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Role of information technology in providing decision support to crisis management

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ROLE OF INFORMATION TECHNOLOGY IN PROVIDING DECISION SUPPORT TO CRISIS MANAGEMENT : CASE STUDY OF EARTHQUAKE CRISIS IN EGYPT

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The American University in Cairo

School of Business, Economics, and Communication
Department of Management

ROLE OF INFORMATION TECHNOLOGY IN PROVIDING DECISION SUPPORT TO CRISIS MANAGEMENT:

CASE STUDY OF EARTHQUAKE CRISIS IN EGYPT

By
Ann Taysir Nosseir

In partial fulfillment of the requirements for the degree of Master of Public Administration

Under the Supervision of

Dr. Salah El Sabaa

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Abbreviation

CAPMAS	Central Agency for Public Mobilization and Statistics
CIS	Center of Information Systems
CMP	Crisis Management Planning
DSS	Decision Support Systems
ES	Expert Systems
FEMA	Federal Emergency Management Agency
GDP	Gross Domestic Product
IDSC	The Information and Decision Support Center
INP	Institute of National Planning
IS	Information Systems
IT	Information Technology
MBO	Management By Objectives
WHO	World Health Organization
Km	Kilometer

Chapter One
Introduction

In Egypt, the 1992 earthquake caused damages to the buildings and infrastructure in some rural areas, parts of cities, and slum areas. Besides, these damages, several other human fatalities were also reported. This was due to poor standards of construction and inadequate enforcement of building safety regulations. In addition, the lack of community awareness and preparedness for the possibility of an earthquake resulted in unnecessary loss of life due to panic reaction and spread of fear.

It took three days before the government could handle such a crisis. In fact, since the sixties, the civil defense crisis management system was neglected which is a long time. Equipment was not efficient; the staff were not trained; and the earthquake-effect information was not available in time. The army was the only government institution that started to build provisional shelters and offered food to help homeless people. They also participated in rescuing operations. Foreign countries played a very essential role by sending experts, equipment and donations. In addition,NGOs and businessmen tried to offer food, shelter and money to save suffering people.

The 1992 earthquake tragically emphasized the urgent need to have a crisis management mechanism that can effectively and efficiently control and remedy the consequences of a crisis. This body has to use adequate information technology tools that can provide the decision-makers, e.g., President, Prime Minster,

Governors, or the top management with information and recommendations. This thesis explores the use of the information technology tools that can provide decision-making with required information and possible solutions. Some of the examples of information technology tools applied in this thesis include, information systems and expert systems.

I.1 Research Problem

Crisis produces chaos and sudden changes in the surrounding environment; decision makers work to minimize the losses and stabilize the environment. Therefore, crisis managers need accurate and reliable data and information to respond effectively to unexpected changes. In fact, information technology is potentiality able to provide decision-makers with dependable data.

This research will explore the appropriate information technology techniques and applications to assist decision-makers during an earthquake crisis in Egypt.

1.2 Major Question

- What is the role of information technology in serving the decision making process in crisis management?

1.3 Specific Questions

- What are the approaches and methodologies available to decision makers in Crisis Management?
- What is an expert system that provides decision makers with several recommendations - scenarios to respond to an earthquake crisis?
- What are the types of information to implement an emergency plan in an earthquake crisis?
- What is the design structure of a data base that supports the crisis management plan in case of an earthquake crisis in Egypt?

1.4 Research Objectives

- To set an information infra-structure to deal with a crisis.
- To set different scenarios within an expert system to enable decision makers to respond quickly in an earthquake crisis.
- To build a database that includes necessary data to support decision makers in an earthquake crisis.

1.5 Methodology

This study will explore the methods that provide decision-makers with required data and information in an earthquake crisis. Although several studies were conducted in crisis management concerning databases, decision making process, information technology, expert systems and predictions, there is no

current study that involves a comprehensive scenario to manage an earthquake crisis within an expert system and an information infrastructure supporting decision markers. As a result, the study will include previous work and produce an information infrastructure and an expert system to alternative scenarios for an earthquake crisis in Egypt. The research will explore also the alternative scenarios for earthquake crises in Egypt, in addition to the different types of information used in a decision making process.

1.6 Propositions

- To enhance the decision making process during an earthquakes crisis, there is a need to establish an organization staffed with efficient decision-makers.
- During an earthquake crisis, there is also a need for specific various types of information to support decision makers.
- During earthquakes in Egypt, there is a need to restructure the decision making process to cope with contingencies.

1.7 Proofing

Earthquakes do not happen frequently by nature; they are unpredictable, so extracted data will be from reviewing journals, reports (i.e., INP report), historical data, internet reviews.

1.8 Importance and Benefits

One characteristic of a crisis is the criticality of time. Decision makers have to analyze a crisis and its consequences and respondwithin a short time. Providing decision-makers with a data base and alternative scenarios will minimize losses and enable them to make accurate and precise decisions.

1.9 Research Design

- Exploring type of information and procedures to assist decision makers in the event of an earthquake crisis
- Exploring the proper information technology technique to be used
- Building a data base inter-institutional relationship
- Establishing crisis management scenarios for an earthquake crisis scenarios supported by an expert system

1.10 Limitations of the Study

- Crises do not happen frequently or similarly; thus defining the precise consequences will not be possible.
- The study will include a recovery plan and different scenarios following the crisis. It will not include the causes of crises or how to predict a crisis.
- The study reviews only available data, i.e., historical data about earthquakes in Egypt.

Chapter Two

Crisis Nature and Crisis Management

2.1 Crisis Nature

2.1.1 What is a Crisis?

In the last twenty years, scholars have given attention to the importance of understanding and defining a crisis situation. Each author defines a crisis from a different prospective and experience. In fact, each author focuses on the entrepreneur level of a crisis and only a few discuss a crisis on the national and international levels. As a result, there are several definitions of a crisis.

For example, in 1978, Selbet discussed a crisis as it relates to the organization. Selbet said that it is "any action or failure to act that significantly interferes with an organization's on going functions, the acceptable attainment of its objectives, its viability or survival, or that has a detrimental personal effect as perceived by the majority of its employees, clients or constituents" (Booth, 1993, p85). The definition addresses only a crisis as it relates to organizations acting as an interfering agent or those that fail to act.

In contrast, Bell (1978) focused on a narrow aspect of a crisis. He argued that "the essence of a crisis in any given relationship is that the conflicts within it rise to a level which threatens to transform the nature of the relationship"(Booth, 1993, p85). He viewed crisis as a series of conflicts and threats to surrounding relationships. Furthermore, Perrow's (1984) definition extends beyond Bell's to say that "a disruption that physically affects a system as a whole and threatens its basic assumptions, its subjective sense of self, its existential core"(Booth, 1993, p85). Perrow's system applies to an

organization, a nation or the world. This definition includes the concept of natural disasters which were not included in previous definitions or understandings.

In the 1990's scholars did not distinguish between a disaster and a crisis and as a result, both concepts are still used interchangeably.Sapir and Misson define an external crisis or a disaster as "any occurrence that causes damages, ecological disruption, loss of human life, deterioration of health services on scale sufficient to warrant an external ordinary response from outside the affected community or area (WHO manual, section XY, 4 article 20, 13/89)" (Clavani, 1994, p208) (Sapir and Misson, 1993, p76).

Furthermore, Massoud adds that "a disaster is a catastrophic situation in which the day to day patterns of life are, in many instances, suddenly disrupted and people are plunged into helplessness and suffering, and as a result, need protection, clothing, shelter, medical and social care and other necessities of life" (Massoud, 1993, p139).

However, Booth explains that an external crisis is a natural or an environmental crisis and a crisis can be seen as an opportunity as well as a threat. In fact, a crisis brings new possibilities and innovative ideas to the forefront (Booth, 1993, p85-86). On the contrary,Weick mentions that a crisis is an uncertain event that brings high risk consequences of events and threatens the major goals of an organization (Weick, 1988, p305).Weick, in his writings, views that a crisis does not offer opportunities, and it is a major threat to an organization, especially, in the case of .an explosion or a gas leaks. Barton also uses this definition of a crisis as hesays that "a crisis is a major, unpredictable event that has potentially negative results. The event and its

aftermath may significantly damage an organization and its employees, products, services, financial conditions, and reputation" (Barton, 1993, p2).

J.D. Ford further adds that an external crisis or a disaster is an unpredictable event that threatens the surrounding area and causes damage, ecological disruption, and loss of human life and stresses managers with time constraints. In some cases, it may produce a positive turning point

(El Hadad, 1996, p10). It is clear that the terms disaster and an external crisis are used interchangeably as they are often given the same meaning.

2.1.2 Types of Crises

There are three main types of crises. Some writers divide the concept of a crisis into two groups natural and man made disasters (El-Saltan, 1996,p11). These two types are divided into sudden onset and slow onset to produce the following three types:

1 Sudden natural disaster.

Booth, Clavani, Sapir and Misson claim that it is a completely unexpected or a sudden threat of a loss that affects the whole organization, such as an "earthquake, tremor, volcanic eruption, cold wave, heavy rain, snow storm, storm hurricane, cyclone, tornado, typhoon, or thunder storm"(Clavani, 1994, p209) (Sapir and Misson, 1993, p76).

2 Natural disaster.

This type is created gradually by the human violent behavior. In other words, it is the human being misuse of resources, and it is due to socio-economic and political variables that produces e.g., "draught, famine, food, shortage plus malnutrition and their consequences: epidemic disease"

(Sapir and Misson, 1993, p76).

3 Man-made disaster

Clavani divides man-made disaster into sudden onset and slow onset. A sudden onset disaster includes structural failure (dams, mine, buildings), fire, explosion, large scale collision, train or air crash, ship wreck, port accident, large scale food contamination, environmental contamination, toxic waste, or a chemical accident. Slow onset disasters include war, civil traffic, refugees (Clavani, 1994, p209), economic crisis, or pollution. Furthermore,Sapir and Misson divide man- made disasters into four items:

- Violent mass such as conflict, civil war, major riots, or uprisings.
- Political involving displaced persons, mass evacuation, refugees, or expelled nationals
- Accidents involving transportation, food, insecticide poisoning, or explosions
- Chemical accidents such as factory explosion, or nuclear accidents

(Sapir and Misson, 1993, p76).

Booth adds to types of crises sudden, periodical and gradual threats. He explains these types based on the organizational behavior, but they could be used on different levels as well. During sudden threats, managers may make deficient responses by selecting essential items for survival and reduce damages. During periodical threat, managers can implement a plan to reduce the effects of the crisis. However, the plan may not be acceptable in a major crisis. The crisis therefore needs professional crisis managers.

Finally, a gradual crisis is more scary because managers do not always recognize it immediately. As a result, they do not often have an efficient plan to reduce its consequences (Booth, 1993, p86-p88).

2.1.3 Characteristics of Crises

As figure 2-1 explains, there are three main characteristics of crises: suddenness, time limits and threat. A crisis has no boundaries; it strikes any organization or a country and is usually inevitable. Because of its inevitability, a crisis causes environmental chaos and we are often faced with a lack of knowledge to understand the crisis. Due to surrounding tension and disturbance that occurs in crisis, events escalate and uncertainty increases. In fact, each crisis has its own unique cause and effect. In order to manage a crisis one needs a rational and well equipped agency (Barton,1993,p87)

(El Hadad,1996,p10).

The main three items of crisis characteristics

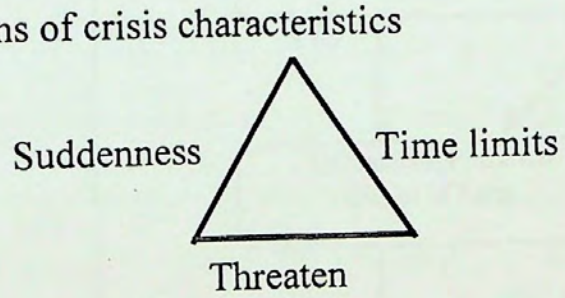
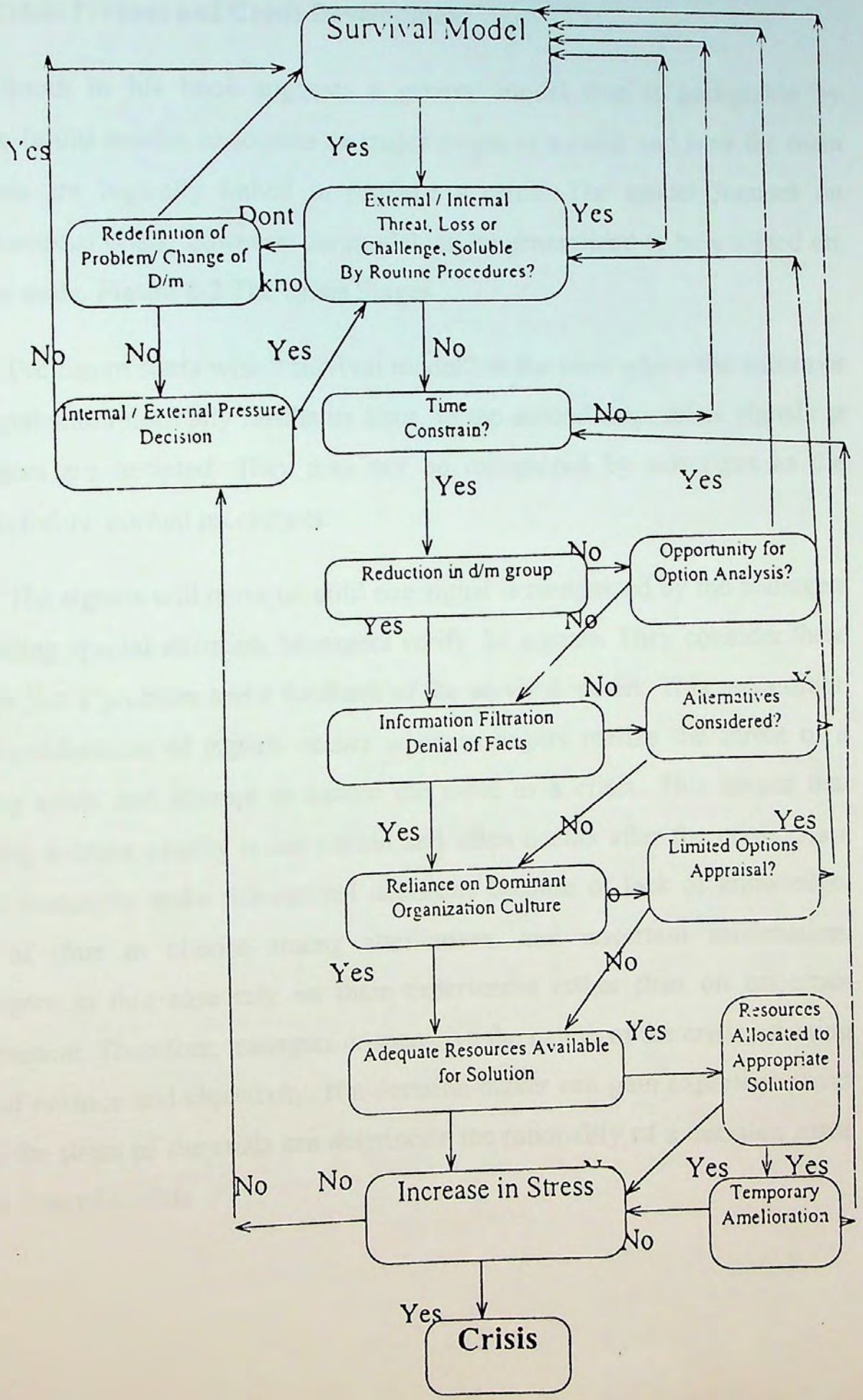


Figure 2-1 Characteristics of Crises

Source: (El Hadad, 1996, Figure I, p10)



2.2. Stages of a Crisis

Source: (Booth, 1993, figure 2-1,p105)

2.1.4 Crisis Process and Crisis Development

Booth in his book suggests a general model that is acceptable by writers. In this model, he focuses on major stages of a crisis and how the main elements are logically linked to produce a crisis. The model focuses on organizational crisis; however; the model can be generalized to be adopted on a larger scale. Figure 2-2 The Crisis Stages

The figure starts with " survival model" or the state where the nation or an organization normally fulfills its aims. In the second step, crisis signals or indicators are initiated. They may not be recognized by managers as the signals follow normal procedures.

The signals will move on until one signal is recognized by the managers as needing special attention. Managers verify the signals. They consider these signals just a problem and a feedback of the survival model. This recognition and consideration of signals occurs when managers realize the threat of a coming crisis and attempt to handle the issue as a crisis. This means that defining a crisis usually is not certain and often occurs after the crisis. As a result, managers make sub-optimal decisions because of lack of knowledge, lack of time to choose among alternatives, and uncertain information. Managers in this case rely on their experiences rather than on uncertain information. Therefore, managers misperceive the nature of the crisis, creating loss of balance and objectivity. If a decision-maker can gain experience over time, the stress of the crisis can deteriorate the rationality of a decision made in the time of a crisis.

In fact, decision-makers respond in different ways. The first type of response is that decision-makers make no decision because they are shocked and overwhelmed by an event. The second way of response is that decision makers make irrational decisions among alternatives. Third, decision-makers make some appropriate decisions as a normal response to the nature of a crisis. Fourth, decision-makers make rational decision, but they are unable to implement these decisions. Fifth, decision-makers rationally decide but these decisions are not applied because of sudden changes in the nature of the crisis. Finally, decision-makers who are able to adopt the crisis lead the organization into the survival models. Therefore, there are two major situations that occur in the time of a crisis: either maladoption or adoption of the crisis (Booth, 1993, p105-p107).

2.1.5 A Crisis of an Earthquake

An earthquake is an earth shake, due to a change in pressure status at the center of the earth, moving massive rocks in high depth. This pressure is because of high temperatures that melt the rock or human activities such as building dams for tanks that cause huge artificial lakes that pressure the earth's surface. Any earthquake shakes are vertical waves, horizontal waves or surface waves (El Hadad, 1996, p68). In other words, "earthquakes are a natural phenomena which occurs frequently in different regions of the world; when they strike populated areas, the consequences are disastrous in terms of loss of life and property damage" (Sobaih, 1993, p117). Efforts are done to predict the place, time and magnitude of an earthquake precisely although forecasting an earthquake will not reduce the number of property losses. It may reduce the number of death cases and injuries (Seddik, 1993, p188).

2.1.5.1 Signals and indicators

Earthquake signals and indicators play a pivotal role in predicting an earthquake to minimize its damages. Indicators are either natural or measured by high technology equipment. The animals' behavior before an earthquake is a natural signal, but this gives a limited time to respond. Another technique used to avoid the consequences of an earthquake is to define expected earthquake areas.

In Egypt, there are five earthquake zones: 1. Red Sea Zone 2. From El Kabir to Abo El Rish, 3.Middle Zone, 4.Mediterranean Zone, and 5. High Dam South Aswan Zone.

Egypt has thirteen earthquake stations equipped with highly sensitive receptors and indicators that measure any extra nature energy. The station uses different programs such as "Earth Data Quake Processing and Pick" that defines the waves and time and place of an earthquake. 'T.Hypo" defines the earthquake place. "Focal mechanism" and "KILMETRICS" are used during an earthquake to analysis and define time, location, and depth.

These programs and equipment are not enough to predict an earthquake activity. This field needs more research to understand the nature of an earthquake. (El Hadad, 1996, p69)

(http://www.consrv.ca.gov/dwg.notes/32.html).

2.1.5.2 The Crisis of an Earthquake has a Special Nature

Each crisis has its own characteristics: internal crisis and international crisis (wars, terrorism). Each crisis differs from the other. However, the three

major items are common for most crises: timelessness, suddenness, and threat. The crisis of an earthquake, in addition to the three common characteristics, has the following:

It causes human, material, and psychological damages; besides, it produces time and mental stress for the decision-maker. It also requires unusual tools and systems to manage; further, earthquakes demand huge material, human, and psychological capabilities. In order to cope efficiently, any organization needs a rational management with an effective communication system because incomplete information causes serious conflicts and may escalate the crisis.

Needless to say that modernization multiplies earthquake losses. For example, modernization increases the population in earthquake zones; it expands the number of skyscrapers and high towers, and multiplies the number of dams in highly populated areas. Unfortunately, most of the developing countries do not apply building measures and conditions in earthquake zones. They do not measure the earth surface before starting to build. The number of plans to prepare and handle an earthquake in these developing countries are limited and insufficient, and as a result, citizens are not aware of security measures (El Hadad, 1996, p69).

2.2 Crisis Management

2.2.1 Why Crisis Management has been Recently Developed

Management science was developed to organize chaos and to transmit an organization from stability to state of prosperity. Until now, early theorists are still dominating management thinking. A theorist's prospective to a crisis was developed and enriched by organizational growth and environmental complexity. In Taylor's work , for example, the main essence is the harmony of interests between workers and employers. He views this in a form of "one best way" or "scientific way" that maximizes the employer's prosperity and maximize the employee's prosperity. He defines a crisis as an internal crisis initiated by the inability of both parties to identify the major reasons leading to poor performance. This "one best way" approach rejects the idea of any other alternative organizing or managing even in the event of a crisis or a change.

Fayol, a founder of the administration approach to management, suggests fighting a crisis is to avoid critical problems. Problems appear if an organization ignores any area of these activities (technical activities, commercial activities, financial activities and management activities, i.e., planning, organizing, command, coordination and control).

In other words, consideration of these activities is the core element in any working environment. Fayol adds that an effective manger has to have detailed information about the organization and update reports periodically. Fayol's theory is used now, although he ignored both cultural influence and human factors. Each country has its own culture and behavior, and as a result, mangers have doubts in the universal use of this theory.

In recent work, writers have been trying to approach management as a social process of work in a changing environment instead of seeing it

as a set of principles, structures and procedures. Managers are classified into either effective "centered managers" who are able to work with others and ineffective managers or "derailed managers" who are insensitive, aloof, and untrustworthy. Based on this view, centered mangers in crisis tend to rely on colleagues. On the contrary, derailed managers tend to protect their own interests and tend to use rules and regulations. Derailed mangers, in this sense, fulfill organization's goals by doing things right, but not necessarily doing things efficiently and effectively. Deming argues that for long term survival of organizations, mangers should develop a quality management principle. "The development of a system of zero defects and the highest quality at a price the customer was prepared to pay was the way not just to success but to dealing effectively with the signals of internal crisis" (Booth, 1993, p20). Deming believes that problems are not due to individuals. Quality management has become difficult to adopt in cases of rapid growing environments because there is difficulty in sustaining the notion and practice of quality management. The staff and management can not create a system and accept stresses and problems.

Mintzberg, in his empirical study, raises the question of what managers actually do. He found that managers play three managerial roles: interpersonal roles, informational roles, and decisional roles. He noticed that mangers understand that handling a crisis is part of their roles. In a small business mangers need to have crisis management skills because otherwise the business will collapse. In large organizations there is a need to vary the types of crisis management skills due to environmental complexity.

Elton Mayo views the importance of understanding human relations. His research pointed the positive influence of informal groups in an

organization. Employees and workers need to be motivated to perform effectively and efficiently.

Management by objectives (MBO) is one technique that integrates formal structure and informal structure together. Druker recognizes the importance of not overemphasizing profit target. There are other areas on which to focus market standing: innovation, production, physical and financial resources, a manager's performance and development, a worker's performance and attitude, and public responsibility. Integrated objectives consist of four steps: setting specific objectives, developing action plans, reviewing periodic plans, and appraising performance. Managers later recognized that MBO is not sufficient in a turbulent environment or an uncertain environment. MBO was developed to respond to environmental changes that were chosen by the managers (Booth, 1993, p26-p27).

With the increase of uncertainty, an organization is viewed as a living organic system or a system which has four critical functional areas : input from external environment, transformation process, outputs, and feedback. The systems theory enables analysts to understand the internal and external relationships of an organization. As a matter of fact, the system tends to function in different ways because mangers make various decisions responding to the environment that creates special relationships. An organization's behavior reflects the diversified tasks an organization makes and the surrounding environment it challenges. This notion is known as contingency theory. An effective organizational system makes an appropriate combination of strategy, structure, technology, commitments and needs of people, and the influence of the environment.

Management theories transform ways of managing an organization to the notion of the relationship between environment and organization. Managers have to consider the relationship between the environment and the organization to be able to transform from one state to another in order to accept changes and face crises (Booth, 1993, p9-p30).

2.2.2 Crisis Management and Crisis Planning

Authors have not made a clear distinction between crisis management and crisis planning. Both Weick and Quarantelli in their papers tried to differentiate between both concepts. Weick addresses this argument by asking what is crisis management? He mentions that "crisis management is often portrayed as a reactive activity directed at problems that are already escalating" (Weick, 1988, p314). He adds that "crisis management can mean quick actions that deflect a triggering event as it unfolds rather than delayed action that mops up after the triggering event has run its consequences" (Weick, 1988, p314). For example, an earthquake, such as the 1992 one that hit Egypt was a triggering event that caused damage and destruction to essential buildings and consequently caused injuries and death. Crisis management responds to this escalating crisis through emergency activities.

Quarantelli puts the levels of crisis control effort in the following order. first, crisis planning; second, crisis management; and third, emergency activities. He clarifies that there is a relationship between crisis planning and crisis management. Poor planning definitely will encourage poor crisis management activities. An effective crisis plan involves general strategy for sudden community emergencies and will lead to good management that consists of particular emergency tactics (Quarantelli, 1988, p374-p375).

