A method for synchronizing situation information and providing customized task using the disaster situation management decision support platform

Eun Joo Kim, Sun-Wha Lim, Sang Gi Hong, Kang Bok Lee
Industrial & Personal Safety Intelligence Research Section
Electronics and Telecommunications Research Institute
Daejeon, Korea
{ejkim, limsh, sghong, kblee}@etri.re.kr

***Abstract*—We propose a method for synchronizing situation management information among multiple users using a disaster situation management decision support platform and providing customized contents for each user. Disaster management manager, who utilize the work process-based disaster situation management decision support system, exist in various categories based on the type of disaster and performing organization. These situation managers can create projects within the system to perform their works. In the case where disaster management manager from the same disaster/organization create individual projects, maintaining synchronization for the required items ensures that personalized content is provided while enabling consistent disaster management for the entire situation.**

Keywords— customized disaster situation management, situation information synchronization, decision support system for situation management

I. INTRODUCTION

With the increasing interest in disaster safety, the need to manage central government and local government disaster safety information systems, which are operated separately by disaster type and performing agency, is growing to reduce duplication and save national budget. Distributed management can lead to duplication of responses to disasters or the establishment of an inconsistent command system, highlighting the necessity of providing disaster situation management services based on a unified platform.

Those responsible for providing disaster situation management services require adaptation to new tasks whenever they change positions or organizations. To reduce the burden, time, and costs associated with this, it is necessary to provide a user-customized content providing method that provides a visualization screen for individual task management so as to reduce work confusion and provide know-how of previous manager.

Furthermore, disaster situation managers propagate situations and carry out response activities based on Standard Operating Procedures (SOP) for disaster situations. Therefore, it is essential to have a way for disaster situation management information to be synchronized in real-time.

A situation management execution project is a process in which the person in charge of situation management performs situation management based on individual situation management information generated as a result of individual situation management information creation instances. This project consists of 1) provision of work process-based situation management information, 2) performance of situation management tasks and dynamic feedback, and 3) implementation of decision-making rules for situation management.

It is possible to create individual projects of the person in charge in order to configure the visualization screen differently according to the preference in the project created by the situation manager in the same institution managing a specific disaster, and to provide synchronization of disaster management between individual projects. There is a need for a method to synchronize situation management information commonly shared on the task management visualization screen in real time.

Furthermore, it is necessary to provide a visualization interface for personalized task management based on user types and department affiliations, allowing users to access either comprehensive tasks for each institution, tasks focused on specific disasters, or specific collaboration functions centered on assigned disaster tasks

II. DISASTER SITUATION MANAGEMENT DECISION SUPPORT PLATFORM

When using a disaster situation management decision support platform, even if situation manager create individual projects to perform disaster situation management tasks for specific disasters, the purpose is to receive synchronization of necessary situation information while also receiving individual task-specific content according to preferences.

Fig.1 illustrates the relationships between the disaster situation management decision support platform, the data manager responsible for generating the foundational data used in the platform, and the situation manager who are the actual users of the platform. External systems that are connected include big data management and the disaster service system.

The system administrator is responsible for approving or rejecting user authorization requests during user registration. Situation managers are categorized into super users, overall users, responsible users, and collaborative users.

Data managers are responsible for building and managing various disaster-related data for situation management services. This includes data related to disaster types, executing organizations, decision-making rules, and more. They also register information related to situation management tasks, considerations, phase transitions, and decision support.

Situation managers are the main stakeholders responsible for situation management during disasters. They can be assigned based on specific disaster types, executing organizations, or detailed tasks.

