

Framework to Establish Disaster Prevention Information System

Kook-Hee Han*, Young-Jik Kwon**

*Dept. of Fire Protecting Information Technology, Kyungil Univ., khhan@kiu.ac.kr

**School of Computer·IT Engineering, Daegu Univ., yjkwon@daegu.ac.kr

Abstract - *The disaster prevention information system is to comprehensively support information collection, processing, search and supply in disaster counter measuring activities, as well as to manage information mainly related to natural disasters unilaterally. Building an optimal system in adequate consideration of features and demands in terms of disaster prevention is requested.*

Suitable infrastructure that can support information technology (IT) in various aspects should be established in order to utilize IT effectively in disaster prevention information. In addition, accuracy, reliability and efficiency as a disaster prevention information system should be equipped with. In this study, a basic framework for the establishment of disaster prevention information system is presented.

Keywords: Disaster, Disaster Prevention, Information System.

1 Introduction

With the drastic change of climate following the global warming and urbanization, there is a growing trend of natural disasters and human-caused disasters, including the subway disaster incident, but the systematic management of advanced country level is yet to be established.

Through the analysis, monitoring and other management on various risk factors that may interfere to the national safety from natural disaster, human caused disaster and others, the factors for natural disaster and human caused disaster are eliminated as much as possible by structuring the foundation for the preventive information system in a way of advance prevention on risk factors of various natural disaster, human caused disaster, fire and others, and when situation arises, the disaster prevention information system is structured to make the advance prevention on risk factors, prompt response for emergency, damage recovery and post analysis and evaluation in a way to strive the quality of people's life and protect the property.

However, the reality of disaster prevention management is Korea has the unorganized laws and regulations that caused the difficulty of organizational integration, low status of the human caused disaster management organization, insufficient knowledge management base needed for the disaster management, lack of specialized research organization on human caused disaster management, lack of cooperation system and integrated command system in time of emergency, problem in traditional human caused disaster management organization structure and others that the needs of

preparing for emergency measure are imminent and serious.

In addition, as each disaster prevention institution has its own independent situation room and disaster prevention information system that there is a lack of information sharing at the time of emergency, and due to the lack of information sharing in general administrative information system for disaster prevention management that it has been significant road block for the efficient disaster prevention management. Therefore, there is a need of designating the responsible institution for each function and comprehensive situation management to control and adjust, and in order to structure efficient disaster prevention information system, there is a need of having accuracy, reliability and efficiency of the disaster prevention information system with the foundation of the knowledge infrastructure, the interconnectivity infrastructure and the integration infrastructure[2].

Therefore, this study has presented the basic framework for structuring the efficient disaster prevention information system.

The structure of this thesis is as follows.

Chapter 2 considers the summary of the disaster prevention information system and Chapter 3 considers the infra and features of the disaster prevention information system. In Chapter 4, it presents the framework for structuring the disaster prevention information system with the conclusion in Chapter 5.

2 Theoretical consideration on disaster prevention information system

2.1 Implication and Type of disaster prevention information system

The disaster prevention information system means a system related to the disaster prevention works in information system operated by each administrative institution, that are equivalent to the National Emergency Management Information System) of the US FEMA, 119 Emergency Disaster Prevention Information System, Flood Information System and other information system of Korea that are designed to manage efficiently for human caused disaster and natural disaster[2].

For a representative disaster prevention information system, there are "119 emergency disaster prevention information system" that is undertaken by the Fire Prevention Headquarter of each local government, the "National Safety Management Information System" that the central and MOGAHA undertake jointly, the "Meteorological Information System" that the Korea Meteorological Administration manages and the "Flood Caution and Warning System" that the Ministry of Construction and Transportation manages[6],[7].

2.2 Needs of disaster prevention information system

Korea has its human caused disaster related affairs focused on the post management of situation and the prevention is focused on the inspection basis with private sector and residents to make repair and maintenance that the comprehensive management on disasters is yet to be made for preventive warning, situation disposition, recovery support, analysis and evaluation.

Also, while the disasters have become diversified and complicated for each type, the work coordination for each part of the administration has yet to be completed that there is no effective and organic response to be made at the time of emergency.

Therefore, there is a need of disaster prevention information system to manage entire stages of human caused disaster management.

For disaster prevention management (human caused disaster management and crisis management), the need for information system has become increased following the changes in the social structure for the type of disasters with the enlargement of emergency, complication and mutual dependency and others that the followings are the reasons behind it[5].

