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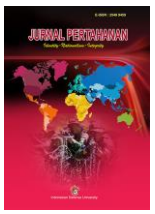

REFUGEE BASED DATA COLLECTION IN DISASTER RESPONSE

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Abstract

Indonesia's high disaster risk requires an information system that can improve effectiveness in disaster response. Therefore, there is a need for an application that could be a means for various information in disaster response in Indonesia. This research uses the Development Life Cycles or SDLC Software, specified with the Waterfall Model. This model has 4 phases, as following: requirement analysis, system analysis, implementation, verification, and maintenance. From this research, a victim-based data collection application can collect data at the disaster site regularly. It also can replace the previous conventional methods so that it can facilitate the National Disaster Management Authority (BNPB) in carrying out information to the community. The results of this study are the prototype of data collection applications in helping disaster response.

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INTRODUCTION

From 2016 data, the world risk index stated that Indonesia is a region with a high level of disaster (United Nations University, 2016). Other data from website bnpb.cloud collected from 01-01-2020 to 20-01-2020 have occurred 13 disaster events (National Disaster Management Authority, 2020). Disasters that occur include tornadoes, floods, and landslides. The flood disaster case resulted in the largest number of affected and refugees with 393395 people with 21 dead and missing victims. The number of disasters requires proper handling at the location of the disaster. Collaboration between agencies and stakeholders related to disaster management is very important to support in creating effective and efficient disaster mitigation conditions (Kang & Shibata, 2010).

Facing a disaster, disaster management is needed. Disaster management is divided into 3 phases (National Institute Of Disaster Management, n.d.), namely: Pre-disaster, During Disaster, and Post-disaster. Pre-disaster (before the disaster) is an action taken before a disaster occurs which aims to minimize the existence of a consequence of a disaster. During disaster (when a disaster) is an action taken during a disaster to aim for the needs of victims and to minimize the suffering of disaster victims. Post-disaster (after the disaster) is an action taken after a disaster that aims to recover the damage caused by a disaster.

In disaster management there is also a circle of disaster management (disaster management cycle) in which there are 7 components (Carter, 2008), namely: mitigation, preparedness, disaster impact, response, recovery, and development. The pre-disaster phase includes a component of disaster prevention, mitigation, preparation, and impact. During the disaster phase, there is a response component. The post-disaster phase has a recovery and development component. For more clearly can be seen in Figure 1.

Figure 1. Disaster Management Cycle
Source: (National Institute Of Disaster Management, n.d.)

A fast and accurate Information in disaster mitigation is one of the problems where technology becomes a means of managing a disaster. (Meissner et. al., 2002; Midkiff & Bostian, 2002; Dakhil & Alshawi, 2014; Alfredo Mahar et. al., 2017). The information in question can be in the form of victim information, logistics, and disaster relief funds. This information can be a communication tool between fellow disaster mitigation agencies and donors in solving disaster problems. Communication that works well can create effective and efficient disaster mitigation conditions (Lowrey et al., 2007; Jaeger et al., 2007).

As explained above, the need for an application as a means for various information in disaster mitigation can be a solution to assist disaster response in Indonesia. The ability of this application can share information regarding the number of victims, logistics, and disaster relief funds. Information sharing can be done online or locally from the post to other refugee camps.

METHODS

The application development model consists of ten steps: Operational Plan, Machine Specifications, Operational Specifications, Program Specification, Coding Specifications, Coding, Parameter Testing (Specifications), Assembly Testing (Specifications), Shake Down, and System

Evaluation (Benington, 1983). The Model illustrates can be seen in Figure 2.

RESULT AND DISCUSSION

Condition

The handling of refugees in the area today is still using the old way that is by using manual data collection based on a paper which is then entered into the excel-based application. In disaster conditions, the evacuation center does not consist of one place but can be composed in a variety of different locations. The location has several refugees that vary with the number which is certainly not small. Data collection still uses excel where population data can be of a double value. A double value occurs because one refugee can move the place at the evacuation post with a variety of specific purposes.