Obviously, crisis planning is the first step to emergency activities. Mc Louglin emphasizes the importance of process planning that leads to the development of a written plan which determines the what, when, where, and who in order to achieve specific demands. Crisis planning has three levels: a pre-disaster phase, an emergency relief phase, and a post-disaster phase. In the first phase, the main objective is to identify the types of crises expected to occur and their magnitude. In other words, managers need to identify prediction methods and start risk analysis and assessment. After mapping the acceptable risk level that can be absorbed by a community, the balance between "risk avoidance and prevention" and "mitigation cost" is estimated. This equation aims to avoid crisis risks and to minimize losses. This strategy, which must be long-term plan is designed to avert and handle the crisis as well as managing threats during and after the crisis (Calvani, 1994, p237). This long term plan includes policies, guidelines, and procedures to prepare precautionary measures, early warning systems, and emergency operations during and after a disaster (Ebeid,1993,p154). In addition, a national emergency organization needs to define a strategy that focuses on crisis management activities, coordinates among external bodies, and sets clear objectives to plot threats and reduce uncertainty (Barton, 1993, p49). Finally, planners need to integrate the predisaster plan of countries national development plans to formulate legislation; for example, encourage earthquake structure in vulnerable areas. It should be clear to planners that disaster planning can reduce damages by first directing socio-economic development projects to the least hazardous areas. Second, integration efforts to minimize possible natural disasters need to be identified (Myhlback, 1994, p120).

In the emergency relief phase, activities are prepared within a general frame work of a national or a regional plan for warning, evacuations, rescue, rehabilitation and reconstruction
(Myhlback, 1994, p121).

Crisis management plans (CMPs) are tools that follow the framework of a national plan. CMPs could be complex and detailed or general and flexible. Their nature depends on the crisis organization, managers, availability of data, and cooperation with other agencies. The success of setting a good CMPs is presented in its ability to avoid causing side effects that enlarge the consequences of the crisis. On the contrary, a poor CMPs may damage human life and cause incremental costs
(Booth, 1993, p147). Thus, understanding the crisis nature can help planners to create successful plans. and depends also on the ability of planners to employ available resources to avoid drawbacks. This is done before the disaster occurs. The plan includes setting priorities, defining responsibility of managers, and coordinating rescue activities
(Myhlback, 1994, p121).

Barton says that CMPs should be in a comprehensive formula; they need to be in a short formula in order to be reviewed in time of crisis. The CMPs which are implemented by Barton only focus on private industry. In fact, they can give us an idea of how they can function when used at the national level. The main feature of CMPs in a certain industry is their comprehensiveness and confidentiality. CMPs information is pertinent and updated. One of the suggested CMPs includes the following outline based on Barton's argument.

1. Introduction or letter from the Chief Executive Office
2. CMP acknowledgment

3. List of crisis team leaders (with all phone numbers)
4. Crisis team contact sheet, including consultants
5. Crisis risk assessment, and summary of potential crisis
6. Documentation section and multiple copies of crisis contact sheet
7. Proprietary information
8. Action steps: who should do what and when?
9. Secondary contacts and resources
10. Media relations (multiple copies of press contact sheet)
11. Financial and legal considerations
12. Crisis center: location map of resource and supplies
13. Post crisis evaluations(Barton, 1993, p199).

On the national level, planners should think in terms of rescue services and civilian protective assistance. In addition, they can prepare CMP in two stages: first, fact finding which includes understanding the nature of the crisis, knowing the available resource, and updating information; second, create different scenarios and prepared for the worst scenario.

In the post disaster phase, all affected areas, building, people, and agencies need recovery. An intermediate program is important to implement. This program includes a reevaluation of the damages by effectively measuring its magnitude. As a mater of fact, this is important in evaluating buildings' material, so that it can face another crisis.

In general, construction activities are based on actual and available data about the crisis or on expected date. In addition, TV and educational organization can create awareness among school children as well as others in dealing with a disaster. Finally, development examples of know how and

techniques should be disseminated to all beneficiaries: Technicians, politicians and relief workers as well (Myhlback, 1994, p121)
(Booth, 1993, p250).

2.2.3 Importance of Crisis Management Agencies Supported with International Agencies

2.2.3.1 Importance of Crisis Management

Natural disaster drawbacks are multiple because governments' systems are getting complicated, aiming at higher GDP, lower unemployment rate. In the development process, various factors are interconnected. A disaster such as an earthquake destroys buildings, causes death, causes loss in agriculture resources, and causes major destruction in a country's infra-structure including schools, and hospitals. Thus, a disaster is a barrier to development.

As mentioned earlier, planning should include a pre-disaster plan that supports development strategies in order to minimize losses. A management crisis agency is a tool to implement these plans. Theagency's structure along with the local structure can effectively handle a crisis by preparing different scenarios that respond immediately to a crisis. This body provides and coordinates effective communication methods. It also disseminates and collects information among different agencies. The following examples are of international crisis management agencies.

2.2.3.2 The American Case:
Federal Emergency Management Agency FEMA

The main goal of FEMA is to ensure effective communication and interactive cooperation among the President, governors, and emergency management agencies at all levels. Its mission is to provide emergency management information by providing suggestions for emergency preparation, responses and techniques of handling a crisis
(Barton, 1993, p219).

The FEMA has a comprehensive emergency management model. This model has four distinct stages:

1 The *mitigation stage* reduces risks by assigning the risk of potential disaster.

2 The *preparedness stage* includes setting plans, having adequate resources, matching remaining risk after mitigation training staff, and clarifying jurisdictional responsibilities.

3 The *respond stage* implements the preparedness stage plans. In other words, managers set reactive activities within the plan framework, and try to manage minimum losses.

4 The *recovery stage* attempts to address aftermath events by analyzing the events of the past disaster to improve management technique and preparedness (Waagh, 1994, p254) (Barton, 1993, p220-p221).

FEMA has one main office in Washington DC and ten regional offices. Each regional office supports four to eight offices with contiguous status. In California, the FEMA focuses on the preparedness stage. There isa special buildings' code that resists earthquake shakes, as well as concentration on the training programs that make people aware of how to respond to such disasters. As a result, when an earthquake hits, the FEMA takes actions according to well-defined procedures.

2.2.3.3 The British Case

In the British government, there is no special crisis management organization; basically, the government is in charge of emergency group:- police, ambulance offices, fire drills, country emergency planning affairs and associated volunteers, such as the Women's Royal Volunteer Services, the British Red Cross and the St. John Ambulance Brigade. The central government department responds to selected areas based on department interest (Handmer and Paker, 1993, p309). These days, The British government suggests having a different view of a disaster or a crisis plan.

The European community in 1987 presented the need to have an integrated emergency system. This European community wants to have a mutual aid plan for emergency response and disaster relief (Handmer and Paker, 1993, p313).

2.2.3.4 The Egyptian Case

Egypt does not have a specialized body to handle a crisis, although there are essential agencies that work to respond to a crisis in Egypt such as the army, Center of Information Systems (CIS), and Decision Support Systems (DSS). The army in the 1992 earthquake reacted effectively to the crisis and provided civilians with most items they needed. NGO's also contributed, providing food, blankets, clothing, shelter, and volunteers. Recently, (CIS) and (DSS) established a crisis management department that helps predict and face crises. The civil defense is a body that functions within the internal ministry, funded by the ministry and by a separate

budget from the government. This body faces financial problems in the regional offices and also does not have full authority and power. The office must refer to the Ministry of Interior.

In fact, Egypt needs an organized body that can respond effectively to sudden events. In addition, this body needs to be prepared to use dynamic alternatives as well as to provide decision makers with required information immediately.

In the beginning, there would be certain barriers to overcome, but it is important to begin developing process because such an agency is an asset in handling a crisis.

2.2.3.5 The Best Structure

Hander and Paker say that there is no single administrative structure that best fits all types of governments. In the beginning, it was believed that a centralized management was the best system, but it was noticed that centralization is best for a routine task. Managers have realized that the decentralized is best suites for complex interaction tasks that allow people to choose different substitutions and various paths.

In US managers see that emergency mechanisms should act as a facilitator rather than as a commander. They coordinate between groups than control.

In short, the appropriate structure is the one that reduces, prevents, and minimizes the drawbacks associates with a disaster through the aspects of disaster management preparedness, response, and recovery
(Handmer and Paker, 1993, p308-309).

2.2.4 Bureaucracy and Crisis Management.

Different Mechanisms Developed within and through Managing a Crisis.

During and after crisis management, different managerial mechanisms and conflicts affect the failure or the success of relieving crisis tension. These managerial mechanisms and conflicts are the bureau politics tension and completion and conflicts between the bureaucratic norms and emergent norms.

In 1918, Weber's ideology of separation between "politics" and "administration" developed the perception of "administration as a neutral competence" and "politics as the domain of policy conflict and ideology" (Rosenthal, et al., 1991, p219). With the development of management perspectives and theories, the policy centrist models of administration increased with the need to understand conflicts between different interests and the desire to negotiate. Thus, the bureau-political model approach is an appropriate perception to understanding the inter and intra organizations setting to minimize conflict and to set a comprehensive rationalistic top-down reform blue prints. In fact, the bureau-politics perspective draws the analysts attention to the conflicts with the organizations branches. This analysis is conducted by identifying the bureau political indicators: number of actors, positioning of the interest power structure, actors that have influence, compromised formulation of decision, and coupling decision implementation. In crisis management, this model can extent to be used in policy making for crisis episodes.
(Rosenthal,et al., 1991, p219-p220).

Bureaucrats and bureaus have various items to do, besides they are usually pressured by time to make several analyses for huge amounts of data. The number of actors in crisis management are the small crisis teams that consist of staff and advisors, so, unfortunately, the crisis data are only processed by those teams. As a result, the decision choice involves only a compromise between two equal alternatives or two similar chioces . Nevertheless, since a crisis has characteristics of urgent time for reappraisal, information overload, and time pressure, serious may add up to renewed rounds of bureau-politics (Rosenthal,et al., 1991, p219-p220).

Another problem that appears during crisis management is the conflict between the bureaucratic norms and emergency norms. First, the bureaucratic norms are characterized by a clearly defined objective, a formal structure, a division of labor, and a set of policies and procedures guiding organization activities. In other words, every item organized and known is clear. This structure functions in a stable environment. On the contrary, the emergency norms work in unpredictable and chaotic environments. People tend to behave in a collective manner that is non-institutionalized since interactions and behavior patterns occur in a serious of abrupt changes in the environment. After a disaster, problems that a rise from normal boundaries and the milling process begins as people question what to do in the conflict. Forms of interactions are developed based on incomplete and incorrect information; people then try to extract key ideas to provide symbols and directions to deal with the crisis, enabling them to end the milling process. All this can be summarized saying that bureaucratic norms and emergent norms move in opposite directions. This gap between bureaucratic norms and emergent norms is one between governmental plans and the needs of

the affected people. If the government prepared to face such a crisis, the gap between both norms will be small, so public organizations can cope effectively with the chaotic situation. If the crisis is unexpected and complicated, the disaster will be criticized by citizens.

In normal cases, the public responds to any unpredictable disaster and the emergent norms are correlated to routine behavior patterns. For example, in order to evacuate an area, volunteers are quickly delegated to help. In this case, the government can cope with the behavior. In other cases, the crisis can create social unrest and violence which will be barrier sto an effective governmental response. This also widens the view as a possible failure response. Finally, before implementing an organizational structure to face a crisis, a government requires an understanding of the crisis mechanisms and how the public can evaluate such effort as a fault effort. Although there are the different norms (bureaucratic norms and emergent norms). They can be viewed as a successful effort. This is the case when a government is well prepared to face such disasters. Inside the emergency organization, bureau policies, tension, and competition are usually centralized; furthermore, centralized administration is for crisis administration. Bureau-politics is the best route to begin to institute democratic thinking and policy as a different alternative to a centralized and coercive bureaucratic administration (Schneider, 1992, p135-p138).

Before and during crisis, and aftermath, there is a need to have effective, accurate and timely information. This information can also be a support to minimize the conflicts and minimize the damages. The folowing chapter will discus in details:information types, categories and quality.

Chapter Three

Information Technology Supports Decision Making Process

3.1 What is Information?

3.1.1 Information

The complexity of the problems after the earthquake arouses the need for an analyzed and organized information flow. Crisis management needs accurate information to support the decisions of the top management of the crisis management agency. Meanwhile, time limits the decision-maker, so information is one way to sort the decision-makers' ideas and to enable him/her to respond effectively. The following chapter will define what information is required, its characteristics, and how the decision-maker can get the supportive information.

Information is the engine of the decision making process. For example, if the supply of information is relevant and accurate, a decision produced will be a suitable decision or a proper solution to a problem. Accordingly, Bentley mentions that information is "what ever contributes to the diminution of ignorance or uncertainty" (Bentley, 1982, p11).

He adds that "information may range from elimination of all uncertainty and ignorance about a decision to adding nothing in removing uncertainty and ignorance" (Bentley, 1982, p11). In other words, relevant information should increase knowledge, reduce uncertainty, and be usable for its

purpose (Rowely, 1992, p11). Thus, the value of the information appears when the cost is subtracted from the producing of information (added value).

Another view describes information as a logical output of a system, and therefore, tangible (Zorkoczy, 1982, p7). It is also a result of combining data (Everest, 1986, p146) or processing data to assist decision-makers. Data is gathered, analyzed, summarized, and produced in the form of reports according to defined rules (Rowley, 1992, p11) (Fried, 1995, p4). As mentioned earlier, processed data becomes information if it is required by the recipient who can extract from, express by, and represent his conventions and ideas to purse activities.

There are two main themes present in the definitions of information. First, information is a processed data; second, information changes a decision-maker's direction. In both cases, information is essentially defined as receiver-based. Browne argues that information, in this principle, is treated ambiguously, subjectively, and has no existence in reality. He frames information as a commodity that has a life; its existence is in written and spoken knowledge and it can be processed, altered, produced, and lost (Browne, 1993, p6).

In fact, Browne uses information, data, and facts interchangeably. He works with information as based facts, opinions, speculation, and other data with potential for meaning; for instance, translated information in oral or written forms and documents of meeting minutes are forms of information potent with meaning.

In times of crisis, decision-makers use information and knowledge about how to behave and interact with the case in order to minimize losses; they need different reports covering the incident, such as, information about nearest hospitals and facilities. Although a source-based definition is acceptable by other authors, it mixes knowledge and information together. Clearly, information, in this case, is a receiver-based and is referred to as analyzed summarized, processed, and interpreted data to guide a recipient.

3.1.2 Types and Categories of Information

Most authors categorize information based on organizational requirements, which enable organizations to survive and grow. Relatively, for an information provider, the classification of information prevails decision-makers as it positions them in the organizational hierarchy. For instance, Thierauf categorizes information in to two parts: internal and external information. In his description of internal information, he arranges information in to three different levels of management: strategic information for top management, tactical information for middle management, and operating information for lower management. Meanwhile, he demonstrates that external information should be increasingly summarized and selective as the position of the receiver decreases in the managerial hierarchy (Thierauf, 1987, p12-p13).

Many writers illustrate the categories and types using normal, everyday examples of life, not example of a crisis time. However, internal environment information is essential to managers i.e., personnel, inventory. Crisis management requires detailed information about the external environment, planning or strategic information.

Bentley divides planning information into three items: first, what is already known i.e., historical facts; second what is reasonable and certain to happen i.e., orders and contracts that have been placed for future periods; and finally, the forecasts, estimates and predications (Bentley, 1982, p13).Rowley supports this argument by defining strategic information or planning information as a description of future development programs.

In case of uncertainty in a time of crisis,decision-makers are confronted by different unknown problems. Thus, historical information, what is already known as reasonable and certain to happen, and trial of prediction and forecasts are all tools to address the crisis domain and its consequences.

Both tactical and operational information cover plans for a short time of less than one year. Tactical information is used by middle management to implement strategic plans. For example, it reflects decisions about specific funding, responsibility, delegation and follow through. On the second level, lower management uses operational information. Thisinformation allows line managers to measure a performance against predetermined goals, including standards and budgeted figures.

As mentioned earlier, time span increases as the level of control rises in the hierarchy; however in crisis management, decisions are made in a short time. Actually, crisis management does not perform similarly as a profitable or public organization's management plan. Managers have to interact quickly and all tactical, operational and strategic information should be considered by the decision maker (Thierauf, 1987, p13) (Bentley, 1982, p13).

3.1.3 Characteristics of Strategic Information

Setting a strategy minimizes crises' risks or out-comes. Strategic information will be characterized as follow:

1 Largely external: Information is about the external environment and all factors affecting the external and internal environment of the decision. E.g., economic trends, technology changes, volcano eruption, ecological changes, and political factors.

2 Largely concerned with the future: Information gathered usually reflects the past behavior and through trends, tools, and methods the future tendency can be forcasted.

3 Qualitative as well quantitative: Strategic information needs to be rich and sufficient to set a strategy.

4 Boundary free: Information should be integrated and comprehensive i.e., a full image of an organization must be achieved (Rowley, 1992, p19).

3.1.4 Quantity of Information

The quantity of information may be seen as an advantage. In fact, quantity is important in case of unpredictable events or messages. Zorkoczy adds " the more unpredictable the message generated by sources, the more information is transmitted" (Zorkoczy, 1982, P9) .For example, in a time of a

crisis, there are different sources that give different information about the incident. Information is repeated e.g., more than one type of information is about one case. This redundancy facilitates making corrections and predictions to present consequent events.

Of course the quantity of information received is limited by time and space. For example, in earthquakes, firemen should respond quickly. There is a limited time to gather all the information about the event. Stevenand Cooke describe the importance of the amount of information and time available. They say "time available is determined by gaps between the decision that must be made (duration of the process) and time (or the out put of the process)that the time itself needs to be made"(Cooke and Slack, 1991, p11). He defines this time by the distinction between actual time that the decision takes to be made or the processes that the decision passes through and the time available to make that decision. During this time, decision-makers collect as much information as they can in order to predict the following events. In fact, in a crisis, time is limited and decision makers need accurate information, but the quantity of information transmitted could be distorted and therefore mislead decision makers.

The quantity of information is crucial but quality of information is effective. Bentley claims that there is no proof that more information leads to better decisions and could be risky if there is a distortion in transmitting information (Richter, 1993, p19).

Consequently, in the three stages of handling information (acquisition, understanding and communicating), information may be misleading and dangerous, especially in cases that require quick responses.

(Gunton, 1990, p10). Finally, the quantity of information is effective when proper analytical methods are used and communication systems are reliable.

3.1.5 Characteristics of Effective Information

Information is vital when it fulfills a decision-maker's requirement and when it affects processing a decision. In other words, the information's intrinsic value relies on the value added to the decision making process. For example, Thierauf explains that "given adequate information on essential facts, management can rely on deductive and analytical methods than on guesses and intuitive judgement" (Thierauf, 1987, p40). On the contrary, wrong decisions are a result of insufficient information.

Realizing the importance of information, in the late 80's, computer conferences emphasized the need to treat information as sixth major corporation's resources next to money, material, machine, facilities, men, management and information. So, information can support managers in different levels in addressing their problems and finding solutions. Briefly, information represents a value added to managerial and operating activities in resolving decision-making problems in case it has the following characteristics:

1. *Accuracy*: Information, that is reaching absolute accuracy, is difficult and relevantly costly.

2. *Timeliness:* In urgent decisions which need quick responses, time influences the success of these decisions, especially, in turbulent environment where time is asset; mean while, this fast respond contradicts with accuracy because fast information is not usually accurate and precise, alsoit is expensive and requires excessive effort in order to get it.

3 *Sufficiency*: Regardless of the size of the report, information should be sufficient, i.e., relevant to the decision environment and decision-makers in the various levels.

4 *Reliability:* Decision makers must have trusted information sources and transmission or communication techniques to make sure that information is not biased and is a true indicator.

5 *Completeness:* Information should cover a particular decision necessity. Otherwise, incomplete information is a misleading.

6 *Detail:* Detailed information concept changes from one management level to another. In the top management, information is focused and summarized. Information, in the lower level, is detailed, descriptive, factual.. However, redundant detailed information causes distortion which should be avoided.

6 *Clarity:* Information is presented, according to the recipient's background.

For example, economists can not understand the dimensions of engineers' terminologies. Similarly, engineers do not grasp the meaning of certain economics' and management's terminologies. From a linguistics point of view, the language influences the message.

7 *Consistency:* Information should be homogeneous. That is, the numbers and types of data in a report must be presented in a standard format through out the report to help in calculations for instance (Reynolds, 1988, p8)

(Richard, 1993, p10-p11) (Rowely, 1992, p16-p17)

(Zorkoczy, 1982, p10-p11) (Bentley, 1982, p11-p12)

(Thierauf, 1987, p12-p13).

3.1.6 Information Handling

Information is transmitted from a generation point to a consumption point. During this transfer, information could be deteriorated. Further, information is a perishable commodity; time determines its value, especially in time of crisis. Packing information in an information system minimizes errors and can provide the recipient with a continuous flow of information, particularly if the system is connected to a network (Bentley, 1982, p15).

3.2 Decision Making

3.2.1. Decisions

A decision changes the consequences of an event, a problem, opportunity or a crisis. As a result, a decision is either good or bad depending on the benefits or the outcomes. Actually, we make decisions everyday, so it is important to know what is a decision, especially in a crisis. Definitely, in times of crisis, good decision reduces the negative consequences. In the following section, we will answer

- What is a decision?
- What is decision making process?
- What are the different decision making types?

What are the elements of a decision?

Authors focus, in their definition to decisions mainly on decisions in a stable environment and only briefly they discuss unstructured decisions or decisions in turbulent environment. Both Cooke and Slack define a good decision as the one where decision makers fully understand the back-ground, objectives, alternatives, courses of actions and ranges of possible consequences of a decision and their differentiation between good and bad decisions (Cooke-and-Slack, 1991, p11-14). They believe that a bad decision is the one which is made in an irrational, careless or frivolous manner. Decisions which are made in an informed and coherent manner can produce satisfactory outcomes and are called e.g., long run decisions (Cooke and Slack, 1991, p11-14) (Rowley, 1988, p17-p18).

Rowley also reflects both ideas in a different wording. "A decision is the selection of a specific cause of action or solution from a set of possible alternative courses of action"(Rowley, 1988, p17-p18). Usually, the difficulty of a decision process is uncertainty. It is not known which action will lead to the best outcome (Rowley, 1988, p17-p18).

Both Mintzberg and Browne argue that a decision is an answer to a question or a choice between alternatives and a specific commitment to action. Usually a commitment of resources and a decision process as a set of actions and dynamic factors begin with identification of a stimulus action and end with specific commitment to action (Mintzberg, 1991, p11)

(Browne, 1993, p5).

In these definitions of decision there are two important factors which are choice and time. The choice is among alternatives. Bozeman adds that besides it dominates the thoughts and actions of managers. The relative time changes from one process to another. This amount of time represnts energy gathering intelligence, framing decisions, selling them and implementing them and usually it is enormous

(Bozeman and Coursey, 1990, p25).

3.2.2 Decision Making Process and Decision Making Elements

Cooke and Slack state eight steps in solving the problem; briefly, they are as Follow (Cooke and Slack, 1991, p18).

1 Observe:

A decision maker recognizes that there is a problem or an opportunity.

2. Recognize problem

After collecting evidence of the need for a decision ,the problem becomes more clear.

3. Set objectives

In this phase, goals and objectives of the decision are stated in order to understand where the decision is going to go. Further, the boundaries of the decision area determined.

4. Understand the problem

Managers diagnose the nature of the problem. For example, a problem can be seen by different people in different ways which assists in its understanding.

5. Determine the options

According to the boundaries of the problem which were defined in phase four, the options are determined. The wider its boundaries, the more this phase has a role to play.

6. Evaluate options

This phase is related to the previous stage. It evaluates whether the options meet the decision objectives.

7. Choice

The most satisfactory of options is chosen. An individual decision maker will choose according to his values. Group decision makers will consult each other.

8 Implementation

Changes can be made in this phase in the selected options. These changes depend on the ability of the decision makers.

9 Monitor

After implementing the decision, the whole process is evaluated and decision makers can see how effective it is. If the result is not satisfying, the observation phase starts again (Cooke and Slack, 1991, p18).

It is clear that decision making includes many items In order to know exactly what they are, Cooke and Slack mention that there are four elements of decision making:

1. Decision body

It simply means " the individual or set of individuals who make the decision" (Cooke and Slack,1991,p11). This definition refers to the decision maker or the human factor that evaluates and chooses among alternatives according to the information available

2 Decision Body options

Decision options are the alternative courses of actions which the decision body must choose (Cooke and Slack, 1991,p11). Mintzberg classifies decision options by whether they are:

a. Fully developed at the start.
b. Found ready made fully developed in the environment of decision and discovered during the decision process.
c. Custom made developed especially for the decision in question.
d. Modified ready made options (Mintzberg,1991,p11).

3 The uncontrollable factors

Factors that affect the final out come and the decision body can not control them.

4 *The consequences*

The combination of both N alternative options and M mutually exclusive states of nature is N*M which is the possible consequences. These consequences are classified in to three levels:

a. Primary consequences: Straight forward statements of the operational results of an event.

b. Surrogate consequences: The interpretation of the event expressed in whatever measures used to describe the outcome.

C. Evaluated consequences: A measure of the worth or utility of the outcome to the decision body. This later set of consequence will be a reflection of the decision body preference or value structure (Cooke and Slack, 1991, p18).

3.2.3 Types of Decisions

1-Strategic and operational decisions

Both types are practiced in all organizations' activities and all organizations' forms whether large or small, profit or non profit , private or public. Cooke and Slack refer to these types in relevance to the organization level. In other words, at the unit level a decision is considered strategic although at the organizational level it is considered operational decision. Other writers that add tactical decisions are located at both levels and concentrate on policies (Cooke and Slack, 1991, p23).

2 -Unstructured and structured decisions

From the title, it is clear that structured decisions are well defined. However, in the unstructured ones, the elements of decision are not clear such as objectives, people.

