorities, slack time, and dependencies - help in showing interrelationship of activities - help daily tracking of where we are, what is going on and what has to be done	- Yes	- Yes	- Did not have time

Here is a table summarizing the comments the EMG members made on which tools would address the five characteristics (planning, co-ordination, communication, identifying resources, and assigning responsibility) of emergency exercise development I discussed in the literature review section. Table 9 is a reprint of Table 1 so as to provide a comparison.

Table 8: Summary of Comments Made by EMG Members on which Project Management Tools Address the Five Characteristics of Emergency Exercise Development.

EMG Member	Planning	Communication	Identify resources	Co ordination	Assigning responsibilities
Member 1	- Stakeholder analysis - Work breakdown structure - Responsibility matrix	- Stakeholder analysis - Responsibility matrix	- Work breakdown structure - Responsibility matrix	- Responsibility matrix	- Responsibility matrix
Member 2	- Work breakdown structure	- Do not know	- Stakeholder analysis	- Responsibility matrix	- Responsibility matirx
Member 3	- Stakeholder analysis - Work breakdown structure	- Do not know	- stakeholder analysis	- Responsibility matirx	- Responsibility matrix
Member 4	- Stakeholder analysis - Responsibility matrix - Network	- Stakeholder analysis - Responsibility matrix	- Do not know	- Responsibility matrix - Work breakdown structure - Stakeholder analysis - Network	- Responsibility matirx
Member 5	- Gantt chart - Milestone list - Stakeholder analysis	- Stakeholder analysis - Responsibility matrix	- Work breakdown structure - Responsibility matrix	- Responsibility matrix	- Responsibility matrix

Here is Table 1 reprinted here as Table 9 so the EMG members comments may be compared with the degree to which I believed each of the selected project management tools could address the five characteristics of emergency exercise development. As seen there is a difference between what the EMG members believed each of the tools would address and what I had suggested they could address. This difference in opinions may be due to a) insufficient training on project management tools (and therefore a different perception of what each tool does) or b) project management tools working differently in a natural (developing an emergency exercise) setting. This difference in opinions on usage of project management tools suggests the need for further research.

Table 9: Matrix Showing Project Management Tools and the Degree to which They Address the Five Characteristics of Emergency Exercise Development.

Project management tool	Planning	Coordination	Communication	Resource allocation	Assigning Responsibility
Stakeholder analysis	high	-	-	low	-
Work breakdown structure	high	-	-	low	-
Responsibility matrix	-	high	medium	medium	high
Activity/milestone chart or list	medium	-	-	-	-
Progress diagram	medium	-	-	-	-
Gantt chart	high	medium	-	-	-
Activity network	high	medium	-	-	-

DISCUSSION AND CONCLUSIONS

My research question, stated earlier in this document, was "given the understanding of project management tools and techniques, in what activities, in developing and emergency exercise, will developers perceive a need to use those project management tools and what will be the stimuli?" The group of emergency exercise developers who were to use these tools in developing an actual exercise did not use them. I therefore obtained their opinions on where they would have used the tools, what need the tools would have addressed, whether it would have improved the quality of their task, and whether it would cut down on time spent on the task.

I analyzed the data from the interviews I conducted to determine where the project management tools could be used, why, would they assist in improving or assuring quality, and whether they would help in cutting down time spent on the task. From these data I was able to determine which project management tools could address specific needs of activities in exercise development. I was also able to determine why the group did not use the project management tools.

I was not able to map out the various stages in exercise development along with the most used project management tools as the group that was to use these tools in developing an actual exercise did not use them. I was able to determine where the group felt the project management tools would be helpful. I was not able to determine whether the project management tools would require modifications to better address needs generated by activities in exercise development. I could not do this as the EMG did not use the tools in developing the exercise and therefore did not have the opportunity for a hands-on application of the tools in developing an emergency

exercise. I was also unable to determine whether the external crisis aura affects the needs of activities in emergency exercise development, as the group did not use the project management tools in developing the exercise.

The information I have obtained from analyzing the data provide some insight into where, why, and how project management tools may be used in emergency exercise development. This information can help emergency exercise developers use project management tools to assist them in developing emergency exercises.

I discuss my analysis of results under each of the project management tools I had selected for use in emergency exercise development.

Stakeholder Analysis

All five members of the Emergency Management Group (EMG) felt the stakeholder analysis tool would be most useful in the planning and scenario development stage in developing an exercise. All members felt that the tool would assist in ensuring that exercise objectives met all needs of all stakeholders, determine the influence of stakeholders, and identify all stakeholders in the exercise project. I had discussed these uses as potential uses (based on the literature) for the Stakeholder Analysis tool in the literature review section.

In addition to addressing the three needs discussed above, member 1 felt the tool would also assist in obtaining buy-in of stakeholders to the scenario developed and help identify relationships among participants. Member 4 felt that the tool would also help focus on developing the exercise and involve all parties (stakeholders) required.

Work Breakdown Structure

Members of the EMG felt the work breakdown structure could be used in the project planning stage of developing an emergency exercise. All members of the EMG felt that the tool would assist in dividing each task into manageable or "doable" sub tasks. I had discussed this use as a potential use (based on the literature) for the Work Breakdown Structure in the literature review section.

In addition to helping dividing tasks into doable sub-tasks, member 1 felt the tool could also assist in identifying who could do the job, determine slack time in a qualitative sense, and help members learn new tasks by assigning new tasks to those members. Members 3 and 5 believed the tool would help with deliverables. Member 5 felt the tool would also make division of labor more visible. Member 4 felt the tool would help clearly define goals and tasks.

Responsibility Matrix

All five members of the EMG felt the responsibility matrix could be used to assist in assigning responsibilities in developing an exercise in the project planning stage. I had discussed this use as a potential use (based on the literature) for the Responsibility Matrix in the literature review section.

In addition to helping with assigning responsibility, member 1 felt the responsibility matrix could also assist in having control over the project, help decide how to distribute labor, help in getting buy-in to the project as everyone would have a stake in the project. Member 3 felt the tool would help in knowing where or to whom deliverables go. All members felt this tool would help with assuring quality.

Activity/Milestone Chart or List

All members of the EMG felt the activity/milestone chart could be used in the project planning stage. The project manager felt the tool could be used during the entire project. All members felt the activity/milestone chart would help in scheduling tasks and showing milestones or deliverable dates. I had discussed this use as a potential use (based on the literature) for the Activity/Milestone Chart in the literature review section.

In addition to addressing the above-mentioned uses for the activity/milestone chart, member 4 felt the tool could be used to assist in ensuring project/contract requirements are met and plan work accordingly. Member 1 felt the tool would help determine dates on which some delays could occur, and check, over time, whether estimates of time are correct.

Progress Diagram

All members of the EMG felt this tool performed the same function as the Gantt chart. They therefore did not think they would need to use this tool.

Gantt Chart

Three members of the EMG felt the Gantt chart could be used as a portrayal tool. They did not know where (which stage) they would use the Gantt chart. The three members felt the Gantt chart would show where they were in the project, would help in showing corresponding activities, and graphically portray the project. I had discussed these uses as potential uses (based on the literature) for the Gantt chart in the literature review section.

All members of the EMG were not sure where exactly they could use this tool.

(Members 1, 4, and 5 believed the tool could be used to portray the project.) Three of the five members (members 1, 2, and 3) did not know how exactly to use the tool and what it could do for them.

Activity Networks

Two members (members 4 and 5) of the EMG felt the network tool could be used in the planning stage. They believed the tool would help show dependencies, critical path, and slack times, and help in daily tracking of where they were, what was going on, and what had to be done. I had discussed these uses as potential uses (based on the literature) for the network tool in the literature review section.

Three members (members 1,2, and 3) of the EMG did not know how to use this tool. Two members (members 4 and 5) knew how to use the tool and felt it would also assist in quality assurance and help in cutting down time spent on tasks.

Project Management Tools and Characteristics of Emergency Exercises

Here is a summary account of which tools EMG members felt they would use to address the characteristics of emergency exercise development:

Planning: stakeholder analysis, work breakdown structure, responsibility matrix, activity network, Gantt chart, and milestone list.
Communication: stakeholder analysis and responsibility matrix.
Identify resources: work breakdown structure, responsibility matrix, and stakeholder analysis.
Co-ordination: responsibility matrix, work breakdown structure, and network.
Assigning responsibility: responsibility matrix.
Table 8 summarized the comments of EMG members pertaining to project

management tools and the characteristics of emergency exercises. I also reprinted Table 1 as Table 9 after Table 8 to allow comparisons to be made.

My research was qualitative in nature. I did not have any testable hypotheses which would help draw firm conclusions. Nevertheless my research will provide emergency exercise developers information that will help them use project management tools. The information pertains to where, how, and why project management tools may be used in developing emergency exercises, and reasons why the tools might not be used.

I set out to investigate where, why, and how emergency exercise developers would use project management tools in an emergency exercise development project. Based on my investigation, I intended to determine what stimuli and needs would cause developers to use these tools. I had stated how I believed the selected project management tools could be used in emergency exercise development. I was unable to determine the stimuli, the external forces (crisis aura), and precisely where in exercise development developers would perceive a need to use project management tools, due to the fact that the developers who were to use the tools in an exercise development project did not use the tools. I was nevertheless able to determine where, why, and how the developers believed they could have the selected project management tools. In addition to this information I was also able to determine why they did not use project management tools (with the exception of two).

The overall opinion of all five members of the Emergency Management Group (EMG) at Management Systems Laboratories was that project management tools would be useful in the beginning stages of developing an emergency exercise. The members of the EMG felt that six of the seven project management tools I had selected for use in exercise development could be used in an exercise development project. Of the six

project management tools, the majority of the EMG members felt most comfortable with four. The six tools the EMG felt could be used in exercise development are:

1. Stakeholder analysis,
2. Work breakdown structure,
3. Responsibility matrix,
4. Activity/milestone chart or list,
5. Gantt chart, and
6. Activity networks.

The group did not think the progress tracking tool would be useful, as the Gantt chart would serve the same purpose, namely project portrayal (refer to the results section). Of the six tools listed above, the majority (3 out of 5) of EMG members felt most comfortable (understood how to use the tools and felt they would use them in an exercise development project) with using the following project management tools:

1. Stakeholder analysis,
2. Work breakdown structure,
3. Responsibility matrix, and
4. Activity/milestone chart or list.

My research, as stated earlier, indicates that project management tools can assist in developing emergency exercises. This is mainly due to their inherent characteristics that allow them to address the needs of activities in emergency exercise development. I will now provide some suggestions for emergency exercise development managers that may help them in using project management tools in developing an emergency exercise.

