ANDROID APPLICATION FOR WASTE TRANSPORT OPERATIONAL ACTIVITY SUPPORT AT PD. KEBERSIHAN KOTA BANDUNG

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ABSTRACT

PD. Kebersihan Kota Bandung is a Regionally-Owned Business Entity (BUMD) which operates in cleaning services. One of the activities is waste transport from the Temporary Disposal Site (TPS) to the Final Disposal Site (TPA) which is carried out using a garbage truck. The transportation process begins with the creation of a letter of assignment which is still considered to be inefficient, due to the long process and the cost of printing the assignment letter. Besides that deviations are often done by drivers due to lack of supervision. This research was conducted to improve the making of a garbage transportation assignment letter and also help determine the scheduling of transportation, as well as overseeing drivers in their activities. Mobile applications allow users to enjoy application features anywhere, where the platform with the most users is Android. With the use of an android application that is centered on a web service, creating the assignment letter becomes more time and cost efficient with the form of a digital assignment letter. Determining of the schedules can also be facilitated by sending reports directly from the drivers of the location of the TPS that have been transported. In addition with using google maps, monitoring the driver also becomes easier with the tracking feature. Based on research and testing conducted, it can be concluded that with the development of an android application on waste transport activities, the process of creating assignments becomes more time and cost efficient and scheduling becomes easier. Besides that, improvement also occurred in the supervision of the driver with the tracking feature.

Keyword : Waste transport, mobile, android, web service, google maps.

1. PREFACE
1.1 Background

PD. Kebersihan of the City of Bandung is a Regionally-Owned Enterprise (BUMD) which is engaged in cleaning services. The main task of PD Kebersihan is to provide services in the field of solid waste to create a clean city, whose activities include road sweeping, collection and removal, processing, transportation, and final processing of waste. Waste transportation assignment activities at PD. Kebersihan of the city of Bandung is carried out conventionally. Making the assignment letter is done by typing a manual which is then signed by the operational department. This activity takes 5 to 10 minutes, but the number of drivers, amounting to 30 to 40 people per work area, results in a longer time for assignment. In addition, because the physical form of paper resulting in the need for paper and printer costs, and requires a large storage area.

In addition, supervision on truck drivers is also lacking. This is because in the SOP for transporting garbage there is no special supervision of drivers when traveling or when transporting rubbish in Temporary Disposal Sites (TPS). This can result in deviations made by drivers such as improper use of lanes and also transportation of waste to the TPS.

Based on data of PD Kebersihan of Bandung City in 2017, in Bandung there are 154 TPS consisting of household TPS, market TPS and commercial TPS. Of all the TPS, the schedule for transporting waste is still carried out according to estimates. Then, because there is no reporting of transportation at the TPS in the SOP, there is a lack of data regarding the results of each transport at the TPS whether the transport has been effective or not.

A mobile application is an application that allows mobility using equipment such as PDAs, cell phones or cellphones [1]. With the application of the mobile application, all needs can be done without taking into account the time and place limits. Android is a Linux-based open source operating system designed for touch screen mobile devices such as smartphones and tablet computers [1]. The use of Android has become a common thing for people because Android is the operating system of the most mobile users. One technology commonly used on Android is camera technology. With the camera technology, the Android device can take pictures and store them in the device. But the use of camera technology is not limited to that. QR Code is a technology whose use depends on the camera, which can be used on smartphones. One example of applying the QR Code is the buspass system on public buses [2]. Another use of QR Code is to do attendance in lectures [3]. Another technology from Android that is often used is GPS. With GPS technology it is possible to find

out the location of related android devices [1] [4] [5]. By knowing the location of the device, remote device tracking becomes possible [6] [7] [8]. In addition to GPS technology and digital maps, users can search for locations and routes of their travels [9] [10] [11].

Based on the explanation of the problems above, it can be concluded the need to make supporting applications to assist operational activities in PD. Cleanliness of the city of Bandung which berbertuk mobile applications based on Android. With this application it is expected that problems in PD. Cleanliness of the city of Bandung can be overcome.

1.2 Android

Android is an operating system for Linux-based mobile devices that includes an operating system, middleware, and applications [12]. Android was originally developed by Android, Inc., with financial support from Google, who later bought it in 2005. The operating system was officially released in 2007.