3 -Dependent and independent decisions

The dependency of a decision is measured from two point of views, past decisions and areas in the organization (Cooke and Slack, 1991, p25).

3.2.4 Role of Information in Decision Making

Information is necessary, but it is not a phase for effective decision making i.e., there are other factors in which decision making relies. In other words, it is a part of the decision making process, however, the word information is not used directly. Decision makers look for alternatives or solutions. Thus, information plays a role, when it is collected to examine the definition of the problem in order to determine the degree to which it is a true statement of the problem or a decision to be made. Organizational decision makers ask for information and justify decisions with information, at least to prove that the process is legitimate.

Usually, there are determinants of information such as time, human resources and money. Information value refers to its availability in uncertain times. If time elapses, this information values zero. Further, there is a relationship between precision, reliability, and relevance of information to its cost.

Mintzberg suggests ten managerial roles. One role is an informational role that monitors the flow of information to understand what is happening, disseminates information, and acts as a spoke's person in external organizations. In addition, he links between different types of information and different stages of decision making (Browne, 1993, p48).

Thus, information processing is required in all stages, to define the problem, develop alternatives, estimate probabilities and order outcomes.

3.2.5 Decision Making in Public Administration

The nature of public administration involves the formulation and implementation of public policies in order to provide services and impose regulations upon individuals, groups, and organizations. As a result, public decisions are relevant to the public policies and usually public administrators try to choose appropriate means to achieve the public objectives.

Rosenbloom and Goldman argue that there are four approaches to make a decision: managerial, political, legal and synthesizing approaches. The managerial approach (rational-comprehensive model) is designed to help the public administrator choose from among competing alternatives by

"1 .Reducing the number of alternatives that need to be considered,

2 .Reducing the number of values that must be assessed in making a choice from among alternatives,

3 .Assuring that the administrator knows how to make a rational choice,

4 .Providing the administration with sufficient information to select from among the alternatives" (Rosenbloom and Goldman, 1990, p320).

The public administration contents and means can reduce the selection among alternatives. First, specialization is one way to reduce the number of alternatives. Specialization, among public agencies, specifies the limits of public administrators; it is a jurisdictional authority For instance, each department does not have to be concerned with issues of other departments and in different agencies. Therefore, the questions, issues, problems, and alternatives facing any given public administrator will be limited accordingly.

Second, the hierarchy of the bureaucratic organizations narrows the range of alternatives to decision-makers and defines the authority of public administrators. The hierarchy assures purposiveness, i.e., "each step downward in the hierarchy consists of an implementation of the goals set forth in the step immediately above" (Simon, 1961, p5). The selection is guided by general objectives and goals. Thus, the hierarchy of bureaucratic organizations is a pyramid of goals and it limits the value of choices available to subordinates.

Third, formalization minimizes the alternatives available by specify the exact factors and information. Standardized forms are to specify the required information. Formalization can preset an indication to decision-makers of the relative weight of each factor in order to minimize the conflict among them. In fact, "formalization is used to attain the goals of impersonality and procedural equality"(Rosenbloom and Goldman, 1990, p323).

Finally, the merit systems assure technical expertise and nonpartisanship. Public administrators should have the ability to make rational choices and these choices are free of partisan political considerations.

In fact, the rational model is simply described in three main steps. It starts with 'determining objectives". With the clearness of the legislation, public

administrator should not have a free hand to set objectives. The system i.e., authority, specialization, hierarchy, law, and the political factors can assure this value. Besides, it will reduce the alternatives available.

Once the objectives are clear; public administrators "consider the means" and the consequences of each, and then "choose among alternatives". This choice will maximize efficiency, economy, and effectiveness. In reality, these values serve as helpful guides. Combining all these factors is difficult.

This model is a good direction in the choice of alternative potential means to define the policy objectives it also uses the public administrators' technical expertise in defining the best solution. However, in the reality, the model does not serve all cases. First, because the government objectives are not clear; it is general. Thus, when it becomes specific, conflicts are generated. Second, the approach is very slow. Public administrators have to define the objectives and choose among them the most effective, economic, and efficient. Third, specialization is a boundary. The objective is achieved in different spheres, under different times and with different aims in mind. The government can not assess the full cost of a particular course of action. Finally, the model is based on theory and abstract expertise . This is why the central planning does not work as it is anticipated to be.

The second model is the political or the incremental model. It starts by "redefining the ends". The model considers that the general objectives may serves the ends, so the ends are defined by the means available to an agency to move in the direction of the general policy. The means available determine what the ends of public policy will be. Second, the model has to "arrive to a consensus". Testing of a good decision is based on a consensus. In this model

means and ends are treated as a package that are more or less acceptable to relevant communities of interest" (Rosenbloom and Goldman, 1990, p333). Hence, the value of evaluating this package is representiveness and responsiveness than efficiency, economy, and effectiveness, so usually the costs more and provide less that expected or rather than the one that is economical and efficient. Finally, "making a satisfactory decision" is based on limited analysis than the rational model. A few means and ends packages considered and the satisfactory is chosen. Therefore, the decisions are guided by past practice than guided by theory.

The incremental model has advantages in terms of representation and responsiveness although it faces some criticisms. First, the more the administrative units are involved, the more difficult is to coordinate among them. In order to reach a consensus, there will be more emphasis on the political support. Thus, avoiding conflicts will be stressed. Second, in the model, modification is very minor; small steps are taken to change and it is possible to end up with undesirable consequences. Finally, this is why this model can not be used in essential decisions that redirect the society, so when a society is seeking rapid economic development it tends to avoid incrementalism.

To establish such a crisis management organization, a proposal should be presented to the People's Assembly; then its aims and objectives should be discussed and modified until the council reaches an agreement and accepts the proposal. During the discussions, the proposal may face criticisms. However, if there is political support, the proposal is most likely to reach a consensus. The budget, size, and the structure of the organization will be also discussed. After the approval of the People' s assembly, this proposal will be approved as a law.

The Legal approach depends on the adjudicatory procedures and it is a special form of incrementalizm. It is assumed that going throughadjudicatory procedure in a large number of instances dealing with essentially the same area of public policy, it will be possible eventually to build a body of principles that defines the public interest.

Finally, in the public administrators day to day administration, decision making approaches are combined. There is a synthesized approach in which the advantages of each approach : managerial, political and the legal are mixed and maximized. (Rosenbloom and Goldman, 1990, p323-p337).

Simon believes that in any activity, there is the process of deciding and the process of doing. The process of doing is neglected because the decision is formulated upon the overall policies. In the principles of organizations, it should assure correct decision as well as effective action. Simon thinks that the execution of decision is by the lower level of the administration. "The operative employee must be at the focus of attention, for the success of the structure will be judged by his performance within it" (Simon, 1961, p3). Simon describes the process of selection in a decision as establishing a reflex action in some senses at least rational (goal-oriented). In other cases, a complex chain of activities called "planning" or "design" activities. For instance, an engineer sets a design for a building. This design will be implemented by further detailed plans for the structure in which will lead to a whole chain of behavior (Simon, 1961, p2-p10).

He mentions that to reduce the gap between the process of deciding and doing there are three issues that need to have attention. The three main administrative issues permit the success of a decision. In his analysis to the hierarchy, that is a vertical rather than in a horizontal way, the three items are coordination, expertise and responsibility. First, the group behavior requires not only the adoption of correct decisions, but also the adoption by all members of the groups. The coordination to finish this plan is either procedural or substantive. Procedural is specification of the organization itself while the substantive is the content of the work. The coordination is in twoforms either within the structure or the content of the work Second, expertise is important to execute the decision effectively. There is a need to specialized skills at the operative level. In the subdivided decision where it is more complicated than subdivided performance, skills are need and the combination between a lawyer experience with the engineer, for instance, experiences can be done to achieve precision. Third and finally the vertical specialization permits the operative employee to be accountable for their decisions and then this vertical specialization assure a legislative control over the administrator, leaving the to deal with technical issues. (Simon, 1961, p2-p10).

3.2.6 Information Technology and Public Administration

Generally in decision making process, a group or a person must define the parameters of a problem and must have factual information and an analytical framework in which to evaluate the factual data in light of goals through a logical process. Computer can organize and maintain the base of factual information and retrieve the information at the right time. Mean while, computers can present analyzed information by using modeling capabilities.

Potency of computing increases its political importance. First, information is power and based on how information is organized and presented individuals can gain or lose relatively to others. Second, control over computing is a source of power they manage a large convert and organizational resources by building a base for further increases in demands and by control capabilities that other need. Third, it is power from its inherent attractiveness as an activity. Employees that are engaged in computing are perceived as advanced, sophisticated and professional
(Ott, Hyde, and Shafritz, 1991, p67-p69).

"The advent of the computer and attendant information systems has the potential to revolutionize public administration" (Rosenbloom and Goldman, 1990, p348).This enables public administration to compute projects and implement public policies. Computer can assist incremental andadjudicatory models by analyzing the public opinion polls, community surveys and voting results. Computerized legal information systems demonstrated the ability to bring previous decisions and principles to attention of lawyers. They can help to foresee the consequences of choice made within the framework of these perspectives. "Computing has had important effect on public organizations. In some cases, public organizations are performing tasks that simply could not have been done without computer capability" (Ott,Hyde, and Shafritz, 1991, p67-p69). In earthquake crisis, information systems will provide top management decision makers of the crisis management agency with fast, reliable and analyzed information. Thus, information systems can reduce the chaotic situation and enable the decision-maker to go through the rational-comprehensive model and choose among different alternatives wisely.

3.3 Information Technology and Crises

3.3.1 Definition

With the growth of the business demands, managers use technology to save time and to assure credibility. With the development of technology, the whole thinking of how to manage and organize the business has changed.

Fried believes that Information Technology presents more managerial challenges. In fact, Information Technology supports day to day operations. Even now-a-days corporations that are not equipped with certain technology are out of competition. In other words, information technology does not propose better performance, but it also provides businessmen with an advantage over their competitors. For instance, database and networks technology are essential in multinational corporations because this technology represents preserved required information and enables the transfer of information. Further, managers and businessmen advocate using IT because it does logical tasks that require several mathematical techniques. It assists businessmen to make informed decisions by gathering and manipulating information quickly and efficiently. Further, it facilitates preparation, distribution and management of information i.e., the right person receives the right information in the right time.

To sum up, Information Technology supports decision makers because it is reliable, controllable, portable, easy to learn and use, consumes less time, and is accurate (Fried, 1995, p15) (Gunton, 1990, p65).

Gunton defines Information Technology and mentions " it embraces a range of electronic technologies for collecting, storing, and distributing information and principally the technologies of computers and

telecommunications" (Gunton, 1990, p2). Boar adds to Gunton definition. He says that " IT is preparation, collection, transport, retrieval, storage, access, presentation, and transformation of information in all its forms (voice, graphics, text, video, and image)" (Boar, 1993, p16).

In brief, IT is the technology used to process information, so it handles both terms "information" and "technology". First, processing information is collecting, transport, retrieval, access, storage, presentation, and distribution of information. Second, the tools or technology used are computers (hardware and software) and telecommunication.

3.3.2 Information and Crisis Management

In an earthquake, for example, information is crucial to planning. It affects the scope of damages and is frequently required to take decisions. Information is divided into three types: first, accurate and available information gives a clear vision and reflects the real status of the crisis. As a result, managers will be able to judge and estimate risks and respond effectively with damages.

The second type is an essential one especially when dealing with rumors. Incorrect information is a misleading guide to managers. Through misinformation, decision makers can make incorrect hypothesis that cause problems and enlarge the crisis effect. Unfortunately, some times, misinformation can cause problems that can not be controlled event after dissemination of proper information. The third type, lack of information, in most of the cases, puts managers in chaos. Managers usually rely on experts and analysts but still the time constrain increases the risk factor. Information is necessary to make effective decisions and it should be accurate However, inevitable crisis can only be partially abated(Barton, 1993, p5-p6) (El Hadad, 1996, p42). Further to ensure efficiency and complacence of

information, it is essential to emphasize communication. In a crisis, communication facilities and equipment are distracted; for example, in Egypt telephone systems are usually temporarily out of operation. Another problem is the scarcity of inefficient equipment.

In preparedness planning, managers need to ensure network communication and various types of equipment and tools. Quarantelli defines four ways of communication. In a crisis agency communication is internal, constant and information goes through normal channels. However, in emergency cases, if communication is not clear or distorted, it might cause multiple damages. The same goes for flow of information among organizations and to citizens. Conversely, the flow of information from public to different organizations is usually through people who rush to make phone calls such as to police. These can be handled through a switchboard. Such an increase is within the system's capabilities. This helps defining the disaster in general and some specific agents.

3.3.3 Information Systems

3.3.3.1 What are Information Systems?

Information systems are established to serve managers to plan, monitor, and control their activities. These systems are established to organize, select, store, retrieve and analyze and interpret messages. This term conveys computer-based services that provide information in response to users' requests. Input to the system is in forms of documents, microforms, computer coded text or graphics. At the same time, output is also in the form documents, computer data presentations, or video presentations. Thus, information systems' basic components are searching

logical, indexing methodology, vocabulary control, software and hard ware (Browne, 1993 , p24) (Gunton, 1990 , p5).

3.3.3.2 Role of Information Systems in Decision Making.

Browne illustrates the importance of using information systems. He believes that there are limitations to human brain which filters the information retrieved and tends to screen out information, creating a cognition dissonance. Further, heavy work loads make managers use current information and often unreliable information. There is also a time lag in manual systems in providing information. In addition, power and politics can distort information (Browne, 1993, p16). Therefore, there is a need for information systems in the decision making process.

3.3.3.3 Using Information Systems in Times of Crises.

One crucial factor in facing a crisis is instant, consistent and reliable information. In 1992 earthquake, for example, information would reveal diverse of data about damage and affected areas and list all agencies involved, such as, NGO's, firefighter rescue teams. In reality, data was incomplete and often contradictory but through the information technology evolution the complexity of gathering, analyzing and presenting data has become faster, more efficient and reliable (Marsh, et al, 1994, p117-p118).

In a computer workstation that includes different databases of considered agencies, records can be accumulated and data updated: for instances, indication of an earthquake, number of hospitals and their capacity, addresses, NGO's, previous earthquake damages, areas, and responses. Data actually is easily retrieved by a direct user via a computer

get exact information in few minutes. The result of accessing the systems is through periodical reports and lists and oral or screen information. Moreover, geographic information systems with the contact of satellites can provide overview of damaged areas.

A network information system can be relied on to provide decision makers with necessary information. However, although these systems can also fall victims of a crisis, they can go far to damage. In such an event, planners need to define alternative plans such as manual systems or reserve systems to deal immediately with a crisis.

3.3.3.4 Using Expert Systems in Crisis Management

Expert systems are advanced systems that provide special knowledge to users. Since crisis times are characterized by chaos; expert systems can effectively propose two or three relevant scenarios or for how to react during a crisis. Decision makers, through a friendly interface with the system, can answer specific questions. Expert systems are used not only in purposing alternatives, but they can also be used in predicting a crisis. By inputting the main features of the crisis, along with coordinates, managers can obtain from the system a certain factor e.g., "70%" regarding the crisis' area and magnitude. With such information, managers are then better equipped to deal with damage resulting from catastrophic events.

This topic is extensively discussed in chapter four. Expert systems are efficient if the systems are properly developed. They can relieve managers of the pressure of time and provide decision makers with the proper knowledge, in the time of emergency.

Chapter Four

Scenarios and Expert Systems

4.1.1 Introduction: How Can Scenarios, as Strategic Techniques, Provide Support to Managers in Crisis?

Examining and predicting the future have interested mankind throughout history. This wonderment started with Mediterranean cultureswho were interested in reacting to and drawing scenarios for future events. The priests of ancient Egypt were early forecasters. They based their predictions on abstracted law from nature. For example, they looked to a passage of comet or the flight of birds to make sense of the world. Hence, these early priests were able to predict the inevitability of destiny
(Ryans and Shanklin, 1985, p37).

In 1798, Malthus wrote his article of population estimates. This was the first step in using mathematical techniques to estimate the future. Furthermore, in the 1970s, forecasting models flourished especially when the world petroleum market shifted. The Royal Dutch Shell company adopted particular scenarios to overcome the oil crisis in 1973 (Bartlett, 1988, p28)
(Mintzberg, 1994, p248).

Wack and his co-workers developed five possible scenarios to deal with the oil crisis. The most useful one required the exploitation of the oil market, the building of refineries, and the ordering of tankers in order to expand market. This scenario most likely activated up stream managers and down stream managers. The former had to accept loss while the latter, who were in charge of refining, transportation, and marketing, had to accept lower growth. The scenario enabled managers to confront the oil crisis effectively (Mintzberg, 1994, p249).

Scenarios of that time addressed economical and technological aspects, avoiding all the social aspects. Herman Kahn and his colleagues however, realized the significance of social issues and presented successful scenarios that attempted to handle human culture (Ryans and Shanklin, 1985, p39-40).

Finally, scenarios historically and now a daysare expanding to discuss different topics not only economics but also social sciences and to reach all topics of human activities and this is why scenarios should be used in times of crisis.

4.1.2 Scenarios Definition

Bartlett's definition reflects the idea of a scenario as a strategic planning technique developed to overcome the problemof the environment in the near future. He mentions that scenarios consist of a series of events and trends, representing the interaction of events with each other to describe the future (Bartlett, 1988, p28).

As a matter of fact, the original meaning of a scenario derived from the dramatic arts that explain a series of events and interactions. In a theater, scenario is the outline plot of the dramatic work. "A scenario is the manuscript of a photo-play setting forth the sequence of action, the description of the characters and scenes and any other relevant details necessary to block in the plot without the extensive recitation of actual script"
(Ryans and Shanklin, 1985, p38).

Willing King, vice-president of corporate planning at Gulf Oil Corporation adds that scenarios are alternative views of the way the major unknowns might logically combine and dynamically interact to create our

future. "Each scenario is internally consistent and distinct from other scenarios. Together they encompass a wide range of uncertainty" (Bartlett, 1988, p28). In this definition, there are two ideas which logically combine and dynamically interact. Godet presents both of these ideas when he mentions that "scenarios are coherent series of assumptions" (Godet, 1987, p8).

Mintzberg illustrates an additional point in Michael Porter's argument. He mentions that scenario building is another strategic planning technique. He describes also a scenario as not only forecasting but also as "possible future structure involving the identification of uncertainties, the determination of causal factors that drive them, and the format of a range of possible assumptions about each combination into the scenario" (Mintzberg, 1994, p248). Mintzberg comments that scenarios are not randomly built. Scenarios focus less on predicting outcome and concentrate more on "understanding the forces that would eventually compel on outcome" (Mintzberg, 1994, p248).

Venable and his colleague stress the same argument stating that a scenario is a set of plausible future events instead of trying to predict the future itself. Plausible or possible future status, in terms of the critically interdependent issues, are variables that define the future presented in a logical and internally consistent manner (Venable, 1993, p703).

Finally, Fried shows that the idea of scenario building may be advantageous or disadvantageous. Scenario building is advantageous when scenarios describe events and its interactions. If the company develops a scenario based on a proper analysis of the internal and external environment forces, the future drawbacks of the crisis can be minimized

(Fried, 1995, p175). In fact, adopting a scenario reflects the company' target and its desire to act within that situation.

A scenario is a qualitative strategic planning method that describes the possible future. As stated earlier, it represents a series of events and trends interconnected logically and dynamically with each other to deal with uncertainty. Through understanding the external and internal forces involved, that managers can select the probable outcome.

4.1.3 Importance of Scenarios

Scenarios were a successful method used in responding to the oil crisis. Shell, after using this method, grew to be the second largest company in the world after Exxon, in a space of only a few years(Venable, 1993, p702). Consequently, private corporations used scenarios in order to examine and identify their choices for the future. In the 1970s, "approximately 22 percent of the fortune 1000 companies were using scenario analysis. By 1983, the percentage of scenario users reached 50 percent; more than 1100 European firms have adopted scenario analysis as a strategic management tool" (Venable, 1993, p702).

Godet argues that scenarios provide managers with guidance in making decisions that will affect a company. Actually, scenarios attempt to pre-empt and foster future development, while changing the way of perceiving ideas (Godet, 1987, p10-11). "By using scenarios as a means of exploring both the possibilities of the future and the responses of the organization, the corporation forecasters and planners will be able to examine many risks and options in a manner not possible with conventional forecasts" (Ryans and Shanklin, 1985, p52).

Finally, Venable recommends using scenarios in the following situations:

A) Highly complex situations with many key unquantifiable factors

B) Highly uncertain situations

C) Situations where there are few or no reliable data for quantitative models (Venable, 1993, p702). Thus, this tool is qualified and useful to handle an earthquake crisis.

4.1.4 Why Scenarios have been Scarcely Developed

Mintzberg discusses two main reasons why scenarios have not been developed as much as possible. First, it is difficult to build proper scenario especially in a complex situation, where there are too many varying variables, such as with Wack challenging the oil crisis. Other planners may find it easier to rely on specific hard data, excluding less well informed judgments and issues. Mintzberg emphasizes that " we ordinarily exclude them from our more careful forecasts, though we know that some very likely events will certainly occur. As a result, our plans are based on the future that we know, which certainly will be realized" (Mintzberg, 1994, p250).

Second, scenarios may be developed well but fail because they do not change the necessary behavior, i.e., to influence the management attitude toward the prediction and to act according to the scenario. For example, "Wack had trouble with Shell's second-echelon managers" (Mintzberg, 1994, p250). Mintzberg adds that many companies delay applying scenario tools for four reasons: systems , waiting verification, politics, and the rejection of the unfamiliar (Mintzberg, 1994, p251).

Managers need time to verify information responding to future scenarios. This response could be conflicted by political threats and

psychological barriers. These barriers cause managers to respond differently to a particular scenario.

4.1.5 Basic Components

Both Robbins and Boar discuss the basic components of a scenario, but each presents his own argument from a different point of view. Robbins divides a scenario into main items or components. This deconstruction of scenarios clarifies complicated events by breaking them down. Boar discusses, in a sequential form, the basic items of a scenario structure, describing the flow of a scenario.

1. Start state is the initial stage of the current situation
2. End state is the final point after adding all components
3. Event is an item controllable by people
4. Causality chain is a set of interconnected events
5. Pivotal event breaks the event
6. Common event is common to multiple scenarios (Boar, 1993, p156).

Robbins classifies the scenario into other items:

1.The focal issue is the main argument of all alternatives

2.Driving forces propel the scenario forward

3.Pre-determined elements are the main components

4.Slow changing phenomena such as destruction in infra-structure

5.Constrained situations are certain events in the future such as legal boundaries

6.Things in the pipeline are things that already exist and will vanish over time.

7.Inevitable collisions are the forces that oppose each other

8.Critical uncertainties are doubtful items that are a set of assumptions

9.A plot is the flow and direction of coming events (Robbins, 1990, p5-6).

In brief, a scenario consists of a starting state and an ending state linked with events and factors that direct the scenario and illustrate where and how and what the ending state will be.

4.1.6 Why Scenarios are Necessary in Crisis

During non-crisis times, successful managers and decision makers create mental models capable of considering the unfolding events, but in crisis times when complexity and confusion increase, managers create mental models that change in a dangerously confusing situation. Because different types of information and various views are gathered separately, the manager is further limited by time in responding to the disaster or crisis effectively (Bartlett, 1988, p28).

Mintzberg suggests that managers need to share their personal views with worldwide views, especially during changing times and in turbulent environments. Scenarios give managers a sophisticated plan by expressing other views and understanding new facts (Mintzberg, 1994, p249). Managers are able to step into a new framework for a better understanding and can also conserve reality into better status.

In fact, there is more to see than what managers normally perceive. Highly relevant information goes unnoticed because, being locked into one way of looking, managers fail to see its importance (Bartlett, 1988, p29).This is why Ryans and Shanklin believe that in times of uncertainty and change, it is probably best to give up trying to identify the future because the signs are contradictory, the omens ambiguous. The needs of the planner may perhaps be better served through the means of scenarios(Ryans and Shanklin, 1985, p36).

All these arguments emphasize the need for scenario methods to support managers to effectively respond to a crisis. However, scenarios are not perceived by all managers to be an effective tool since they are based on assumptions. Scenarios are required in crisis management. Dougherty discusses their necessity in his book on crisis communication. "We need to begin writing down, explain and coordinate with others to work through different scenarios" (Dougherty, 1993, p127).

Finally, Barton summarizes the scenarios importance and says "the entire purpose of a scenario session is to remove managers from the even tempo of the traditional staff meeting and to increase their awareness that one significant crisis could cause them the single worst nightmare of their professional career" (Barton, 1993, p176).

4.1.7 Scenario as a key to Respond a Crisis

The future is unknown and each one does not face the same events because of the conflict of unequal human forces. Godet believes that problems inevitably occur when the gap between realities and aspirations becomes too wide, a change in the rules of the game occurs, and the functioning relationships of a system becomes drastic (Godet, 1987, p9).

One characteristic of a crisis is inevitability. However, if planners prepare in advance, the necessary adjustments needed in a time of crisis will be available. Hence, a scenario technique is one way to be prepared to accept realities (Godet, 1987, p10). In addition, the scenario method explains all future possibilities and the paths by clarifying the possible consequences. Moreover, it helps detecting priority issues for studying and extracting the relationship between them as it

1. deters main issues
2. describes the possible events
3. reduces tension among managers

In fact, scenarios expose individuals to new thoughts and managerial challenges which contribute to adopting new changes in the rules of the game (Barton, 1993, p177).

Scenarios minimize the negative impact of a crisis, helping managers to face new challenges.