EMG Members' Suggestions for Using Project Management Tools

From interviewing members of the EMG, I learned where they believed the project management tools would be most useful in developing an emergency exercise. I have discussed how each of the selected project management tools may be used in exercise development in the Discussion section of this document. In interviewing members of the EMG, I also obtained their opinions on the overall use of project management techniques and tools. Here is a list of suggestions and direct quotes from the interviews that emergency exercise development managers may find useful in implementing the use of project management tools. (Refer to appendix M for transcriptions of interviews.)

- Begin using project management tools early in the project.

Members of the EMG felt they needed to begin using project management tools upfront. They believed the tools were most suitable for planning the entire project. They also felt using the tools at the beginning would be time consuming, but benefits would be reaped later.

- Project management tools need to be used together as a set of tools rather than as independent tools.

Based on what the members of the EMG said about the project management tools, I learned that the tools needed to be used together. Each tool works in conjunction with the others (suggesting that the tools need to be used as a set). Using them together would provide greater benefits in efficiency and quality. I quote one of the EMG members to support this suggestion, "If you use the four tools (stakeholder analysis, work breakdown structure, responsibility matrix, and activity/milestone chart) in the way they are designed to be used, you do not use them in a vacuum. (You use them as a whole - together.)"

- Ensure that users of project management tools understand the benefits of using the tool (i.e., the tool's purpose, proper use, and outputs).

Members expressed the opinion that they would use certain project management tools based on the "payoff" of the tool. Therefore, I believe that exercise development managers should ensure that developers know the benefits of each project management tool, namely what information the tool will provide, how it must be used, and its purpose. This leads to the next conclusion, namely training.

- Training is required to reap the benefits of using project management tools

Members of the EMG expressed the fact that their not being familiar with the project management tools prevented them from using the tools. They felt they needed to get more familiar with the project management tools to use them. I therefore suggest that exercise development managers provide sufficient training to their teams on using project management tools, before implementing their usage in developing an emergency exercise.

Explanation for Why Project Management Tools Were not Used by the EMG

The members of the EMG did not use the project management tools in developing Joint Response '93, an emergency exercise. Through my interviews of members of the group I learned that the main reason was time. The project normally takes approximately three months to execute. The group had approximately one month in which to develop the exercise. Further analysis of interview data revealed that the members were not familiar with the project management tools. I added this fact to my conceptual model to show that there was an additional force influencing usage of project management tools in an emergency exercise development project. This is a more probable reason for the group choosing not to use project management tools in developing an emergency exercise.

On examining the comments of members I noticed a pattern. Member 4 is the leader of the group. Focussing on the quality theme, I noticed that of the six project management tools EMG members said they would use in developing exercises, only two tools were actually used in the emergency exercise they developed. These two tools were those that the leader felt would help improve quality. These two tools are the responsibility matrix and the milestone chart. The leader also said that the network tool would help in improving quality. This tool was not used and three members of the group did not know whether this tool would help improve quality. This tool was probably the hardest to use among the six tools. From this observation I conclude that the leader of the group influenced which project management tools were used in developing the emergency exercise. I believe the leader was able to exercise this influence over the group due to being able to define the situation and communicating it to the group (Hollander and Offermann, 1990). Yukl (1989) defines power as "the capacity to influence unilaterally the attitudes and behavior of people in the desired direction." There are different sources of power--position power, personality power, and political power (Yukl, 1989). The leader was able to influence the group due to control over resources as a result of position power (Yukl, 1989). Based on my conclusion that the leader influenced which project management tools the group used, I develop my first hypothesis.

Hypothesis 1

The usage of project management tools in an emergency exercise development project is influenced by the leader of the project team.

I had given the EMG members a seminar on using project management tools (stated earlier in the methodology section). One of the members attended a seminar on project management tools conducted by a professional organization after I gave the

group my seminar. I assumed that the group would practice using the project management tools, but they did not practice. Analysis of members' comments on which project management tools they would use to address characteristics of emergency exercise development reveals that they would use the tools differently than I had originally believed. (Table 1 in the literature review section summarized how I believe the selected project management tools will address the characteristics of exercise development.) This difference in opinions may be due to a) insufficient training on project management tools (and therefore a different perception of what each tool does) or b) project management tools working differently in a natural (developing an emergency exercise) setting. From these conclusions I develop my second and third hypotheses.

Hypothesis 2

Training on usage of project management tools influences usage of the tools in an emergency exercise development project.

Hypothesis 3

Project management tools may be used differently in an emergency exercise development project than in a traditional project.

In the previous paragraphs I discussed reasons for why project management tools were not used by the EMG. The reasons were obtained based on analysis of data gathered from interviews. There could be another reason for the EMG not using all the project management tools--self-efficacy. "Self-efficacy is a person's belief about his or her ability to perform a certain activity" (Merritt & Koball, 1993; Bandura, 1986). Studies have shown that a person's self-efficacy influences other factors such as tasks the

person chooses to engage in, persistence, interest, and performance (Merritt & Koball, 1993; Bandura, 1986). It is possible that members of the EMG did not have sufficient self-efficacy to cause them to feel comfortable enough with the project management tools. Self-efficacy could be the reason why they did not use the project management tools. I did not try to determine whether self-efficacy was the cause for the EMG's not using the project management tools as investigating self-efficacy was beyond the scope of my research endeavor.

Recommendations for Future Research

In this section I provide recommendations that may be useful to researchers intending to investigate this field further.

My research focused on using tools and techniques from one area, namely project management, and applying them to another field, namely emergency exercise development. To determine where experts in exercise development would use project management tools, I decided to have them use the tools. I provided them with a one and half hour seminar on how to use project management tools. Though the group was enthusiastic about using project management tools, they did not use them when confronted with a time crunch. They believed that not being familiar with the project management tools was the cause. I believed that a one and half hour seminar would be enough to train the users, but it would need to be followed by practice. Based on my findings, I would recommend that either more training or more opportunity for practice is necessary before exercise developers feel comfortable with using project management tools.

I would also suggest that future research investigate the influence of the leader of the emergency exercise development group on usage of project management tools by the

group in developing the exercise.

Based on my findings, another suggestion is that the researcher be a part of the development team when studying how project management tools are used in developing an emergency exercise. This would provide users a ready source of information to clarify any doubts. Also this experience would provide the researcher an opportunity to experience where the tools could be used. The researcher's presence would also act as a stimulus to those developing the exercise.

I interviewed members of the EMG about three months after they had completed the exercise development project. I could not interview them earlier due to their unavailability and time constraints. It would have been more beneficial if I had conducted the interviews immediately after the project. Conducting interviews immediately after the project would ensure that the users relate their experiences when the information is still fresh in their memories.

This research could have provided more information if the project management tools were used in an emergency exercise development project. I believe the tools could be used beyond the planning stage in exercise development. For example, a computerized Gantt chart and network could be used on a daily basis to track the project.

This research could be extended to conducting the emergency exercise. The information gained from such research could be helpful in improving exercises, which would contribute towards being better prepared for an emergency.

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APPENDICES

APPENDIX A

Chronological Sequence of Events for this Research

Jan 1992

I began work as a GRA with the EMG group at MSL in January 1992. I was hired after interviewing with the then program manager. He hired me as I'd expressed an interest in researching applied project management. His interest was in the area of crisis and risk management. He saw potential in my researching the application of project management to crisis or risk management. I began looking for literature in crisis management and crises in projects. I also looked into the possibility of researching early warning systems.

Mar 1992

The program manager, who hired me, left MSL in March 1992. This changed my research focus. The group did not have the resources to support research not related to their work in emergency management. I therefore switched to researching the application of project management to emergency management.

Apr 1992

The EMG group at MSL was awarded the contract to develop the Joint Response full participation exercise for 1992. The exercise was to be conducted at DOE's Fernald, Ohio, facility, managed by the Westinghouse Environmental Management Company (WEMCO).
This contract prompted me to look into the possibility of researching the application of project management to developing an emergency exercise. I began by developing a list of requirements for an exercise. I went

through Department of Energy (DOE) documents and guides on emergency management to obtain information. The intention was to provide EMG with a "laundry list" of things they had to do towards developing the exercise.

This task helped me learn about exercise development. The next task I did was to interview each member of the group to determine the tasks they performed to help develop Joint Response '92. I listed all the activities to be carried out in developing an exercise and had each member fill in what he or she did, along with the inputs they needed, the individual priority of the task, and the approximate time spent on each task. The result of the list was a set of Gantt charts showing the activities performed by members of the EMG. Also, I developed a table showing exercise development activities, who performed them, individual priorities, inputs required, and the approximate time spent on each activity. The table helped me work out a sequence of activities and also the input needed from colleagues for various tasks. I also developed a responsibility matrix showing the names of individuals performing (responsible for) various tasks.

The above activity helped me get a good picture of how an exercise was developed. I observed that planning was informal. No specific tools were used to assist the group in developing the exercise. They were all under great stress, as they had deadlines to meet. Each member was performing more than one task. I also observed that the absence of one member (due to illness) put the group through a lot of problems. They had to hurriedly obtain the services of personnel from other groups.

My observations led me to believe that project management would certainly help the group manage the process better. There were a number of similarities between emergency exercise development and project management (discussed in detail earlier in the literature review section). I noticed that both had a specific start and end. Both had multi-disciplinary teams to perform the job. Both had similar phases (conceptual, planning, execution, and termination). Both had multiple stakeholders. Both required careful planning. These similarities prompted me to explore further how project management could help in developing emergency exercises.

My research led me to believe that developing a good scenario was important for a good exercise. Developing a good scenario necessitated that exercise objectives be clearly defined. This necessitated identifying the scope of the exercise, identifying the participants, and obtaining their objectives.

I believe that providing exercise developers with tools to assist in planning and scenario development will be very useful, as these are two key stages of the exercise development process. If these two stages are executed well, the rest will follow.

Jul 1992

I researched communication to help the EMG in training emergency telephone operators. The material I researched pertained to asking the right questions and how to listen to obtain maximum information from the caller.

Sept 1992

Joint Response 1992 was held on September 12 at DOE's Fernald facility (managed by WEMCO). I attended the exercise to get a picture of what happened during the exercise. I witnessed the focal incident and also the Emergency Operations Center (EOC). I was also given the opportunity to help make simulated emergency phone calls to various locations as part of the exercise. This experience was very valuable as I was able to see a full-scale exercise and also meet emergency management personnel in the field. I spoke with them on an informal basis about emergency exercise development. The personnel expressed an interest in project management and felt project management would help them. The manager of the EMG asked me to put together a presentation on project management tools and techniques as applied to emergency exercise development. The presentation was to be given at a TRADE conference in Seattle, Washington. WEMCO's emergency manager at the Fernald plant was to assist in delivering this presentation. She was convinced of the usefulness of project management tools and was keen to learn more about their usage and application.