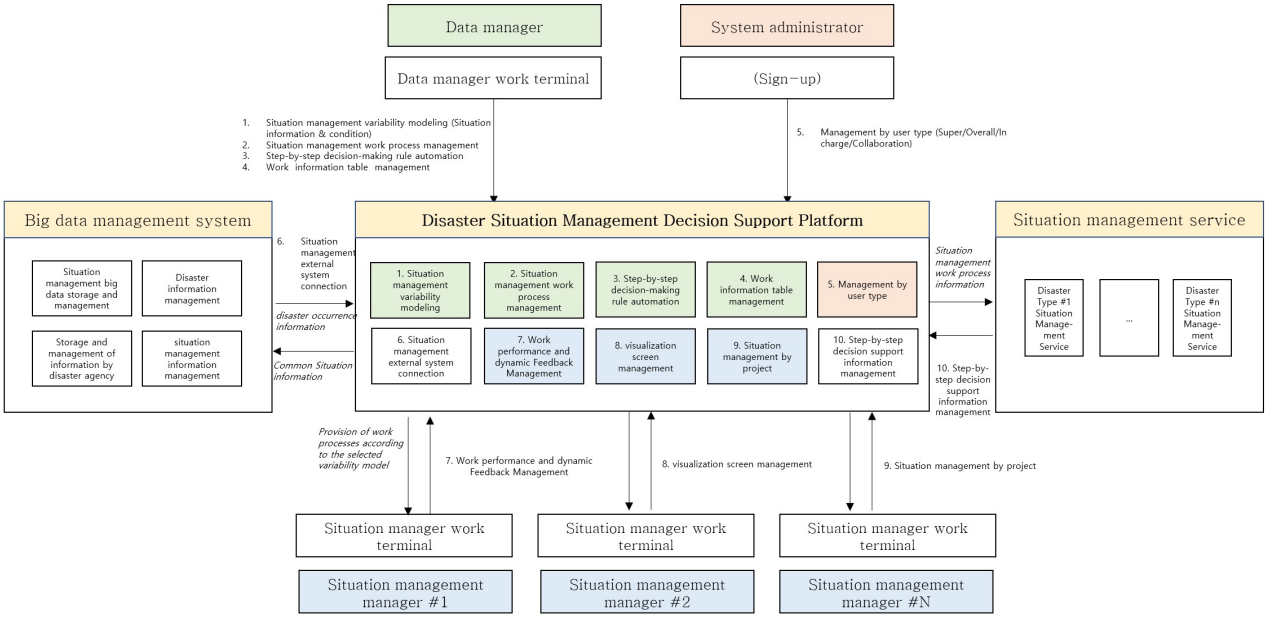

Fig. 1. Relationships between the disaster situation management decision support platform, the data manager, and the situation manager

III. CLASSIFICATION OF USER'S TASK LIST

The Disaster Situation Management Decision Support Platform allows situation managers to log in and create separate projects for each disaster that occurs. The platform provides a visualization interface for the situation manager, presenting the registered task process management information, including the tasks, considerations, phase transition details, and decision support information specific to the situation manager's responsibilities for each disaster.

A. Generation of Task List Number

In order to provide customized contents to the manager of situation management, all the situation management tasks for the corresponding disaster should not be provided on the visualization screen, but only the tasks that the manager should perform should be provided.

The data manager performs SOP-based task registration, collaboration function registration, and task table management function that generates task list numbers to provide tasks.

The disaster response process has separate tasks for each disaster response department, and at this time, the disaster response department refers to a department that performs each of the 13 collaborative functions. By linking the collaboration function with the task list, users' tasks can be classified by department.

1) Tasks(or Works) use the action contents according to the list of 48 actions of the 'On-site Action Manual' for each disaster.

2) As for the collaboration function, 13 collaboration functions are provided equally regardless of the type of disaster and the performing agency.

3) Using the relationship between collaboration function – action content – department, a task list number [collaboration function number + action number] is created, and a task list with the corresponding collaboration function is provided according to the type of situation manager and department(Table 1).

TABLE I. TASK LIST NUNMBER

13 collaboration functions	Action contents	Task List number	Department
e.g.) ②Emergency livelihood support	e. g.) 11-9	②-11-9	e. g.) Welfare Policy Division

IV. SYNCHRONIZATION OF SITUATION INFORMATION

A. Classification of Situation Manager Type

The process of creating a project for a disaster by the situation manager can be done in two ways. The first approach involves creating a single project that multiple users can share on a visualization interface. The second approach allows each user to create individual projects with personalized visualization interfaces, synchronizing only the content relevant to the common situation management tasks in each phase of the workflow.

This paper proposes a method where situation managers for specific disasters create individual projects.

Firstly, the classification of situation manager's types was carried out to configure different visualization interfaces when creating a project. The situation manager's user types were categorized as super-admin, overall user, responsible user, and collaborative user. (R: Read permission, W: Write permission)

- Super administrators have permissions for all projects.
- Overall users have permissions for all projects related to their affiliated organizations.
- Responsible users have permissions for projects related to the selected disaster of their affiliated organizations.
- Collaborative users have permissions for collaboration functions mapped to their departments within the projects related to the selected disaster of their affiliated organizations

B. *Synchronization between projects*

The Disaster Situation Management Decision Support Platform creates a context for each project when the situation manager generates a project. This context is maintained and manages all project-related information until the project is completed. When a disaster occurs, before creating a project, the situation manager uses information from the data manager to generate a context with items to be synchronized from the situation management data. This context is created for the purpose of synchronizing individual contexts and is referred to as the Parents context.