4.1.8. Characteristics of Effective Scenarios

Boar suggests five characteristics for a good scenario

1." It postulates plausible divergent future
2. The future is deterministic driven by controllable events
3. It captures strong biases and different point of views
4. It stimulates debate, perpetuates learning, questions long-held assumptions and challenges embedded " mental models" of the industry
5. It includes, at minimum, three end states including a " risk free" conventional wisdom end state" (Boar, 1993, p179).

Scenario development stimulates debates: It is dynamic and provides managers with an extraordinary learning experience. However, if it was deterministic, the scenario scope would be limited in its anticipated problems and opportunities.

Ryans and Shanklin add three other elements that make a good scenario: credibility, utility, and intelligibility. First, a scenario is credible when it can be accepted by a planner and a draftsman. Second, scenarios must

include relevant facts and data to be beneficial to planners. Finally, scenarios should be sequential, easy to understand, clear, and utilizing essential information (Ryans and Shanklin, 1985, p43).

4.1.9 Scenarios and Database

Information gathering is an essential step in creating a scenario. Data is gathered from different sources about various subjects(e.g,., information about economic trends, social attitude, or technology). Although the purpose of a scenario is to study certain aspects of the future, uncertainty about a crisis may hinder the collection of information and data. Therefore,Godet explains the need for a database. He describes two phases of scenario methods, the construction of a data base and the construction of a scenario. He stresses the importance of gathering data and information and sets it in a separate phase. This first phase includes detailed, comprehensive, quantitative and qualitative data about the focal issue; broad scope; and dynamic and past trends (Godet, 1987, p25).

In three steps, Godet argues how it is possible to construct a database that correspond to questions of the future. These phases are

1. Study the environment within the boundaries of the focal issues
2. Identify the key variables
3. Review the actor's strategy in the final stage. The analysis is to identify the leading actors which have influenced development the old system.

Finally, in a form of table, this analysis will provide a guideline to a draftsman to construct a good scenario (Godet, 1987, p25-26).

4.1.10 Methods for Developing Scenarios

Methods for developing scenarios presented by various authors differ in details, but they all share the same core arguments. The following will concentrate on one general method developed by Venable and Robbins. Venable introduced a general methodology based on main five steps and Robbins sets eight steps. In this method, both methods can be combined to major five steps:

The first step is to identify the strategic decision context (Venable, 1993, p704) or the focal issues of the decision(Robbins, 1990, p5-6). According to Fried, for example in a public sector company, board of directors of the company explores the proper issue through interviews or brainstorming sessions with experts, consultants and middle management, to identify the known or suspected concerns and problems;

"1.needed, requested or anticipated modifications;

2.historical and forecaster experiences for ongoing operations;

3.potential enhancements needed to improve managerial process, such as improved human interfaces and improved query capabilities;

4.changing work conditions or short and long terms strategies that may affect the application" (Fried, 1995, p177).

The second step is listing key factors in the environment. In general the draftsman list all the factors affecting the organization. In the third step, the company's committee monitors the environmental forces or lists all key factors and driving forces. Venable presents one technique in order to identify these factors by dividing the environment into three levels. The general environment, which at the national level is the primary strategic issue faced Furthermore, the affiliated environment setting is where top management

committee tends to identify trends and events that will likely influence the future strategy. Finally, the task environment is which committee defines governments' events, trends, variables and attributes, in a list form. These pre-determined elements are ranked prior to level of critical uncertainty (Venable, 1993, p705-706) (Robbins, 1990, p7). Fried argues that these factors (state, national, and international regulations, legislation and other pressures) are explored by interviewing groups of local, state, and federal organizations, a company's director of communications, legislators, unions or consumers, and customers or suppliers (Fried, 1995, p178-p197).

Barton illustrates a different opinion toexhibit key factors. He proposes a role to play, in which each employee or team member holds a different position than the traditional one. Members of a team crisis should respond to the event and describe the position's vulnerable points and focal issues. During the role playing, the players should understand the motivation and needs of each character. This type of brainstorming workshop widens a manager's awareness of areas, which may significantly change the direction of future events (Barton, 1993, p179).

The fourth step is developing a scenario logic or selecting the plot lines that best fit available information. There are three main plot lines: winner and losers, challenge and response, and evolution. Winners and losers exist when resources and opportunities are limited and a positive result of one side reflects a negative result for the other. This conflict is inevitable; hence, only one is gaining while the other is losing; winners continue to win and losers remain losers.

Challenge and response is frequently used, and it is based on a simple trend analysis. The actor responds to the assembly in a adverse trend. The obstacle must be overcome to achieve the goal. The response may vary from

one scenario to another, depending on each draftsman. The response may be adoptive to change or it may be a radical in its approach. The case of Egypt best fits the challenge and response plot.

Evolution is change in either growth or decline over a long period. The plot is sensitive, so it is not provoking changes or reactions. To select one of these plots, managers have to review the information, driving forces, and focal issue (Venable, 1993, p705-706) (Robbins, 1990, p8).

The fifth and the final step is elaborating the scenario. After identifying the focal issue, key issues and the scenario direction, scenarios are placed in a narrative form in order to help decision-makers. A plot is private, successful and effective by how well it serves the management in decision making, not by how interesting it is (Venable, 1993, p708) (Robbins, 1990, p8).

Godet presents scenario methods including

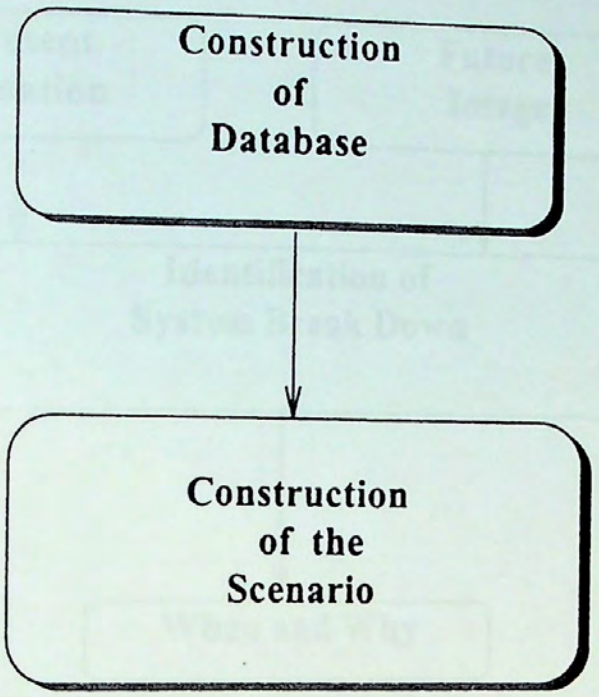


Figure 4-1 Scenario Methods

Source: (Godet, 1987, p23)

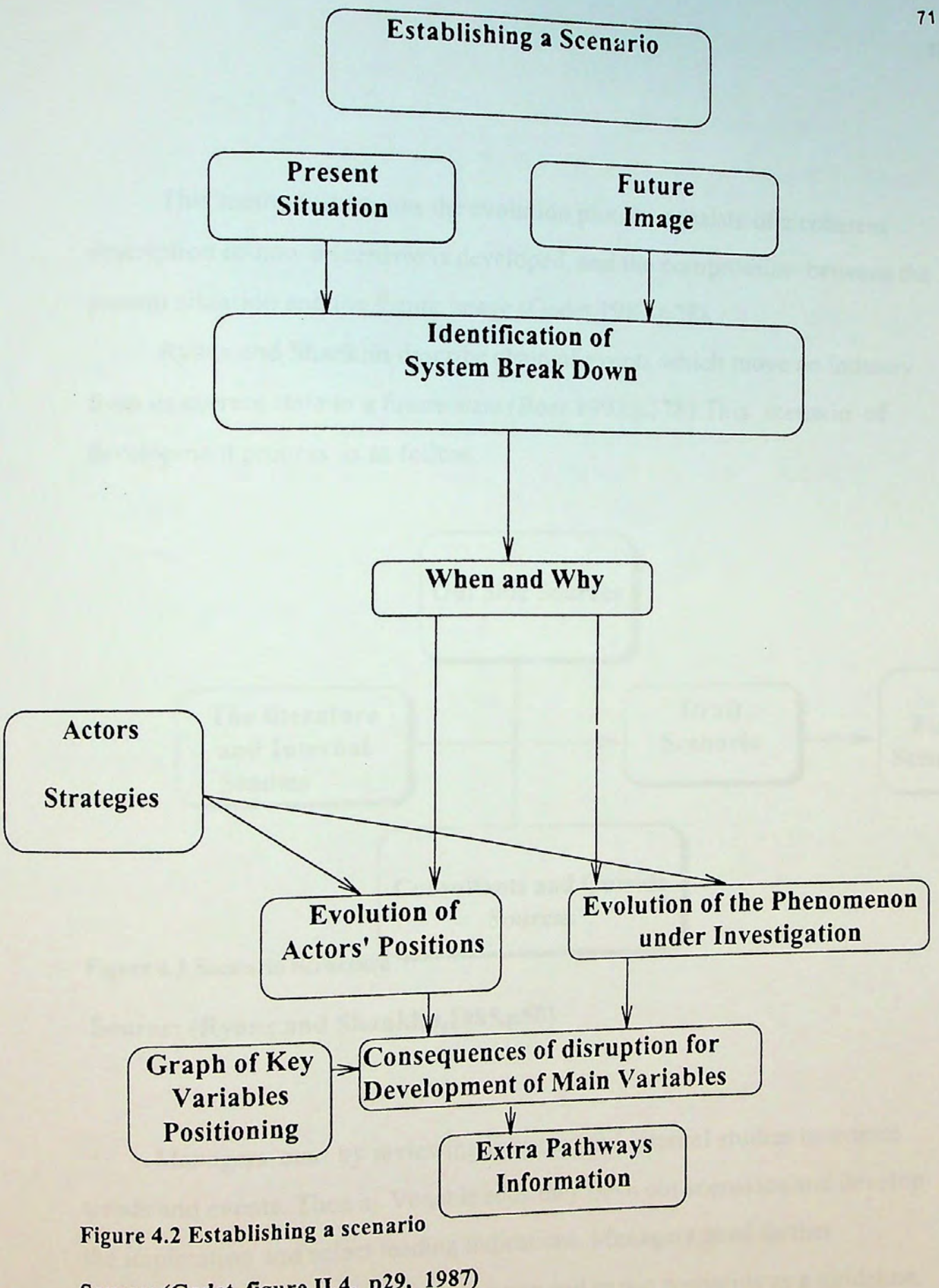


Figure 4.2 Establishing a scenario

Source: (Godet, figure II.4, p29, 1987)

This method illustrates the evolution plot. It consists of a coherent description of how a scenario is developed, and the compromise between the present situation and the future image (Godet,1987,p27).

Ryans and Shanklin describe chain of events which move an industry from its current state to a future state (Boar,1993,p178).This scenario of development process is as follow

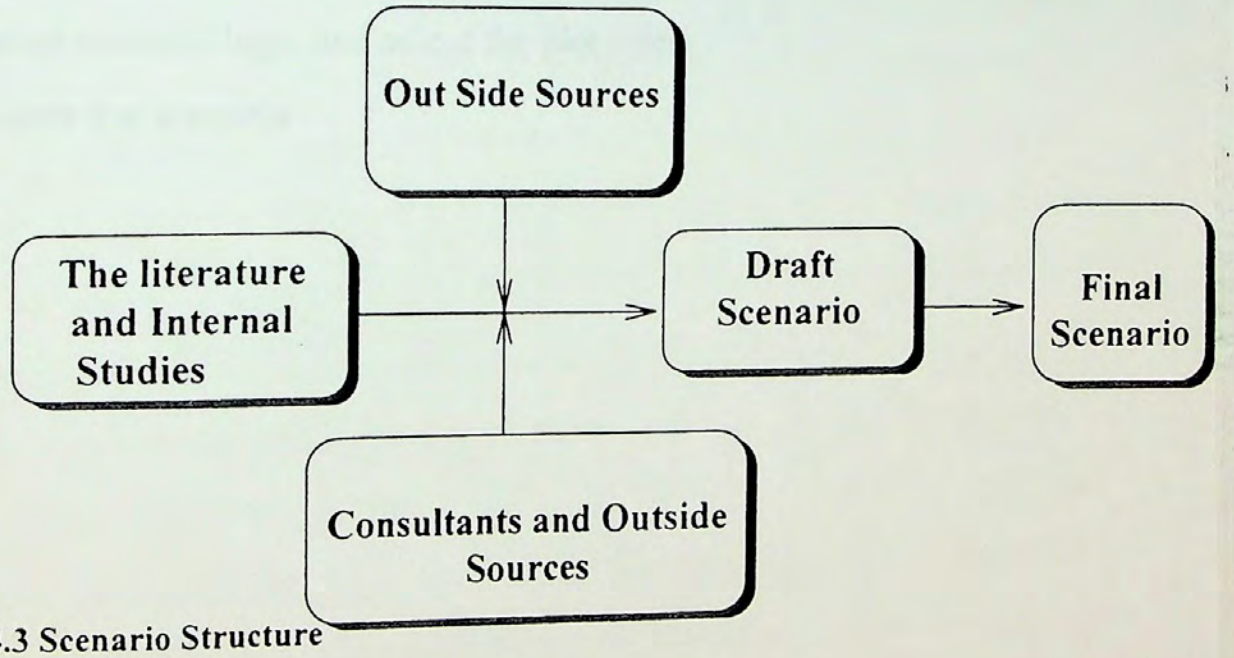


Figure 4.3 Scenario Structure

Source: (Ryans and Shanklin,1985,p50)

Managers start by reviewing literature and internal studies to extract trends and events. Then as Venable adds they flesh out scenarios and develop the implication and select leading indications. Managers need further discussions to define the desired direction and to use scenarios as a guideline.

They should look for a feedback to check the direction of the scenario. Creating indicators based on the main purpose of the scenario can measure the deviation from reality (Venable,1993, p708) (Robbins,1990,p8) .

Finally, we come to the conclusion that scenario development method has five main items that can be used to support decision makers in an earthquake crisis.

1.Identify the focal issue or strategic decision context

2.List key factors in the environment

3.List the driving forces and analyze the significant issues

4.Develop scenario logic and select the plot lines

5.Elaborate the scenario

4.2 Role of Expert Systems in Adding Credibility to Decision Making in Crisis Management.

4.2.1 What are Expert Systems ?

Pigford and Baur agree that expert systems are computer systems that replicate the human expert thinking to solve a real world problem in a certain domain of knowledge (Baur and Pigford, 1990, p15). This replication can be divided into main groups. Gunton classifies expert systems into two classes. First, systems help people (not-expert) to solve a well defined problems such as car systems. Gunton calls this group advice systems. Second, the decision assistance systems, which help experts to navigate problems with a complex domain of knowledge, for example, a physician diagnosing an obscure disease (Gunton, 1990, p15). To sum up, Masuch supports this argument adding that " their general function is to give either direct or implied advice to managers who have a problem to solve or a decision to make" (Masuch, 1990, p19).

Expert systems are sufficient to be able to do different skillful consultation in different fields such as medical diagnosis, chemical identification economic geology, structure analysis, chess, emergency situations. In addition, expert systems enrich management decision making in less well defined domains such as in planning, designing and interpreting. (Boland and Hirschheim, 1987, p135).

Morckler, in his book, illustrates the success of expert systems in various fields. For instance, in 1975, MYCIN a medical diagnosis was developed at Stanford University. The project was a consultation between a physician and a patient. The physician entered the patient's symptoms

known as facts MYCIN matched these facts with rules in the knowledge base then it provided a list of alternatives. PROSPCTOR was developed in Stanford Research Institute similar to MYCIN, geologists enteredd their information about the field observation then the system gave the geologists an answer support with a degree of certainty.

To sum up, expert systems are systems that support managers to solve a problem or to make a decision through duplicating the human expertise in a domain of knowledge.

4.2.2 Why Using Expert Systems

In Crisis Management, experts are rare and the field has uncertain variables due to its turbulent environment. In times of uncertainty, experts' knowledge is crucial and it provides support in managing critical issues. Godet believes that experts can reduce the degree of uncertainty (Godet, 1987, p66) because experts have the ability to perceive meaningful patterns, embody complex inferences and abstract principles, and then arrange in a coherent and useful manner. "They are able to construct cause and effect sequences which lead toward the explanation of a problem or the attainment of a goal with their domain' (Masuch, 1990, p14).

Expert systems can provide managers with different sets of applications. First, for example, they can be used to distribute expertise. i.e., answering inquiries whether within the organization or within consumers for instance. In Egypt, the expert system project in the ministry of agriculture provides farmers with alternative plans or advices. These plans are about what and when to plant certain types of crops and how to

overcome crops diseases. Second, expert systems can also be used tostore the expertise of senior staff. Organizations can possess discontinued expertise, so they can preserve the knowledge of senior staff in a well developed knowledge base and an expert system. Third, and finally, integrating the knowledge of experts with applications of expert systems jointly. The individual experts' knowledge and the machine knowledge-can be combined to construct a multiple integrated knowledge base (Hellerstein,et al., 1990, p6).

In brief, expertise is essential to solve a problem or to assist managers to make decisions. Expert systems' applications usually demonstrate expertise in the form of questions and answers and provide managers with quick answers to their inquiries because "knowledge is power"(Reynolds, 1988, p180) especially when managers are faced with situations that are unusual due to lack of familiarity or because the issue is complex. Expert systems can aid and support decision makers tocope with infrequent and uncertain issues (Hurley.and.Wallace, 1986, p566) .

4.2.3 Expert Systems Components.

Authors agree that the three main components of expert systems are

1 Knowledge base

2 Inference engine

3 User interface

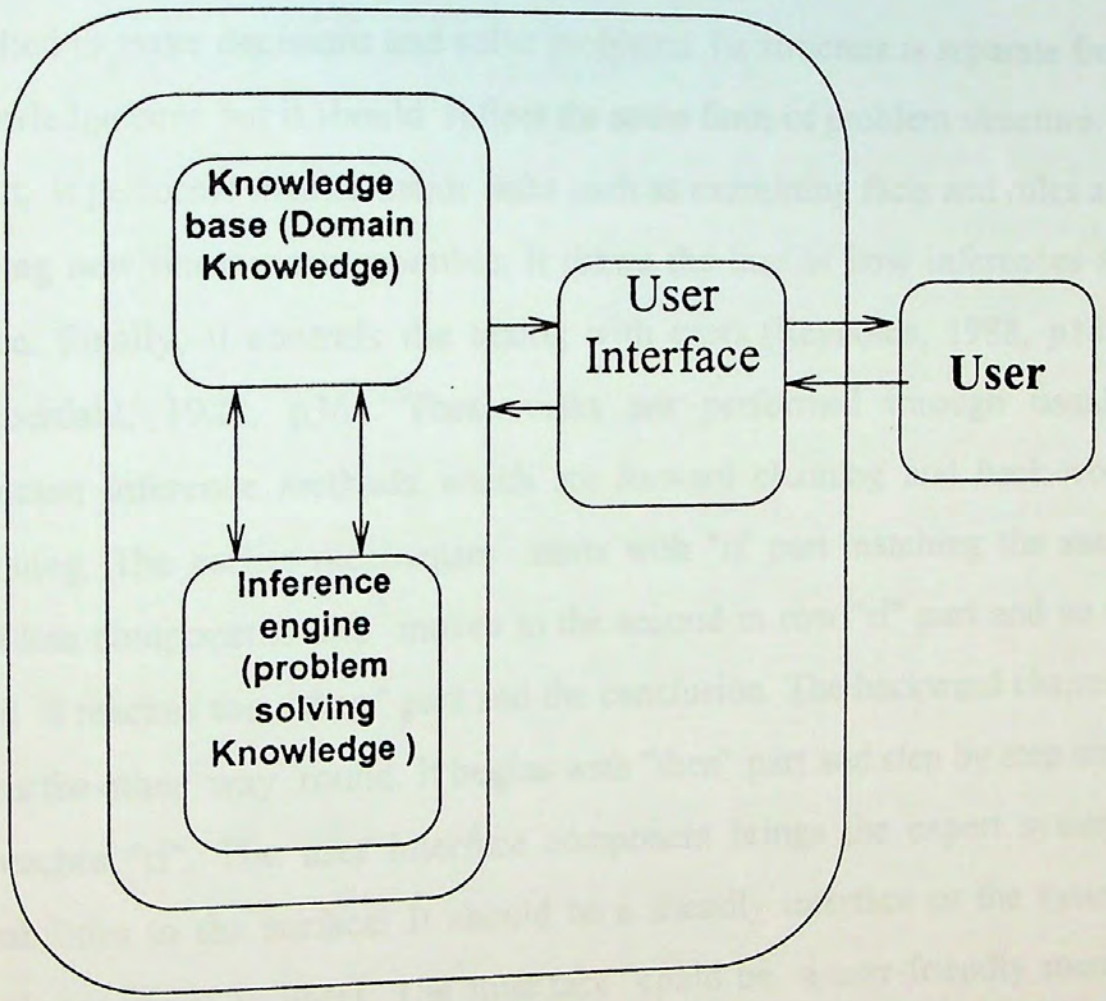


Figure 4.4 Expert Systems' components

Source: (Baur.and.Pigford,1990,figure2.1,p20)

A knowledge base contains factual and empirical knowledge of expertise in forms of facts and rules. As an advantage, it reflects problem solving experience in specific area (Neberdahl, 1988, p35). In common forms of expert systems, a rule-base system consists of a series of "if-then" rules. These if-then rules allow experts to modify the knowledge base (Baur and Pigford, 1990, p20) (Reynolds, 1988, p180).

An inference engine decides when and how facts and rules are to be applied to make decisions and solve problems. Its structure is separate from knowledge base but it should reflect the same form of problem structure. In short, it performs mainly major tasks such as examining facts and rules and adding new ones when possible. It draws the line of how inferences are made. Finally, it controls the dialog with users (Reynolds, 1988, p181) (Neberdahl, 1988, p36). These tasks are performed through usually common inference methods which are forward chaining and back-word chaining. The earlier mechanism starts with "if' part matching the same problem components and moves to the second in row "if" part and so on until it reaches the "then" part and the conclusion. The backward chaining starts the other way round. It begins with "then" part and step by step until it reaches "if". The user interface component brings the expert systems capabilities to the surface. It should be a friendly interface or the system won't beneficial to users. The inter face could be a user-friendly menu, graph-, icon-, or command- driven to easily understandable and accessible (Reynolds, 1988, p181).

4.2.4 Evolution of Expert Systems.

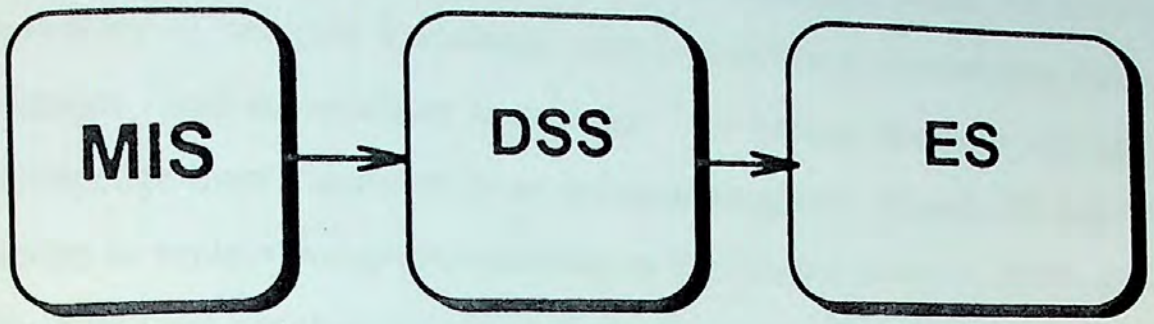


Figure 4.5 Evolution of Expert Systems

Computer tools play a crucial role in the management domain. Computers applications in management began with Management Information System (MIS and then Decision Support Systems(DSS) and finally Expert Systems (ES). The purpose of MIS is to focus in scope and select data to produce meaningful output. Briefly, MIS answers the question of "what is". Problems in reality get larger and more complex and an MIS are inadequate to handle these problems. DSS play an advantageous role to help managers to make decisions, so they concentrate on "what if" and analyze the options.

DSS do not present solutions or recommendations but DSS improve the ability to judge and make decisions. Expert systems focus on structure problems like "now what?" and "why". Masuch answers the question of why ES are more necessary more than DSS in five points. He demonstrates the value of ES in comparison with DSS. First, ES do not use a cumbersome data bases but seek certain data for usage based onestablished rules and facts. When using ES, there is not much time consumed because data are filtered, so the advice is timely , relevant, accurate and credible. Second, building ES takes less time than a DSS statistical model certainty.

At the same time, developing and updating DSS takes more time than maintaining ES which require only minor changes. Third, ES have an inventory of heuristic knowledge which is unlike a normal data base, it changes and accumulates knowledge. As human being, it can add a knowledge from a question or an information given. Fourth, ES have the ability to explain that gives credibility to ES. On the contrary, DSS can not describe their conclusions and need to retrieve massive data, elaborate and make complex analysis. Fifth, ES give an advantage of communication and friendly interface with a logical argument.

Briefly, expert systems would be preferred because managers can have confident of ES conclusions, especially when the environment is turbulent (Masuch, 1990, p21-p22).

4.2.5 Features of Expert Systems

In the management field, expert systems add an advantage because of their features. Pigford clearly demonstrates the five features of expert systems as follows:

1. Dealing with uncertainty
2. Explanation
3. Ease of modification
4. Transportability
5. Adoptive learning

First, while reaching a conclusion or a solution, managers rely on the availability of knowledge and information that might be true or false. In reality, information and knowledge are not usually accurate and precise; there is a degree of uncertainty. Expert systems are capable of dealing with knowledge which is incomplete or not fully accurate. Thus, the solution with a percentage of confidence ranges from 0-100% percent.