For this presentation, I used the work breakdown structure (WBS), stakeholder analysis, responsibility matrix, progress diagram, gantt chart, and activity network tools from project management. I modified the tools so they reflected emergency exercise terminology. No other modifications were carried out. Also the stages in exercise development were divided into conceptual, planning, execution, and termination phases of project management. I found that these tools addressed the

important parts/activities of exercise development--the planning and scenario development stages.

Feb 1993

I interviewed members of the EMG to determine what tools they used in developing the Joint Response '92 full-scale exercise. I also determined the stages of the exercise development process that EMG was involved in for Joint Response '92. The stages provided a background for my case study research effort.

Mar 1993

I conducted a seminar/workshop on project management for the EMG members. The seminar was done to familiarize them with the basic tools and techniques of project management. They would then use these tools when developing Joint Response '93. The exercise was scheduled to be held in June '93. I also developed a log for them to maintain, on a daily basis, during the development of Joint Response '93. This log would help me interview them about the tools they used and for what purpose.

Nov 1993

I interviewed each member of the EMG to determine how they would have used the project management tools and the benefits of each. The purpose was to determine how, where, and why the tools could be used. (Note that the EMG did not use the project management tools in developing Joint Response '93. I therefore obtained the members' opinions about the usefulness of each of the project management tools.)

Nov-Dec 1993

I analyzed the data I obtained and drew conclusions on whether the

project management tools would help in emergency exercise development, which of the seven project management tools would be most useful, and further research potential.

APPENDIX B

Memory Jogger Log before Changes

JOINT RESPONSE '93 PROJECT MANAGEMENT TOOLS USED

INSTRUCTIONS:
Please use this form **everyday**. It is meant to keep track of the **project management tools** you used when developing **Joint Response '93**.
Please use figures or a brief sentence to describe the activity you performed. Circle the project management tool you used, use a yes or no to answer whether the tool was useful, and state very briefly whether you encountered any obstacles in using the tool and if so what it was. Thank you very much for your cooperation.

Activity	**Project management tool used**	**Useful?**
	Stakeholder analysis, WBS, Resp. matrix, Activity/milestone list, Progress diagram, Gantt chart, Networks	
	Stakeholder analysis, WBS, Resp. matrix, Activity/milestone list, Progress diagram, Gantt chart, Networks	
	Stakeholder analysis, WBS, Resp. matrix, Activity/milestone list, Progress diagram, Gantt chart, Networks	
	Stakeholder analysis, WBS, Resp. matrix, Activity/milestone list, Progress diagram, Gantt chart, Networks	
	Stakeholder analysis, WBS, Resp. matrix, Activity/milestone list, Progress diagram, Gantt chart, Networks	
	Stakeholder analysis, WBS, Resp. matrix, Activity/milestone list, Progress diagram, Gantt chart, Networks	
	Stakeholder analysis, WBS, Resp. matrix, Activity/milestone list, Progress diagram, Gantt chart, Networks	
	Stakeholder analysis, WBS, Resp. matrix, Activity/milestone list, Progress diagram, Gantt chart, Networks	

APPENDIX C

Memory Jogger Log after Changes

JOINT RESPONSE '93 PROJECT MANAGEMENT TOOLS USED

INSTRUCTIONS:

Please use this form **everyday**. It is meant to keep track of the **project management tools** you used when developing **Joint Response '93**.

Please use figures or a brief sentence to describe the activity you performed. Circle the project management tool you used, use a yes or no to answer whether the tool was useful, and state very briefly whether you encountered any obstacles in using the tool and if so what it was. Thank you very much for your cooperation.

Activity	**Project management tool used**	**Useful?**
	Stakeholder analysis, WBS, Resp. matrix, Activity/milestone list, Progress diagram, Gantt chart, Networks	
	Stakeholder analysis, WBS, Resp. matrix, Activity/milestone list, Progress diagram, Gantt chart, Networks	
	Stakeholder analysis, WBS, Resp. matrix, Activity/milestone list, Progress diagram, Gantt chart, Networks	
	Stakeholder analysis, WBS, Resp. matrix, Activity/milestone list, Progress diagram, Gantt chart, Networks	
	Stakeholder analysis, WBS, Resp. matrix, Activity/milestone list, Progress diagram, Gantt chart, Networks	
	Stakeholder analysis, WBS, Resp. matrix, Activity/milestone list, Progress diagram, Gantt chart, Networks	
	Stakeholder analysis, WBS, Resp. matrix, Activity/milestone list, Progress diagram, Gantt chart, Networks	

Purpose of each project management tool

Stakeholder analysis: identifying stakeholders and influence

WBS: breakdown an activity into "doable" tasks

Resp. matrix: assign tasks to team members

Milestone/activity list: list milestones or activities, also showing dependencies and durations

Progress diagrams: progress made

Gantt chart: graphical picture of activity durations showing start and end dates (milestones may be included too)

Network: activity sequence, critical path, identify activities that have slack.

APPENDIX D

Interview Protocol

Purpose: to interview EMG (Emergency Management Group) personnel after they completed development of Joint Response 1993.
This interview was used to determine the following:
how could the project management tools be used
where they could be used
why they could be used

I used the following interview protocol when interviewing the EMG members:

"Good morning/afternoon_____how are you? I would like you to tell me which project management tools you would have used, for what activities, and how you would have used them in developing an emergency exercise."

APPENDIX E

Project Management Seminar Evaluation Form

Please complete this evaluation form at the end of the seminar. Your feedback will be used to judge the effectiveness and usefulness of this seminar. Please feel free to ask the presenter for help to clarify any questions.

Please answer the following items by circling the appropriate answer.

1. Preparation of presenter
   Fair Good Very good Excellent
2. Clarity of presentation
   Fair Good Very good Excellent
3. Helpfulness of exercises
   Fair Good Very good Excellent
4. Usefulness of information presented
   Fair Good Very good Excellent
5. Overall presentation
   Fair Good Very good Excellent

Please rate the following by circling the appropriate answer

6. Overheads
   Fair Good Very good Excellent
7. Handouts
   Fair Good Very good Excellent
8. Exercises
   Fair Good Very good Excellent
9. Verbal presentation
   Fair Good Very good Excellent

Please respond to the following quesitons with a YES or NO

10. Tool: Stakeholder Analysis
    a) Will this tool be useful to you? _____
    b) Do you feel comfortable using it? _____
    c) Do you need any further help or clarification with this tool? _____

11. Tool: Work Breakdown Structure
    a) Will this tool be useful to you? _____
    b) Do you feel comfortable using it? _____

c) Do you need any further help or clarification with this tool? _____

12. Tool: Responsibility Matrix
    a) Will this tool be useful to you? _____
    b) Do you feel comfortable using it? _____
    c) Do you need any further help or clarification with this tool? _____

13. Tool: Activity/Milestone list
    a) Will this tool be useful to you? _____
    b) Do you feel comfortable using it? _____
    c) Do you need any further help or clarification with this tool? _____

14. Tool: Progress chart
    a) Will this tool be useful to you? _____
    b) Do you feel comfortable using it? _____
    c) Do you need any further help or clarification with this tool? _____

15. Tool: Gantt chart
    a) Will this tool be useful to you? _____
    b) Do you feel comfortable using it? _____
    c) Do you need any further help or clarification with this tool? _____

16. Tool: Network
    a) Will this tool be useful to you? _____
    b) Do you feel comfortable using it? _____
    c) Do you need any further help or clarification with this tool? _____

Please return the evaluation questionnaire to the presenter after you finish.
Results of this evaluation will be used as part of research findings.

APPENDIX F

Project Management Tools Evaluation Form

Please answer the following questions with a YES or NO and if YES please provide a brief explanation for your answer. Your answers will be used to gauge how familiar you are with project management tools and their usage.

1. Are you familiar with project management tools?

The following is a list of project management tools please answer by circling YES or NO, whether you are familiar with them and if you are, state very briefly how you would use the tool.

2. Stakeholder analysis How would you use this tool?	Familiar?	YES	NO
3. Work breakdown structure (WBS) How would you use this tool?	Familiar?	YES	NO
4. Responsibility matrix How would you use this tool?	Familiar?	YES	NO
5. Activity/milestone list How would you use this tool?	Familiar?	YES	NO
6. Progress chart How would you use this tool?	Familiar?	YES	NO
7. Gantt chart How would you use this tool?	Familiar?	YES	NO
8. Network How would you use this tool?	Familiar?	YES	NO

APPENDIX G

Project Management Seminar Evaluation Summary.

Date conducted: March 8, 1993

Number of participants: 10 (5 EMG members, 2 student members, 1 observer, 2 pilot subjects)

Project management tool familiarity pre test

This evaluation does not include the pilot subjects as their purpose was to test the logs used as "memory joggers"

- Seven of the eight participants felt they were familiar with project management tools

Tools:

Stakeholder analysis: majority of the participants were familiar with this tool (5)

Work breakdown structure: fifty percent of the participants were familiar with this tool (4)

Responsibility matrix: majority of the participants were familiar with this tool (6)

Activity/milestone list: majority of the participants were familiar with this tool (7)

Progress chart: majority of the participants were not familiar with this tool (5)

Gantt chart: majority of the participants were familiar with this tool (6)

Network: majority of the participants were not familiar with this tool (7)

Comments: most of the participants were familiar with the project management tools, except the progress chart and networks. They have been exposed to the above tools through the project management tools seminar I developed in September-October 1992 for the TRADE conference. Also some members have used these tools previously.

Nevertheless they were not familiar with the activity network.

Project management tools familiarity post seminar test (6 of the eight post seminar tests were returned)

- Most participants felt they were now familiar with the project management tools

Tools:

Stakeholder analysis: majority of the participants felt they were now familiar with this tool (6)

Work breakdown structure: majority of the participants felt they were now familiar with this tool (6)

Responsibility matrix: majority of the participants felt they were now familiar with this tool (6)

Activity/milestone list: majority of the participants felt they were now familiar with this tool (5)

Progress chart: majority of the participants felt they were now familiar with this tool (6)

Gantt chart: majority of the participants felt they were now familiar with this tool (5)

Network: majority of the participants felt they were now familiar with this tool (5)

Comments: after the seminar the majority of participants felt they were familiar with the tools, especially the progress charts and networks.

