# DECISION SUPPORT SYSTEM FOR DISASTER MANAGEMENT PROPOSED CONCEPTUAL FRAMEWORK

**[1]MAHA ALKHAFFAF, [2]FARIS ABUJAMOUS**

World Islamic Sciences University, Hashemite University

**Abstract** - The world has begun to look for ways to respond to disasters since their obvious impact on all aspects of life. Hence, the use of decision support systems is one of the most important ways to deal with the complexity and uncertainty of the circumstances surrounding disasters. Decision support systems are the way to deal with the complexity of hiring skilled personnel. To reduce operational constraints such as workload and availability of resources, these constraints make it more difficult to identify tasks in a timely manner and to respond to conditions quickly and effectively, thereby increasing losses from Disasters, as well as damage to the reputation of disaster management organizations. This paper therefore proposes a decision support system for disaster response.

**Keywords** - Decision Support System, Disaster Management

## I. INTRODUCTION

There are four stages of disaster management: mitigation, preparedness, response and recovery. The disaster response phase includes a range of activities such as implementation of plans, establishment of command centers and shelters, and provision of all necessary emergency services [1]. At this stage, critical activities must be scheduled and sequenced. The appropriate staff must be appointed in a timely manner to reduce the accumulation of negative impacts Although the recovery phase (including cleaning, infrastructure repair and replacement, and continued provision for IDPs [1] may be slower, the need for efficiency and effectiveness is equally important.

Hence the importance of preparation and all the details of disasters. However, once the actual disaster has occurred, managers at the site must develop complex responses within a limited time frame without referring to their top managers.

As a result, the more difficult the disaster becomes, the greater the need for managers to adapt to the development of the situation. It is important to plan from the local response staff from the outset rather than using a "top-down" Based on the role of senior managers away from the disaster scene, and thus this paper will address the resource-limited scheduling of disaster response and recovery using the decision support system In this paper we will identify the decision support systems and their role in disaster management where the parts of the study will be updated to be as follows

1. To define the decision support system in a procedural definition and then to differentiate it from other types of information systems
2. Identify the life cycle of the disaster and divide it by types of continents: strategy, tactical and operational
3. Drawing illustration of some previous studies that dealt with the role of decision support systems in natural disasters and others, and then come up with a summary of these systems and possible future studies in this area.

## II. BACKGROUND AND LITERATURE REVIEW

**Role of decision support system in disaster management:**

Many of the previous studies on disaster management have identified the importance of their decision support system, focusing on disaster response and recovery as well as the need for proper sequencing, as well as the recognition of scarce resource constraints.

In its beginnings, disaster management research has focused on the use of management science tools in three aspects: facilities, sites and emergency equipment. Brown and [7] developed a decision support system that dealt with methods for assigning tasks in post-disaster relief efforts. In time, however, Kolesar [26] propose a mathematical programming model and a guiding algorithm to address the location of fire engines in the city New York. In recent studies, studies focus on recognizing the need to plan emergency response rather than reactionary response, Mendonca et al [30] It was suggested to use decision support systems in disaster management. Brysson et al. [9] mass his thinking in using Group Decision support System(GDSS) by developing the problem of selecting a sub-schema (a limited part of the disaster recovery planning process) using mathematical programming and discussing the phases (or objectives) of this system that can be applied under different disaster conditions or timing. In disaster management studies and modern decision support systems, Liu and Chao [29] examine disaster management from the perspective of the facility's

location. A logistics relief network consisting of relief suppliers, relief distribution centers and relief demand areas. Where a multi-objective approach was proposed to respond quickly to relief requirements. Balcik and Beamon [3] suggested that software be developed for the location of the facility and the pre-treatment of stocks to enable disaster relief. Their model allows organizations to understand the ability to respond, and make adjustments to their operations as discussed by Özdamar Wei [33] sending the car to disaster relief planning. They proposed a mathematical model, a procedure for resolution, and then showed it to problems that were randomly generated on networks.

## III. WHAT IS THE DECISION SUPPORT SYSTEM?

The decision support system is defined as a computer-based interactive information system, like Management information systems, which also serves at the enterprise management level. However, unlike MIS (which processes data), it processes information to support the decision-making process of managers. Provides middle managers with information that enables them to make smart decisions. Hence, this system consists of

1 .Decision support system database
2 .Decision support system software, which includes a variety of models, each model performs a specific function. Forms selection depends on user requirements and DSS purposes. DSS contains predefined models (or procedures) that use new models that can be used to support a particular type of decision.
3. DSS User Interface: An interactive graphical interface that makes interaction easier between the decision support system and its users. This component of the Decision Support System displays the results of system analysis in different formats, such as text, table, charts, or graphics. The user can select the appropriate option to display the output according to its requirements.

The current decision-making system, which is available on the market, has the advantages of disaster management. It provides the ability to benefit from the interaction between the user and the system, and can be designed to suit the purpose for which it was created.