By using certainty factors assigned to facts and rules, it can indicate the degree of correctness of conclusion.

Second, expert systems can explain how and why a decision or a solution was reached. Therefore, Managers can understand the results and also can add modifications to the solution. Third, expert systems are designed to facilitate desired changes. Actually, modifications are in knowledge base domain, especially if the systems were developed using shells rather than high level computer languages, e.g., LISP or PROLOG. Shells are easier to managers to make changes in the knowledge base. Fourth, expert systems are usually developed on one type of computers. The expert systems development process can use different types of computers, definitely the system will have a higher level of usability. Finally, expert systems have the ability to learn i.e., adding and modifying facts and rules. This feature will enable expert systems to emulate the human being feature in solving problems, so in the future researchers will actively work to generalize this characteristic automatically (Pigford, 1990, p22-25).

4.2.6 Integrated Expert Systems

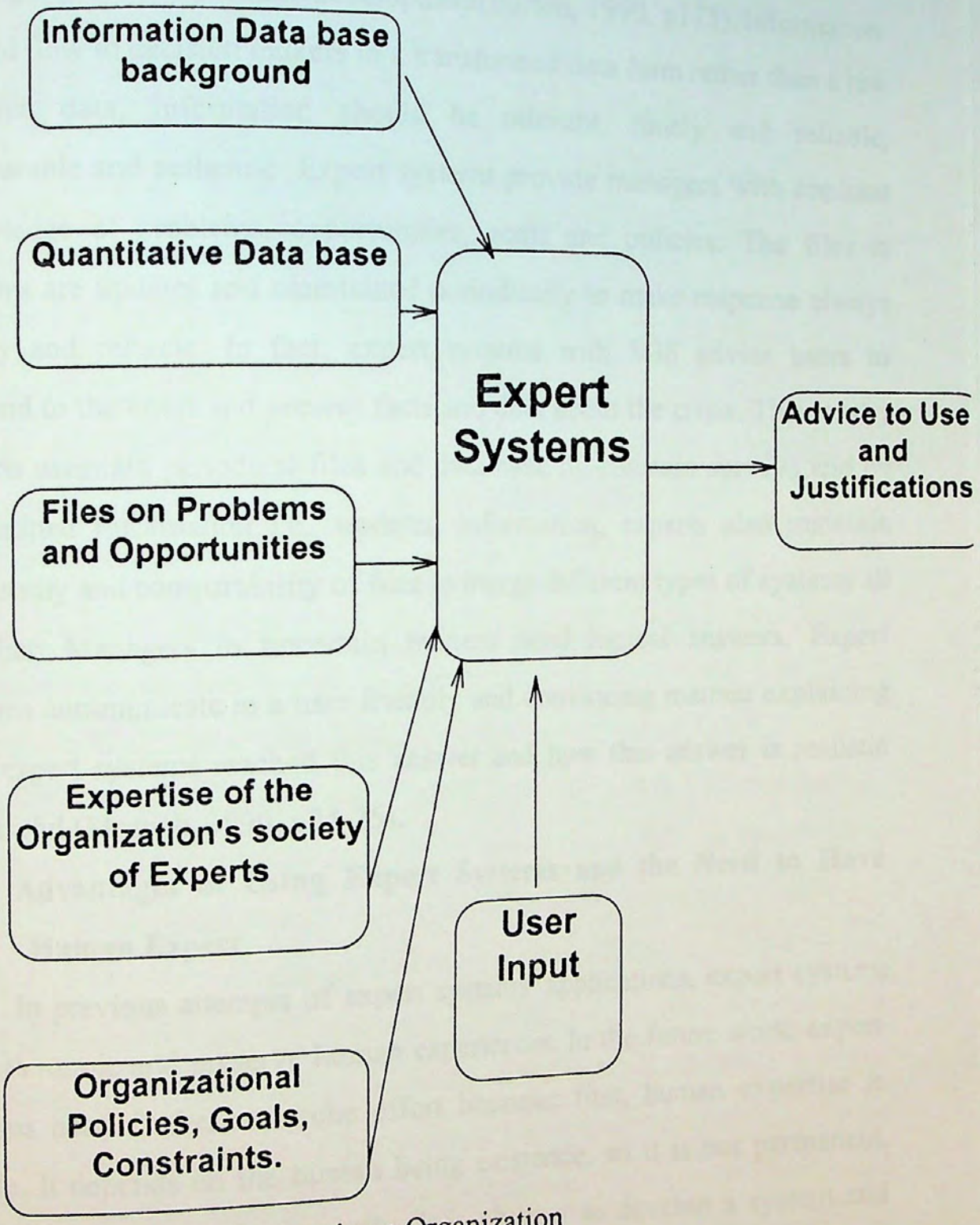


Figure 4.6 An Expert System in an Organization

Source: (Masuch, 1990, fig1.1, p26)

In crisis management plans, Barton explains two phases: First, fact finding and second scenario development(Barton, 1990, p175). Information should flow to decision makers in a transformed data form rather than a raw material data. Information should be relevant, timely and reliable, comparable and authentic. Expert systems provide managers with constant knowledge of problems, opportunities, goals and policies. The files in systems are updates and maintained periodically to make response always timely and reliable. In fact, expert systems with MIS advise users to respond to the crisis and present facts and data about the crisis. This is why experts maintain periodical files and data base by constant surveys and by transmitted information i.e., updated information, experts also maintain uniformity and comparability of files to merge different types of systems all together. Managers in uncertain matters need logical answers. Expert systems communicate in a user friendly and convincing manner explaining why expert systems reached this answer and how this answer is realistic and useful (Masuch, 1990, p24-25).

4.2.7 Advantages of Using Expert Systems and the Need to Have Human Expert

In previous attempts of expert systems' applications, expert systems tried to mimic and preserve human experiences. In the future work, expert systems need further researche effort because: first, human expertise is fragile. It depends on the human being existence, so it is not permanent. Second, human expertise is costly. It is cheaper to develop a system and maintain it. Further, the system is portable, it moves from one place to

another and to remote areas. Finally, expert systems are easy to document and have consistent results.

On the other side, unlike a human- being, expert system can not learn from an experience. Expert systems can extract facts but not rules. Meanwhile, the knowledge acquisition process is a barrier. Experts do not easily give their experiences. Expert systems can serve significantly in certain domain but not in all problems (Masuch, 1990, p33)
(Pigford, 1990, p30).

To conclude, expert systems support managers in decision making process and can provide them with required experiences in specific domains. Future works need to involve expert systems in different domains and enhance their capability to represent diversified experiences.

4.2.8 How Do Expert Systems Function?

The mechanism begins with users asking questions through friendly interface device, then expert systems scan its knowledge base which contains "if"and "then" rules and mathematical formulas. While reviewing knowledge base, an expert system matches questions with rules and facts.

For example, "if {the traffic light is red} then {cars should not move} and if {there is an accident} then {there is a traffic jam}" (Mockler, 1989, p23). Each rule can have more than one if statement. Inference engine passes through the knowledge base and if all "if" parts are true, the engine fires the conclusion or the solution. This mechanism is the forward change process. The program navigates all the rules that apply and execute the rules one by one, until the final conclusion is reached. On the contrary, the back ward chaining process begins with "then" part then "if" part and so on until the inference engine uses both forward and backward chaining, using chaining

approaches. Transforming this process into machine language programs; programmers can use LISP or PROLOG languages for instance
(Thierauf, 1987, p60-61) (Mockler, 1989, p23). The expert system of the crisis management agency can use both mechanisms the forward and back ward chaining process. Meanwhile, the PROLOG language will be of a great help in developing the system.

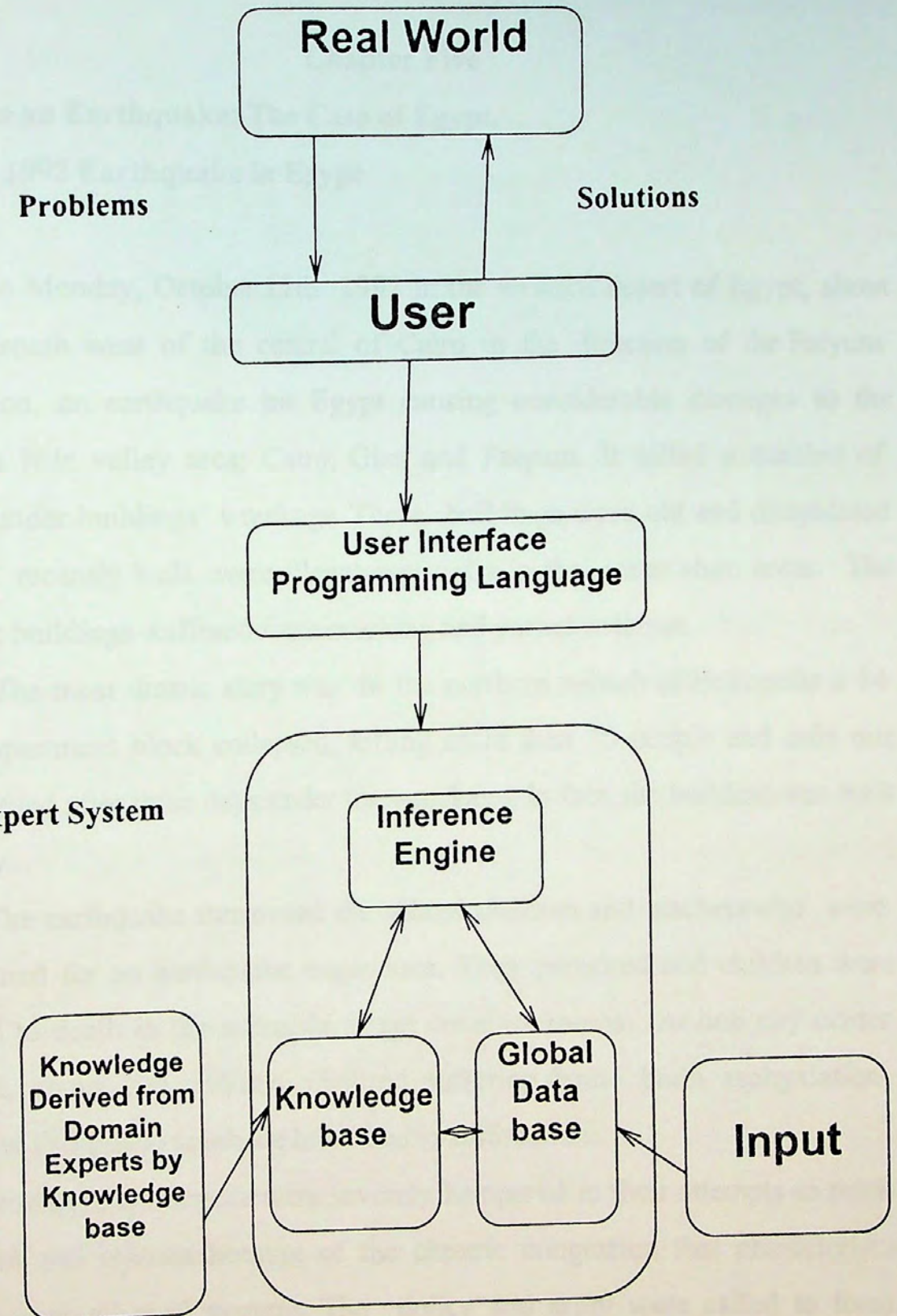


Figure 4.7 An Expert System

Source:(Thierauf,1987,figure2.12,p61)

Chapter Five

Focus on an Earthquake: The Case of Egypt.

5-1 The 1992 Earthquake in Egypt

On Monday, October 12th 1992 in the western desert of Egypt, about 35 km south west of the central of Cairo in the direction of the Faiyum depression, an earthquake hit Egypt causing considerable damages to the northern Nile valley area: Cairo, Giza and Faiyum. It killed a number of people under buildings' wreckage. These buildings were old and dilapidated and the recently built were illegal especially in the inner slum areas. The touristic buildings suffered from cracking and partial collapse.

The most drastic story was in the northern suburb of Heliopolis a 14 story apartment block collapsed, killing more than 70 people and only one was rescued after three days under the wreckage. In fact, the building was built illegally.

The earthquake threatened the school children and teachers who were unprepared for an earthquake experience. They panicked and children were crushed to death in the scramble to get out class rooms. At one city center hospital, about 100 children admitted suffering from brain asphyxiation-failure of Oxygen to reach the brain due to suffocation.

Emergency services were severely hampered in their attempts to reach the dead and injuries because of the chronic congestion that characterizes Cairo's over all road systems. The police and army were called to form

cordons around hospitals as people crowded to get an information about their missing relatives.

After the earthquake, 1.087 schools had to be closed because of earthquake damages. 3.569 schools required extensive renovation.

In the Nile valley and in northeastern Faiyum depression, many traditional buildings were destroyed and modern buildings of brick fell down because they were not built to resist moderate earthquake forces.At Barnasht, 80 percent of the buildings in the villages were destroyed.

Some political parties and religious groups in Egypt tried to gain a political advantage in the local elections which were on the third of November. To demonstrate their credibility for government, they prepared hot meals and collected and distributed donations. They provided also shelters for hundreds of homeless families. During the campaign, their slogan was "Islam is the Solution".

After the earthquake, several donating agencies, individuals, and governments donated funds to support Egyptian government to overcome this crisis. Donating agencies were NGO's such as the Red cross, Egyptian business men in USA, and chamber of commerce in Alex. External Donations were from Saudi Arabia, Switzerland, Australia , and other countries. Donations reached 212 million$. Dr. Atef Sedkey, Ex Prime-Minister, discussed, in "Maglis El Shab" people's assembly, the national plan to face the earthquake's damages. The cost was four billion Egyptian pounds to build schools, houses, pay compensations. In fact, negative impact of the earthquake still exists up till now.

Unfortunately, for three days the bureaucracy proved unable to cope swiftly and effectively with the problems caused by the earthquake. Beside, the poor standards of construction and inadequate enforcement of building and safety regulations were largely blamed. Generally, the lack of community awareness of and preparedness for the possibility of an earthquake resulted in additional unnecessary loss of life; e.g., the death of school children was because of the panic reaction and the unawareness of teachers
(Degg, 1993, p227-p237).

In fact, the system to face such a disaster was ignored for long time. The civil defense established in the late 60's under the era of Gamal Abd El Nasser headed by the Vice President Anwar El Sadat was neglected and staff were not prepared. Its duties were to rescue people and evacuate damaged buildings. Unfortunately, equipment was insufficient
(Abd El Azem, 1992, p16).After the Earthquake, the Shura Council discussed the need to have a plan to face such disaster. The plan includes mainly predicting the earthquake through specialized research centers and the need for effective communication. In 1976, there was a national emergency plan that supervised rescue operations, trained civilian, and defined responsibilities (Amin, 1992, p15).

5-2 Information Technology and Decision Making in the Government of Egypt

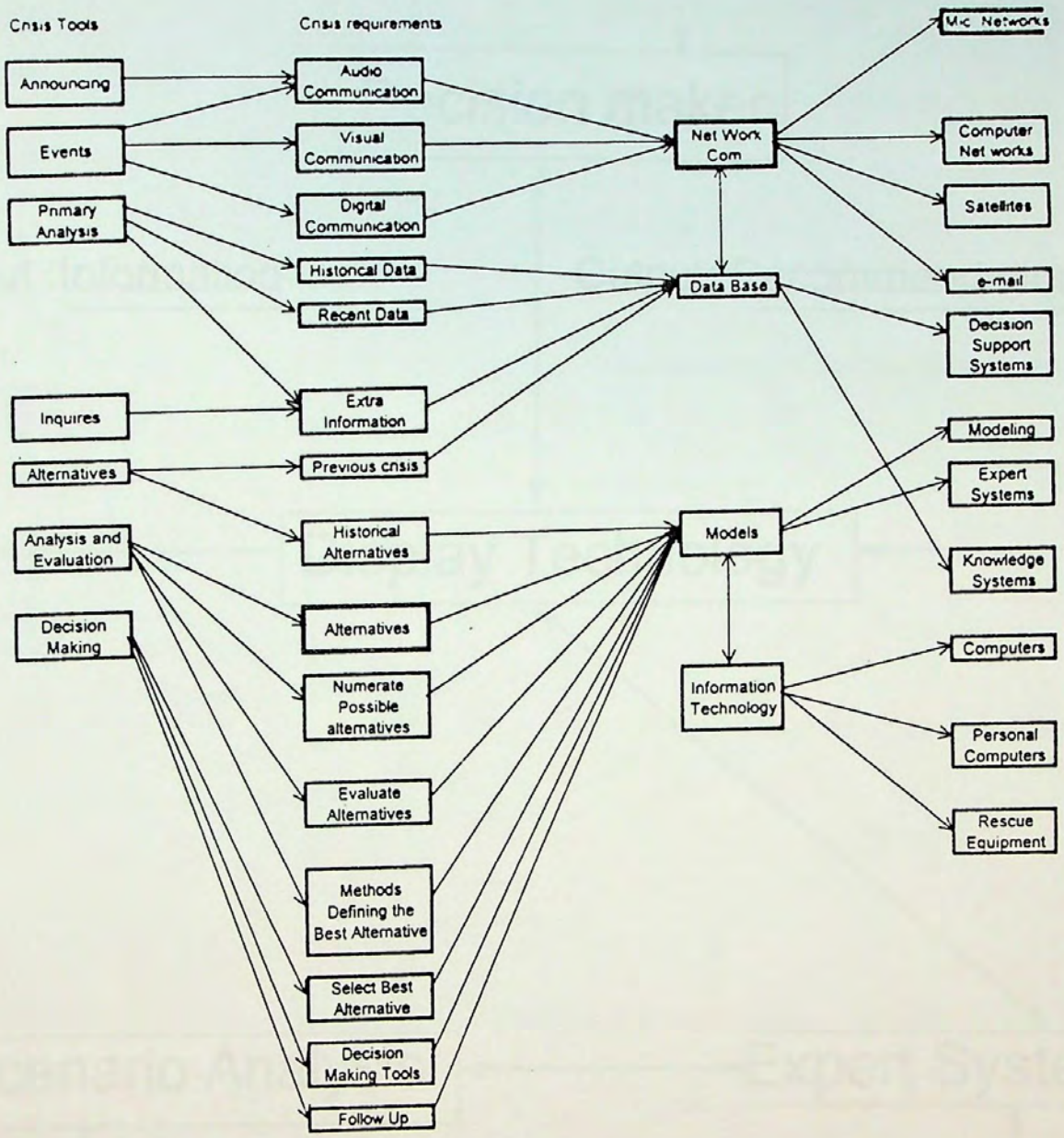
The Egyptian cabinet machinery consists of aprime minister, ministries and committees. Decision making at the cabinet level addresses a variety of national socio-economic and infrastructure concerns such as reducing the deficit in the balance of payments and national budget, debt management, performance improvement of public sector organizations, ways of promoting the development of small and median-scale private industries, and the allocation of resources to solve urban housing problems and over-population.

The decision making process involves much debate and group discussion, requires much preparation of position papers studies, and is subject to public accountability and media attention. A simplified view of the cabinet decision making process showing key participants, deliberation forums, and information flows. The decisions around issues considered by the cabinet are usually complex ill-structured. Interdependent, and multi-sectoral, with strategic impacts at the national, regional, and international level. The nature of the information environment can be characterized as one which is data rich, but information poor, in which there is an overload of information of questionable reliability, which often yields multiple and murky interpretations, and which is often qualitative and disjointed. The cabinet is the epitome of the strategic decision making at the group level under complex and turbulent conditions which is in bad need for information and decision support systems.

The Cabinet of Egypt is the highest executive body in the country. It consists of ministries and is headed by the prime minister. Each minister is responsible for a given sector, industry, agriculture, and energy. The cabinet addresses multi-sectoral issues, policies, and programs. The cabinet agenda is usually set according to the scope, urgency, and criticality of issues. In this regard, the cabinet interacts with ministries, parliament, governorates (states or provinces), government agencies, and universities. Its decision making process usually involves discussions, debates, the preparation of memoranda, and multi-sectoral studies.

The Information and decision support center (IDSC) has three main objectives: first, to develop information and decision support systems for the cabinet and top policy makers in Egypt; second, to support the establishment of decision support centers in existing ministries and to make more efficient and effective use of available information resources; third, to encourage, support, and initiate informatics projects to accelerate the managerial and technological development of Egyptian government ministries and agencies.

To achieve these objectives IDSC developed a three level framework: At level one, IDSC built a base at the cabinet to provide cabinet issue support information for cabinet issues, decision support, multi-sectoral analysis, and integration. At level two, national nodes linked IDSC with ministries and national agencies and support centers at ministries and national agencies. At level three, they extended telecommunications access to international sources of information and major data bases (El Sherif, 1990, p79-p101)
(El Sherif,,1989, p1-p6).



5.1 Crisis Management Tools
Source: (El Hadad, 1996, figure 3, p48)

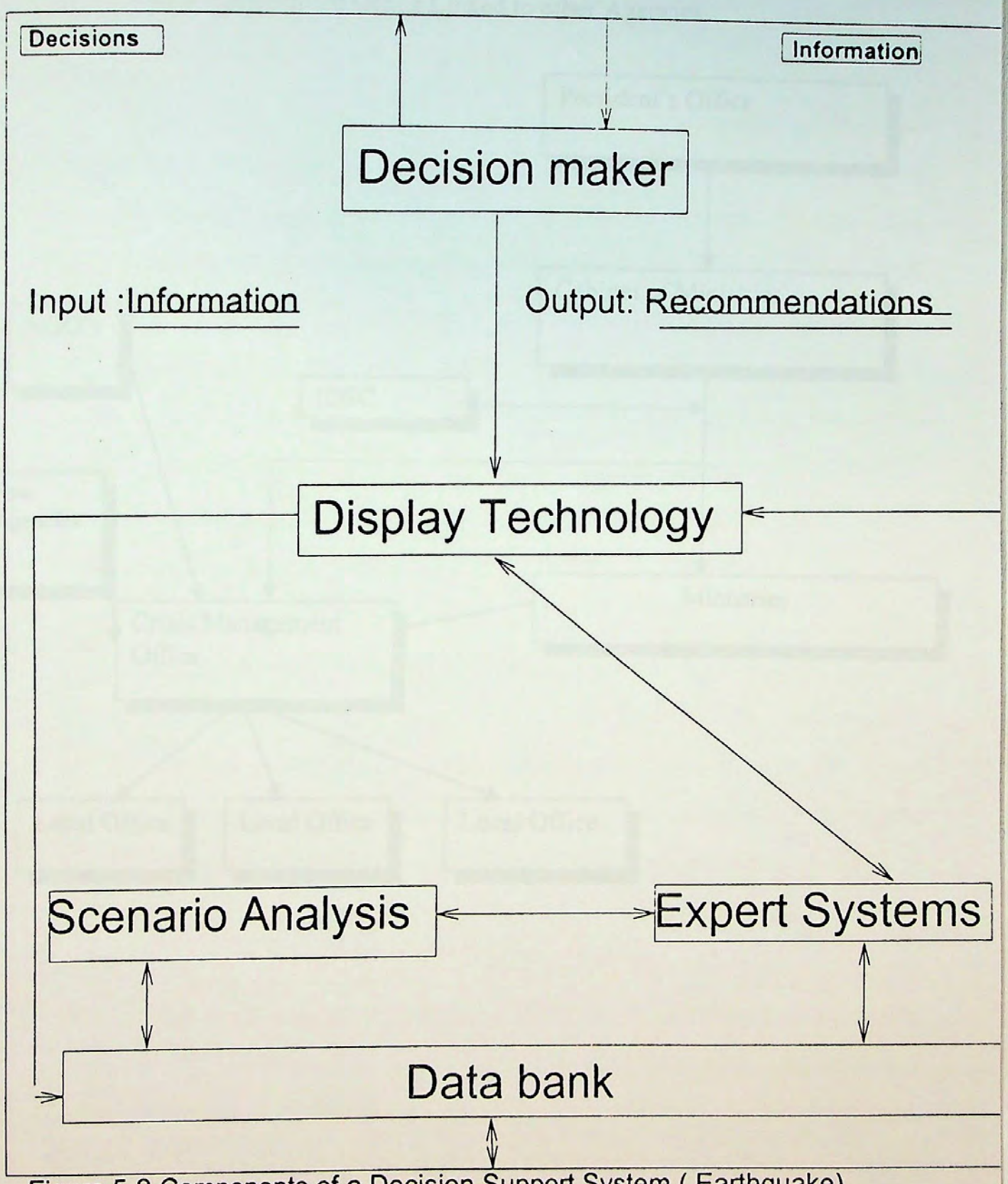
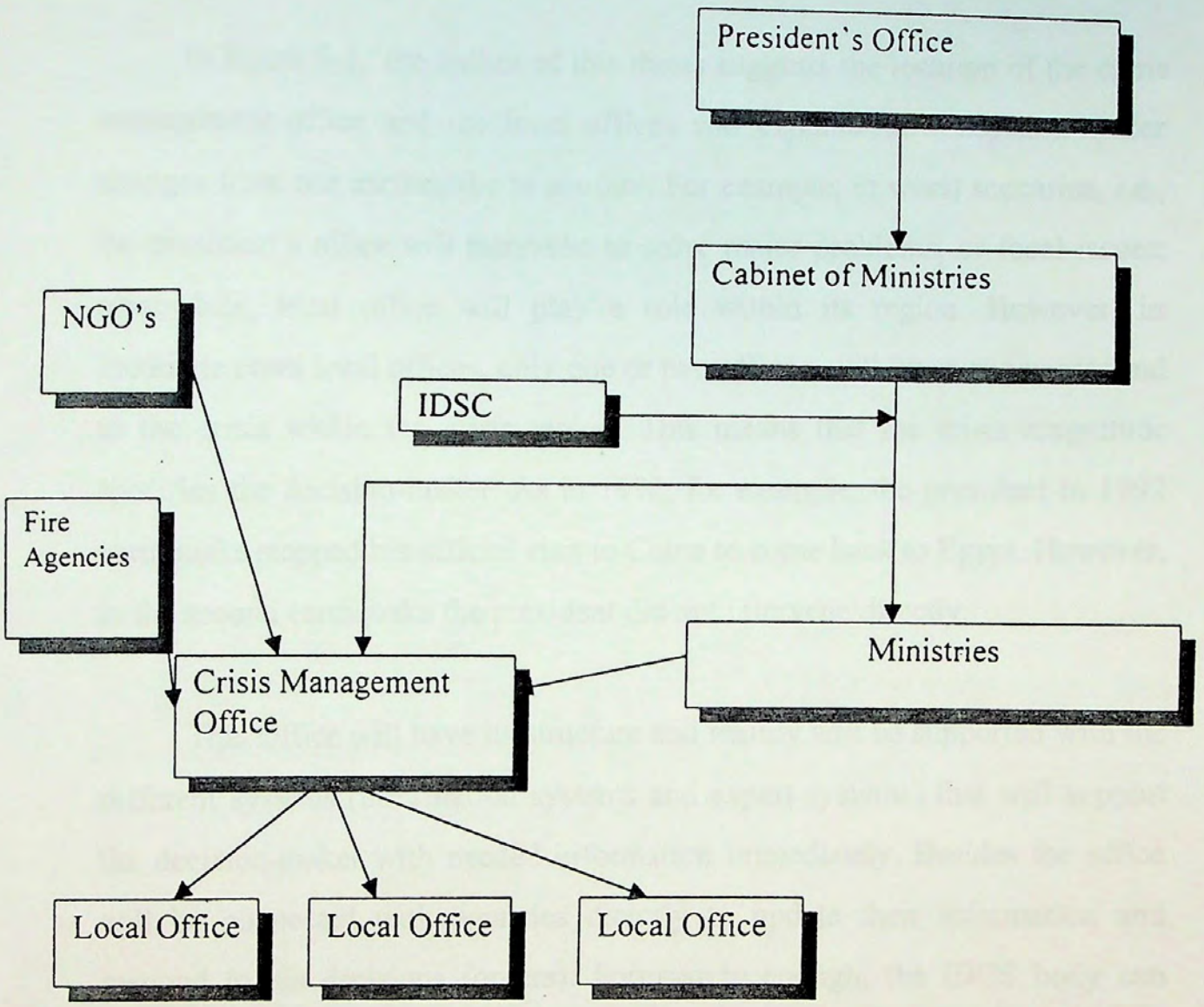


Figure 5-2 Components of a Decision Support System (Earthquake)

Figure 5-3
Crisis Management Office Linked to other Agencies



5-3 Crisis Management Office and Tools

In figure 5-3, the author of this thesis suggests the location of the crisis management office and the local offices and explains how decision-maker changes from one earthquake to another. For example, in worst scenarios, i.e., the president's office will intervene to solve major problems, or focal issues; meanwhile, local office will play a role within its region. However, in moderate cases local offices, only one or two offices, will intervene to respond to the crisis within the crisis region. This means that the crisis magnitude specifies the decision-maker. As in 1992, for example, the president in 1992 earthquake stopped his official visit to China to come back to Egypt. However, in the second earthquake the president did not intervene directly.