Overall Evaluation of presentation and usefullness of the project management tools (7 of the 8 evaluation forms were returned)

1. Overall presentation was rated as very good

2. The exercises to use the project management tools were rated as good
3. Tools:

a) Stakeholder analysis

Useful: majority felt this tool was useful (6)

Easy to use: majority felt it was easy to use (6)

Need help to understand it: majority did not need any further help (6)

b) Work breakdown structure

Useful: majority felt this tool was useful (6)

Easy to use: majority felt it was easy to use (6)

Need help to understand it: majority did not need any further help (6)

c) Responsibility matrix

Useful: majority felt this tool was useful (6)

Easy to use: majority felt it was easy to use (6)

Need help to understand it: majority did not need any further help (6)

d) Activity/milestone list

Useful: majority felt this tool was useful (6)

Easy to use: majority felt it was easy to use (6)

Need help to understand it: majority did not need any further help (6)

e) Progress chart

Useful: majority felt this tool would not be useful (5)

Easy to use: majority felt it was easy to use (6)

Need help to understand it: majority did not need any further help (5)

f) Gantt chart

Useful: majority felt this tool was useful (6)

Easy to use: majority felt it was easy to use (6)

Need help to understand it: majority did not need any further help (6)

g) Network

Useful: some felt it would be useful (4)

Easy to use: some felt it was not easy to use (4)

Need help to understand it: some felt they needed further help (4)

APPENDIX H

Personal Evaluation of Project Management Seminar

Date: March 8, 1993

Sub: *Personal evaluation of project management seminar given to the EMG*

The seminar began at 11.45 am. We were 15 minutes late due to delay in arrival of participants. I began by distributing a pre-test to all participants. The purpose of this test was to gauge how much they knew about project management tools. After the seminar with a definition of project management. I went on to discuss some characteristics and phases of a project. I also specified that the focus of the seminar would be the project management tools and exercises to familiarize the participants with the tools. I began with the stakeholder analysis and went through each of the seven tools I had decided to teach them about.

- I broke up the participants into two groups. I had them pick numbers (8) and divided them by grouping odd and even numbers.
- The exercises were carried out by the groups. The intention was to increase involvement and also to help participants learn from each other, as some of them were aware about the tools.
- I had two (2) pilot study participants who worked together as a separate group. I did not want them to be a part of the other two groups as they were using the log I had designed to help users keep track of the tools they use.

Observations:

- the EMG manager suggested that it would have been better if I'd used an emergency exercise type of project for the exercises I'd designed, instead of a house. Most people had no experience with building a house and either rented one or lived in an apartment

- One of the EMG member's asked some questions about the WBS and Responsibility matrix. The questions pertained to the use and purpose of the two tools. The exercises helped the member get a better picture of the tools and usage. I also explained the purpose of the two tools and illustrated this with an example.
- Another member asked some questions about the network. He felt it was very useful. The seminar probably helped add more to his understanding of networks than other tools, as he was already familiar with pm tools. He also commented that the network seemed to be useful in a static situation, wherein things were fixed and no changes occurred. I explained that using a computer would be very helpful in using the tool in a dynamic situation, as the software could calculate new networks as changes occurred and would therefore help create "what if" scenarios.
- When I began explaining the activity network tool, the EMG manager commented that they had no slack in any of their activities. I illustrated, by developing a network, that this was not true and slacks would become apparent only after the network was developed. The network exercise was useful as it helped clarify this point about slack and the critical path.
- I went too fast on some of the tools (WBS, Responsibility matrix, gantt chart) due to the time constraint. I definitely needed two and half to three hours. But I was able to present all the tools I had set out to present.
- Some participants commented that having to deal with a house project made them have to really think through what was required in building a house. In my opinion this was valuable as they were able to think through the intricacies of the task at hand and thereby understand the use of the tools.

Statistics:

Number of EMG full timers present: 5

Number of EMG students present: 2 (I was not informed that they would join us,

nevertheless their presence was helpful as they helped make the two teams larger)

Pilot subjects: 2 (they used the pm tool log)

Additional participants: 1

Total: 10

What Could Have Been Better:

1. I should have used an emergency exercise oriented project
2. Three hours would have been an ideal time for this seminar
3. Participants should have had the opportunity to use each tool fully

Why I Chose to Use a Non-Exercise Related Project for the Tool Exercises?

I thought that designing the project management tool exercises in a manner that they would focus on emergency exercise development activities would bias the participants opinions on where to use the tools. Since these tools have not been used before, it added to my fear of bias. I figured that a "general" project such as building a house would give the participants a feel for using each of the project management tools, without biasing their opinions about where to use them in the exercise development process. Also since the purpose of my study is to find out where and why exercise developers use the project management tools, I did not want to put in any element concerning exercise development and thereby bias the participant's opinions. *Nevertheless, using an exercise oriented project would have helped the participants as they would be dealing with something rather familiar.*

APPENDIX I

Transcription of Interviews with Pilot Study Subjects

Subject 1

Good morning ( ) and how are you? Excellent thank you. Thank you for using the log when you carried out the exercises as part of the project management seminar which was held on March 8. What I'd like you to do is to tell me which project management tools you used for what activities and how you used them for the various exercises during the seminar. I know you may not have used some of the tools, but please feel free to tell me which tools you didn't use and tell me why you did not use it. Suppose you didn't use a tool for a particular activity go ahead and tell me why you didn't use it and talk about it. Use this log to assist you as you talk about the project management tools you used. You can begin by starting at the top and going downwards and talk about each activity. Feel free to tell me everything you remember. Also try to keep in mind what activities you tried to carry out with the help of these tools and how you went about using them.

Ok, the first one was stakeholder analysis. This tool is not very familiar to me. I saw it during the seminar. I learned who the stakeholders are for the house building project - primary stakeholders and secondary stakeholders. I had some structure to go by. I did not know what a formal stakeholder analysis is like. It helped me identify who the constituencies are or who will benefit from the project, who are responsible for the project. It is a pencil and paper tool. Identify who is involved using circles. Who would benefit from the project. To some extent it made it easier to understand the purpose of the project. The purpose of building the house. It helped me establish a framework even before I started the project. It helped me scope the project to a certain extent and delimit it. I know who benefits or who is responsible, accountable

etc.. It helped determine who influences the project, though I this did not happen right away.

2. WBS I am more familiar with this tool. I've used it before. It helped develop a more formalized structure for work. It helped show a hierarchy of tasks or processes. It helped show work elements. The activity of building a house is made up of a lot of sub-activities. The WBS was the appropriate tool to establish the hierarchy. The hierarchy helped see the whole picture and relationships and the magnitude of different tasks. It helped me think about the requirements to some extent and also gave me some foresight about the possible sequence/connections. It summarizes the tasks in a simple way. I can see all the tasks at one time. It helped with planning.

3. The responsibility matrix. After having the WBS I had a better idea of tasks. The matrix helped me list the activities. It is a two dimensional matrix, where we show the persons responsible and what the tasks are. The tasks are from the WBS and the key responsibility is derived from the stakeholder analysis. Using the WBS and stakeholder analysis I was able to draw information. I then determined who was responsible, executed, supervises etc.. It enabled me to see who is responsible and therefore see what is possible - specific person for a specific task and then get the people together. With just the WBS and stakeholder analysis, I wouldn't know who would do the job, but the responsibility matrix helped determine how exactly to implement the project - who will do what.

4. Activity/milestone list: this one showed the time taken for each activity and dependencies. It helped me see the time dimension. It helped me establish the time and therefore resources and peoples commitment, It acted as a key element of planning.

5. Gantt chart: this is a very common tool. To me its a kind of log. It is very powerful, but simple. It helps me see progress and also milestones. It helps give physical evidence of what happens. It helped in sequencing - how the activities and

milestones are sequenced and dependency - on the preceding activity. It helped with resource allocation - overlap. It gave me a whole picture but, not in full detail. It is some kind of forecasting, one doesn't know what is going to happen - it gives some kind of prediction. Whether a milestone can be achieved or not. It gave a bigger picture of the sequencing. It is almost like a systems perspective. Without this tool I can resort to memory, which activities go first etc.. The Gantt chart helped formalize things, gave it structure. I used the WBS, responsibility matrix, activity list, and stakeholder analysis (not much) to help develop the Gantt chart.

6. Network: this is the most complicated one. This one shows the linkage and gives a better picture. It shows the relationship of activities and the sequence. It also shows the critical path and the path that has most slack. Now it is getting more clearer - Gantt chart and network together give a better picture. It helped in resource allocation - it shows the sequencing, precedence, relationship - direct or indirect. The slack helped me determine where I can ease off.

I'd like to go over the tools once again and I'd like you to tell me what kind of changes you'd like to have modified in the tools to make them easier to use.

Stakeholder analysis: The tool is good enough.

WBS: It is established and needn't be modified. The hierarchy is fine

Responsibility matrix: It is ok for me, adding something more would make it more complicated, Maybe you can prioritize the tasks - but the thing to bear in mind is simplicity.

Activity/milestone list: It could be combined with the Gantt chart maybe

Gantt chart: I don't think I'd modify it

Network: Showing probabilistic information might help, if things are kept simple. Otherwise it is fine.

Subject 2

Good afternoon ( ), thank you for coming in this afternoon for this interview. I'd like you to use this log you maintained during the seminar and go over each of the tools you used and tell me how you used each of the tools, where you used them and why?

1. Stakeholder analysis: There are three parts - first is identifying the stakeholders and listing them , who could impact the project, and then diagram to identify the most influential one and specific influence. Who to worry about and who not to worry about. It helped identify the stakeholders and how they could impact the project what I have to give them and what they have to give me. It helps clarify responsibility and it helps group stakeholders- most important, least important and also influence during various stages of the project.

It would help if a definition of types or categories of stakeholders was provided, so that I can cover all types of stakeholders

2. WBS: I used the WBS to decompose the project of building a house from a very high level to what do I have to do to build the house. It is useful to breakdown the project from higher to lower activities. I used it to organize the different activities/tasks I needed to do. It helped me by showing the grouping of activities. Without the tool I could have missed steps or tasks. The tool helps understand and see the whole project at the component level.

I think it might have been helpful to have a process associated with it, a structured interview sort of thing to help break the work down. I don't know how to make this process of breaking down the work more specific.

3. Responsibility matrix: I used the tool by having the stakeholders along one axis and the activities along the other axis. The WBS gave the activities and the stakeholder

analysis gave the people who would be responsible. I used it to match the activity with the people who would influence that activity. I used it to understand who has impact on specific tasks - who needs to be consulted, is responsible etc.. It made it easier to determine who needed to be there at a certain time. It helped see the link between a certain person and the activity.
The roles - responsible etc. need to be defined, so that the overlaps are better understood

4. Activity/milestone list: I used it to list the activities, due dates, and duration. I also used it to determine dependency and how the activities are related to each other. It helped to see the dependency between different activities.