## IV. DISASTER MANAGEMENT

The executive director of disaster management institutions typically wants to present comparative disaster data in tabular form, while the disaster management team that creates a design plan would like to view the results of the analysis in the form of graphs. The current decision support system provides the day created with the web-based interface for its users some special capabilities such as better interaction, customization, and ease of use.
The Management Decision Support System (DSS) deals with other external actors in disaster management

1. Director of Disaster Management
2 .Disaster response environment

As mentioned in the components of the Decision Support System, the part responsible for the environment and in our case (related to the disaster) is located in the database, and is usually in the database all useful data related to the disaster such as weather factors or what resources are available to help solve mitigating the impact of the disaster.

The decision support system provides analytical statistical tools to deal with these data to provide useful information to help make the appropriate decision. As for the second component of the decision support system is the software and models, in the case of disaster management, these models provide solutions that are usually unclear or known to people. The models provide solutions that are usually unclear or known to ordinary people or managers. The system analyzes the available alternatives and offers them a differentiation to provide with the best alternative.

The last component is the user interface, in the case of disaster management, it provides the interface between the Director of Disaster Management and the rest of the components of the decision support system (DSS)

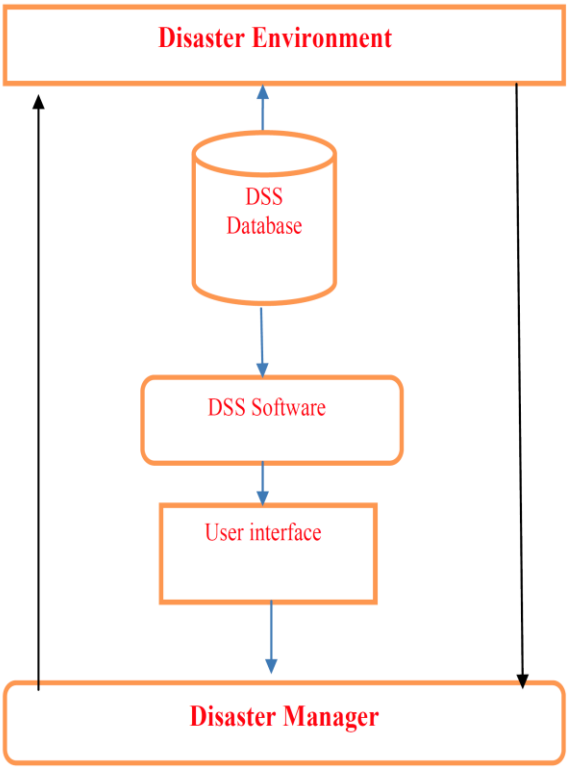
When a user requests the data from the Database, the data is presented via the user interface. The third component, the models and the software, organizes the important, useful, and relevant data only in the disaster to expose the user to the user.

The DSS components are integrated with each other. Some users only have to choose the best model for them, identify the appropriate data and leave the rest of the work to the system alone to provide the best alternative to solve the problem.

Fig 1 illustrates the components of the decision support system for disaster management. The decision support system contains an important component, which is the user interface, which provides the DIALOG, which specifies the data that the manager may need, and clarifies and controls the responsible component, which is responsible for explaining and controlling the relationship between the user and the rest of the system functions. Inputs and Programs Outputs: Input programs are responsible for control

and control of the table of contents. Output programs are responsible for displaying data either on graphics or tables.

One of the most important features of this component of the decision support system is the ability to present information clearly to be understood by the manager to deal with it easily and have a response to solve the disaster in which the time factor plays a major role to recover from the losses of the disaster




**Fig(1) DSS Components for Disaster Management**

### DSS Features

1. The decision support system is designed to support managers to deal with unstructured (non-recurring) problems that come suddenly and compulsively
2. This system came in line with modern technology, which plays an important role in solving many problems, including disaster management
3. This system is interactive and provides the user with easy ways to deal with the system
4. The system can deal with non-routine problems while providing solutions that illustrate the sequence of factors and conditions to solve complex problems
5. This system is based on the decision-making problems of individuals (individuals) concerning the personal aspects of individuals, which may be carried out by individuals (in humans) in some cases biased to one alternative without another and without scientific justification.

## V.MANAGEMENT INFORMATION SYSTEM FEATURES

Management information systems are distinguished from the administrative decision support system as follows:

1. Information systems focus more on data processing and structured problems as these systems deal more with routine, functional and functional data that helps in the organization's functions such as accounting, finance, marketing, etc.
2. Information systems provide timely reports as well as some mandatory reports
3. Information systems can deal with data on internal processes in organizations

It is clear from the advantages of both the decision support system and the advantages of other systems. The decision support system is more specialized in the unstructured problems of disaster management

### Disaster Management

**FEMA has classified disaster management into four phases**

1. The stage prior to preparation for emergency management, in which programs and policies are put in place to minimize the impact of risks
2. The preparatory phase, which includes training for organizational response, identification of resources required for disaster management, and inventory management of these resources to be used in case of emergency
3. Immediate response to emergencies, which includes assessment of the situation and the situation surrounding the disaster and identify important resources and critical and then control and control.
4. Post-disaster response and long-term coverage

**Each of these stages has specific needs of information**

Few researchers presents the disaster management requirements provided by the management decision support system

**1. Preparedness**

• Identify what is available in stores of resources required to respond to an emergency and determine where to store it

• What scenarios are available to train the Emergency Emergencies Center?

