Design of emergency response assessment system using Feature-Driven Development approach

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Abstract. This research aims to analyze and design an emergency response assessment system for disaster that will aim for a voluntary team being able to conduct quick assessments in the affected area more effectively and quickly. Feature-Driven Development (FDD) approach is deemed appropriate for analysis and design and later will be developed an emergency response quick assessment system that will be used to collect data such as the impact of facilities and infrastructure, security situation, transportation access, food supply and so on. The aim of the assessment is to use the data will to find out whether an intervention is needed or not. After that, the data is processed and results in the provision of useful assistance on target and on benefits site following the conditions and regulations in Indonesia.

1. Introduction
Disasters in Indonesia based on data compiled by BNPB (Badan Nasional Penanggulangan Bencana) recorded at least 207 disaster events that occurred in Indonesia according to data recapitulation until Tuesday, January 21, 2020, this year. If you look at the previous year's data, the trend of disaster events in early January 2020 decreased by 29.6 percent compared with data for 2019. However, the number of decreases was not too significant, namely 290 events in 2019 and 207 in 2020 [1]. Every disaster in Indonesia requires an emergency response assessment to collect data on each event that is needed later to be used in making decisions for effectiveness in solving problems [2–4].

The disaster itself is a series of events that threaten and disrupt people's lives, which can be caused by either natural or non-natural factors or other factors that can cause human casualties, environmental damage, property losses, and psychological impacts [5–7]. So the Assessment in a disaster's emergency response is essential to obtain useful and accurate data and information before it is needed for decision making if an intervention is required or not for a disaster.

Types of Assessment are usually three types, namely: Rapid Assessment, Continual Detail assessment. These different types will be used to the needs according to the conditions and obligations of the disaster that occurred [8]. In this research, the analysis and design of the Emergency system The Response Assessment discussed is only a rapid assessment and a detailed assessment that is adjusted to the needs of collecting data and information at the disaster site [9–12]. The analysis and design will be carried out using an FDD (Feature-Driven Development) approach that illustrates the fast adaptive process that can be applied to software projects that are of a sizeable size and more significant [13].
Design of an emergency response assessment system for disaster that can be the part of the blueprint and can be applied to the Assessment on the disaster site that also follows the conditions and regulations in Indonesia.

There are several studies on emergency response assessment systems for disaster, including research on the implementation and analysis of data collected for cellular data collection, which is used to provide information for decision making for emergency response and recovery procedures and assessment data using ODK (open data kit) collected in Indonesia [14]. Besides there is research on a conceptual design for rapid assessment specifically for houses that were damaged after the disaster, the design of the system is designed for mobile applications and the design of web-based applications and smartphones [15].

As for the research conducted in this paper, it has similarities with previous researchers, namely creating a design system for Emergency Response Assessment. Details on Emergency Response Assessment are divided into two, namely rapid assessment and continuous detail assessment in data collection that has different parameters and functions in data collection. The goal depends on the type of disaster and the following applicable regulatory conditions, which will allow for future data to be collected later for decision making.

2. Methods
The research undertaken to create an Emergency Response Assessment system has several stages of an activity to achieve the objectives of the analyst and design that refers to the FDD (Feature-Driven Development) method [13,16,17]. The steps in the FDD method consist of:

2.1. Build an overall model
The design of the emergency response assessment system model will be shown in the Process Business Architecture, which features designs for hardware (database/server) [15,18], for synchronizing integration for the data needed and suggestions for programming languages or other requirements necessary for making the application later.

2.2. Build a feature list
The following stage is to define the features that exist in the system in detail. For this stage, it is illustrated by the use case diagram and use case scenario and will explain the detailed process for each part of the system.

2.3. Plan by features
In planning the details of each Feature in the system, system activity diagrams can be used. There will be a drawing of an activity diagram that describes how the system is working in general. Also a list of all the plans by features.

2.4. Design by feature dan build by feature
At this stage, technical features are compiled, database design, and form display for each Feature, and the making of the application is based on the features that have been planned.

This research only discusses the Build an overall model and build a feature list phases. If this two-step is done and the results are within the following needs, it will be developed later for the Design by Feature and Build by Feature phases in making the Emergency Response Assessment system application.

3. Results and discussion
Discussion and Results of research from the design of the Emergency Response Assessment System:
3.1. Build an overall model

Figure 1. Business process architecture.

The purpose of making business Process Architecture like Figure 1 above is to define which are the function of the business process is need it. The Figure above is to show all the functions and also hardware databases that will be designed for the Emergency Response Assessment system.

The following is an explanation for user hardware, database, and server architecture as well as application architecture from the illustration above:

- **Hardware User:** The hardware used by the user recommended is a mobile phone or laptop for those in the disaster area or personal computer for the Admin [15]. Because it is not yet known the situation in the area where the disaster should think about the specifications of the gadget and have backup power if something happens. In a disaster area, there is a possibility that there is no internet network, so the data must be stored in advance on a mobile phone or laptop. Therefore it's necessary to synchronize data between hardware for fast transfer of all data so that it can be stored on one hardware before moving to the server later for data integration. Hardware such as laptops should have NFC (Near Field Communicator), RFID (Radio Frequency Identification), or other supporting technologies that support to synchronize the data. But sending data to the server should be done in realtime if possible.