5. Gantt chart: I used it to put down activities and timeline and what needs to be done. When the activities have to start- how long as well as when they can begin and when they end. It is a graphical representation. It helped see the duration of one activity relative to another and also the dependence - one starts when the other ends. It made it easier to see the scope of the project - here are the activities and here is the time required. So you see the whole project, the time required, and the relationships between the various activities.
No modifications needed

6. Network: It helps show activities, the relationship between them, and dependencies. When tasks have to be done - before or after. I would have used it for scheduling. It would help tell me whether the project can be done on time and determine the critical path and how long the tasks can be delayed.
No modifications are needed.

APPENDIX J

Biases

Here are the biases I have with respect to the application of project management tools in developing emergency exercises.

1. I took a course in project management at Virginia Tech as part of my graduate program. The course included working on a project as part of a team. This project gave me the opportunity to use various project management tools and techniques. I also worked with a project management software package. The course in project management helped strengthen my belief that project management tools would be useful in emergency exercise development.

2. Working with the Emergency Management Group (EMG) at Management Systems Laboratories (MSL) gave me the opportunity to meet professionals in this field. Through informal conversations with these professionals, I gathered that project management would be useful in emergency exercise development.

3. I observed the EMG develop Joint Response '92 between April and August 1992. Observing the entire development of the emergency exercise allowed me to see where project management tools could be used. This opportunity strengthened my belief that project management tools would be useful in emergency exercise development.

APPENDIX K

Transcribed Interviews with Members of the Emergency Management Group at Management Systems Laboratories

EMG (Emergency Management Group) member 1

Interview 1

Nov 1, '93

Stakeholder analysis: Had enough familiarity with stakeholders to know who were involved. In my opinion, in the planning stage and scenario development stage knowing who the stakeholders are allows you to identify those stakeholders who have vested interests and the relationships among participants. With respect to planning it allows you to make sure that your objectives cover all the needs of all the stakeholders. Sometimes even the implicit needs. These are as important as the explicit needs. When you look at emergency management you are looking at a political entity. If you understand who your stakeholders are, their political dimension, and the relationship among them, you make sure that if problems occur it is not because you purposely or inadvertently violated the political sensitivities of the participants. The other side of the stakeholder analysis that is clearly most important outside the political arena, from the scenario development perspective is that once you've identified who your stakeholders are you can get to know what their needs are and get buy-in to the scenario. This is because, in exercising, if you do not have total buy-in or ownership of the scenario you are going to have difficulties during the exercise and post exercise simply because there will be a lot of headhunting. So the buy in or at least the offer of buy in of the scenario is required. Also this helps identify the emergency personnel and equipment they have. This is necessary to

develop a proper scenario. You also learn about political sensitivities. So the stakeholder analysis gives you a lot of information which makes your job easier and harder as you have to request the information. This can go against the requirement of an exercise that the scenario details are to be kept secret. The stakeholder analysis also helps you identify trusted agents - not everybody can know what you are doing. The trusted agent can read the scenario and give a commitment as an individual and to the project as well. They can also tell you how things would be done - how they'd interface with other participants. This is helpful in developing the proper scenario. The stakeholder analysis from a planning perspective and a scenario development perspective is probably the most important tool. This is because you can get technical information (what is technically correct for a realistic scenario), resource information, get to know the participants, and the people side of things. Doing a stakeholder analysis of the project team may also be useful.

Work breakdown structure: it allows you to divide and conquer your tasks. What tasks you have to do, what are the components of your tasks. You can even start figuring out deadlines, or sequence them. It helps you determine the doable parts of your tasks. You get down to the nuts and bolts of things. The WBS also you to organize your effort. It also allows you to start to identify who you have in your organization, and others and their skills. You can have someone in mind to do a task and the sequence. Who can do the task is another part of the doable element of the WBS. What are their strengths and weaknesses. Also it may help put others onto specific tasks to help them learn the task (with reference to the MSL group). I don't know how we could have done a WBS during our current exercise. Maybe there is a way to do it in parallel. In this case some of the work had already been done, so we just took that and worked further on it. Our lack of doing a WBS hurt us as we did not who was doing what and for whom or to whom. The WBS would have also helped use

sequence things. Sometimes we did not know what tasks had been done and what tasks had not been done. The WBS is important because it helps identify the tasks we have to do on a day to day basis and what has to be done to accomplish those tasks. We did not have the time to do a WBS or think about it. Maybe we did not manage the project properly, because we got lost in meeting deadlines. The WBS allows you to build in some fudge time and where they are or occur. We did not have the time to make any mistakes, but we were not able to carry out any quality checks. We were not happy with some of the things we did. The WBS also would help know where slippage can occur and allow for rework etc.

Responsibility matrix: this tool is a must, whatever the project. This helps you know who is responsible for what. You don't have control of the project without the responsibility matrix. It helps in checking quality as I know who is assigned the job and whether it is done well. If not does that person require training or is not interested in the task, or is not capable The tool thus helps identify who is responsible for what. Another thing is that the responsibility matrix helps you decide how you are going to distribute your labor. It also acts as a quality check - you cannot have the same people doing everything need to have a distribution of labor. One person does the task and another should review it, as the performer cannot be objective. It thus helps you use your labor efficiently. Also the responsibility matrix helps in getting buy in to the project as you give everybody a responsibility and they have a stake in the project. This is particularly true in an exercise as no one wants to fail in the exercise. If they know they are responsible, the buy in will be greater.

Activity milestone list/chart: I confuse it with the WBS. I don't know how I'd do this on a short fuse. Breaking down the tasks into milestones may not be necessary. The four tools will allow you to assess your project at the end. The activity milestone

chart will allow you to figure out actual slippage dates and also allow you to see where you did not meet deadlines or milestones. Looking at different milestone charts would allow you to see whether your estimate of time was correct. Seeing a lot of milestones missed tells you that your time estimates were unrealistic.

The Gantt chart, network, and progress chart : I am not familiar with them. The Gantt chart is probably useful for portrayal. The network confused me, I do not understand it. I would be uncomfortable using the network. I would look at the benefit, what would I gain by using the network. Should I use the network over the Gantt chart. Gantt chart would probably be more useful in exercise development. I would look at the payoff of these tools. Maybe my inability to use these tools makes me look at the benefit of using the tools (Gantt, networks, progress). I can't say our exercise would be better if we used these tools. I guess the question is what is the learning curve. How familiar are we with these tools to allow use to use the tools on a project. Learning to do the project using the tools or learning to use the tools - it is probably both. I would use the first three tools and use either tool four or the Gantt chart. This is probably a flaw in me, as when I think of a task I think in terms of what do I have to do and in what sequence. I use tools 1 2 and 3 all the time but I probably do not see the payoff of the other tools.

EMG member 1

Interview 2

November 5,1993

I Stakeholder analysis

1. Are participants the same as stakeholders?

Yes.

2. Would stakeholder analysis help you understand how the participant could influence your project?

Yes. This is because you may be able to uncover any hidden agendas that they may have. But more importantly, if you understand stakeholders, they should by definition influence your exercise. However, you need to have control over how they influence the exercise as much as you possibly can or at least be able to anticipate how they may negatively influence the exercise. The reason why stakeholder analysis is so important is because you do not want any surprises. You do not want to find out in the middle of the exercise that because you ignored a stakeholder at the beginning you now have a problem that will affect the outcome of the project.

II WBS

1. Deadlines and sequencing, how would you use the WBS to determine these?

Once you start to break down the project into definable tasks and subtasks, you start to figure out how it works. In WBS we have a starting point and an ending point with a number of tasks in between that we have to accomplish. Once we identify these tasks and any sub tasks that are included within, you begin to see more than just a linear list of tasks and sub tasks. If we consider a project that has four tasks. Tasks 1 and 4 are somehow related and tasks 2 and 3 are very important. We can see that we do not have much slippage on 2 and 3.I do not see the WBS and the milestone charts as separate. Clearly, they are separate instruments or tools but one has to inform the other. You cannot say that for WBS I have a definable deadline but you can get an idea of what kind of deadline you have and how many days or hours you want to assign to these tasks. It is a qualitative kind of field for what your milestone chart should look

like.

2. how would you use the WBS to build in fudge time (slack) and where this fudge time (slack) will occur

Not every task requires the same number of hours or amount of effort. On the other hand if you consider you actual project team as a part of your stakeholder If we look at all our tasks and assign task 1 to Mr. Jones as he is very good at it and assign task 2 to Mr. Smith as it is his area of expertise, we can get those two tasks done faster than what the average calls for or any kind of deliverable deadline. You would look not only at the tasks but also at who would be asked to do it. If the task is given to someone who is experienced and is good at it the task may be finished in a shorter time. In the WBS it is all very qualitative, it is a very intuitive kind of guesswork. It prompts you to think. The WBS should make you think of the time for each task. It is a planning tool with a time element even though it is not defined in terms of time.

3. Would the WBS have helped in checking quality?

We did carry out quality checks but maybe in WBS the quality control was built in. Maybe it is a sub task. On the other hand , one of the things that you should do in developing the WBS is to select a person from the team who is experienced enough or thorough enough to be the quality control person. If I am assigned a task as a part of a large project I can build quality in at the front end. My inspection may not be good enough because I am too close to what I am doing. You have to look at your WBS, look at the interrelated sub tasks. What are the quality characteristics or criteria that I can use? Can we maintain quality? What do we have to do to maintain quality? That part of the WBS should be quality check. In the TQM sense we build it into the front end. When you do that you do not build it in everywhere I do not know if you want to have a WBS with a list of tasks and quality at the end. Maybe it should be implicit.

III Responsibility matrix

1. Would you use the matrix in conjunction with the WBS, i.e. take "doable" tasks from the WBS and assign them to members of your team?
The WBS and responsibility matrix stand alone insofar as they are tools but they are interrelated. Let us say that you started doing the WBS. You would think about who would do the tasks. You would list the stakeholders and project team as a stakeholder. In designing the WBS you think about who we would like to be the project leaders or actually doing the various tasks. When you get to the responsibility matrix, you think about who to assign what to. So it is like a continuous process.

2. Would these tools help you to ensure that people are not doing tasks that constitute as a conflict of interest?
On one hand you would not want to have two deadly enemies either work together or serve a quality control on one another's projects. On the other hand if they work together , maybe they will learn to know each other and become more effective. Once you do the stakeholder analysis and find that you have two stakeholders who have difficulty working together but have to be included in the project, it would be counter-productive to put them in a responsibility matrix where they would work together. But sometimes two such stakeholders have to work with each other because that is where their areas of expertise lie.