This Office will have its structure and mainly will be supported with the different systems (information systems and expert systems) that will support the decision-maker with needed information immediately. Besides the office will be connected with agencies directly to update their information and respond to his decisions (orders). Fortunately enough, the IDCS body can facilitate this task and link the manager with the ministries and different agencies.

In Booth's model as explained in chapter 2, there are steps to control a crisis starting with a signal and ending with a solution and back to the stable statue or the survival model. In each stage managers use crisis management tools to support them during the decision making process. In the following figure 5-1, the main crisis management tools are shown.

When crisis signals are initiated, information is transmitted through audio, visual, or digital communication. With the information, managers start a primary analysis of the crisis using historical data from databases and knowledge base. After shaping a general idea of the crisis, decision-makers can evaluate and analysis the crisis by using a specialized expert system and modeling techniques. In this stage, managers can set possible alternatives, and evaluate and select the best one.

In the following parts, the main tools and items are presented as referring to the earthquake in Egypt. The information needed during the crisis, the database including historical and emergency data, a scenario and an expert system that provides recommendations to decision makers are mentioned.

In figure 5-2, the main components of a decision support system are displayed. The system receives information as input and processes this information and then produces an output, which is a recommendation. During the process, the system uses the data bank and sets different scenarios and finally through the expert system it prods the recommendation .As mentioned earlier, the following pages will describe each item separately.

Information Types: The Case of an Earthquake in Egypt

Information Types	Examples	Sources
Strategic Information [Planning Information]	List of all helping agencies Scenarios Crisis symptoms Crisis impacts and history Crisis types	Reports Developed Literature Previous experience and Internet Reports literature

Information Types	Examples	Sources
Tactical Information.	Hospitals	The INP Report
	• Transportation	
	• Fire agencies	
	• Utilities	
	• Pure water	
	• Schools	
	• Shelters	
	• Bakeries	
	• NGO's	
	• Roads and Streets	
	• Media	
	• Ministry of Finance	
	• Ministry of Defense	
	• Ministry of Local Administration	
	• Ministry of Health	
	• Ministry of Scientific Research	
	• Historical information	
	• Losses	
	• Expectation	
	• Police Stations	

Information Types	Examples	Sources
Operational Information	**Hospitals** • Addresses • Phone numbers. • Departments • Nurses • Facilities • Doctors **Transportation** • Types • Capacity • Area • Direction • Stations **Fire-drills** • Firemen • Specifications • Fire-Engine • Material **Utility agency** • Addresses	The INP Report

Information Types	Examples	Sources
Operational Information	**Shelters** • Addresses • Capacity • Expected **Bakeries** • Addresses • Staff • Quantity • Quality **Schools** • Addresses • Type • No. of students • No. Of classes • Teachers • Students • Information Name address • School contractors address • Names	The INP Report

Information Types	Examples	Sources
Operational Information	. Phone numbers . Area . Stations . Cars for removing water . Water Quality . Rate of Leakage . Staff . Spare Parts **Pure Water** . Addresses . Staff . Material **Roads and Streets** . Direction . Alternatives . Stations	The INP Report

Information Types	Examples	Sources
Operational Information	**Ministry of Defense** • Address • Phone numbers • Type of support **Ministry of Local-Administration** • Address • departments • Type of support **Ministry of Health** • Address • Departments • Type of support	The INP Report

Information Types	Examples	Sources
Operational Information	**Ministry of Scientific Research** • Address • Researches • Advice • Support • Full information **Historical information** • Size • Damages • How long • Required fund • Losses **Expectation** • Size • Duration • Where • Damages	The INP Report

Information Types	Examples	Sources
Operational Information	**Police Stations** • Address • Phone numbers • capacity	The INP Report

Information Types	Examples	Sources
External Information	Other experience	Literature
InternalInformation	Egypt's environment	INP Investigation
Historical Information	Previous experience	literature
Forecast information	Prediction information	literature
Warning Information	Warning signals from forecasting information and phone calls	INP Investigation and literature

5-4 Information Types

In Egypt, the IDSC is a good base that can support the recommended crisis management body. This crisis management body consists of a main managerial agency under the supervision of the ministerial cabinet and its branches in the governorates. This body will have an information system and an expert system to provide a quick response to decision makers in the crisis management agency.

To have a strong data base, there is a need to explore information types. There are eight types of information that are needed during the crisis: first, strategic information or planning information such as all the ministries and agencies involved in responding during the crisis, second, the tactical information e.g., list of all hospitals, NGO's, schools and agencies involved, third, the operational information for example, the addresses, phone numbers and doctors in hospitals; fourth, external information e.g., other experience of different countries, their response and behavior; fifth, internal information such as Egypt's environment i.e., civilian response, sixth, historical information as the previous experiences, seventh forecasting information, predicting information; eighth, warning information, warning signals from specialized agencies.

The data collected is an example of different types of information. It is clear from the information that Cairo and Alexandria have a privilege. All agencies are centralized in these governorates. For example, there are 100

hospitals in Cairo and 96 in Alexandria although in other governorates this figure ranges from 72 to 37. The services also are centralized in Cairo; for instance, the number of ambulance per citizen is 107 to 100 in Cairo; however in other governorates the number of ambulance per citizen ranges from 75 to 33 per 100. School students are more in Cairo. This means that there is a need to give considerable care within the awareness training programs to the students in Cairo. Since the class density is approximately the in all classes 40 students per class, the agency can set one plan i.e., rescuing the students. Total road length give an indication. In Cairo the road length is 5200 km but in other governorates the road length is about 2500 km. This meansthat Cairo needs a special computer program that solve the road conjunctions during crisis time. Most of the governorates need more telephone lines. In Cairo there are 1091212 telephone line about 6 persons; however, in thegovernorates the average is more than 30 persons per telephone. The figures are as follow: in El Bahra there are 79862 line , 50 persons per telephone ,in Kafr El Sheikh there are 82310 line , 28 persons per telephone, and in ElGarbih there are 114504 line and , 30 persons per telephone El Monofia 84734 lines, 32 persons per telephone (IC DSS, May 1995)(CAPMAS) Information Center.

These data are very essential during a crisis. The crisis manager can define his resources to solve such a problem. After the crisis, these data can help to resolve aftermath destruction. In general, these data reflect the existing situation of the available agencies and the capacity of each. In order to keep the system efficient these data should be updated on a periodical basis.

5-5 Database

The database will provide historical data of an earth quake crisis and will support decision makers with all information about hospitals, transportation, roads, fire agencies, police stations further other involved agencies such as NGO's ministry of finance, ministry of health.

In the main five screens presented, the user will be able to input information, modify information and inquire. In a crisis, the decision maker will be able to locate, for example the nearest hospital along its capacity and the street direction that the fire engine will cross through. Then the user can get printed reports or review required information on screen easily[1].

[1] Screens (1-7) designed by the author of this thesis as a summary of literature survey. They were not in any other sources presented. see figure 5-4

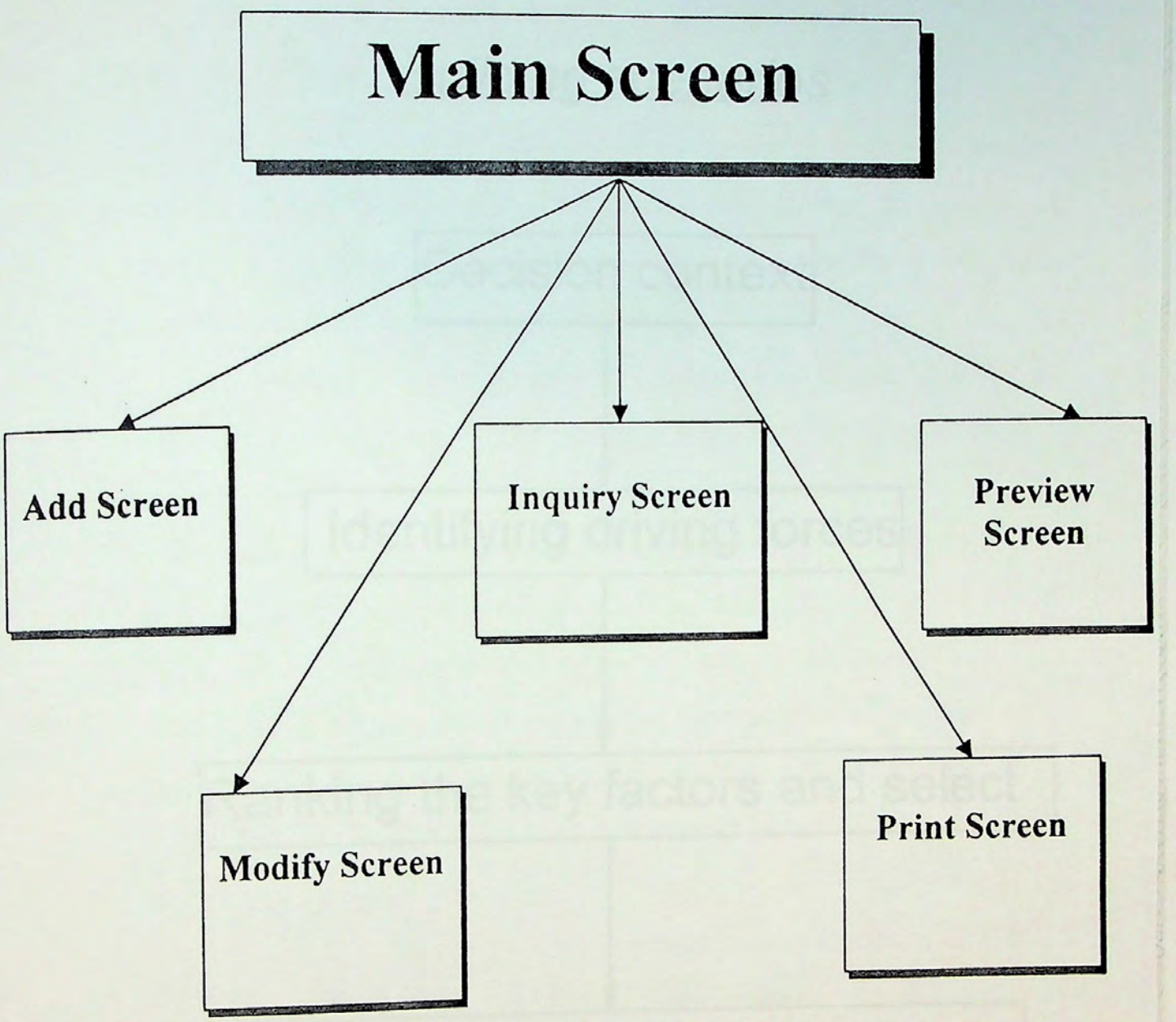


Figure 5-4
Screens of the Database
See Appendix b

Building scenarios

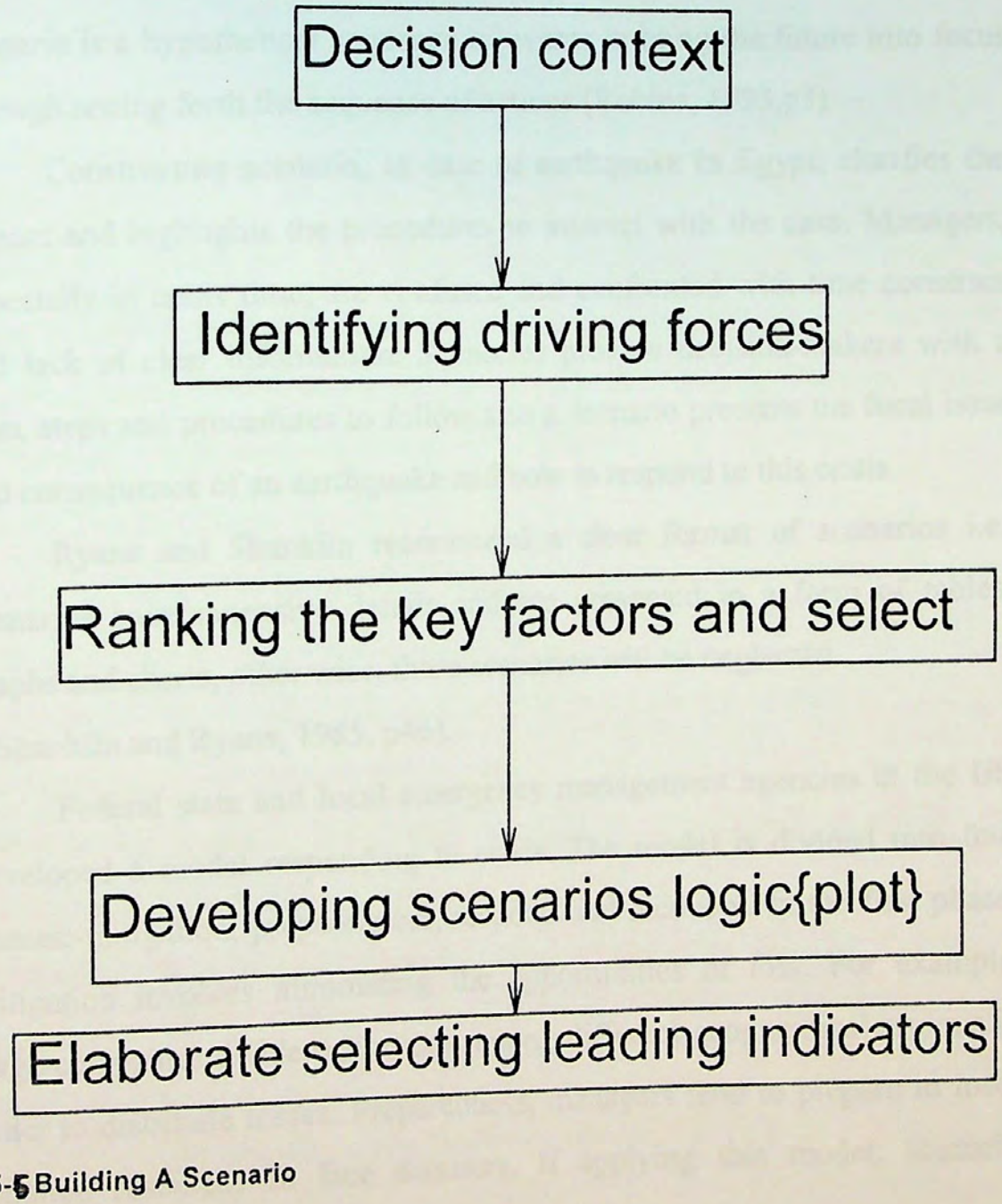


Figure 5-5 Building A Scenario

5.6 Decision Making Process and Scenario Development

Scenario is a strategic planning technique which is used to identify the future especially in times of uncertainty and change. In other word, scenario is a hypothetical sequence of events to bring the future into focus through setting forth the sequence of actions (Robins, 1993,p3)

Constructing scenario, in case of earthquake in Egypt, clarifies the impact and highlights the procedures to interact with the case. Managers, especially in crisis time, are confused and confronted with time constrain and lack of clear information. Scenarios provide decision-makers with a plan, steps and procedures to follow also a scenario presents the focal issue and consequence of an earthquake and how to respond to this crisis.

Ryans and Shanklin recommend a clear format of scenarios i.e. scenarios have extensive details and are presented in a form of tables, graphs and charts, other wise, these scenarios will be neglected (Shanklin and Ryans, 1985, p46).

Federal state and local emergency management agencies in the US developed a model responding to crisis. The model is divided into four phases;-mitigation, preparedness, respond and recovery. In the first phase, mitigation involves minimizing the opportunities of loss. For example, large companies divide operations among different geographical regions in order to distribute losses. Preparedness, managers tend to prepare to meet required resources to face disasters, If applying this model, scenario development is one way to prepare to crisis. The response

Phase is while crisis is actually happening. " if the disaster's extent is unpredictable, even during the event, the crisis manager might have to do some thinking quickly" (Barton,1993,p221). Hence, everything that has to be done to minimize the drawbacks of crisis is already done in the previous two phases. Finally, recovery is after the crisis strikes. All events of analyzing the past event and recovering procedures finishes in a short period. In other word, everything is back to normality (Barton,1993,p221).

1 The Strategic Decision Context

Scenarios are developed to prepare a full spectrum of the situation, respond to minimize damages caused by an earthquake, give manager different alternatives to act upon, and finally to minimize the gap between the bureaucratic norms and emergency norms.

2. *List Key Factors*

There are five major factors and measurements which orient the direction of the alternative scenarios of earthquake

1. The crisis weight: (i.e. losses, the impact on the government resources, public psychology and strategic issues)
2. The crisis density: (i.e. availability of resources and capability of absorbing the crisis impacts in a short or long time.)
3. Interconnection (i.e. all factors interconnected that magnify the crisis size)
4. Crisis duration
5. Place (i.e. remote areas, near close or isolated)

These five major keys divided into three levels, the five factors can be described (high, medium, low)

1.Crisis size

- high (above 7 Richter)
- medium (4 Richter - 7 Richter)
- low (4 Richter less)

2.Crisis density

- high (no resources , no information)
- medium (available resources, no experience, no clear information)
- low (available resources, clear vision)

3. Side effects (on the political life, human life, economic life)

- high
- medium
- low

4. Place

- The whole country
- Some places
- remote areas

5. Duration

- high (i.e. 60 sec. >)
- medium (i.e. 30 sec. - 60 sec.)
- low (i.e. 30 sec. <)

(El Hadad, 1996, p69 p75)

These five indicators measuring an earthquake provide, hypothetically , more than one scenario, about 729 case (3*3*3*3*3) .The main focus is on three scenarios the worst case and a medium earthquake and a no effect earthquake.

In the first scenario, where all factors are measured high. The earthquake is above 7 Richter and lasted more than one minute, the density is high. There is no available resources and no information; consequently the political, human, and economic life are threatened severely especially when the earthquake strikes the whole city. This is the worst case.

Worst Case

1. Buildings collapse, debris and glass scatter
2. Factories collapse, fires start, gas leakage
3. Historical buildings, museums and touristic sites are destroyed
4. Schools suffer damage, school children panic and cause more damage
5. Bridges crumble, natural gas and power lines shape a part and waste pipes explore
6. National building crack: High Dam, Nuclear Center, Suez Canal, Airports, Factories, Banks, and Hospitals

Consequently

1.Loss of souls and injuries

2.leakage of poisoning gas from the earth

3.Fall down in the communication systems

4.Shortage of water supply

5. Destruction of the transport system

6.Fires and smoke

7.Chaos , criminal behavior, and panic

8.Destruction in the agricultural land

9.Disturbance in the political life

10.Damages in the airport buildings, runways, communication system

11.Damages in power supply and energy system

12.more suffering to the poor (e.g. no food and no shelter)

In plotting the future events, challenge and response are sufficient plot line or best fit. In a form of table, each agency is responding to the earthquake, focusing on the role of the central agency for crisis management.

Worst Scenario

Each agency responds to the crisis in three steps. The scenario is formed. The main objective is to understand the earthquake and the role of agencies.

1. Crisis definition (worst - case) in this case, the value of all factors is high (i.e. crisis size = high, crisis density = high, side effect = high, location = the entire country, duration = more than one minute)
2. List the main duties of each agency in a written form and in a flow chart
3. List main duties of agencies in steps form and in a flow chart form

The following is a summary of a literature survey that explains how managers act in a crisis. Each of the following scenarios represents a different agency. The author is listing scenarios of:

1. General office of the crisis management.
2. Hospitals
3. Fire Agencies
4. Transportation and Traffic System
5. NGO's
6. Sanitation
7. Utilities
8. Media
9. Ministry of Education
10. Ministry of Defense
11. Ministry of Finance
12. Ministry of Health
13. Ministry of Local Administration
14. Ministry of Scientific Research

Following are these scenarios in details:

1.Scenario of General Office of Crisis Management

1. Manager on duty immediately notifies the general manager.
2. Define crisis effect ,location and consequences.
3. Identify disaster affected area and define responsibilities.
4. Define roles.
5. Define messages and to whom (i.e.,
    - Disaster victims (injured, separate from the family, suffer damages etc..)
    - Potential volunteers (who are willing to assist to relief effort)
    - Disaster workers (individuals, organizations that understand the scope and details)
    - Governments officials (city, country, state, etc..)
    - Community leaders (member of the board of NGO's))
6. Make statement to the news medial and public
7. Define the location of shelters and fixed or mobile feeding camps
8. Set major plans to rescue national buildings(high dam, main bridges, Underground.. etc..)
9. Assure more than one communication services
10. Define schools damages and inform public by brief programs of how to react in case of earthquake
11. Define bakeries' places and capacity through database and send message to increase the capacity in selected areas.
12. Provide volunteers and staff with short training programs
13. Manage government funds, united way and private donations

14.Prepare follow up reports to different agencies

15.Update data base

16.prepare final report

2. Scenario of Hospitals

1. Manager on duty notifies the general manager about the earthquake
2. Define the earthquake size, impact, place
3. Check database and contact the nearest hospital , notify the hospital committee:- nurses, radiologist, pathologist, pharmacist, etc..
4. Send note to prepare main support supportive diagnostic facilities namely x- ray, laboratories and blood bank
5. Send note to prepare main operating rooms
6. Mean while, send emergency vehicles equipment
7. Check data base and coordinate among hospitals (i.e.
   - National medical center with highest level of health care
   - Regional hospitals that cover general hospital care in the region
   - District medical care units or hospitals
   - Specialized hospitals with a particular activities
   - Private hospitals
8. Call army's assistance (e.g. hospitals, transportation, shelters and variety of communication systems)
9. Prepare follow up reports
10. Prepare reports of all procedures to challenge earthquake drawbacks.
11. Set final report includes recommendations
12. Prepare a final report includes recommendations and the positive and negative sides of the case, and update database

3.Scenario of Sanitation

1. Notify the manager on duty
2. Identify the earthquake
3. Check data base and contact nearest agencies
4. Send a clear description of the fire to send either vehicles or helicopters
5. Send a clear message to the fire agency to be prepared to a gas leakage, electric problems and building collapses.
6. Coordinate with specialized agencies and experts that rescue life under wreckage
7. Prepare follow up reports
8. Prepare reports of all procedures to challenge earthquake drawbacks.
9. Set final report includes recommendations
10. Prepare a final report includes recommendations and the positive and negative sides of the case, and update database.