- **Architecture Database and Server:** The database is recommended to have it locally and on the server. Local database, both in mobile apps or web apps on personal computers, is used to store data if cannot connect to the database at the central server [16]. If conditions allow it can be synchronized with data at the center, of course, with limited capacity, then there is a recommended backup system so that it's easy to move data. The central database and server can be placed in the cloud for the hardware settings. Further planning can place a hybrid server where there are a database backup and server in the form of hardware. This will be used for the placement of sensitive data if there is and can be used as backups data. The thing to think about is making synchronization rules that are good for applications and data that can be used in realtime. Data that has been integrated will be used for various things for decision making or data collection for other applications developed.

- **Application Architecture:** The application has three main functions, namely setting, rapid Assessment, and Detailed Assessment. These three functions are for different purposes, the settings for the parameters of the application and the settings in the Admin's requirements, as well as rapid Assessment and detailed assessments such as creating a team of volunteers, dates, and other master data requirements according to needs. In terms of programming languages, because this application is planned to be made for mobile-based and web-based, for mobile-
based, it is recommended to use native language because if it is applied correctly in terms of functionality, it will be better whereas for web-based it is adjusted to the scale of data and architecture database, user and server, and for this application, a microservice architecture suggested to use because it will affect the relationship between the application and the database so that it can share a single database scheme and other services that are needed in the future [13,17].

3.2. Build a feature list

3.2.1. Use case diagram. The definitions in the Build a feature list are illustrated with use case diagrams, use case scenarios, and activity diagrams as needed. But in this research paper will only discuss use case diagrams due to their limitations. Use case diagrams are an overview of the system that consists of use cases, actors, and iterations between them. The case diagram does not provide a detailed description of the use case. Still, only a brief description of the relationship between the use case, the actor, and the system below is a description of the use case diagram for Emergency Response Assessment system:

![Use case diagram for emergency response assessment system](image)

In Figure 2, there are two active actors: User: consisting of volunteers, team leaders, and person registers and other actors Admin. In the picture above, the Admin can see the system as a whole, here the role user settings are made by the Admin for the user team to become a volunteer or must first register later in the confirmation by the Admin that the user has registered following the job desk. The Admin is in charge of setting up each Assessment if needed, also regulating the application, as well as looking data generated from the team who at the disaster site. The difference between team leaders here can make arrangements for an Emergency response assessment, be it rapid or detailed, team settings, data requirements, date settings, report analysis, or the status of the Assessment. The volunteer user who carried out the Assessment with the user team leader, their task was to obtain accurate data about what happened at the disaster site. This initial description of the system can change according to later needs.
3.2.2. Feature list. In this feature list, the discussion is the features that the Emergency Response Assessment System will have:

- Settings: this Feature at the current discussion stage has three settings, namely application settings, user or role settings, and overall assessment settings. Application settings are for the settings of the layout for the form of data display, display color, etc. Following the standards and needs of the team. For example, team division can have generalist, specialist, and multidisciplinary functions depending on their respective roles, user, and role settings. Determining new roles for each user can be added. The flexibility is needed here. While for the overall assessment settings, the settings for the Assessment that will be used later, be it rapid or detailed Assessment set here is the parameter-parameters that will be used in each of these assessments.

- Rapid Assessment: this Assessment is usually the first time that is done when a disaster occurs somewhere. So the features in this section should be simple, not too many details. Because this Assessment determines whether it is necessary to do a detailed assessment (continued), recording the Assessment can be done several times, depending on the severity of the area [9,15]. Parameters on this Feature that are processed by data are general data (the type of event, date, time, officer, etc.), general and information data (number of victims, refugees, and other details), Facility and Infrastructure impact data (residential, transportation access, communication access, and public facilities).

- Detail Assessment: In this Assessment can be a continuation of rapid or independent, then, of course, there is a forward feature of the rapid Assessment that has been made is determined from the condition of a disaster case [9]. This can be done in several phases, so in making this Assessment determined either by the team leader or the person authorized to plan the Assessment, this determination will determine the outcome data be analyzed for decision-making purposes. Data parameters available in this Feature are general data, transportation access, demographic data, food data, shelter data, and other data needed in accordance with the current manual assertions.

In the discussion of this feature list, there still a lot to be discussed; it needed to broken down again, so the feature list is structured from a technical perspective. Some features are not yet like this report is important because the data here is used to make decisions on the next system update, and many others may be continued in the future research.

4. Conclusions

In this research, only a preliminary discussion for the design of the Emergency Response Assessment System still needs to be well spelled out in the use of this method. It must be clarified by, for example, drawing another UML (Unified Modeling Language) for its design. Most likely, there will be changes adjusted to suit the conditions of this application needs. In the future, it can be added to the analysis and design as well as the decision-making system for the Emergency Response Assessment System in making this application.

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