Data on the occurrence of disasters carried out at the location of the disaster was carried out by volunteers and officers who were in the field. The coordinator at the time of the disaster itself is carried out by the Regional Disaster Management Agency (BPBD). While other components involved can be from the Indonesian National Army, the Republic of Indonesia Police, the Indonesian Red Cross, as well as other communities or organizations.

The disaster location data collected will then be reported to the National Disaster Management Agency (BNPB) as a disaster management agency at the national level. Reporting used today still uses email, telephone, or HT with radio waves. Reporting data will be received by the BNPB deputy central operations controller. The deputy center of the operations

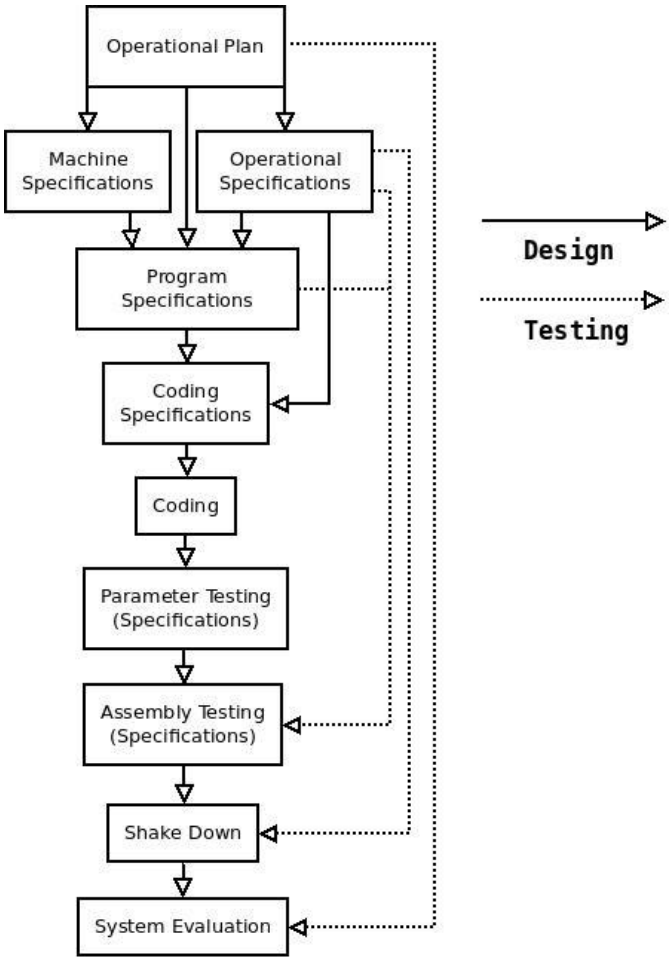

Figure 2. The Waterfall Model
Source: Benington, 1983

controller then sends the data back to the data center, information, and public relations and can then be uploaded on the BNPB Indonesia Disaster Information Data application.

Requirement

In the Requirements, a collection process of the requirement is needed to carry out in making disaster information systems. The table below is the requirement analysis in the manufacture of disaster information system products.

The system used uses web-based which can be served online and offline. For online services, you can use a hosting account and domain for demo. Whereas the offline service uses a server that can be installed free software-based. Software used to support the system itself or other uses a Linux-based operating system where the demo uses Debian with a text-based user interface, the database uses MySQL and the webserver uses Apache2. Other tools needed are for editors using sublime text and for transferring data to a server using FileZilla. For more details can be seen in Table 1.

Application Scheme

The scheme that will be created for the distribution of disaster relief distribution is centered on the central post, which is used as a logistics storage center. Central post has functions, namely disaster relief collection, data collection, data analysis, aid distribution, and uploading data for the web. Disaster relief collection comes from the assistance of social organizations or community organizations and the government. A donor can provide assistance with both sources of assistance based on information obtained from the website whose data is sourced from the central post. When part of the disaster relief was collected, then it was the collection from the refugee camps. Distribution of aid is carried out according to data analysis so that all refugee camps can receive the distribution of aid following the number of refugee camps. The Logistic Management of Aid Distribution to Natural Disaster Survivors carried out according to data analysis so that the distribution of aid can be received by all refugee posts according to the position of the refugee camps. Management of Aid Distribution is carried out according to data analysis so that the distribution of assistance can be received by all refugee camps according to the words of assistance entered by uploading it to the server that has been made. Data collection also included data on victims found in the refugee camps.