IV Overall questions

1. How will the four tools allow you to assess your project at the end?
If you use the four tools in the way that they are designed to be used, you do not use them in a vacuum. You use them in the way you develop stakeholder analysis, WBS,

responsibility matrix and milestone charts. They all have end points after it is called the end point of the project. You know what you want the project to look like and you know you want it to come out on time. If profit is the focus you want it to come out under cost or at least at cost. If you look at the end product and how you laid things out you will know where the flaws in your product are. What you may not always know is where or how they arose. I do not know if anybody has said that these tools can be used in the analysis of a project. It is possible that if we want to identify the discrepancies in a project the critical path analysis becomes most important. We may be able to trace the discrepancies to either not using the critical path or misinterpreting it. If these tools can be used at the beginning and throughout the project, I do not see why they cannot be used at the end as well and see what they can tell us about the project. By the end of the project the tool is not just a tool but a tool filled with data. Let us say that you have five projects at the same time and the scope of these projects is the same, the tools help us to examine what we did successfully, what we did unsuccessfully. There is no such thing as a perfect project and so we can see what we could have done better.

2. Would the four tools help you:

- cut down time spent, once you become familiar with them?

Once you get used to the tools, you begin to think in terms of them. The first thing I would do in planning a project is to identify my stakeholders and find how they could obtrusively or unobtrusively affect the project. Once you get used to the tools you will save time because they help you plan better and you do not have to repeat steps. These four tools represent a process or the part of the process that is the planning process. I believe that each of these tools has a time benefit attached. If you say that you cannot afford to do those you will have a lot of dead ends. Because you did not first understand their importance. you probably did not consider your stakeholders and so

assigned responsibilities to people who either could not do the task or were not interested in it. I think it is a cost benefit analysis that will save you both time and money.

- improve quality?

Yes.

-clearly define goals and tasks?

Yes. The thing you should think about to do any or all of the tools will help you to refine your goals and objectives. You will have goals from the beginning when you do stakeholder analysis. The other thing is that you should do them sequentially. I do not believe that WBS can be done without doing a stakeholder analysis first or a responsibility matrix can be done without the WBS and stakeholder analysis. It makes you think about your objectives in a different way and define them much better.

-improve communication?

Yes, because you know who should be talking to whom and how. They will also learn to talk to one another. The best way to make a stakeholder comfortable is to allow him or her have their own say. The best way to understand one another is to listen to each other. A part of the stakeholder analysis may well be a stakeholder meeting where you lay all your cards on the table. When you do the WBS and the responsibility matrix there should be fewer questions and misunderstandings.

- assist in better planning?

Absolutely. I think you need these tools to plan anything. I do not think that the size of the project should limit anything or preclude anything.

- identify resources?

Maybe not all the resources can be identified but it helps you use all your resources. However, to use them, you have to first identify them. Maybe in the stakeholder analysis a stakeholder you had not anticipated is going to crawl out of the woodwork. In WBS too some unplanned task may arise.

improve coordination?
the tools do help in coordinating a project. Coordination is about reducing redundancies, stops and starts, improving efficiency all of which improve quality. You have to coordinate just to use the tools, even before you are on the project. There is so much coordination involved in using those tools correctly on a project team. So before you begin working on the project you already have a well coordinated team.

3. Which tool would you use for the following
- Planning - Stakeholder analysis, WBS, and the responsibility matrix.
- Coordination - Responsibility matrix and milestone chart / activity
- Communication.-.Stakeholder analysis and responsibility matrix
- Identifying resources - WBS, responsibility matrix (for people resources) and Gantt chart
(to a small extent)
- Assigning responsibilities - Responsibility matrix

All these tools are means of documenting you project. Not using the first four tools may cause you to cut corners in the project and affect quality.

EMG member 2

Interview 1

November 10, 1993 (AM)

We used the responsibility matrix for all the tasks to determine who would be responsible for what. We used some kind of milestone list because it was required in the RFP. It was probably used in scheduling to help in planning it better since we did not have much time for the actual work itself. I know the Gantt charts but they are too confusing. We could have done stakeholder analysis. It would have been useful to identify who we could use and how they could help us. A lot of these tools we could have used at the front end of the project to give us a clear idea of what we had in store and what we were going at.These tools could have been very useful if we had had the time.

EMG member 2

Interview 2

November 11 (PM)

I Stakeholder analysis

1. Would the stakeholder analysis have helped you determine the influence of the participants on your emergency exercise project? How would it have helped?

Yes. It would have helped . It would have helped us determine who influenced or helped us with the project.

II WBS

1. Would a WBS have helped you define tasks for individuals within the team as well as participants of the project?

Yes. It would have helped in breaking up the many little things we had to put together for the controller and evaluator manuals- what to include in it, the training, the exercise plans, and all the different parts.

2. Would it have helped in a quality check?

Yes.

III Responsibility matrix

1. What would the tool have helped you to do?

It would have helped us identify who would be responsible for which part of the documentation or training or the different aspects of preparing for the exercise, who was responsible and who was to help.

2. Would you use these tools in conjunction with the other tools (WBS, stakeholder analysis, milestone chart)?

I do not know. We could have probably used the stakeholder analysis and figured out what was within the project.

IV Overall questions

1. Would the four tools you are familiar with help you

- cut down time spent?

WBS

-improving quality?

Responsibility matrix

-Define your goals ? tasks?

WBS

- in planning?

WBS

- identify resources?

Stakeholder analysis

-improve coordination?

Responsibility matrix

-assist in communication?

The communication tool

EMG member 3

Interview 1

November 3, 1993

I should begin by saying that we did not use any of these tools with the possible exception of a form of milestone chart. The contract as I understood it, did not call for the use of these tools. There was no stipulated requirement to use them. I think that part of our approach to this project and many others involves a small team configuration where almost all of the work is on the table, that is to say , everyone knows what everyone else is doing. There may have been little incentive to use these tools for this project but maybe for a broader project, one involving more personnel we may have used the tools. We did not consider, in a formal sense, using these tools. We did not actually talk about using the tools and then reject them. It simply did not occur as possible

Stakeholder analysis: The first tool that you described is the stakeholder analysis. I am not clear where we could have used it in this project and for what end. Our relationship to the contracting organization, the sponsor, or the client was a straightforward one. Our relationship with the client is fairly cut and dried by the contractor language. Their concern was that stakeholders was not our concern. We related directly to the client. I am aware that they do have stakeholders and should have probably done stakeholder analysis but I am not aware that they did.

WBS: The work breakdown structure is a tool that could have been successfully used. Had we done it it would have affected the success of the project. It would have been very useful in the beginning stages of this project while writing the proposal to do it. When we were responding to their request for a proposal we could have created a much more compelling proposal if we had first known the work breakdown structure and delivered the proposal in the language that the work breakdown structure would have suggested. Unfortunately, while writing a proposal of this sort, what we are doing is responding to their request which is couched in their language. It perhaps represents their approach to work breakdown. It may not. It may simply be based on an individual's notion of how the work should flow without doing an analysis that would be characterized by work breakdown. We did not really feel that we had the option of confronting their request with a variant that would represent our own work breakdown structure. The project that we undertook to do for them was highly susceptible to work breakdown structure. We would have improved the project immensely had we done it. It was in a product oriented breakdown since the kind of support that we were asked to provide was essentially oriented around products. Whether we were delivering scenario materials for the exercise, drill and training material or evaluating, these were all in the form of product documentation.

Responsibility matrix: The next tool is the responsibility matrix. This is a much more meaningful tool for the kind of work we did for Fernald than stakeholder analysis. I think that the client should have done stakeholder analysis and we should have undertaken to do the responsibility matrix. When you are dealing with a relationship and the interface between two complex organizations and the Department of Energy I think the responsibility matrix would have been a very useful tool to discover just who we were delivering what to in those cases, who was really in the approval chain, the review chain, who was supervising whom in terms not only of the materials that we were de-

livering under the contract but also in terms of the actual exercise activity. Most of us who work in this group that I am a part of, know all of this. We are either intuitive or sensitive to people's past experiences but it has never been formally laid out as a responsibility matrix would have led us to do. We could have badly blundered if we had depended exclusively on an intuitive level of understanding responsibilities in that sort of a matrix. It would have been much better if we had formalized it.

Milestone/activity list/chart: The project activity milestone chart list is a tool that we actually used to a very primitive extent. We tend to develop a set of milestones and organize a lot of our work activity around acknowledgment of these milestone points. We do not use the kind of specific formal tools that you describe. We do not use the Progress Diagram, Gant charts Bar charts, or activity network. I am quite ignorant of the usefulness of these tools. I have never experienced using them other than during the seminar that you gave us. I have not inspected versions of them or tried to figure out how they could be useful to me. I really have no personal interest in using those tools as I have no personal knowledge of how they could pay off for me in using them.

Member 3

Interview 2

November 11, 1993

I Stakeholder analysis

1.Could this tool be used to determine the influence the participants on the exercise project?

Yes. I believe that we could have used it to identify the stakeholders. That would have required developing a familiarity with the situation in which the exercise would be

invented.

II WBS

1. Would doing an internal WBS help in defining tasks to be done by individuals within the team and participants outside the team?
It is possible. I think that the WBS is most applicable in a team or organizational situation where the structure and relationship among the members is clearly formalized. There is clear cut organizational chart with functional assignment of activity. What we put together for working on this exercise was a little more organic. It had a fluid organization which changed in response to the task it had. So the lead person on the task would be changeable and so would the relationship with the other members to the lead person of the team.

2. You mentioned that the WBS would have improved your project immensely. Could you elaborate on that? What would it have improved?
I think it would have given us more control over staffing the project. We did the project with an understaffed team and we completed the project in spite of it. The WBS would have allowed us to perceive where we more people and why.

3. What do you believe would have improved by doing that?
I think we could have worked more quickly and efficiently. We could have avoided double working. All of us worked on everything because we did not have enough personnel to cover all the work.

III Responsibility matrix

1. Why do you believe that the responsibility matrix would have been a meaningful tool in an exercise development project?

One of our primary concerns in the kind of project that we developed, which is in most cases, documentation of some sort or another, we tend to provide our customers with paper products of some kind. I think the responsibility matrix would have been a very useful tool in managing the quality control of the product because the responsibility matrix provides for a great deal of quality control in just the way it is delineated.

2. What does the tool do to help in developing an emergency exercise?

It does not really matter if it helps in an emergency exercise because it is a more useful instrument for quality control.

IV Overall questions

1. Which of the tools (the four tools you are familiar with) would help you

a. cut down time spent on tasks?

Activity milestone chart. WBS may also be useful

b. improve quality?

