SI8_Requirements analysis for the disaster logistics inventory information system to improve the effectiveness and efficiency of handling emergency response periods

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Requirements analysis for the disaster logistics inventory information system to improve the effectiveness and efficiency of handling emergency response periods

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Abstract. The exact specifications of system requirements are very important factors in the system development process. Any deficiency at this stage will affect the quality of the output of the information system developed. Therefore, system analysts must focus on how requirements are defined and modeled. Building a new information system is a complex process that consists of many steps that must be done before the final product is prepared for the customer. It is important to meet the needs and expectations of customers to maintain project sustainability in the future. There are several approaches to develop new information systems in which different strategies, methodology, modeling techniques or life cycles can be used.This study aims to analyze the need for the development of a website-based disaster logistics inventory information system. This research produces an analysis of information system requirements both from functional and non functional aspects. Based on functional analysis obtained the minimum specifications that must be owned by information systems, while the non-functional analysis obtained the minimum data needs to run a website-based disaster logistics inventory information system.

1. Introduction

Mount Merapi is one the most active mountain in the world for its relative short periodic and high intensity of eruption around 3 - 7 years [1]. The biggest eruption of Mount Merapi occurred in 2010 with 3 times bigger eruption power than the previous one with the launch of a glowing cloud with the radius of 14.5 km. According to the *Badan Nasional Penanggulangan Bencana (BNPB)* - National Emergency Response - Mount Merapi eruption occurred lasted for 14 days since October 26, 2010. Based on the data of *BNPB* on the eruption of Mount Merapi in 2010, it recorded 277 deaths and missing, 186 injured and 159.977 people were evacuated.

According to *Pusat Vulkanologi dan Mitigasi Bencana Geologi (PVMBG),* the type of Mount Merapi eruption was cyclical and it would reoccur in a certain period of time, so that Mount Merapi has a periodic potential disaster. Therefore, the local government must be ready in handling the eruption [2, 3, 4, 5, 6]. The local emergency response (BPBD) Sleman area, Special Region of Yogyakarta is a government institution that has the duty to deal with the disasters occur within the province of The Special Region of Yogyakarta.

Management of relief items for disaster victims from the start of procurement or shelter assistance, inventory, and distribution is part of Humanitarian Logistics (HL) [7]. There are four things that must be considered in handling HL, namely a) the uncertainty of distribution routes (road conditions),

security, changes in facility capacity, and uncertainty in demand for logistics needs; b) communication and coordination difficulties due to disruption of communication, involvement of many parties consisting of government, civilians and Non-Government Organizations (NGOs), and there is no access to real-time and accurate request information; c) efficient and timely distribution is difficult; d) limited resources so that they cannot overcome the scale of the disaster [8].

One obstacle in the disaster logistics process in Indonesia is the limited access to information on the needs and supplies of relief goods. Delay in access to information causes the handling of disasters to be ineffective and inefficient. For example, related parties are often late to know the scale of the disaster, the number and type of assistance both goods and services needed, and the distribution of locations of refugees [9]. For this reason, the Regional Disaster Management Agency (BPBD) in charge of handling disasters in the regions needs to have an integrated inventory information system (IIS) between the center of the aid post in BPBD Sleman Regency and all refugee camps. The IIS needs to be equipped with an inventory database per item/type of relief item, so that the relevant parties can find out the type and amount of relief items available in the main warehouse. In addition, IIS can be used as a medium of communication between the BPBD, donors, and those responsible for refugee barracks (users). Donors can find out the type of relief items needed so they can provide assistance according to the needs of victims, while users can provide data on the needs of relief items in each barrack. Thus, the distribution of disaster relief items can be carried out according to their needs, namely in terms of time, number, and type.

2. Research Methods

2.1. Humanitarian Logistics (HL)

Various types of disasters need to be managed by different solutions. Logistics is the most important element in humanitarian assistance efforts. How to manage the logistics of humanitarian assistance will determine whether the disaster management operation is a success or failure? However, logistics is often the most expensive activity of any disaster aid. Based on the study, it is estimated that the logistics costs for disaster management are around 80% of total costs in disaster relief [10].

Logistics management for disaster management is known as humanitarian logistics or often referred to as humanitarian aid logistics. Humanitarian logistics is an activity of planning, implementing, and controlling the flow of humanitarian aid in an efficient, cost-effective and humanitarian aid supply supported by information regarding the distance and location of the main warehouse and refugee barracks in order to reduce the suffering of disaster victims [11]. Optimizing the logistics performance of humanitarian assistance requires that all relationships between parties or actors involved in disaster management be managed through an integrated approach efficiently and effectively in coordinating inter-organizational performance, eliminating redundancy, and maximizing the efficiency of the entire emergency supply chain.

Disaster management is often described as a process consisting of several stages, namely: mitigation; preparation; response; and reconstruction [12]. The four stages are called the disaster management cycle. The involvement of disaster logistics management at the preparation, response and reconstruction stages as presented in figure 1.

Figure 1. Disaster management cycle [12].

2.2. Stakeholders in Humanitarian Logistics

Humanitarian logistics includes a number of activities and involves many parties, starting from preparation, planning, procurement, transportation & distribution activities, storage, tracking, and customs clearance. Stakeholders in humanitarian aid logistics activities are [13]: a.) Domestic and foreign donors, government, companies, citizens and NGOs; b.) National NGOs, *PMI*, and *BNPB/ BPBD*; c.) Transportation service providers: land, air, sea, river and railroad; d.) Warehousing service provider; e.) Transportation management company; f.) Customs and Excise; g.) Relief recipient.