1.3 Google Maps API

The Google Maps API is a service for adding maps based on Google Maps data. The API automatically handles access to Google Maps servers, downloading data, displaying maps, and responding to map movements. Users can use API calls to add markers, polygons, and overlays to the base map, and to change user views of certain map areas. These objects provide additional information for the location of the map, and allow user interaction with the map. The API allows developers to add the following graphics to the map.

1.4 Geofence

Geofence is a virtual perimeter for real-world geographical areas. Geofence can be generated dynamically, such as within a radius around a point location, or geo-fence can be a set of predetermined boundaries (such as school zones or environmental boundaries).

1.5 Firebase Cloud Messaging

Firebase Cloud Messaging (FCM), formerly known as Google Cloud Messaging (GCM), is a cross-platform solution for messaging and notifications for Android, iOS, and web applications. The main features of FCM are as follows.

a. Send notification messages or data messages. Send notification messages that are displayed to users. Or send data messages and fully determine what is happening in the application code.
b. Versatile message targeting. Distribute messages to client applications in one of 3 ways: to one device, to a group of devices, or to devices that subscribe to topics.

c. Send messages from the client application. Send notifications, chat and other messages from the device to the server via a reliable and battery-efficient FCM connection channel.

1.6 QR Code

QR Code stands for Quick Response Code is a type of barcode that contains a matrix of dots that can be scanned / scanned using a QR scanner or smartphone with a built-in camera. After scanning / scanning, the software on the QR scanner or smartphone will change the code of the dots into numerical or string characters. For example, scanning a QR Code with a smartphone might open a URL in the smartphone web browser.

1.7 Purpose and Objectives

Based on the background of the research, the purpose of this study is to design applications as tools for operational activities in the transportation of waste in Bandung.

The purpose of this study is as follows.
1. Streamlining the assignment of garbage transportation by making digital assignments that can be accessed online through the android mobile application.
2. Increase supervision of drivers by tracking using GPS.
3. Facilitate the determination of scheduling the transportation of waste at each TPS by making a report of each transportation of waste at the TPS.

1.8 Research Methods

The method used in this research is descriptive method, which is a method in examining the status of a human group, an object, a set of conditions, or a system of thought, or a class of events at the present time. The purpose of descriptive research is to make a description, picture or painting systematically, factually, and accurately about the facts, properties, and relationships between the phenomena under investigation [12]. The stages in the research method can be seen in Figure 1.
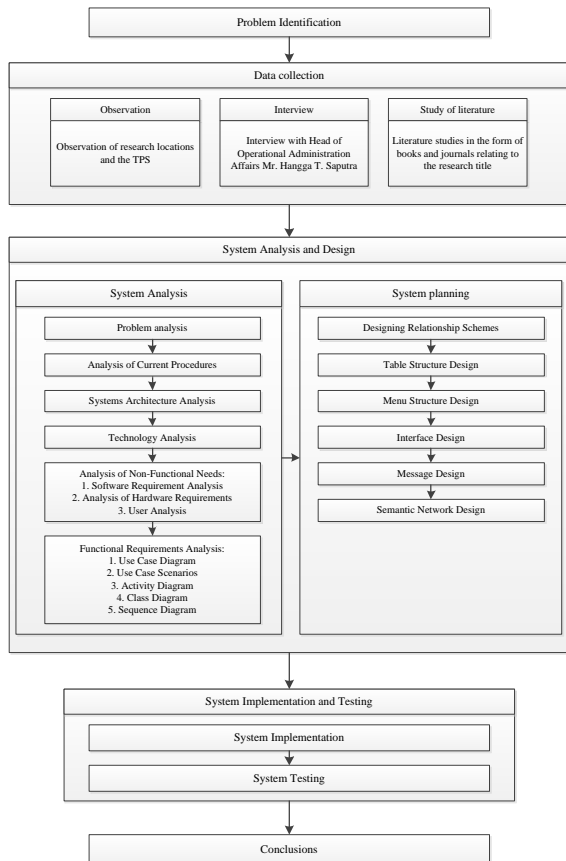
Figure 1 Research Framework