Responsibility matrix and stakeholder analysis

c. clearly define goals/tasks?

I am not sure any of those tools would help us define our goals if they are introduced after the project is contracted because the goals and tasks should be stipulated within the contract. If we had perhaps done stakeholder analysis before we wrote the proposal for the contract it may have us identify our goals. The milestone chart may have also proven useful.

d. assist in better planning?

All four tools are very useful in planning. They are probably much more useful as

planning tools than as project management tools

e. identify resources?

I am not sure

f. assist in communication?

Information flow in a project team is a different issue and I am not sure any of these tools address that directly. I think that it needs support from a different kind of tool.

g. improve coordination?

Responsibility matrix

h. assigning responsibilities?

Responsibility matrix.

Date: Nov 11, 1993

Questionnaire for EMG member 4

Note: Subject four could not be interviewed due to the person not being available. I used the following questionnaire to obtain this member's opinions

The following questions pertain to the seven project management tools I gave a seminar on. These tools were to assist in emergency exercise development.

Please answer each question based on your opinion, even though you may not have used the tools in developing an emergency exercise.

Stakeholder analysis

1. Where would you have used this tool?

   Beginning of project

2. What would this tool have done for you?

   Shown stakeholders/interested parties and level of influence

3. What would this tool have made easier for you?

   To focus on developing the exercise to involve all of the parties required

4. Would this tool help cut down time spent on the task?

   No

5. Would this tool have helped ensure/improve the quality of your task?

   No

Work breakdown structure

1. Where would you have used this tool?

   Project planning

2. What would this tool have done for you?

   Break the work down into more manageable pieces

3. What would this tool have made easier for you?

   To get arms around the project

4. Would this tool help cut down time spent on the task?

   Yes

5. Would this tool have helped ensure/improve the quality of your task?

No

Responsibility matrix (Used this tool)

1. Where would you have used this tool?

Project planning

2. What would this tool have done for you?

Clearly defined responsible parties. Also show approval authority

3. What would this tool have made easier for you?

Define tasks, areas of responsibility, and accountability

4. Would this tool help cut down time spent on the task?

Yes

5. Would this tool have helped ensure/improve the quality of your task?

Yes

Activity/milestone chart or list (used this tool)

1. Where would you have used this tool?

Project planning and throughout the project

2. What would this tool have done for you?

Shown deliverable dates

3. What would this tool have made easier for you?

To ensure we were meeting contract/project requirements on time and to plan out our work based on those deadlines

4. Would this tool help cut down time spent on the task?

Yes

5. Would this tool have helped ensure/improve the quality of your task?

Yes

Gantt chart

1. Where would you have used this tool?

To show where we are in the project

2. What would this tool have done for you?

Shown where we are in the project

3. What would this tool have made easier for you?

To show us corresponding activities

4. Would this tool help cut down time spent on the task?

No

5. Would this tool have helped ensure/improve the quality of your task?

No

Networks

1. Where would you have used this tool?

To plan

2. What would this tool have done for you?

To show dependencies/critical path

3. What would this tool have made easier for you?

To show critical path - where it occurs

4. Would this tool help cut down time spent on the task?

Yes

5. Would this tool have helped ensure/improve the quality of your task?

Yes

Part II

1. Which tool(s) (once you are familiar with the tools) would you use for the following:

cut down time spent on a task

Network

improve quality

Milestone chart, Network

clearly define tasks/goals

Milestone chart, WBS, Responsibility matrix

improve communication

Stakeholder analysis, Responsibility matrix

assist in planning

Stakeholder analysis, Responsibility matrix, Network

identify resources

-

improve co ordination

Stakeholder analysis, Responsibility matrix, WBS, Network

assigning responsibility

Responsibility matrix

EMG member 5

Interview 1

November 11, 1993

Stakeholder analysis - This might have been a useful tool to identify the stakeholders in the exercise development for Fernald. That is the only use I can see for it right now. You can get the stakeholder's special interests and agendas and see how it works and influences the project. Sometimes you have political interests to consider in developing a scenario like this. You have to address this political sensitivity. Stakeholder analysis may have given us insight into that. We did not have time to do the stakeholder analysis but we certainly could have used it.

WBS - This would have been a very useful tool. This is probably the most important of these tools because it helps you plan your job better. It tells you what you are going to be doing and when, who is responsible, what happens if it does not make it, and this is connected very closely to the critical path analysis. It is also important for the documents. Documentation for the exercise including the scenario books, manuals, and evaluator manuals and entire packages of materials where there is a certain a critical path. We could have been a little more organized about the way we went about it. For this years exercise we had some idea of what came first and what came second, but it was basically blindly getting the work done. If we had had time to lay out the WBS at the beginning, I think it could have improved our efficiency if we were able to work on things in advance and in the right sequence.

Responsibility matrix - I think that this is linked with the WBS. I see them as two complementary tools, who is responsible , who executes, has to be consulted etc.. The process, I think, is streamlined with our group. We have a small group and assigning responsibilities is not such a big task and could be part of the WBS. Reviewing supervising, and execution are built into the WBS.

Project activity/milestone list - This is an important tool. You need a milestone chart to do planning. We had a modified kind of milestone chart. We were working in a four week time frame rather than in a three month time frame. Therefore everything was compressed.

Gantt charts: Did not use this tool - did not take the time to do this. Did not have the time to sit back and see how the project was going. Had we had more time we would have used the Gantt charts.

Network: I think for a complex project with a lot of complexities the network would be extremely useful. If we had three months to do the project this would have been a very useful tool, because it would have shown us on a daily basis exactly where our priorities were, what could not slip, what had to be on time, and what was holding up other activities.

Subject 5

Interview 2

November 11 (PM), 1993

I Stakeholder analysis

1. You mentioned that this tool could used to address political sensitivities. Where in the process would you have used this tool?

We would have used it before we developed the scenario. The scenario drives quality activities and if you have a political sensitivity there, you have to address it before you develop the scenario.

2. What would this tool have done for you?

It would have enabled us to fine tune the scenario to be a better match to all the stakeholders.

3. What would this tool have made easier for you?

If you are talking about the actual event and not hypothetically, I would not know because it went well for us. I think we had adequate grasp of the sensitivities. Were the situation more complex or difficult to read, it would have given us better abilities to adjust to a more complex situation.

4. Would this tool have helped to ensure the quality of the task?
Again, if we had been in a situation that had more political sensitivities that we had not been able to get a grasp of, it would have helped. But in this case I think we did a good job of it.

II WBS

1. You expressed the opinion that breaking down your tasks into smaller doable units would have been very useful. Where would you have used this tool?
We would have used right at the very beginning in planning the structure of the process that we had to go through to achieve all our objectives. We did use a sort WBS in developing the proposal that we used to respond to the RFP that enabled us to get the contract. We did in fact use some WBS type of planning. We had the subject divided and conquered and we gave different sections of the proposal to different people. We put some deadlines on it and worked towards them. So we did use WBS to some extent in the early phases and even during the actual exercise

2. What would this tool have actually done for you?
The WBS tends to give you a clearer perception of what exactly you have to do, when you have to do it and who is doing it. It gives you an anchor to hang your planning on. You are not just floating around wondering what to do next. You have it clearly organized. The division of labor is more visible.

3. What would this tool have made easier for you?
I think this tool relates to the same tool as the last one, that is having to do with the critical path because it enables you to see is most important at any given point of time.

4. Would this tool have helped ensure or improve the quality of your task?
Yes, I think it would. By building tools like this into the planning process you will improve quality.

III Responsibility matrix

1. Would you use this tool in conjunction with the WBS?
I am a little bit fuzzy on how that would work but of all the tools I think this has the least utility for what we did. We did use it as a part of the WBS but without actually thinking of it as separate.

2. Where would you have used this tool if you had had the opportunity?
We would have probably used it in breaking down the work between the review dates and the due dates. I think that is probably the easiest fix for it or the place where it should be put into the process.

3. What would this tool have done for you if you had put it there?
I guess it would have made our planning more concrete, more visible and more formalized.

4. What do you believe this tool could have made easier for you?
We might have had some small efficiency gains during the review process but I do not see it as a major quantum leap gain.

5. Would this tool have helped cut down the time spent on a task?

I do not think so.

6. Would this tool have helped in ensuring or improving quality?
Possibly. We might have achieved some small gains.

IV Activity milestone list

1. Where could you have used this tool?
I think it puts together the WBS and to some extent the responsibility matrix. The way I see it, this really enables you to plan out some of the Gantt charts. You have the opportunity here to list out your activities and milestones and show them graphically. It is always better if you can portray something graphically. You can read it at a glance. You can look at it and figure out where exactly you are in the process. I think you can fit this tool in with the other planning tools and the project management tools, particularly the Gantt charts.

2. What would this tool have done for you?
I think we would have achieved some gains in the efficiency of our process by having a visual graphic type reminder. Again, we did not have the time. If you have a longer process of development you need something to keep you focused and that is what this tool does for you - keeps you focused.

3. What do you believe this tool would have made easier for you?
I think the idea of being able to rate yourself to what you are doing is the theme here. It makes more easy the portrayal of more complex information over a longer period of time. When you need to portray your information and you have a three month development frame instead of the one month development frame, a graphic type tool

becomes important. It is more useful here because you tend to forget what you did six weeks ago and what you have to do six weeks from now.

4. Would this tool have helped to cut down time spent on a task?
I am not sure. it would have probably added some time because you have to spend time on keeping things updated. It would be time well spent, if you had the time .

5. Would this tool have helped to ensure or improve the quality of the task?
I think so. There is a good possibility in that.

V Gantt charts

1. Where would you have used this tool?
I was looking at the Gantt charts and the milestone list as a sort of common thing

VI Network

1. Where would you have used this tool?
I think this is what you need for a long term process. I think a three month development frame would have really stretched into the project activity network. With a short window it would not work this well but with a long window it would be very important to use it. Showing all the dependencies and places where you cannot have slack is a really nice concept. It works especially well with a project that has more documents and more deadlines. They all interrelate in some way. You have to prepare draft plans before you can have the final plans because you have to meet with certain committees an so forth, in preparation for the draft plan and the scenario development. There is a phase for trial run and there is a phase for the final full scale

exercise. All these things are interrelated and to show how they are interrelated and how they all fit, this is a very unique tool. It really captured my imagination. Of all the tools this is the most robust of them all and by far it has the most capabilities for complex projects. I really like this tool.

2. What would this tool have done for you?
During our development process it would have given us a daily tracking tool to track where we were, what was going on and what was going to happen so that we did not lose sight of any of the pieces. We would not have to scramble around and work inefficiently in one area when we could have been working more efficiently in another area all along and being more proactive in areas we needed to be proactive.