2.3. Inventory Information System

The system is a series consisting of two or more components that are interconnected and interact with each other to achieve goals. Systems are usually divided into smaller sub-systems that support larger systems [14]. Meanwhile, information is data that is presented in a certain form to help make decisions [15]. So, the information system is a combination of the components that collect, process, store, and provide the output of every information needed in business processes, Information systems in the form of applications consisting of software, databases and related manual processes [16].

The inventory information system provides detailed data about items of goods available, suppliers, quality of goods, the number of items that must be ordered and the number of items that have expired [17]. Information systems for disaster relief goods inventory are needed to facilitate access to information between stakeholders so that handling disaster logistics becomes more effective and efficient [9].

3. Requirements Analysis

3.1. User Characteristics

Characteristics of users are parties who will carry out activities on this information system. These entities are super-admin, admin refugee posts, and donors.

- Superadmin is the head or employee of the natural disaster management agency whose task is to manage and supervise the logistical assistance contained in the posts when natural disasters occur. Superadmin can manage user data, user assistance posts, users of refugee posts, goods, refugee posts, aid posts and transaction reports contained in the system.
- Admin of the refugee post is an employee/volunteer who is in a refugee post whose duty is to manage the demand for goods/logistics materials and validate the items that have been received.
- Donors are parties involved in providing voluntary assistance to the community, whether individuals or groups of people without aiming to benefit from their activities.

3.2. Device Requirements

The need for minimum specifications on the Merapi relief inventory information system consists of the needs of minimal specifications for hardware, software and brain ware.

Hardware used as a means of support in the form of:

- Computers with minimum specifications of Intel Pentium IV processors, 512 MB (Random Access Memory) and 80 GB Hard disks.
- Monitor, keyboard, and mouse.
- Modems or similar devices to connect computers to internet networks.

The software needed to run the information system created is:

- Microsoft Windows XP as the minimum operating system on a computer or other similar operating system.
- Web browser to run information systems.
- XAMPP is software that includes the Apache program as a web server, MySQL as a database server and PHP as a web programming language.

3.3. Functional Needs

Functional requirements are needs related to the business processes of the system made. From the observations made, the functional requirements in the system are made, here is a list of system functional requirements:

- The system can add, change, delete and display user data in refugee posts carried out by Superadmin
- The system can add, change, delete and display user data to donors carried out by Superadmin.
- The system can add, change, delete and display relief items data carried out by Superadmin.
- The system can add, change, delete and display data on refugee posts conducted by Superadmin.
- The system can display reports on the sending of relief items carried out by Superadmin, and the admin of the refugee post
- The system can display data reports on receipt of relief items carried out by Superadmin and admin of refugee posts
- The system can add, change, delete and display the data on aid items carried out by Superadmin, admin of refugee posts and donors
- The system can add, change, delete and display the data requested by the refugee post
- The system can add, change, delete and display data requests from refugee posts conducted by Superadmin
- The system can add, change, delete and display delivery data carried out by the refugee post admin
- The system can add, change, delete and display the purchase of relief goods through the government funding budget carried out by Superadmin
- The system can add, change, delete and display imported goods received from donors carried out by Superadmin
- The system can display reports of items received and items sent during a certain period of time carried out by Superadmin.
- The system can add, change, delete and display items sent by donors.
- The system can add, change, delete and display data items that have been received by Superadmin by donors

3.4. User Menu Structure

The menu structure is the initial design for software applications and website systems that focus on interactions with users. In the user menu structure, there are features that can be accessed by each type of user.

The structure of the login menu is a page for users to enter into information systems. Users can enter according to the user's access level. Access levels in this system include superadmins, admin and donors.

The superadmin menu structure that can be accessed after logging in to a superadmin user. Login is done by using an email and password from superadmin, then superadmin will enter the dashboard that has a menu list on the side. Menus that can be accessed by superadmin include:

a. Add, change and delete admin data for refugee posts and donors.
b. Add, change and delete system user group data.
c. Add, change and delete item category data.
d. Add, change and delete funding source data.
e. Add, change and delete warehouse data.
f. Add, change and delete post data.
g. Add, change and delete item data.
h. Add, change and delete inventory data.
i. Add, change and delete incoming order data.
j. Add, change and delete donation data.
k. Add, change and delete item request data.
l. View reports of incoming orders and goods requests.
m. View and change BPBD office data.

n. View and change account data such as names, emails, and passwords.
o. Exit the system

The admin menu structure of the post that can be accessed after logging in with the email and password from the admin, then the admin will go to the dashboard which has a menu list on the side that matches the access rights. Menus that can be accessed by superadmin include:
a. See admin data for refugee posts and donors.
b. View data group system users.
c. Add, change and delete item category data.
d. View funding source data.
e. View warehouse data.
f. Add, change and delete post data.
g. Add and change unit item data.
h. Add, change and delete inventory data.
i. Add and delete item request data.
j. View and change BPBD office data
k. View and change account data such as names, emails, and passwords.
l. Exit the system

Donor menu structure that can be accessed after logging in using e-mail and password from the donor, then the donor will enter the dashboard which has a menu list on the side. Menus that can be accessed by superadmin include:
a. Look at the item category data.
b. View warehouse data.
c. See post data.
d. Look at item data.
e. View inventory data.
f. Add and delete donation data.
g. View and change account data such as names, emails and passwords.
h. Exit the system

4. Conclusion

This research produces an analysis of information system requirements both from functional and non functional aspects. Based on functional analysis obtained the minimum specifications that must be owned by information systems, while the non-functional analysis obtained the minimum data needs to run a website-based disaster logistics inventory information system.

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