• What are the costs and dimensions of tables for disaster preparedness policies here and when using What If Analysis? Sensitivity analysis, which is

characterized by the decision support system that it is possible to determine policies and the cost of preparing for disasters with high accuracy.

**2. Mitigation**

• What is the nature of the hazard and how likely this risk is, and then who are likely to be affected by those risks or which geographical areas are affected by such risks

• What are the potential costs of risks and what are the time pressures surrounding the disaster

What is the significance of the time factor in responding to the disaster? The decision support system plays an effective role by using sensitivity analysis and What If Analysis to determine the costs and time pressures of responding to the disaster

• What alternatives are available to mitigate the effects of the disaster and what are the effects and outcomes of these alternatives? The main advantage of the decision support system is to help the manager identify the alternatives available to solve the problem and then determine what is the best alternative to solve the problem and mitigate the effects of the disaster.

**3. Emergency Response**

• Does the emergency center follow new and pilot procedures and what is the degree and capacity of this center to move and move?

Users of the decision support system can apply innovative ideas, particularly in terms of mobility and mobility. By integrating and using one of the components of the decision support system, OLAP can be used to provide opportunities for mobility, Through the Internet for disaster management. What inventory is available to cover the disaster? What resources are available and what are their storage locations The decision support system provides easy solutions to difficult questions by providing information that was in the form of data stored in the database - the first component of the decision support system - and then processed to serve one goal - inventory management3 What information is required, what information should be communicated to those responsible, and what guidance is required in response to disasters Information systems play an important role in providing accurate, timely and relevant health information. All these information specifications make it important and useful to use information systems, in particular systems of support Decision to respond to the above questions.

What are the institutions other than the Central Emergency Organization that can assist in rescue operations and contribute to solving problems and disasters, and what is the possibility of assessing the necessary requirements for disaster response and then which legislative institutions are responsible for developing disaster response instructions and identifying Disaster and responsible for responding to it.

The decision support system, with its advantages and components such as data mining, enables access to important and hard-to-access information using this technology. The decision support system also provides other tools such as OLAP or even the use of information systems which facilitates access to the disaster area at the required speed. The decision support system is capable of using specific techniques to locate the most qualified cadres to reach the scene of the disaster as quickly as possible.

**4. Recovery**

- Who are the population and geographical areas affected by the disaster and what is the area of destruction
- What levels of destruction are occurring (weak, medium, strong?)
- What are the duties, responsibilities, budget and schedules of work programs to recover from this destruction?
- The question here (if all of this is true)
- What is the state of recovery projects that deal with these trends? How safe is safe enough
- What is the degree of safety with regard to changing the nature of preparedness policies, and what if we follow this preparedness plan, what alternatives are offered and what are their results?
- What assessment procedures are being initiated and what are vital points in the disaster-affected country

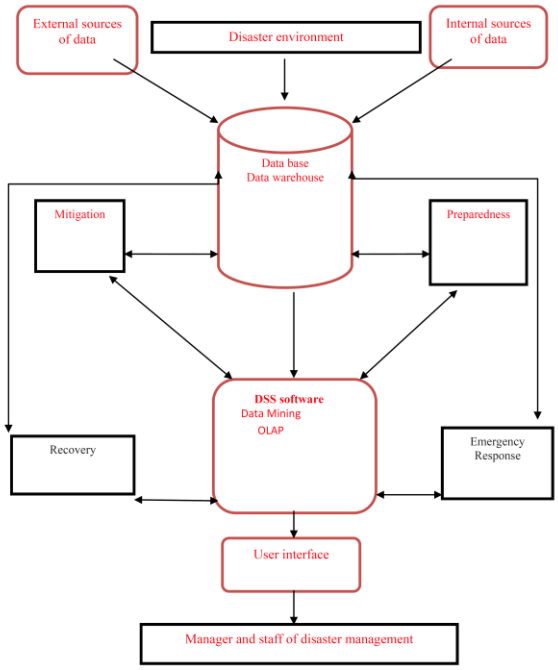
## VI.PRACTICAL FRAMWORK FOR THE USE OF THE DECISION SUPPORT SYSTEM IN DISASTER MANAGEMENT

Practical framework for the use of the decision support system in disaster management

Figure 2 shows how the components of the decision support system are used to support disaster management in four of its core phases and shows how the components of the decision support system play an active role in each of these stages

Each of the components of the decision support system is characterized by the addition of disaster management staff and managers, and can be used as a guide to the application of the technology of decision support system in disaster management in all components.

The decision support system consists of three components, the boss plus the end user. The following part of this research paper describes the use of each component of the decision support system and its importance in supporting




**Fig(2) DSS framework for disaster management**

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