3. Would this tool have helped you cut down time spent on a task?
Yes, we would have definitely saved time. Instead of managing by crisis, you can plan ahead of time and be more organized.

4. Would this tool have helped ensure or improve the quality of your task?
Absolutely. I think this could have helped improve quality.

VII Overall questions

Which tool(s) (once you are familiar with the tools) would you use for the following:

a. cut down time spent on a task?
The WBS. you keep breaking it down till you get things broken into tasks and sub tasks. The organization that you get from doing that is going to save you time. It will make the process run smoother. The critical path would help in cutting down

time too.

b. improve quality?

I think all of them would do that but I think the best one would have been the network.

c. Clearly define tasks and goals?

WBS

d. Improve communication?

Stakeholder analysis and maybe responsibility matrix.

e. assist in planning?

Gantt charts and milestone list

f. identify resources?

WBS and responsibility matrix

g. improving coordination?

Responsibility matrix

h. assigning responsibilities?

Responsibility matrix

APPENDIX L

Summarized Comments of Members of the Emergency Management Group at Management Systems Laboratories

Stakeholder Analysis

Member 1 - Comments

- Use it in planning and scenario development stages to identify stakeholders who have vested interests
- Identify relationships among participants
- Assists in ensuring that exercise objectives cover all needs of all stakeholders, including implicit needs
- Helps obtain buy in of stakeholders to the scenario
- Stakeholder analysis provides a lot of information that makes the job easier
- Helps identify trusted agents to help check the scenario and be committed to it
- Important tool from planning and scenario perspective
- Helps identify hidden agendas

Member 2 - Comments

- Tool could have been used to identify who could be used and how they could help (identify stakeholders)
- Would have helped determine who influences or could help with the project

Member 3 - Comments

- Could have used the tool to identify the stakeholders

Member 4 - Comments

- Use to determine stakeholders or influential parties and level of influence
- Tool would have helped focus on developing the exercise and involve all parties (stakeholders)required

Member 4 - Comments

- Use it to identify stakeholders, their special interests and how this influences the project
- Help in identifying the political interests in developing the scenario
- Use it before developing the scenario and fine tune the scenario to match stakeholders needs

Work Breakdown Structure

Member 1 - Comments

- use it to divide and conquer tasks
- Help determine doable parts of tasks
- Help figuring out deadlines and sequencing in a qualitative sense
- Helps in beginning to identify who can do the job, which is a part of the doable element of the tool. This also allows helping people learn tasks, i.e., those who need to become more familiar with certain tool can be assigned these tasks
- Important tool as it helps to identify the tasks to do on a day - to - day basis and what to do to accomplish those tasks
- Tool allows you to build slack time and where this will occur in a qualitative or intuitive sense
- Allows you to think about quality

Member 2 - Comments

- Would have helped to break down many things we had to put together for manuals and plans
- Would have helped in checking quality
- Could have used it at the beginning of the project

Member 3- Comments

- Would have beneficial in the beginning stages of the project
- Would have helped with deliverables
- Would have given us more control over staffing the project. This would have helped us work more quickly and effectively.

Member 4 - Comments

- Used it to help in project planning
- Tool would help break down the work into manageable pieces
- Would help cut down time spent on tasks
- Would help clearly define goals and tasks

Member 5 - Comments

- Helps plan things up front
- Helps with deliverables
- Tool could have improved efficiency
- Provides a clearer picture of what exactly one has to do
- Tasks are clearly organized
- Division of labor is more visible
- Would allow one to see what is most important at any given point in time

Responsibility Matrix

Member 1 - Comments

- Would help in knowing who is responsible for what
- Would help have control over the project
- Would help in checking quality as I would know who was assigned a task
- Would help in deciding how to distribute labor and use it effectively
- Would help in getting buy-in to the projects everyone has a responsibility or stake in the project
- Would also help to put the right people together to work together

Member 2 - Comments

- Would be useful in determining who would be responsible for different aspects of developing the exercise

Member 3 - Comments

- Would be a useful tool to discover who we are delivering what to
- Would help in understanding responsibilities as it would be formalized
- Would be useful in managing quality

Member 4 - Comments

- Would be useful in project planning
- Useful in clearly defining responsible parties and showing approval authority
- Would have helped define tasks, areas of responsibility and accountability
- Would help in cutting down time spent on tasks
- Would help in quality control

Member 5 - Comments

- Would be useful in making plans more concrete, visible, and formalized
- Possibly useful in quality control
- Would be useful in knowing who is responsible, reviews, executes, or has to be consulted

Activity /Milestone Chart

Member 1 - Comments

- Would help in figuring out actual dates on which some delays can be allowed
- Would allow one to see where deadlines were not met
- Different milestone charts over a period of time could tell us whether our estimate of time was correct

Member 2 - Comments

- Used the tool to obtain milestones to cross
- Helps in scheduling

Member 3 - Comments

- Used it to develop a set of milestones to organize work activity

Member 4 - Comments

- Used the tool in planning and throughout the project
- Showed deliverable due dates
- Assist in ensuring that project/contract requirements were met and plan work accordingly
- Would help in cutting down time spent on tasks
- Would assist in quality control

Member 5 - Comments

- Used the tool in planning
- Helpful in portraying milestones and activities graphically
- Would help maintain focus on the project in longer projects
- Would assist in quality control

Gantt Chart

Member 1 - Comments

- Useful for the portrayal of the project

Member 2 - Comments

- I am not familiar with the tool

Member 3 - Comments

- I am not familiar with the tool

Member 4 - Comments

- Would have used it to show where we were in the project
- Would be useful in showing corresponding activities

Member 5 - Comments

- Mainly as a portrayal tool, Used in the same way as milestone/activity lists

Networks

Member 1 - Comments

- Not familiar with the tool

Member 2 - Comments

- Not familiar with the tool

Member 3 - Comments

- Not familiar with the tool

Member 4 - Comments

- Would have used it in planning
- Would be useful to show dependencies and critical path
- Would help cut down time spent on a task
- Would help in ensuring quality

Member 5 - Comments

- Would have been useful for a complex project stretching over a longer period of time
- Would be useful in showing priorities, slack time, and dependencies
- Use it to show inter relationships of activities
- Would help in daily tracking of where we are, and what is going on and what has to be done
- Would help in cutting down time spent on activities as you plan ahead
- Would help in quality control

APPENDIX M

RightWriter and ASKSAM Sample Outputs

Sample List of Words Selected Using RightWriter for Search String Using ASKSAM

RightWriter analyzes data from an interview and lists the words used in the data along with the frequency of usage. Knowing which words are used frequently helps in creating a search string in ASKSAM to locate sentences where the words are used. Here is a sample list of words along with frequency of occurence generated as an output from RightWriter.

<< WORD FREQUENCY LIST >>

analysis	2	and	3
are	1	as	2
assess	1	assign	1
assigning	1	assist	1
am	1	become	1
better	1	build	1
checking	1	clearly	1
co	2	communication	2
conjuction	1	could	1
cut	1	date	1
deadlines	1	define	1
determine	1	doable	1
doing	1	end	1
familia	1	following	1
for	2	four	2
from	1	fudge	2
goals	1	have	1
help	2	helped	1
how	4	hughes	1

improve	3	influence	1
matrix	2	members	1
occur	1	of	1
once	1	co-ordination	2
overall	1	participant	1
participants	1	planning	2
project	2	quality	2
question	2	resources	2
responsibility	1	sequencing	1
slack	2	spent	1
stakeholder	2	stakeholders	1
sub	1	take	1
tasks	2	lean	1
the	14	them	1
these	1	this	1
time	3	to	4
tool	1	tools	3
understand	1	use	2
wbs	6	where	1
which	1	will	4
with	2	would	7
you	8	your	3

<< END OF WORD FREQUENCY LIST >>

<<** END OF SUMMARY **>>

Sample ASKSAM Output Showing Sentences in Which Specific Search Words Occur.

AskSam helps analyze transcribed data from interviews. Using words obtained from the word frequency list produced by RightWriter, various search patterns can be carried out in AskSam. The search word is highlighted on the computer screen to facilitate identification. Various combinations may be used, including Boolean searches. Parts of a word can be used. Once a specific word has been identified, the sentence in which the word occurs can be examined and analyzed to determine themes across interviews. Search string words have been shown italicized as an example.

Interview 1
John Mitchell
November 11, 1993
Stakeholder analysis--This might have been a *useful* tool to *identify* the stakeholders in the exercise development for Fernald. That is the only *use* I can see for it right now. You can get the stakeholder's *special interests* and *agendas* and see how it works and *influences* the project. Sometimes you have *political interests* to consider in developing a *scenario* like this. You have to address this political sensitivity. Stakeholder analysis may have given us *insigh*t into that. We *did not have time* to do the stakeholder analysis, but we certainly could have used it.

WBS--This would have been a very *useful* tool. This is probably the *most important* of these tools because it helps you *plan* your job better. It tells you *what you are going to be doing* and when, *who is responsible*, what happens if it does not make it, and this is connected very closely to the critical path analysis. It is also *important* for the documents.

VITA

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EDUCATION

Virginia Polytechnic Institute and State University, Blacksburg, VA
MS in Industrial and Systems Engineering, 1993
(Management Systems Engineering Option)
Thesis: Application of Project Management Tools to Assist in the Process of Developing Emergency Exercises.

Bangalore Institute of Technology, Bangalore, India
BS in Mechanical Engineering, 1990

PERFORMANCE IMPROVEMENT

- Assisted in developing performance improvement training sessions using quality tools
- Participated in a five-member project team to develop a performance measurement system for the Virginia Productivity Center
- Carried out time and cost studies that led to the installation of a computerized accounting system to improve productivity

MANAGEMENT

- Supervised and directed skilled personnel
- Organized and co-ordinated information seminars for clients
- Recruited new clients and increased business from existing clients

COMMUNICATION

- Designed and delivered presentations for projects to clients and peers
- Perceptive to needs and customs of people from other cultures
- Worked closely with professionals with different educational and cultural backgrounds

EXPERIENCE

- Graduate Research Assistant, Management Systems Laboratories, Blacksburg, VA (1/92 - present)
- Graduate Research Assistant, Virginia Productivity Center, Blacksburg, VA (8/91 - 12/91)
- Manager-Customer Relations, Fotoset Company (P) Ltd., Bangalore, India (1/90 - 7/91)

AWARDS AND ACTIVITIES

- Certificate of recognition, Management Systems Laboratories
- Member, Institute of Industrial Engineers
- Member, Toastmasters International (Public Speaking Organization)

Anil Swami