Data analysis was carried out after the data collection process was completed, an analysis was carried out to determine the

Table 1. Requirement Analysis

Service	Package
	Web (Online Service)
-Hosting	Online Hosting with Cpanel to file manager with bandwidth is optional and storage minimum 500mb for testing
-Domain	Online Domain with optional extension
	Server (Offline Service and for evacuation post)
-Operating System	Debian text-based
-Database	MySQL
-Web Server	Apache2
	Tools
-Script Writer	Sublime Text
-Transfer File	FileZilla

Source: Proceed by Authors, 2020

amount of assistance distributed to reach refugee camps. Logistics distribution is carried out according to data analysis so that all refugee camps can receive the distribution of assistance according to capacity and sufficient. Data collection was carried out again after the distribution of aid to upload assistance data that came out of the central post. The final step is the data that is located in the server and then uploaded on the website so that it can be used as a reference for the community to send aid. The scheme can be seen in Figure 3.

The use of the application is held by the admin or survey post officer, while the admin or survey officer can be from the BPBD or other agencies. Election admin or survey officer is a person appointed by the BPBD which in this case is the coordinator in disaster management. Admin and survey officers must fill refugee data in the system which can then be done between centralized posts, where one post is designated as a data center. From the central post then data can be uploaded to the website and then can be processed on Design is a process in system analysis including flowchart and BNPB.

The concept of a computer network used in this application is wireless which uses a grid model media antenna while the grid model antenna will be directed to another refugee location so that it will create a computer network. The lattice antenna model was chosen because it has a great distance so that it can be accessed from one point to another. If from one point to another too far you can add lighting by installing a lattice model antenna to install the signal so that it will increase the range.

Application Design

Application Design is a process in system analysis including flowchart and entity relationship diagram application system. The system diagram consists of 3 flowcharts, namely web, server, and disaster post. Each application has functions and roles, including Refugee Camps, Central Post, and Website.