1.9 Software Development Methods

The Software Development Method that will be used in this research is the modified waterfall method. The modified waterfall method uses the same phases as a pure waterfall, but does not use discontinuous bases. With this the phase can be worked together or return to the previous phase if needed [13].
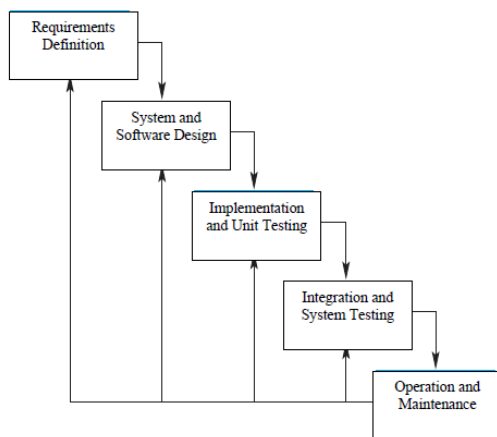

Figure 2 Waterfall Method

2. RESULTS AND DISCUSSION
2.1 Systems Architecture Analysis

The system to be built is based on Android mobile using Google Maps API. Next in Figure 3 can be seen the system architecture to be built.
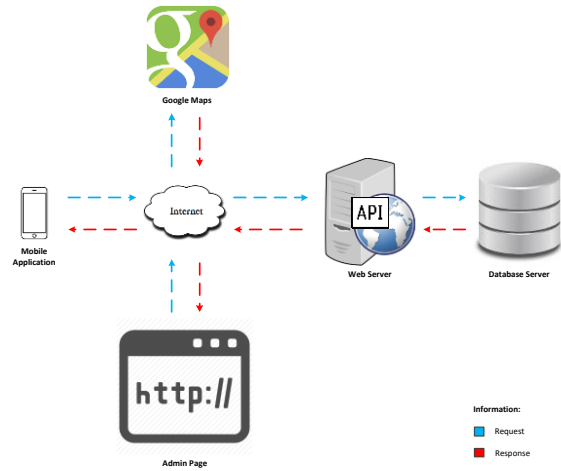
Figure 3 System Architecture

2.2 Problem Analysis

Based on the background of the problems outlined above, some of the following problems can be concluded.
1. How can the application make efficient the creation of a waste transportation assignment letter.
2. How can the application be able to add control to the garbage truck driver.
3. How can the application help in scheduling waste transportation.

2.3 Analysis of the Procedure to be Built

The procedure that will be built contains the procedure for transporting waste by involving the application to be built. Next in Figure 4 is the procedure that will be built.
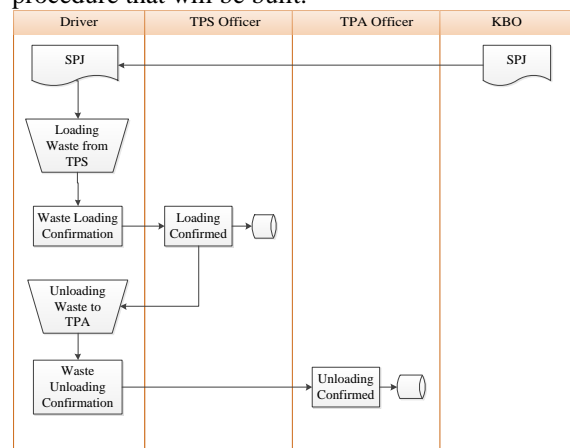

Figure 4 Procedure to be Built

2.4 Technology Analysis

Technologies used in the application are Google Maps API, Geofence, Firebase Cloud Messaging, and QR Code.
1. Google Maps API

Google Maps API is a technology used to add maps to applications. Used when drivers navigate and track drivers by KBO, TPS Officers, and TPA Officers. The polylines feature is used to create navigation paths on the map. The application uses GPS sensors to find out the location of the device and a marker feature to mark the location of the driver when tracking. Next in Figure 5 described the navigation work system using Google Maps.
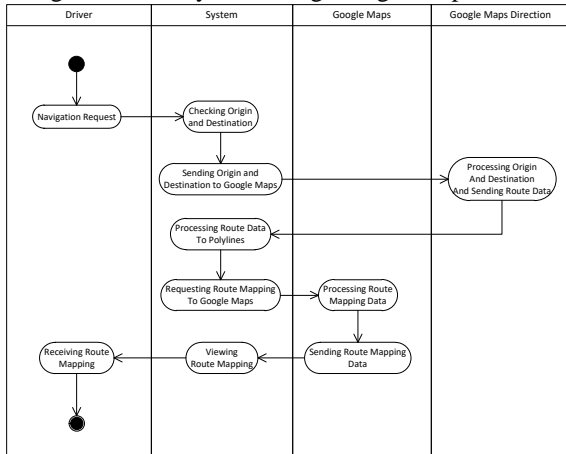