First, it reduces the forecasting and responding time on the crisis under the crisis management to enable appropriate preparation and responses. The disaster

prevention information system provides the time for decision makers under the pressure of time, a major attribute of the crisis.

Second, the volume of information that the manager of the crisis is enlarged that the uncertainty in the decision-making is reduced with the increase of alternative to enhance the possibility of reasonable decision-making.

Third, through the various DB and system that organizes the basis of the crisis management information system, the easy access to the specialized knowledge takes the role to expand the variety of knowledge for the crisis management. Forth, the group characteristics in crisis management demand the adjustment within and outside of the group in various fields. The information system enhances the information accessibility among the various interested parties and enables active intents to accelerate the sharing of information.

2.3 Functions and composition of the disaster prevention information system

The disaster prevention information system is based on the computer and communication technology under the crisis situation and, if it is designed and managed in sophisticated manner, it would rationalize the complicated and uncertain decision making under the crisis. In addition, it reduces the forecasting of crisis in crisis management and responsive time to enable appropriate preparation and responses, and it provides the time for decision makers under the pressure of time, a major attribute of the crisis [5].

The disaster prevention information system is a system to collect, store, process and deliver the information of damage and action taken, climate related information and other data, damage site or disaster response situation of each institution, and the following is the organization of it [6].

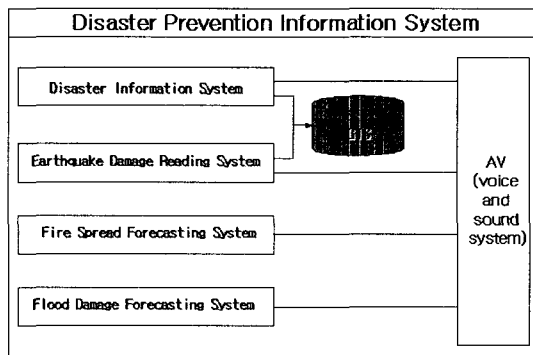


Figure 1. Organization of disaster prevention information system

2.3.1 Natural Disaster Information System

This is the system to collect and process the information related to the natural disaster measures individually collected by each disaster prevention related institution and reflect in the natural disaster measures.

2.3.2 Earthquake Damage Reading System

Immediately after having the great earthquake, for certain hours, the damage situation is completely unknown or insufficient that the Earthquake Damage Reading System finds out the disaster situation from the helicopter to survey the damage area and degree of damage to make prompt and accurate response action.

2.3.3 Fire Spread Forecasting System

This system forecasts the direction of fire in times of earthquake through the fire spread forecasting approach and fire spread interference factor on the situation in downtown, building and others. Through this system, detailed response plan to manage the fire fighting forces efficiently, lead the evacuees and other actions.

2.3.4 Flood Damage Forecasting System

The Flood Damage Forecasting System is a system to utilize in forecasting the flood damage in the river base and low areas from typhoon, intense rainfall and others and utilize in prompt and appropriate response plan including evacuation and others that it is a simulation system to expect the flood damage in 3 hours from the current weather information.

2.3.5 Geography Information System

This is the system to composite with the geography information stored in the DB with the disaster related damage information and others sent from the Damage Information System and the Earthquake Damage Reading System and indicate the attribute information of evacuation place saved in separate DB and others.

2.3.6 AV System

The AV system is to provide the damage and action information, climate information and other disaster information, earthquake damage information from the helicopter and others in visual information, and support the basic functions of the disaster prevention center for information collection, conference, decision, survey, command, and other functions that it is formed with the AV serve system to indicate the disaster information data, screen and others on large screen, indication board serve system to indicate the climate information and others.

3 Infra of disaster prevention information system and the

characteristics of disaster prevention information system

3.1 Infra of disaster prevention information system

For the disaster prevention information system, in order to effectively utilize the information technology, there is a need for infra to support it. The information infra for the disaster prevention information system is largely composed of three elements in knowledge infrastructure, interconnectivity infrastructure and integration infrastructure[8].

First, knowledge infra accumulates, analyzes and utilizes in its sub-structure for disaster related knowledge through the measurement system, information analysis, natural disaster forecasting, natural disaster influence modeling, data and information management that the information outcome is appropriately provided to each of the disaster prevention related institutions, and it can be structured and utilized by the organizations of government institutions, pertinent institutions, private organizations, and NGO.

Second, for interconnectivity infrastructure, this is a sub-structure for helping understanding of information delivery for searching and distributing for data, information outcome and disaster related supply of knowledge, understanding of information provided from the knowledge infrastructure that the current Internet-based network technology undertakes some of the functions.