Refugee Camps - The disaster application at the refugee camps serves to

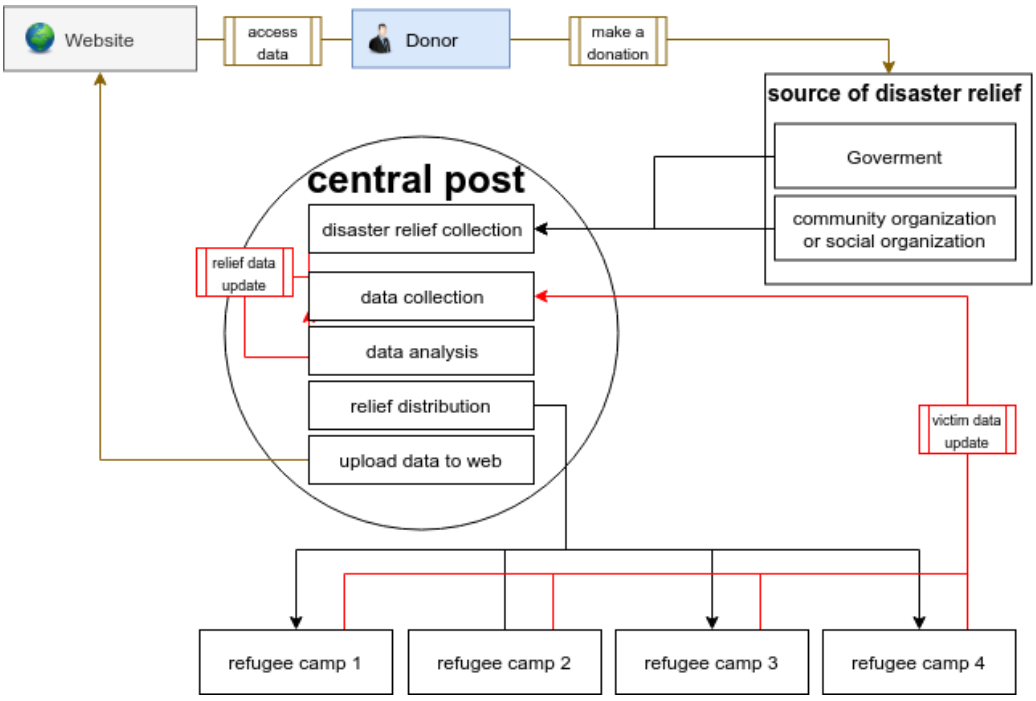

Figure 3. System Scheme
Source: Proceed by Authors, 2020

input data such as disaster victims and aid distribution. These data after input are then synchronized with the central post as the data center of the disaster. Refugee camps can also download data from the central post if the previous refugee camps have data that is synchronized with the central post. Refugee camps can also make logistical requests to the central post with the application. The flowchart can be seen in Figure 4.

Central Post - The disaster application at the central post is the data center for disasters. The central command post is tasked with collecting data collected from the refugee camps and selecting the same data so that duplication does not occur. The central post is also responsible for receiving logistical requests from refugee camps so that they can be appropriately distributed. Central post has an important task where the central post must synchronize the data collected to the website so that it can be known to the public. The flowchart can be seen in Figure 5.

Website - The website is a service that provides information from synchronized data from the central post at the disaster site. Data on the website can be accessed by the public so that it can be used to help in disaster management. The flowchart can be seen in Figure 6.

Entity-relationship diagram (ERD) is a diagram that describes a relationship between tables and databases. The disaster logistics system application consists of 3 entities Refugee Camps, Central Post, and Website. Refugee Camps - In the refugee