Figure 5 Navigation Workflow

2. Geofence

Geofence is a technology for determining virtual perimeters for areas defined on a map. Implementation of the application uses the Geofencing API. In the geofence application is used to provide notification when the driver is near the location of the TPS or TPA.

3. Firebase Cloud Messaging (FCM)

FCM is a service for sending messages and cross platform notifications. Implementation of the application uses the FCM SDK. FCM is used at the time of notification of making a letter to the driver, confirmation of SPJ by the driver, information on the arrival of the driver to the TPS, confirmation of transport of garbage at the TPS, and others.

4. QR Code

QR Code is a type of barcode that contains a matrix of dots that can be scanned / scanned using a QR scanner or smartphone camera. Implementation of the application uses ZXing or Zebra Crossing libraries. QR Code is used when confirming transport at the TPS and garbage disposal at the TPA. The QR Code is derived from the SPJ number encoded to md5.

2.5 Use Case Diagram

Use Case Diagrams illustrate the interaction between actors and systems. The application that will be built consists of four actors, namely KBO, drivers, polling station officers and landfill officers.
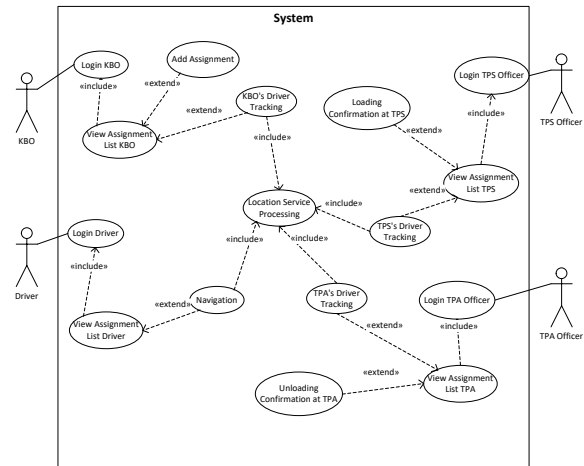

Figure 6 Use Case Diagram

2.6 System Design
2.6.1 Relation Schemes Design

Relationship schemes describe database tables and relationships between tables. Next in Figure 7 is the application relation scheme that will be built.
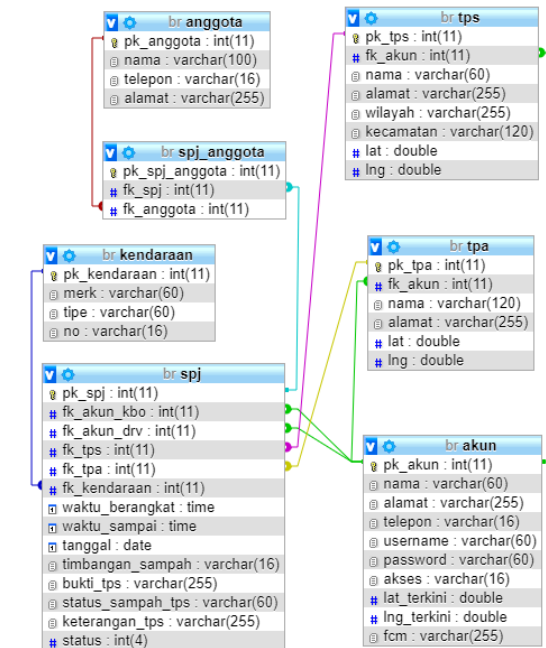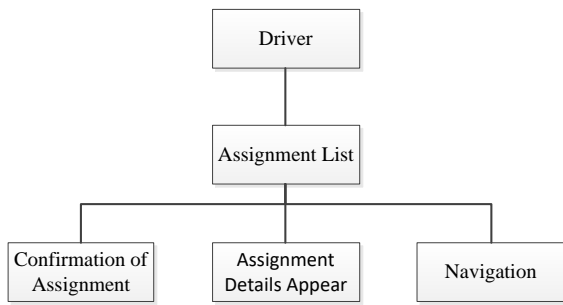