Third, the integration infrastructure is a sub-structure to adjust and integrate the roles of each institution that it takes the most important role in structuring the efficient information infra.

3.2 Characteristics of disaster prevention information system

In natural disaster and human caused disaster, the disaster prevention information system has significant efficacy in appropriate response, efficient time management (efficient time), reasonable decision making, easy approach to the specialized knowledge and others, and the disaster prevention information system has to contain a few conditions to have this type of efficiency. When the requirements are classified and arrange with the connection of the efficacy of the disaster prevention information system, it shall be as follows[2].

- ◆ Prompt and accuracy of information (responsiveness, accuracy, reproduction, measurability and others)
- ◆ Integrated adjustment (joint use possibility, provision possibility and others)
- ◆ information acquisition and approachability (full monitoring, accurate convenience, cost effective service and others)

First, if the promptness and accuracy are high, the disaster situation is confirmed in real time that it can provide various information on the on-site command with the possible remote commanding, and it may be facilitated as the base data for the accurate damage assessment and impact assessment that it enables for prompt and efficient disaster response activities. Second, if the integrated adjustment is high, the disaster prevention information system of each of the disaster prevention related institution is connected in network to share the information on the human resources and physical resources to enable to structuring of organic cooperation system related to disaster prevention. Lastly, if it has high information acquisition and approachability, the participation in broad fields and various organizations into the crisis management would be promoted. A system with high approachability exchanges the information among the participants, and makes easier adjustment in the disaster prevention management. Therefore, in order to heighten the approachability, the portable features of hardware and software has to be maximized, and in order to relax the bottle-neck phenomenon arising from the flow of information, there has to be the exclusive cable, satellite and wireless network to form[5].

4 Framework for Structuring the disaster prevention information system

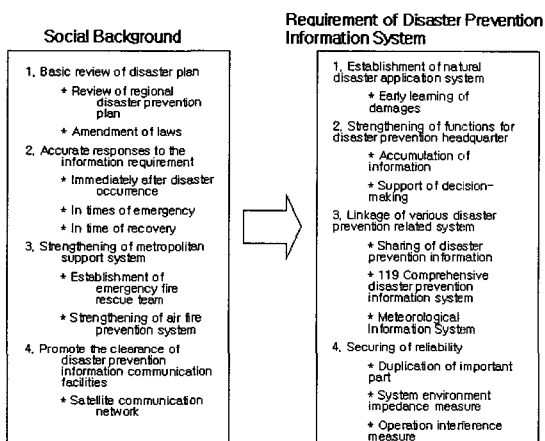


Figure 2. Framework for Structuring the disaster prevention information system

The disaster prevention information system manages the information related to the natural disasters, and at the same time, it comprehensively supports the collection, processing, search and provision of information in the natural disaster measure activities that there is a need of structuring the optimal system that sufficiently considered

the features of disaster prevention and the requirement thereto.

Therefore, the disaster prevention information system for natural disaster and human caused disaster has to secure the significant efficacy in appropriate response, efficient time management (efficient time), reasonable decision making, easy approach to the specialized knowledge and others with the following requirements.

- ◆ information collection enabling the prompt initial response
 - ◆ Broad information exchange beyond the administration system
 - ◆ Effective support by the on-site activities through the mobile phone terminal and others
 - ◆ Delivery of accurate information for residents
 - ◆ Effective support on decision making from the head office
 - ◆ Effective linkage with the relevant institution and relevant system
 - ◆ Introduction of system that meets the regional characteristics
 - ◆ Securing of reliability through the operation in time of natural disaster
 - ◆ Structuring of Web-based comprehensive disaster prevention information system to comprehensively support the information of disaster and natural crisis as well as the basic works in prevention, preparation, and response and recovery stages
 - ◆ Structuring of real time image provision, mobile phone location information server and data recovery system and others for the accident site command in far distance
- The following is the framework for structuring the disaster prevention information system (Figure. 2).

5 Conclusion

The disaster prevention information system has to be structured in comprehensive system to support the information of disaster and natural crisis as well as the basic works in prevention, preparation, response and recovery stages that are appropriate for the local characteristics, and the linked situation management system structuring has to be promoted to enable the comprehensive situation responses to minimize the damage and analyze the information efficiently on the network on central situation room for central government and local government. In addition, With the upgraded interest of people on the safety and management, the system to realize the scientific fire action for fire safety and already structured system thereto is restructured in the Web-based system, and comprehensive response system by the prompt onsite command, cooperation system between the pertinent organizations, and unified fire activity information.

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