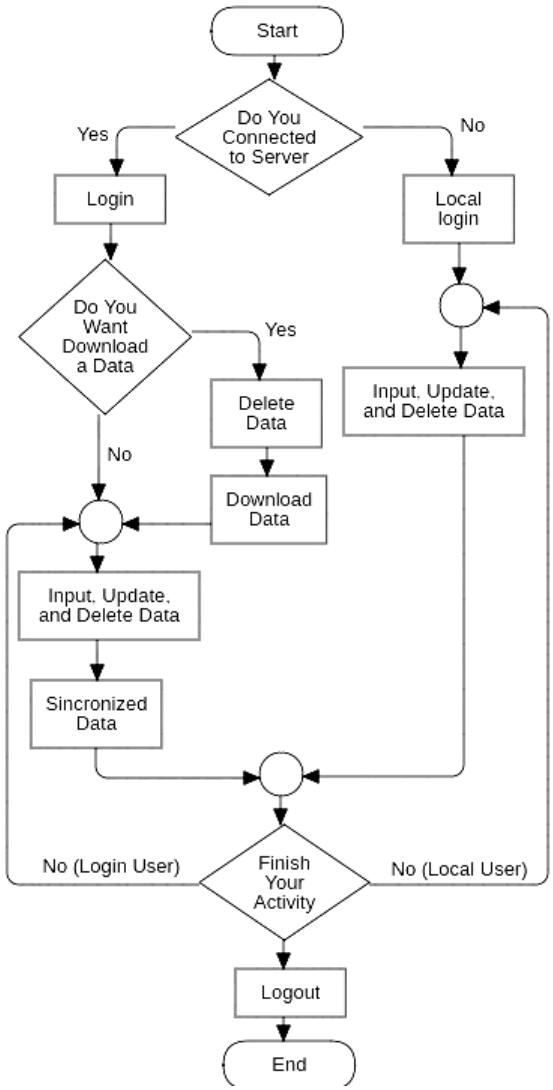

Figure 4. Refugee Camps Application Flowchart
Source: Proceed by Authors, 2020

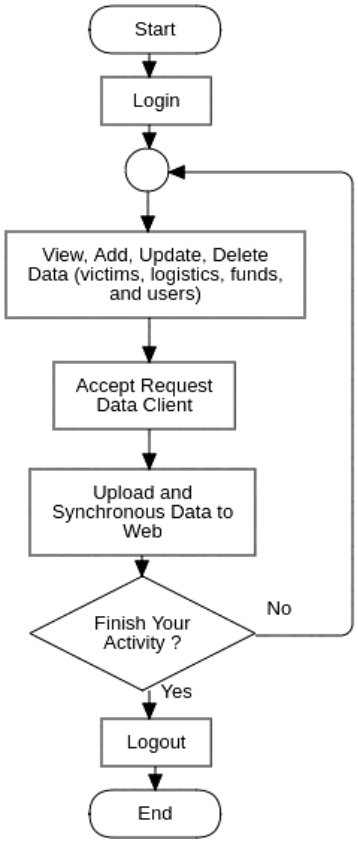

Figure 5. Central Post Application Flowchart
Source: Proceed by Authors, 2020

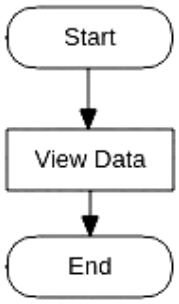

Figure 6. Website Application Flowchart
Source: Proceed by Authors, 2020

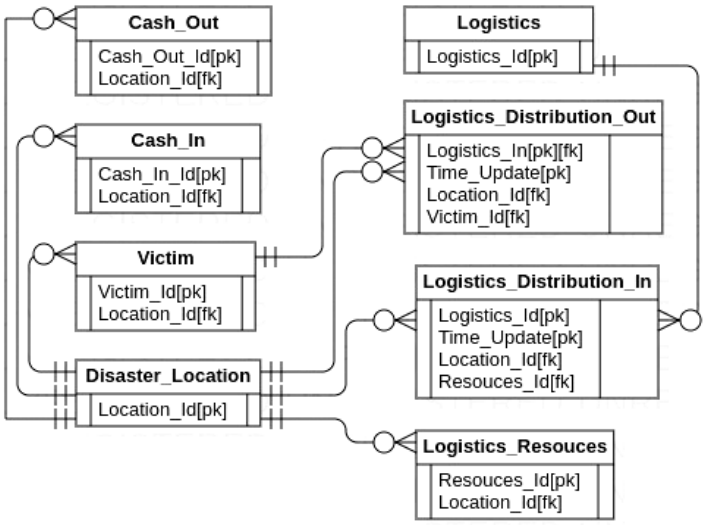

Figure 7. Refugee Camps Entity Relationship Diagram
Source: Proceed by Authors, 2020

camps, there are eight tables: Cash_Out, Cash_In, Victim, Disaster_Location, Logistics, Logistics_Distribution_Out, Logistics_Distribution_In, and Logistics_Resources. Refugee camps only store data used by the place itself. For entity relationship diagram can be seen in Figure 7.

Central Post - At the central post eleven tables are consisting of:

- Cash_Out
- Cash_In
- Logistics_Distribution_In
- Logistics_Resources
- Logistics
- Logistics_Distribution_Out
- Request Status
- Victim
- Victim_Update
- User
- Refugee_Camps

Data at the central post can be accessed privately and obtained from refugee camps. For entity relationship diagram can be seen in Figure 8.

Website - For websites, tree tables are consisting of: Logistics, Logistics_In, Request_Status. Website data is the result of the synchronization data from the data collected at the central post. For Entity-relationship diagram can be seen in Figure 9.

Implementation

Making disaster applications using PHP, HTML, CSS, and Javascript programming languages. Disaster application websites use a single file "index.php" using the