When the situation manager creates a project, a project-specific context is created. As tasks are performed and dynamic feedback is provided, the situation management information within the context may change. If the synchronization items in the individual project contexts change, the updated information is provided to the Parents context, and based on this, other contexts are also updated to reflect the changes uniformly(Fig 2).

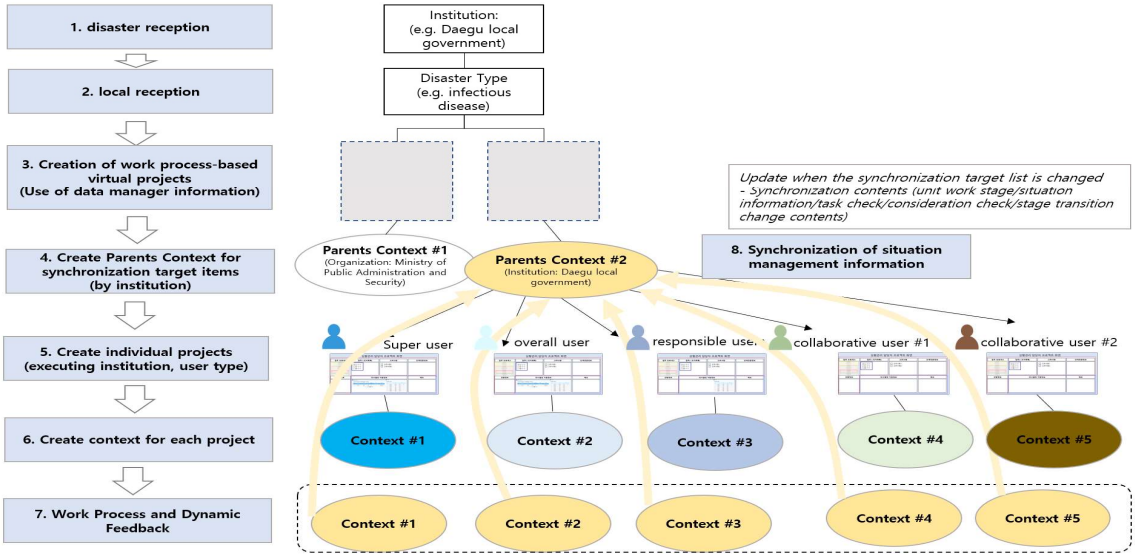

Fig. 2. Each project creation & syncronization process

C. *Project visualization screen*

Fig. 3 represents an example of the visualization screen for the project created by the situation manager. The visualization screen provides various information, including work processes, tasks, considerations, step transition information, situation information, and decision support information. The task items display disaster tasks based on the manager's permissions. If the manager's permission is overall or responsible, all tasks for that specific task process phase are displayed. If the manager's permission is collaborative, only tasks with collaboration function numbers corresponding to the manager's performing department are displayed.

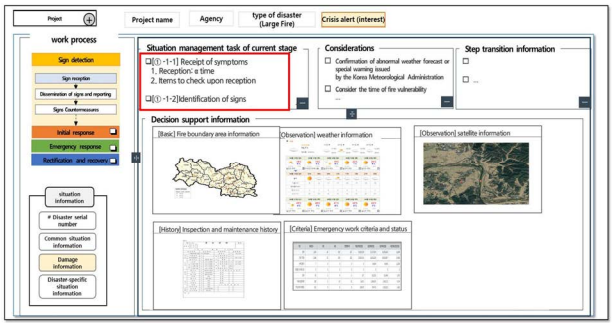

Fig. 3. Visualzation viewer screen provided by the situation management decision support platform

The decision support information refers to various data and details obtained from the disaster-specific situation management service system, provided in a step-by-step manner to support decision-making. This information includes, for example, contact information, weather updates, real-time disaster status, etc., and is presented in the form of a window on the platform with a URL. The viewer can be customized based on the preferences of the situation manager, allowing for personalized screen layouts.

V. Conclusion

In this paper, the task list numbers were generated using the data built based on SOP (Standard Operating Procedures), which included action items, 13 collaborative functions, and the relationships between departments performing these functions. Additionally, the situation manager's user types were classified, and their permissions for the projects they use were set. By utilizing individual projects, situation managers can receive customized contents tailored to their needs. Furthermore, information synchronization between project contexts enables the synchronization of situation information.

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