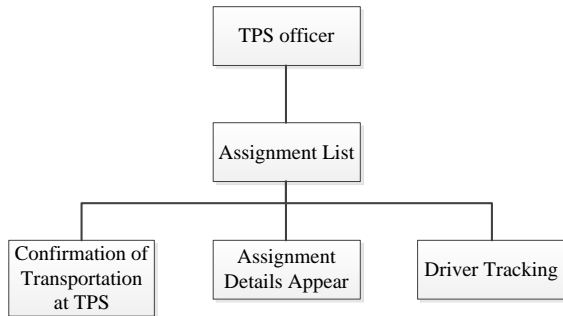**Figure 7 Relation Scheme**

2.6.2 Menu Structure Design

Menu structure describes the menus in the application and the flow between the menus. Following is the menu structure of the application that will be created.
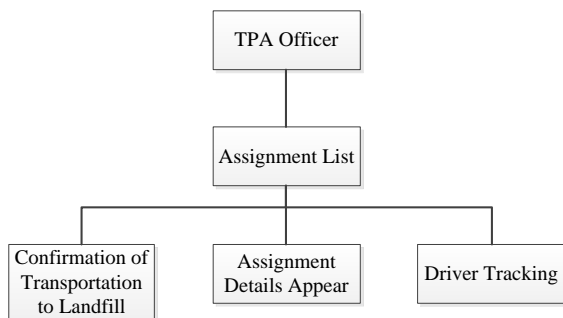

Figure 8 Menu Structure of KBO

Figure 9 Menu Structure of Driver

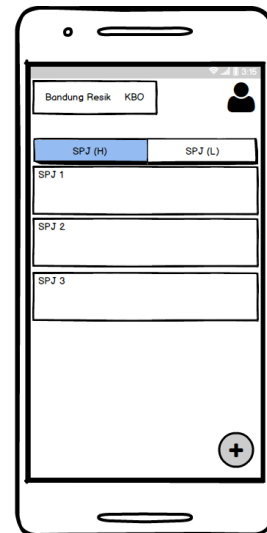**Figure 10 Menu Structure of TPS Officer**

Figure 11 Menu Structure of TPA Officer
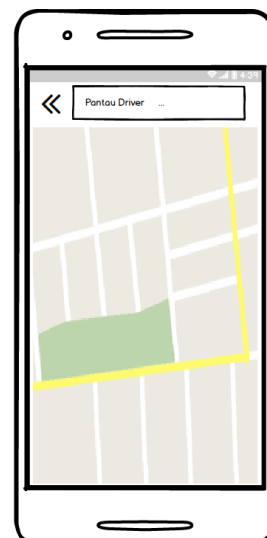
2.6.3 Perancangan Antar Muka

Perancangan antar muka menggambarkan rancangan tampilan aplikasi yang akan dibangun. Perancangan ini digunakan sebagai acuan pembangunan aplikasi. Berikut beberapa gambaran antar muka aplikasi yang akan dibangun.
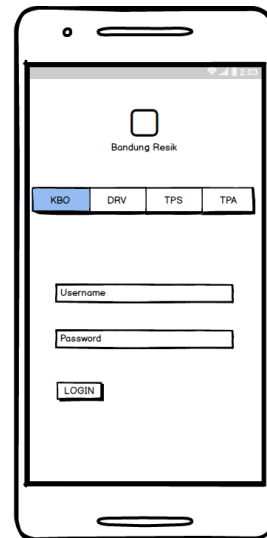
Figure 12 Login Interface

Figure 13 Assignment List Interface

Figure 14 Maps Interface

3. CLOSURE

3.1 Conclusion

Based on the design that has been made supporting applications for waste disposal activities in Bandung can be used to produce assignments quickly and can be stored in a database. In addition to Google Maps, monitoring of the driver can be done as well as the report of the results of transportation can help determine the subsequent transportation of waste. So it can be concluded that the design of applications supporting waste activities in Bandung has met the research objectives.

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