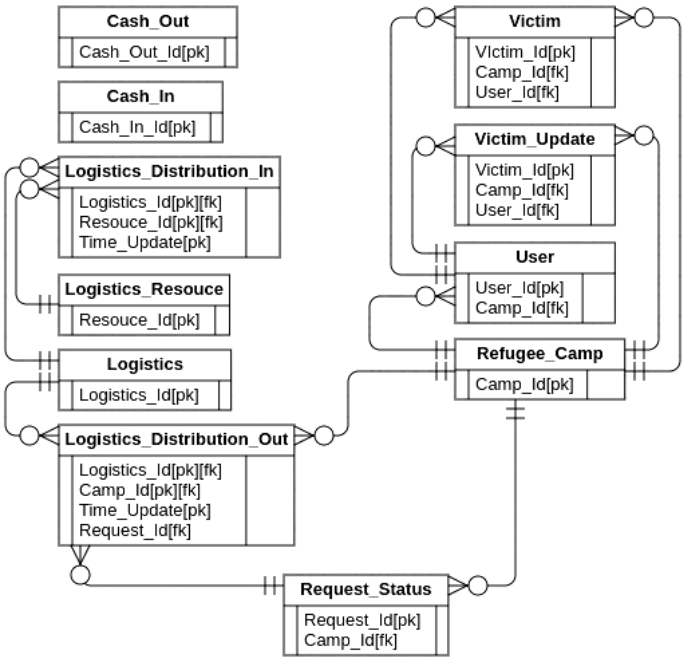

Figure 8. Central Post Entity Relationship Diagram
Source: Proceed by Authors, 2020

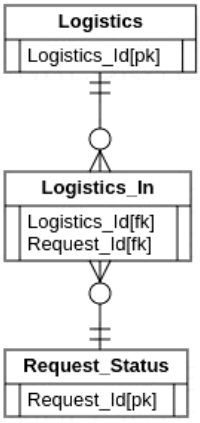

Figure 9. Website Entity Relationship Diagram
Source: Proceed by Authors, 2020

"get" method where separate files called "include" based on the variable. Folders divided into 8 folders: .css, fonts, include, js, connection, content, control, and progress. The folder structure in a disaster application website can be seen in figure 10.

The Database is a place to store data using the SQL language. Databases use structured and interconnected tables. The results of database creation can be seen in Figure 11 and Figure 12.

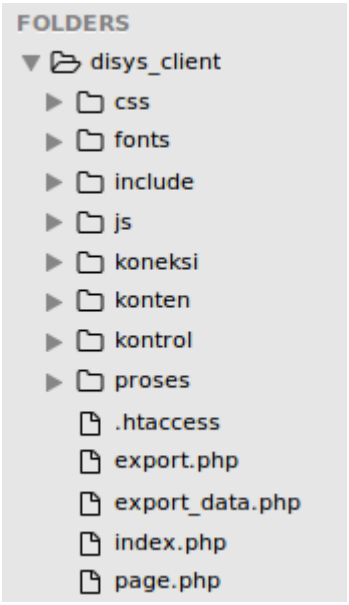

Figure 10. Folder Structure
Source: Proceed by Authors, 2020

Disaster logistics applications in data synchronization using the application programming interface (API). Application Programming Interface made to provide certain functions to be accessed by other devices. In this application, the API used to share the contents of the database both between the central command post, refugee

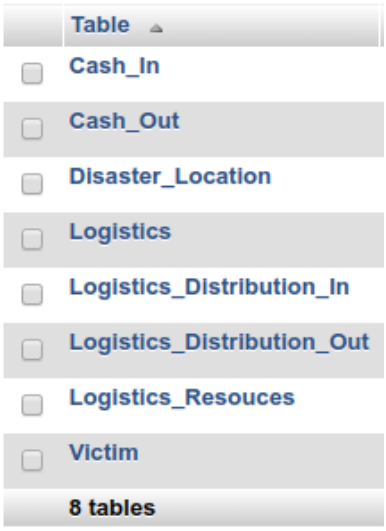

Figure 6. Refugee Camps Database Result
Source: Proceed by Authors, 2020

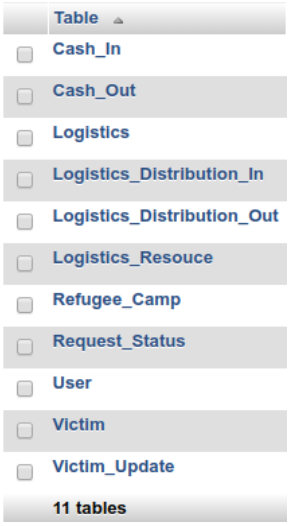

Figure 12. : Central Post Database Result
Source: Author, 2020


```
{
    "error": false,
    "message": "Berhasil mendapatkan data korban",
    "semuakorban": [
        {
            "nik": "123",
            "nama": "tarjo",
            "jk": "Laki-Laki",
            "alamat": "kalibening",
            "status": "Meninggal",
            "status_luka": "0",
            "usia": "20",
            "kewarganegaraan": "WNI",
            "keterangan": "",
            "kode_posko": "1",
            "nama_posko": "Puskesmas Kalibeninng",
            "time_update": "2019-03-28 09:18:20",
            "user": "posko1"
```


Figure 7. API Result
Source: Proceed by Authors, 2020

camps, and the website. This API converts the Structured Query Language (SQL) programming language into JavaScript Object Notation (JSON). The following are API results obtained from victim data that can be seen in Figure 13.