4.Scenario of Traffic System

1. Define crisis zone and damages
2. Check all roads directions and set a clear map of the target area
3. Check type of transportation that serves this area (i.e., bus, tram, underground, cares)
4. Coordinate with other agencies to get helicopters, winches, or tractors if needed
5. Define alternative paths and roads
6. Set clear traffic signals guiding drivers
7. Prepare follow up reports
8. Prepare reports of all procedures to challenge earthquake drawbacks.
9. Set final report includes recommendations
10. Prepare a final report includes recommendations and the positive and negative sides of the case, update database.

5. Scenario of NGO's

1. Identify the crisis place and effects
2. List all NGO's names and address either internationally or nationally through data base
3. Contact NGO's and inquire about the type of assistance that it can provide
4. Coordinate with other agencies the check agencies needs
5. Arrange for Volunteers, Shelter, Food, Money, Vehicles, Clothes Schools, and Essential medicine
6. Disseminate information to individual on booklets
7. Prepare long term shelters, clothing, replacements of basic house hold furniture, medical needs.
8. Provide very short training programs of how to rescue victims and how to survive
9. Define the red cross facilities location whether fixed or mobile
10. Inform NGO's of type of victims :- disaster victims(injured, separated from family, suffers damages and others)
11. Notify NGO's to ask for more volunteers and who are willing to assist with relief effort
12. Prepare follow up reports
13. Prepare reports of all procedures to challenge earthquake drawbacks.
14. Set final report includes recommendations
15. Prepare a final report includes recommendations and the positive and negative sides of the case, update database.

6. Scenario of Sanitation

1. Define the crisis zone
2. Check water sources and broken water pipes
3. Define spare parts, equipment and workers and define alternative paths and which taps to be closed
4. Call For extra help from nearest emergency unit
5. Prepare follow up reports
6. Prepare reports of all procedures to challenge earthquake drawbacks.
7. Set final report includes recommendations
8. Prepare a final report includes recommendations and the positive and negative sides of the case, update database

7. Scenario of Utilities

1. Define the crisis zone and check database to define the nearest unit
2. Check the water direction and set alternative paths and close taps
3. Define needed spare parts workers and equipment
4. Check database and call close emergency units
5. Prepare follow up reports
6. Prepare reports of all procedures to challenge earthquake drawbacks.
7. Set final report includes recommendations
8. Prepare a final report includes recommendations and the positive and negative sides of the case, update database.

8.Scenario of Media

1. Define disaster domain
2. Check database and contact media " TV, Radio,.. etc.."
3. Define the segregation among different recipients:

- Disaster victims (injured, separate from the family, suffer damages etc..)
- Potential volunteers (who are willing to assist to relief effort)

- Disaster workers (individuals, organizations that understand the scope and details)
- Governments officials (city, country, state)

4. Inform different media agencies of NGO's services in order to Send message to victims to access the services and to guide volunteers' where to go, how and what type of courses they have to receive
5. Provide them with information of hazardous gases that cause loss of consciousness or death.
6. Inform them about the hospitals and first aid services
7. Make daily report to local news media about services, victims
8. Prepare follow up reports
9. Prepare reports of all procedures to challenge earthquake drawbacks.
10. Set final report includes recommendations
11. Prepare a final report includes recommendations and the positive and negative sides of the case, update database.

9. Scenario of Ministry of Education

1. Define the crisis zone
2. Retrieve database (schools, students, teachers)
3. Check nearest emergency, hospitals, fire agencies
4. Consult the original construction engineer
5. Send volunteers to rescue students
6. Make short training programs
7. Send experts to rescue especial cases
8. Prepare follow up reports
9. Prepare reports of all procedures to challenge earthquake drawbacks.
10. Set final report includes recommendations
11. Prepare a final report includes recommendations and the positive and negative sides of the case, update database.

10.Scenario of Ministry of Defense

1. Define the crisis area
2. Send rescue operations
3. Give support to hospitals, communication, shelter Food and or clothing
4. Prepare follow up reports
5. Prepare reports of all procedures to challenge earthquake drawbacks.
6. Set final report includes recommendations
7. Prepare a final report includes recommendations and the positive and negative sides of the case, update database.

11.Scenario of Ministry of Finance

1. Define the crisis effect
2. Estimate the required amount of money
3. Prepare follow up reports
4. Prepare reports of all procedures to challenge earthquake drawbacks.
5. Set final report includes recommendations
6. Prepare a final report includes recommendations and the positive and negative sides of the case, update database.

12. Scenario of Ministry of Health

1. Define the crisis area, place, and effect
2. Check hospitals, , health units, and emergency services
3. Coordinate among hospitals
4. Prepare follow up reports
5. Prepare reports of all procedures to challenge earthquake drawbacks.
6. Set final report includes recommendations
7. Prepare a final report includes recommendations and the positive and negative sides of the case, update database.

13. Scenario of Ministry of Scientific Research

1. Define the crisis
2. Check history of the crisis

3. Support prediction researches
4. Check researches and expert in the field of rescuing victims
5. Check research and new technology in the field of communications
6. Prepare follow up reports
7. Prepare reports of all procedures to challenge earthquake drawbacks.
8. Set final report includes recommendations
9. Prepare a final report includes recommendations and the positive and negative sides of the case, update database.

14. Scenario of Ministry of Local Administration

1. Define the crisis size, consequences e.,g., which municipalities or villages that are affected by the earthquake and determine the number of dead people, the destroyed buildings, lands and roads.
2. Check the hospitals in the governorates, and medical units in the district centers and the villages.
3. Check the water resources to villages and the damaged roads.
4. Check transportation facilities, electricity networks.
5. Check shelters and other services
6. Coordinate among local agencies NGO's, Hospitals, Schools to provide health and social assistance
7. Coordinate among villages' headmen 'Omdas" to arrange the public work .
8. Prepare follow up reports
9. Prepare reports of all procedures to challenge earthquake drawbacks.
10. Set final report includes recommendations

11.Prepare a final report includes recommendations and the positive and negative sides of the case, update database (Albert, 1997, p230) (Al Khawashky, 1993, p159-172) (Barton,1993,p67-178) (Booth,1993,p45-239) (Broderick, 1994, 75-80) (Carney, 1993, p134-151) (Clavani,1994, p56-189) (Degg,1993, p229-333) (Doughert,1992,p56-198) (Ebied,1993,p154-156) (El Hadad, 1996,p13-231) (El Soltan,1996, p67-79) (Fink,1986,p87-132) (Mahfouz,1993,p23-28) (Nimpuno,1994,p105-112)(Quarantelli,1988,p374) (Sobaih,1993,p117-120)

6-7 Knowledge base Screens

This system will support the decision makers in the crisis management agency with recommendations to over-come the crisis. The decision maker will answer the questions and the system will provide him with recommendations. The system has five main factors and each should have a value. First, the system will ask about the strength of the earthquake and the expected answer will be high (above 7 Richter), Medium (between 4 Richter- 7 Richter),or low (less than 4 Richter). Second, it will inquire about the resources available and the answers will provide these alternatives (high, medium, or low). Third, the inquiry will be about the impact of the crisis on human life and economic life and also there will be three values (high, medium, or low). Fourth, the system will ask about the damages in the whole country, some places or in remote areas only. Fifth, the system will inquire about the duration of the earthquake more than 60 sec., less than 60 sec., and more than 30 sec.

Finally, after the system will get the values of the five factors. It will provide the user with essential instructions that he can follow. In the following screens, there is the example where all the factors value high and it is the worst case.[1]

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[1] These screens are developed by the author of this thesis See figure 5-5

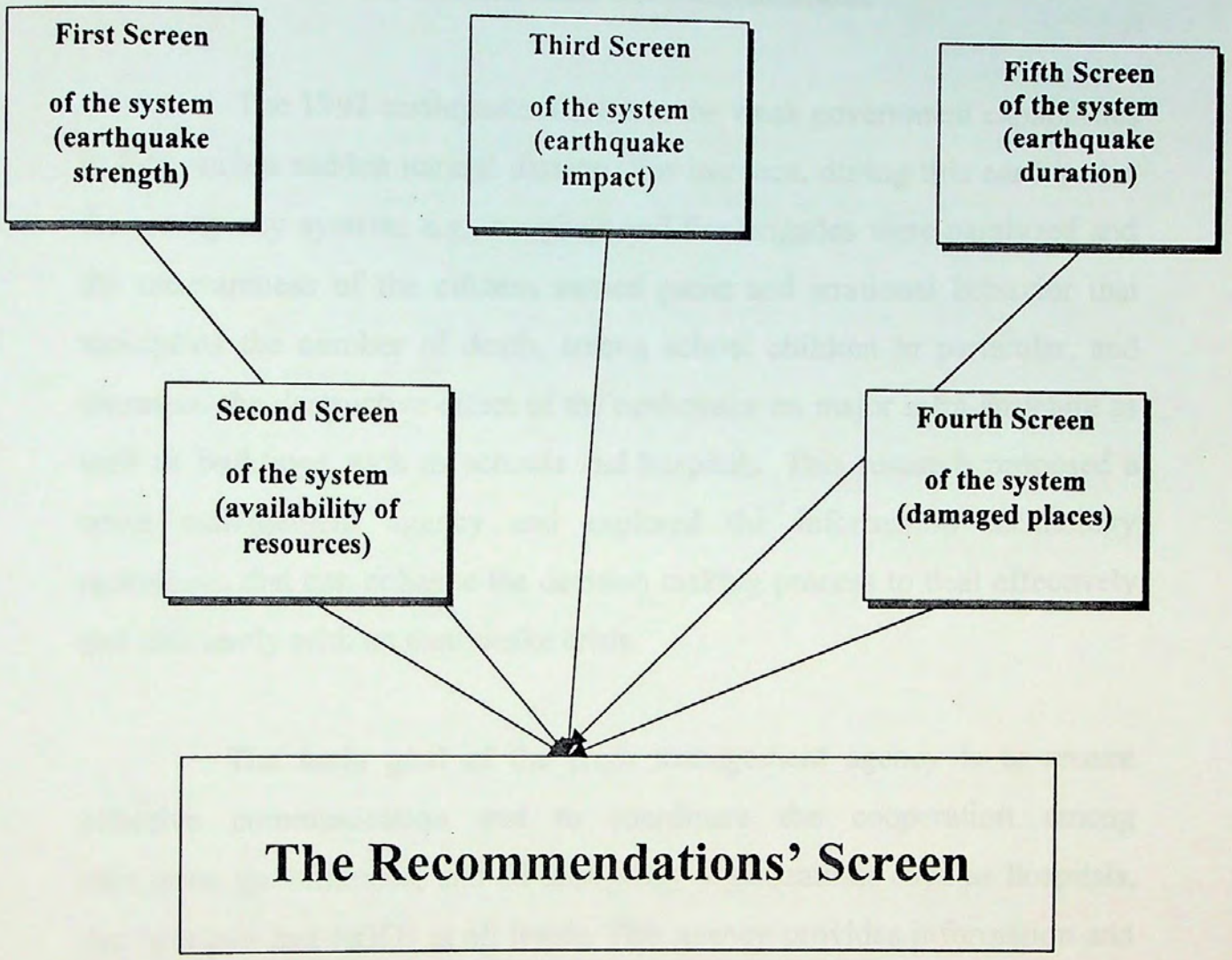

Figure 5-5
Screens of the Expert System
See Appendix c

Chapter Six

Conclusions and Recommendations

The 1992 earthquake illustrates the weak government capabilities to face such a sudden natural disaster. For instance, during this earthquake, the emergency systems e.g., hospitals and fire brigades were paralyzed and the unawareness of the citizens caused panic and irrational behavior that multiplied the number of death, among school children in particular, and increased the destructive effect of the earthquake on major infra-structure as well as buildings such as schools and hospitals. This research proposed a crisis management agency and explored the information technology techniques that can enhance the decision making process to deal effectively and efficiently with an earthquake crisis.

The main goal of the crisis management agency is to ensure effective communication and to coordinate the cooperation among ministries, governorates, and all emergency organizations such as hospitals, fire agencies and NGOs at all levels. This agency provides information and manages the crisis in its three stages through four phases: Before the crisis "Mitigation stage" and the "Preparedness stage", during the crisis "Response stage" and after the crisis " Recovery stage". The research investigates the response stage, which includes a set of recommended activities that are based on the information available during the earthquake.

This agency is under the supervision of the Prime Minister and the IDSC. The IDSC is developing information and decision support systems to the Egyptian Cabinet and other government organizations. Hence,

this location will increase its political importance and will facilitate executing its objectives. For example, first, the agency develops an integrated information system, meanwhile it could access the governement information systems. Second, Its recommendations will ensure serving the public in a timely and efficient manner and will reduce the human suffering and building damages will be taken into consideration.

In order for the agency to proceed, it needs an information system as well as an expert system. This research explored the types of information that are needed to the crisis management procedures and will be included in the database. These types are planning information, tactical information, operational information, external information, historical information, forecast information, and warning information.

The developed information system involved all the listed information types. During the 1992 earthquake crisis, the information was incomplete and contradictory. This database will solve the problem of gathering, analyzing and presenting information. Thus, information will be efficient and reliable.

The, explored expert system includes the alternative scenarios that can assist a decision-maker in any case of earthquake. These scenarios are developed through listing the possible cases. In the beginning the key factors are listed and these are as follow: the magnitude, the crisis impact, the duration, the places, and the availability of resources. Then each factor will be evaluated with three possible values, for instance high, medium, or low and this will produce several cases that need several recommendations. The research focused on the worst case and listed the reaction of all the organizations, ministries, and agencies that support resolving the problems.

The system supports the top management with clear plans that they can execute. During crisis times, the decision-maker is confronted with timelessness and threats; meanwhile, the problems are complex and confusing. This expert system has a friendly interface that facilitates using the system. In the first five screens, the key factors are displayed with their possible values. In each screen the user i.e., decision-maker and top management, chooses the value of the existing situation of the earthquake, until the final screen. The system displays the possible recommendations and all the involved organizations scenarios and how they should respond.

These information and expert systems clarify that the agency uses the rational-comprehensive model of decision making. The top management chooses among alternatives and this selection is guided by the main goal that minimizes the loss of life and the destruction of buildings. It is clear that the staff hired should be selected by the merit system to assure technical expertise and nonpartisanship. At the same time, the location and the small size of this agency will reduce the gap between the emergency norms and the bureaucratic norms. The plans of the government will not be far from the needs of the people because of the effective communication and the accessibility of information through the information system developed.

This research was based on a great deal of scholarly literature that examine each natural disaster as a completely unique event. It is impossible to determine when a response will succeed and when it will fail. There are essential needs and preparations to be made to face such a crisis. From what has been discussed, the author of this thesis sees briefly that:

First, there is a need to establish a crisis management agency. Its main department should be supervised by the Cabinet and should have local branches in the governorates so as to facilitate merging of their efforts with the civil defense work. Both levels i.e., main and branches can play a significant role in developing effective and efficient systems for disaster recovery. All this should be envisaged within long term solutions and focusing on rapid rescue and relief.

Second there is a need for a well-developed communication system to manage on a large scale of information. Such network should help local offices and integrate all work together and assure cooperation among agencies. In Japan, the Hanshin- Awaji Earthquake in 1995 destroyed several important places in Hyogo prefecture. Planners established a comprehensive plan to fight disaster consequences. The plan included three main items: safety buildings, environment preservation, and disaster resistant. Their crucial focus was on establishing a sophisticated communication system and emergency management network for disaster information exchange.

Third, it essential to have a database system that keeps all historical data and basic information. This database should be accessible on the network to key managers in crisis agency. This database has to be updated on a periodical basis.

Fourth, there are a myriad of software packages that can facilitate analysis of individual positions of these tasks and data sets. Expert systems have proved to be reliable to provide recommendations and smart solutions

to decision-makers. Expert systems can make analysis in a short time and give managers quick recommendations to respond to disasters effectively.
In addition, the author believes in the following:

- The public plays a crucial role in crises: Crisis awareness education and information can change the consequences. It is important to disseminate awareness programs at the local level. The programs should help local people to identify the best ways to protect themselves, their homes, and crops and live stocks. This can be through the support of media. This issue requires further research to find various ways to contact individuals and prepare them to face disasters. In Japan, In Hyogo prefecture, there is a main center exhibiting the 1995 earthquake and how civilians respond to such disasters.

- Bureau-politics tensions and the difference between the bureaucratic norms and the emergency norms are usually ignored. It is important to understand and to overcome this problem through group thinking or brain storming meetings, and to allow a certain degree of openness and facilitate democratic control. On the employee level, the manager should hire creative, flexible, hard working and motivated employees.

If Egypt succeeds in taking into consideration and implementing the above recommendations, then whenever an earthquake or a crisis of that sort happens, management of crises can be more successful and loses can be reduced and /or minimized.

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Appendix a

Information Sorted by Egyptian Governorates(9 Selected Governorates). (IC DSS, May 1995)(CAPMAS) Information Center

Governorate	Information Type	Information Title	Data
Cairo	Tactical	Hospitals	
	Operational	No. of Hospitals	100
	Operational	No. of Beds	9288
	Operational	No. of Doctors	12843
	Operational	Bed per Citizen	749
	Operational	Doctor per Citizen	542
	Operational	Ambulances per Citizen	107 per 1000
	Tactical	Fire Agency	
	Operational	No. of Vehicles	115
	Operational	No. of Centers	75
	Operational	Car per Citizen	35 per 1000
	Tactical	Bakery	
	Operational	No. of Bakeries	1768
	Operational	Bakery per Citizen	3.93 per 1000
	Tactical	Buildings	
	Operational	Mosques	2282
	Operational	Church	165

Governorate	Information Type	Information Title	Data
	Operational	Cultural Buildings (Cinema, Theater. .etc.)	78
	Operational	Hotels	99
	Operational	No. of Rooms	12893
	Operational	No. of Universities	39
	Operational	No. of Institute	10
	Operational	No. of School Class	41625
	Operational	No. of School Students	1743739
	Operational	Student per Class	41.89
	Strategic	Infra- structure	
	Tactical	Sanitation	
	Operational	Produced Potable Water	4200 per 1000 m2/ day
	Tactical	Electricity	
	Operational	Consumed Electricity	8309 million K.W.H
	Tactical	Utility	
	Operational	Capacity	3000 m2/day
	Tactical	Transportation	
	Operational	Total Roads length	5200 km

Governorate	Information Type	Information Title	Data
	Tactical	Communication	
	Operational	No. of Telephone Lines	1091212
	Operational	Person perTelephone	6
	Operational	No. of Mail offices	801
	Operational	Person per Office	8683

Governorate	Information Type	Information Title	Data
Alexandria	Tactical	Hospitals	
	Operational	No. of Hospitals	96
	Operational	No. of Beds	10359
	Operational	No. of Doctors	5057
	Operational	Bed per Citizen	331
	Operational	Doctor per Citizen	678
	Operational	Ambulances per Citizen	33 per 1000
	Tactical	Fire Agency	
	Operational	No. of Vehicles	98
	Operational	No. of Centers	40
	Operational	Car per Citizen	20 per 1000
	Tactical	Bakery	
	Operational	No. of Bakeries	1073
	Operational	Bakery per Citizen	3.2 per 1000
	Tactical	Buildings	
	Operational	Mosques	1819
	Operational	Church	36

Governorate	Information Type	Information Title	Data
	Operational	Cultural Buildings (Cinema, Theater. .etc.)	46
	Operational	Hotels	54
	Operational	No. of Rooms	4041
	Operational	No. of Universities	22
	Operational	No. of Institute	3
	Operational	No. of School Classes	18766
	Operational	No. of School Students	850818
	Operational	Student per Class	45.34
	Strategic	Infra- structure	
	Tactical	Sanitation	
	Operational	Produced Potable Water	1702 per 1000 m2/ day
	Tactical	Electricity	
	Operational	Consumed Electricity	1483 million K.W.H
	Tactical	Utility	
	Operational	Capacity	1540 m3/day
	Tactical	Transportation	
	Operational	Total Roads length	855 km

Governorate	Information Type	Information Title	Data
	Tactical	Communication	
	Operational	No. of Telephone Lines	409132
	Operational	Person per Telephone	8
	Operational	No. of Mail offices	112
	Operational	Person per Office	30634

Governorate	Information Type	Information Title	Data
El Bahra	Tactical	Hospitals	
	Operational	No. of Hospitals	71
	Operational	No. of Beds	3546
	Operational	No. of Doctors	2266
	Operational	Bed per Citizen	1120
	Operational	Doctor per Citizen	1753
	Operational	Ambulances per Citizen	54 per 1000
	Tactical	Fire Agency	
	Operational	No. of Vehicles	95
	Operational	No. of Centers	50
	Operational	Car per Citizen	46 per 1000
	Tactical	Bakery	
	Operational	No. of Bakeries	312
	Operational	Bakery per Citizen	12.7 per 1000
	Tactical	Buildings	
	Operational	Mosques	3687
	Operational	Church	36

Governorate	Information Type	Information Title	Data
	Operational	Cultural Buildings (Cinema, Theater. .etc.)	33
	Operational	Hotels	17
	Operational	No. of Rooms	295
	Operational	No. of Universities	6
	Operational	No. of Institute	1
	Operational	No. of School Classes	23376
	Operational	No. of School Students	993959
	Operational	Student per Class	42.52
	Strategic	Infra- structure	
	Tactical	Sanitation	
	Operational	Produced Potable Water	305 m3/ day
	Tactical	Electricity	
	Operational	Consumed Electricity	1368 million K.W.H
	Tactical	Utility	
	Operational	Capacity	207 thousand m3/day
	Tactical	Transportation	
	Operational	Total Roads length	2263 km

Governorate	Information Type	Information Title	Data
	Tactical	Communication	
	Operational	No. of Telephone Lines	79862
	Operational	Person per Telephone	50
	Operational	No. of Mail offices	502
	Operational	Person per Office	7914

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Governorate	Information Type	Information Title	Data
Kafr El Shekh	Tactical	Hospitals	
	Operational	No. of Hospitals	36
	Operational	No. of Beds	2423
	Operational	No. of Doctors	1032
	Operational	Bed per Citizen	935
	Operational	Doctor per Citizen	2196
	Operational	Ambulances per Citizen	81 per 1000
	Tactical	Fire Agency	
	Operational	No. of Vehicles	76
	Operational	No. of Centers	28
	Operational	Car per Citizen	30 per 1000
	Tactical	Bakery	
	Operational	No. of Bakeries	154
	Operational	Bakery per Citizen	14.7 per 1000
	Tactical	Buildings	
	Operational	Mosques	2353
	Operational	Church	11

Governorate	Information Type	Information Title	Data
	Operational	Cultural Buildings (Cinema, Theater. .etc.)	20
	Operational	Hotels	2
	Operational	No. of Rooms	62
	Operational	No. of Universities	7
	Operational	No. of Institute	1
	Operational	No. of School Classes	13821
	Operational	No. of School Students	543154
	Operational	Student per Class	39.3
	Strategic	Infra- structure	
	Tactical	Sanitation	
	Operational	Produced Potable Water	408 per 1000m3/ day
	Tactical	Electricity	
	Operational	Consumed Electricity	509 million K.W.H
	Tactical	Utility	
	Operational	Capacity	436 thousand m3/day
	Tactical	Transportation	
	Operational	Total Roads length	2091 km

Governorate	Information Type	Information Title	Data
	Tactical	Communication	
	Operational	No. of Telephone Lines	82310
	Operational	Person per Telephone	28
	Operational	No. of Mail offices	90
	Operational	Person per Office	25178

Governorate	Information Type	Information Title	Data
El Garbih	Tactical	Hospitals	
	Operational	No. of Hospitals	93
	Operational	No. of Beds	6835
	Operational	No. of Doctors	3261
	Operational	Bed per Citizen	503
	Operational	Doctor per Citizen	1054
	Operational	Ambulances per Citizen	55 per 1000
	Tactical	Fire Agency	
	Operational	No of Vehicles	93
	Operational	No of Centers	41
	Operational	Car per Citizen	40 per 1000
	Tactical	Bakery	
	Operational	No. of Bakeries	429
	Operational	Bakery per Citizen	8.01 per 1000
	Tactical	Buildings	
	Operational	Mosques	2800
	Operational	Church	36

Governorate	Information Type	Information Title	Data
	Operational	Cultural Buildings (Cinema, Theater. .etc.)	12
	Operational	Hotels	3
	Operational	No. of Rooms	109
	Operational	No. of Universities	14
	Operational	No. of Institute	3
	Operational	No. of School Classes	21778
	Operational	No. of School Students	888270
	Operational	Student per Class	40.79
	Strategic	Infra- structure	
	Tactical	Sanitation	
	Operational	Produced Potable Water	521 per 1000 m3/ day
	Tactical	Electricity	
	Operational	Consumed Electricity	1231 million K.W.H
	Tactical	Utility	
	Operational	Capacity	154 thousand m3/day
	Tactical	Transportation	
	Operational	Total Roads length	732 km

Governorate	Information Type	Information Title	Data
	Tactical	Communication	
	Operational	No. of Telephone Lines	114504
	Operational	Person per Telephone	30
	Operational	No. of Mail offices	485
	Operational	Person per Office	7087

Governorate	Information Type	Information Title	Data
El Monofia	Tactical	Hospitals	
	Operational	No. of Hospitals	72
	Operational	No. of Beds	3410
	Operational	No. of Doctors	1520
	Operational	Bed per Citizen	791
	Operational	Doctor per Citizen	1758
	Operational	Ambulances per Citizen	81 per 1000
	Tactical	Fire Agency	
	Operational	No. of Vehicles	4
	Operational	No. of Centers	43
	Operational	Car per Citizen	43 per 1000
	Tactical	Bakery	
	Operational	No. of Bakeries	373
	Operational	Bakery per Citizen	7.2 per 1000
	Tactical	Buildings	
	Operational	Mosques	2626
	Operational	Church	35

Governorate	Information Type	Information Title	Data
	Operational	Cultural Buildings (Cinema, Theater. .etc.)	14
	Operational	Hotels	0
	Operational	No. of Rooms	0
	Operational	No. of Universities	11
	Operational	No. of Institute	3
	Operational	No. of School Classes	18238
	Operational	No. of School Students	741049
	Operational	Student per Class	40.63
	Strategic	Infra- structure	
	Tactical	Sanitation	
	Operational	Produced Potable Water	189 1000m3/ day
	Tactical	Electricity	
	Operational	Consumed Electricity	614 million K.W.H
	Tactical	Utility	
	Operational	Capacity	54 thousand m3/day
	Tactical	Transportation	
	Operational	Total Roads length	1340 km

Governorate	Information Type	Information Title	Data
	Tactical	Communication	
	Operational	No. of Telephone Lines	84734
	Operational	Person per Telephone	32
	Operational	No. of Mail offices	339
	Operational	Person per Office	7882

Governorate	Information Type	Information Title	Data
El kalubih	Tactical	Hospitals	
	Operational	No. of Hospitals	55
	Operational	No. of Beds	7568
	Operational	No. of Doctors	1506
	Operational	Bed per Citizen	402
	Operational	Doctor per Citizen	2022
	Operational	Ambulances per Citizen	33 per 1000
	Tactical	Fire Agency	
	Operational	No of Vehicles	15
	Operational	No of Centers	18
	Operational	Car per Citizen	66 per 1000
	Tactical	Bakery	
	Operational	No. of Bakeries	556
	Operational	Bakery per Citizen	5.5 per 1000
	Tactical	Buildings	
	Operational	Mosques	2512
	Operational	Church	37

Governorate	Information Type	Information Title	Data
	Operational	Cultural Buildings (Cinema, Theater. .etc.)	18
	Operational	Hotels	26
	Operational	No. of Rooms	70
	Operational	No. of Universities	9
	Operational	No. of Institute	3
	Operational	No. of School Classes	17277
	Operational	No. of School Students	777843
	Operational	Class per Student	45.02
	Strategic	Infra- structure	
	Tactical	Sanitation	
	Operational	Produced Potable Water	65 1000 m3/ day
	Tactical	Electricity	
	Operational	Consumed Electricity	1483 million K.W.H
	Tactical	Utility	
	Operational	Capacity	44 thousand m3/day
	Tactical	Transportation	
	Operational	Total Roads length	1302 km
	Tactical	Communication	

Governorate	Information Type	Information Title	Data
	Operational	No. of Telephone Lines	94709
	Operational	Person per Telephone	32
	Operational	No. of Mail offices	234
	Operational	Person per Office	13013

Governorate	Information Type	Information Title	Data
El Sharkih	Tactical	Hospitals	
	Operational	No. of Hospitals	69
	Operational	No. of Beds	3509
	Operational	No. of Doctors	1650
	Operational	Bed per Citizen	1203
	Operational	Doctor per Citizen	2558
	Operational	Ambulances per Citizen	59 per 1000
	Tactical	Fire Agency	
	Operational	No. of Vehicles	88
	Operational	No. of Centers	35
	Operational	Car per Citizen	66 per 1000
	Tactical	Bakery	
	Operational	No. of Bakeries	404
	Operational	Bakery per Citizen	10.4 per 1000
	Tactical	Buildings	
	Operational	Mosques	4524
	Operational	Church	43

Governorate	Information Type	Information Title	Data
	Operational	Cultural Buildings (Cinema, Theater. .etc.)	20
	Operational	Hotels	6
	Operational	No. of Rooms	137
	Operational	No. of Universities	20
	Operational	No. of Institute	2
	Operational	No. of School Classes	24585
	Operational	No. of School Students	1013063
	Operational	Student per Class	41.21
	Strategic	Infra- structure	
	Tactical	Sanitation	
	Operational	Produced Potable Water	346 1000 m3/ day
	Tactical	Electricity	
	Operational	Consumed Electricity	973 million K.W.H
	Tactical	Utility	
	Operational	Capacity	207 thousand m3/day
	Tactical	Transportation	
	Operational	Total Roads length	1781 km
	Tactical	Communication	

Governorate	Information Type	Information Title	Data
	Operational	No. of Telephone Lines	102668
	Operational	Person per Telephone	41
	Operational	No. of Mail offices	594
	Operational	Person per Office	7104

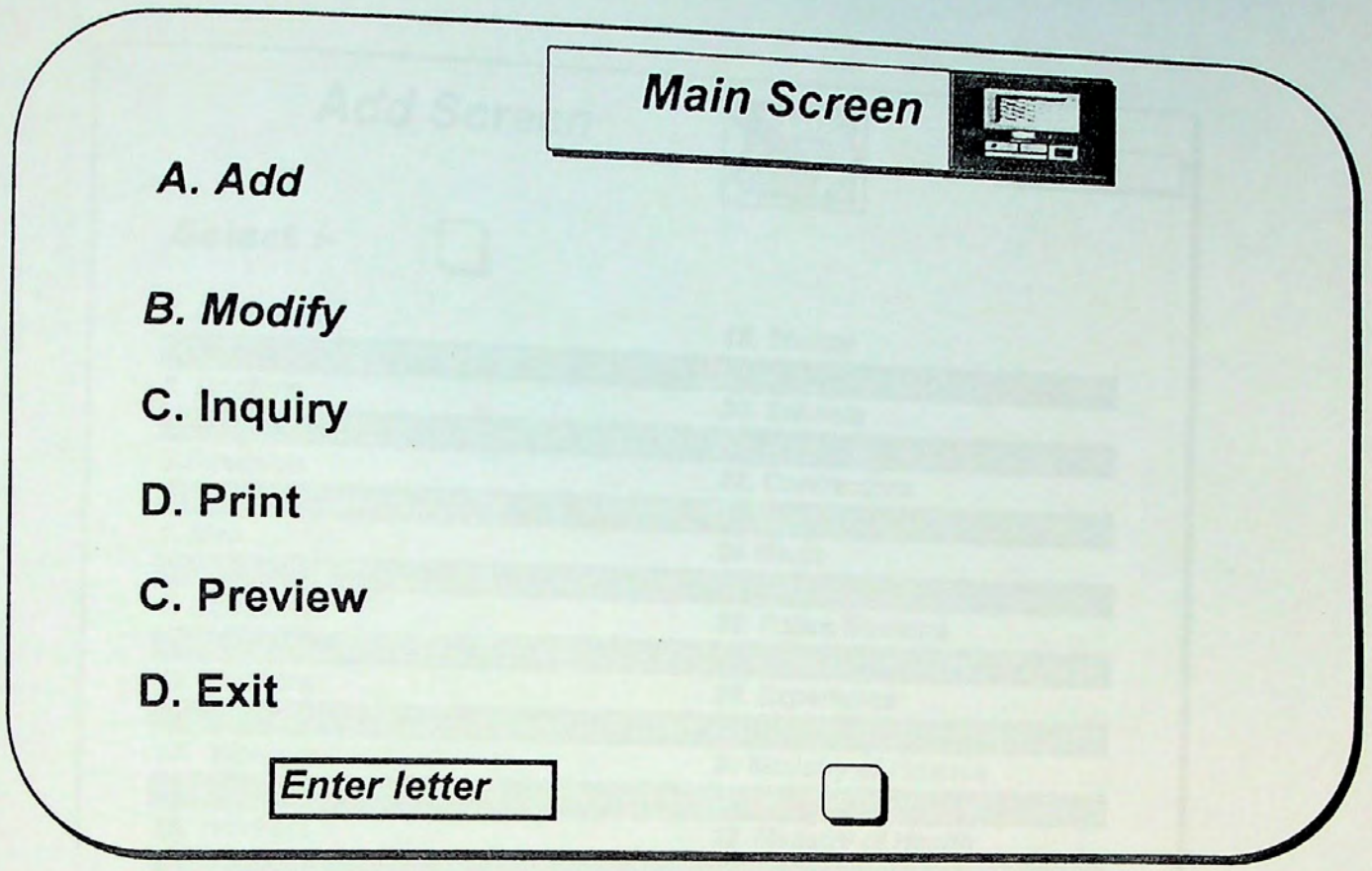
Governorate	Information Type	Information Title	Data
El Dakahlih	Tactical	Hospitals	
	Operational	No. of Hospitals	106
	Operational	No. of Beds	4624
	Operational	No. of Doctors	4730
	Operational	Bed per Citizen	914
	Operational	Doctor per Citizen	893
	Operational	Ambulances per Citizen	56 per 1000
	Tactical	Fire Agency	
	Operational	No. of Vehicles	79
	Operational	No. of Centers	36
	Operational	Car per Citizen	80 per 1000
	Tactical	Bakery	
	Operational	No. of Bakeries	339
	Operational	Bakery per Citizen	12.5 per 1000
	Tactical	Buildings	
	Operational	Mosques	3982
	Operational	Church	31

Governorate	Information Type	Information Title	Data
	Operational	Cultural Buildings (Cinema, Theater. .etc.)	37
	Operational	Hotels	8
	Operational	No. of Rooms	462
	Operational	No. of Universities	20
	Operational	No. of Institute	2
	Operational	No. of School Classes	30276
	Operational	No. of School Students	1199676
	Operational	Student per Class	39.62
	Strategic	Infra- structure	
	Tactical	Sanitation	
	Operational	Produced Potable Water	574 1000 m3/ day
	Tactical	Electricity	
	Operational	Consumed Electricity	1373 million K.W.H
	Tactical	Utility	
	Operational	Capacity	136 thousand m3/day
	Tactical	Transportation	
	Operational	Total Roads length	1061 km

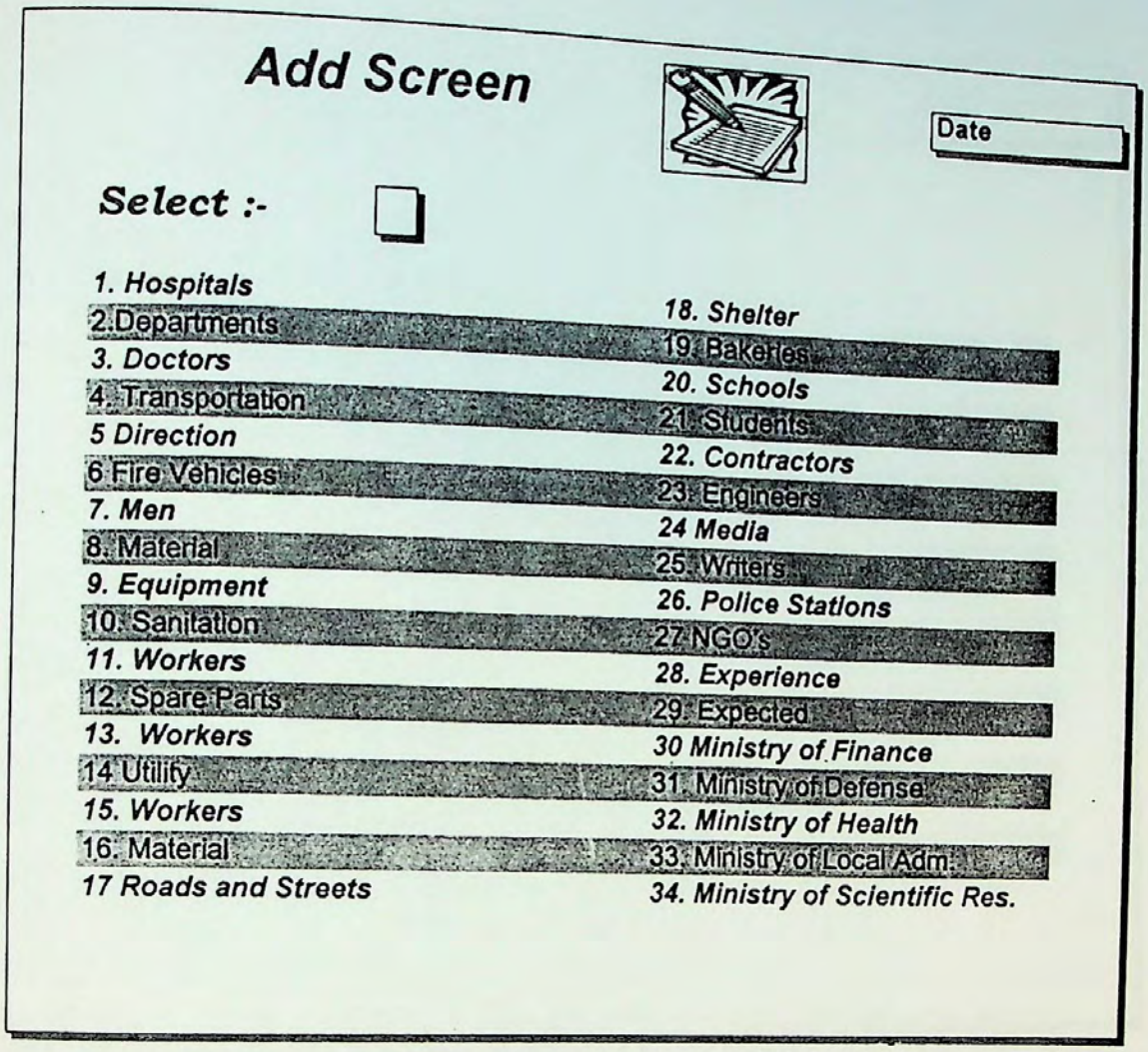
Governorate	Information Type	Information Title	Data
	Tactical	Communication	
	Operational	No. of Telephone Lines	148281
	Operational	Person per Telephone	28
	Operational	No. of Mail offices	456
	Operational	Person per Office	9268

Source: (IC DSS, May 1995) and
(CAPMAS) Information Center.

Appendix b



Screen(1) The Main Screen of The Database



Screen (2) The Add Screen of The Database

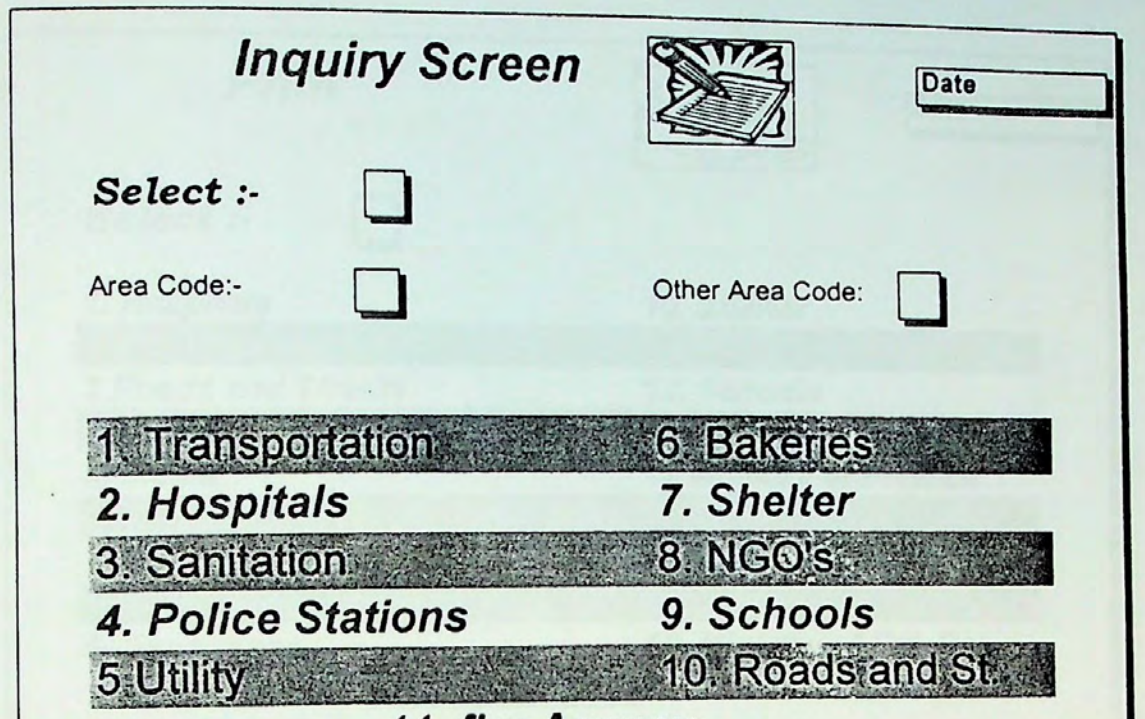
Modify Screen

Date

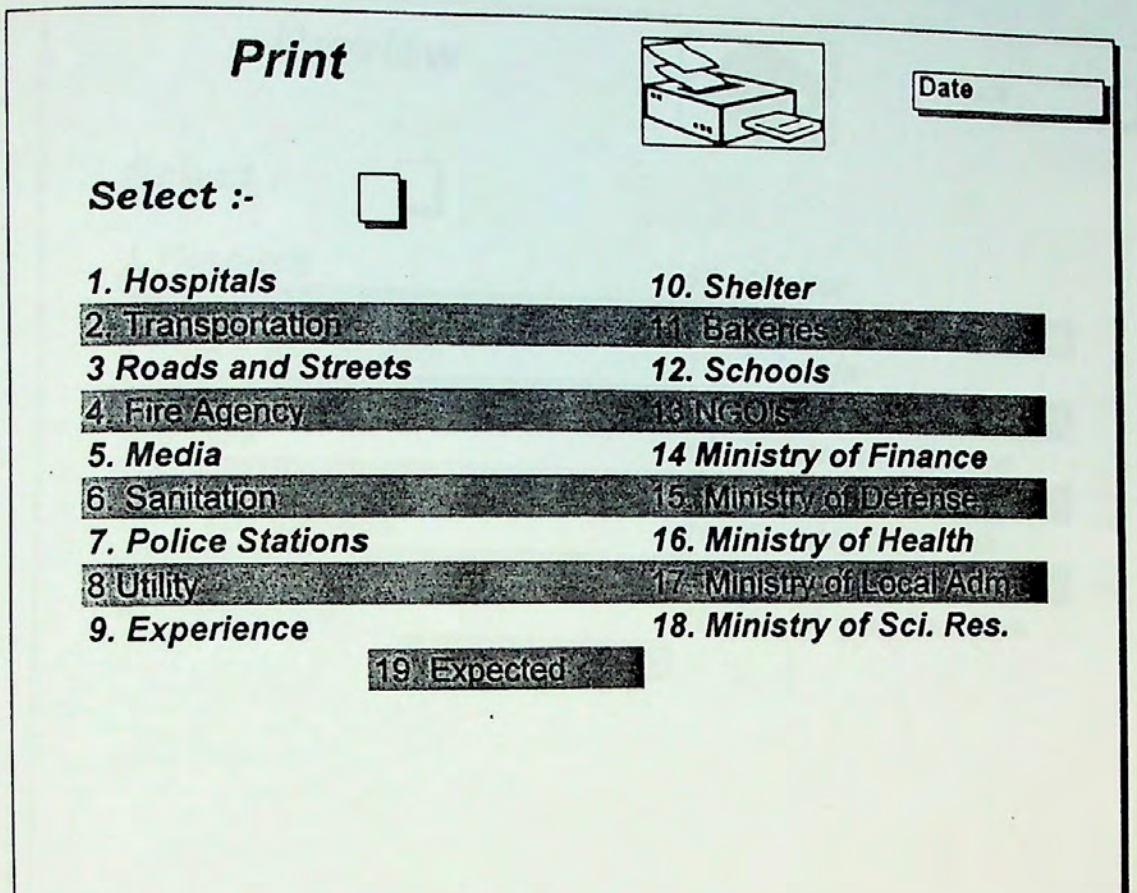
Select :-

1. Hospitals	18. Shelter
2.Departments	19. Bakeries
3. Doctors	20. Schools
4. Transportation	21. Students
5 Direction	22. Contractors
6 Fire Vehicles	23. Engineers
7. Men	24 Media
8. Material	25. Writers
9. Equipment	26. Police Stations
10. Sanitation	27 NGO's
11. Workers	28. Experience
12. Spare Parts	29. Expected
13. Workers	30 Ministry of Finance
14 Utility	31. Ministry of Defense
15. Workers	32. Ministry of Health
16. Material	33. Ministry of Local Adm.
17 Roads and Streets	34. Ministry of Scientific Res.

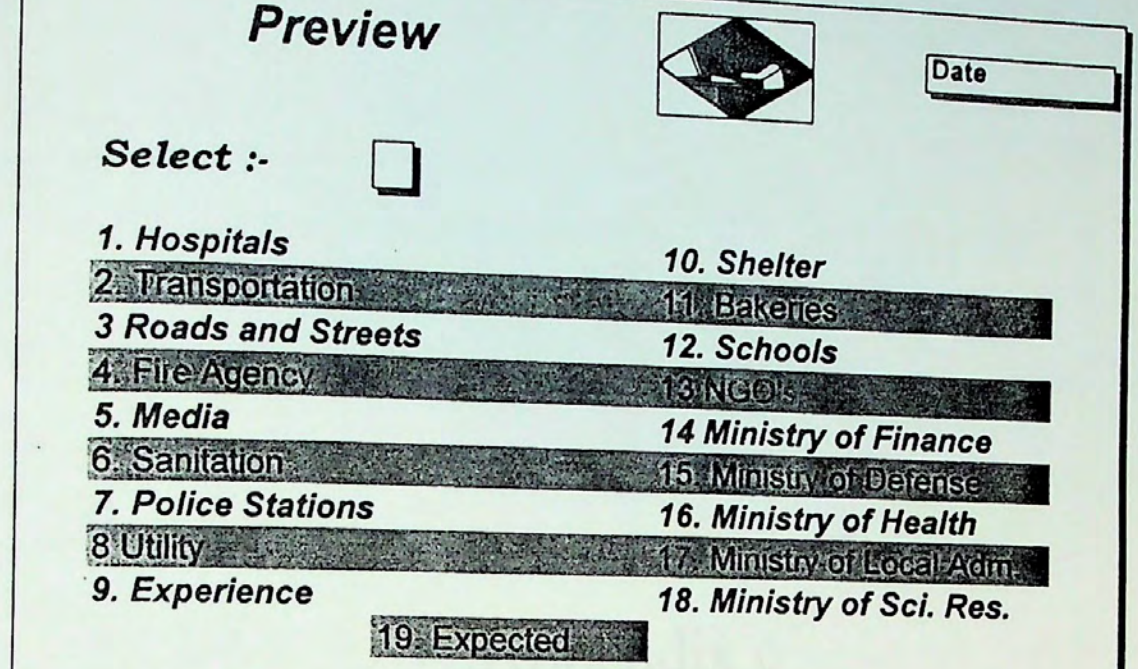
Screen (3) The Modify Screen ofThe Database



Screen (4) The Inquiry Screen of The Database



Screen (5) The Print Screen of The Database



Screen (6) The Preview Screen of The Database

Appendix c

This System will Support with Suggestions

In order to overcome

this ***Earthquake Crisis***

Please: Answer the following questions

Question 1

What was the Earthquake Strength?

A) High: above 7 Richter

B) Medium: Between 4 Richter- 7 Richter

C) Low: Less than 4 Richter

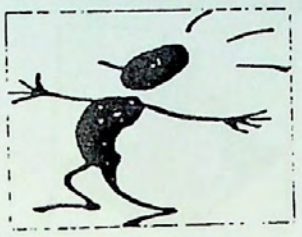
Please: Choose A,B,or C

Screen (7) The First Question of the Expert System.

This System will Support with Suggestions

In order to overcome

this **Earthquake Crisis**



Please Answer this Question

Describe the Existing Situation *(i.e.availability of resources)*

A) High (no resources, no information)

B) Medium (available resources, no experience, no clear information)

C) Low (available resources, clear vision)

Please: Choose A,B,or C ☐

Screen (8) The Second Question of the Expert System.

This System will Support with Suggestions

In order to overcome

this Earthquake Crisis

Please Answer this Question

What is the impact of this crisis on the human life and economic life ?

A) High

B) Medium

C) Low

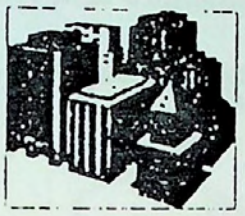
Please: Choose A,B,or C

Screen (9) The Third Question of the Expert System.

This System will Support with Suggestions

In order to overcome

this Earthquake Crisis



Please Answer this Question

Where are the Major Damages?

A) The Whole Country

B) Some Places

C) Remote Areas

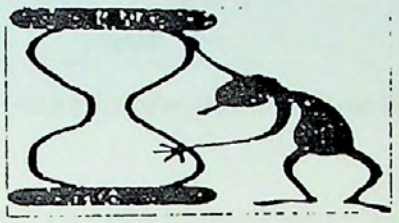
Please: Choose A,B,or C ☐

Screen (10) The Fourth Question of the Expert System.

This System will Support with Suggestions

In order to overcome

this [illegible]



Please Answer this Question

For how long did the earthquake last?

A) High (more than 60 sec.)

B) Medium (between 30 sec. to 60 sec.)

C) Low (Less than 30 sec.)

Please: Choose A,B,or C ⌟

Screen (11) The Fifth Question of the Expert System.

Recommendations

This crisis is the worst case, Please follow these instructions

1 *Define carefully the affected areas and the numbers of victims*

2 *Send messages to potential volunteers,*

disaster workers, official workers and community leaders

3 *Make statements to media*

4 *Define shelters and food camps locations*

5 *Contact other agencies: hospitals, fire Agencies...etc.*

6 *Manage Official and non official fund*

7 *Prepare follow up reports to different agencies*

Screen (12) The Recommendations of the Expert System.