Verification

In the Verification Process, use the expert judgment method and white-box testing. Expert judgment is verification that is directly like an interview with the experts in this matter is Suprapto from Pusdatin BNPB and Yuyun Yuhana from the Pusdalop BNPB. The results of the interviews can be seen directly in Table 2.

Maintenance

From the results of the verification, the input was limited by limiting the impact of casualties. The data in the victim table and victims_update et al. to the age column and age category. After that, the data can synchronize data with the online system with the data needed are time, disaster event, reporter, and the number of victims. Data on the number of victims needed in the input can then be retrieved from the

Table 2. : Interviews Result

Verifier Name	Suggestion
Suprapto	Recruitment in public relations, data, and information only requires events, report dates, places of occurrence within the sub-district, victims based on age, sex, and impacts obtained from the victims themselves, material losses, according to data at dibi.bnpb.go.id. Besides that, it does not require name data because the name cannot be published. After all, it is a privacy right.
Yuyun Yuhana	The reporting process must have a time of occurrence and time of reporting so that it can be seen from the time of update so that it can be seen the progress of each report.

Source: Proceed by Authors, 2020

database that has been made by adding up by age category: toddlers (0-6 years), children (6-10 years), teenager (10-20 years), adults (20-60), and elderly (> 60 years) (Mutiara, 2003).

Based on the age of the victims, they were divided into sex categories (male and female) and impacts (died, injured, survived). Then the updated data is divided into several columns including : event_date (datetime), date_update (current_timestamp), event (text), user_id (text), region_affected (text), toddler_victims (int), child_victims (int), teenager_victims (int), adult_victims (int), elderly_victims (int), male_victims (int), female_victims (int), died_victims (int), wounded_victims (int), survivor_victims (int).

CONCLUSIONS, RECOMMENDATION, AND LIMITATION

From this research, the victim data collection application can help to collect data at the disaster site regularly and can replace the previous conventional methods so it can facilitate the (BNPB) in carrying out information to the community. However, this research needs to be improved, especially to be able to collect data regarding facilities that have been damaged. These facilities can be in the form of private ownership such as houses or public property such as educational facilities, religious facilities, and others.

This research has limitations where the product still contains a prototype that still has some shortcomings. Integration on prototypes is still not integrated with existing applications at BNPB. Besides being integrated with the BNPB application, it is also not integrated with other data such as occupation data and others. The limitation lies in the proper source of energy at the post. If there is no electricity from either the provider or the portable one then this prototype cannot work.

To improve the function of the application, it is expected that integration can be made with existing applications at BNPB such as the Indonesian Disaster Information Data (DIBI). The integration is expected to make it easier, improve accuracy and speed up the BNPB in carrying out information to the public related to the disaster that occurred. The more accurate and faster information is expected to be able to reduce and counter the issue of incorrect or HOAX issues that are often spread in the community.

Another integration is also expected to be able to integrate applications with population data such as family data or Population Identification Number. Integration is then expected to make it easier for officers to get from refugees and can be one of the quickest means of confirming the number of victims at the disaster site. The integration will increase accuracy in data collection and will

minimize the risk of data redundancy.

Applications are also expected to be supported by the construction of portable infrastructure. Infrastructure is expected to be moved from one location to another so that it is finished being used can still be used. The risk of the Indonesian disaster is high and almost occurs in all locations in Indonesia, thus requiring infrastructure that can be used many times. Another integration is also expected to be able to integrate applications with population data such as family data or Population Identification Number. Integration is then expected to make it easier for officers to get from refugees and can be one of the quickest means of confirming the number of victims at the disaster site. The integration will increase accuracy in data collection and will minimize the risk of data redundancy.

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