

# Waste Management System using Information Technology for the Improvement of Structured Environmental Ecosystem

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## ABSTRACT

The urban waste management system in Indonesia, which still relies on an end-of-pipe solution, using the open dumping on Final Processing Site method is considered inappropriate because it causes several problems, including the narrowing of the landfill area and the increasing volume of waste generation. And the impact of environmental damage around the Final Processing Site due to uncontrolled waste pollution. This method encourages the city government to make efforts to handle urban waste problems more precisely. One alternative for handling waste is establishing a mobile-based installation of information management technology with community-based waste management to maintain and restructure a controlled environmental ecosystem. In this work, the information management method directly touches the community as users of handheld devices, namely mobile devices based on Android and IOS, which are empirically very close to the community. Based on the sample survey results on the use of the management method, to test its effectiveness. It is a model of one Ward in one city with a total of 6 community units and 50 neighborhood units with 2,975 houses was taken 10% as a qualitative survey sample with an average effectiveness result of the use method about 87% percent to improve the existing conventional waste management. Thus this method provides an effective solution to the current methods that occur in urban areas in Indonesia.

**Keywords** : urban, waste management, mobile-based

## 1. INTRODUCTION

The rapid population growth triggers new problems in environmental aspects in a place or region, especially in urban areas. One of the biggest problems in the urban environment is waste. There is still a lack of poor waste management, such as being left in a full bin for too long and not immediately taking action to dispose of it to a final disposal site. It is indeed a problem because garbage that has been piled up for too long will cause unpleasant odors and cause air pollution(Perini et al., 2017), which has an impact on environmental health. In addition to full trash bins, it also triggers residents to throw garbage anywhere because there are no containers to dispose of the trash(Sakthimohan et al., 2020).

In order to improve the quality of life, especially in densely populated urban areas, and overcome the problems described in the previous paragraph, the author designed a hygiene control device in the form of an Android-based trash can in hand. All data from the garbage can be displayed through the android application to be monitored by the garbage officer based on the schedule(Moch. Kholil et al., 2020)(Mansingh, 2020), so it is hoped that there will be no more garbage that has been piling up for too long and is not following the schedule(Khokhlov et al., 2021). It will pollute the environment and make the work of the garbage collector more efficient because it is unnecessary—waiting for reports from residents other than that garbage collectors do not need to patrol to monitor which trash bins are suitable for disposal(Bakti et al., 2020)(Mansingh, 2020).

Some of the research results have been carried out by the same field and theme as the reference(Parpanathan, 2021)(Srilatha et al., 2021). Therefore, the research title is Waste Management System using Information Technology for the Improvement of Structured

Environmental Ecosystem. This method makes it possible to describe a more organized urban environmental ecosystem(A, 2021).

## 2. METHODS

The research method used in this research is through literature study, discussion study, mechanical and electrical design, system testing, and then analyzing the system test results(Wang et al., 2020).

In this research, the object and location of the research are limited so that the sample area coverage can be controlled with the primary objective of developing a strategy for waste management in the research object(Nadaf et al., 2020)(Das et al., 2019). It consists of 6 community units and 50 neighborhood units with 2,975 houses in Gadingkasri Village, Malang City as the scope, which will be carried out based on a literature study by taking case study locations in urban areas in Indonesia.

The philosophical concept of solving waste problems in urban areas describes the stages or processes of making an Android-Based Waste Management Service Application in Malang City. The process of collecting waste data is carried out periodically based on data that the community has collected from the research object("Aplikasi Layanan Pengangkutan Sampah Berbasis Android," 2018)(Prasetya et al., 2019b)(Waste Management, 2003). Data collection is carried out in three ways: literature study, survey, and observation of what was done in figure 1.

*Figure 1: Survey and observation Process*



In the literature study process to obtain data or information from documents written from someone who has experienced an event (primary) or an event reported from another person than written by this person (secondary) with the specifications of the problem and providing technology-based solutions information that is actively related to the object of research(Gowda et al., 2021)(Bakti et al., 2020). Then the survey process aims to obtain information on resource persons who are considered to provide information about the waste management service process, which is the research object.

Comprehensive observation aims to obtain information in places considered to provide information about the waste management service process in the research object(Filimonau & De Coteau, 2019).

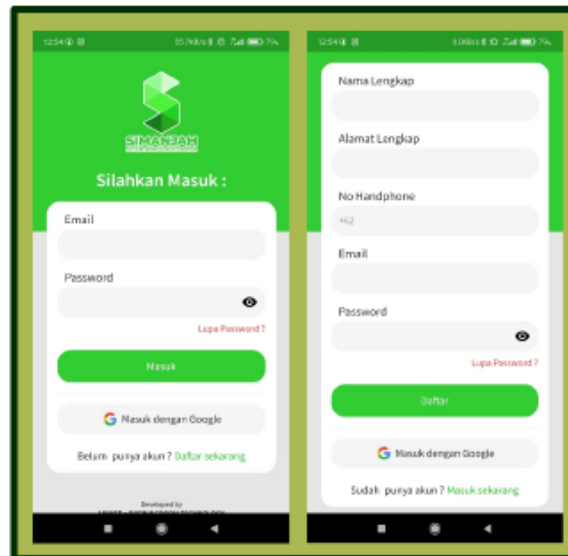
After these stages are carried out, the Android-Based Waste Management Service application in the research object that has been determined to be used is the Rapid Application Development (RAD) method(Huh & Park, 2020)(Prasetya et al., 2019a). There are three phases in the RAD method involving the analyzer and the user in the stages of assessing, planning, and implementing. The three phases are requirements planning, RAD design workshop (RAD design workshop), and implementation.

### 3. RESULT AND DISCUSSION

In this Android-Based Garbage Management Service application, the user is every user of the waste management service. Those in the research object and the application user are the party of the service provider who will regulate, dispose of, pick up or retrieve the waste in the research object. This application is used by every community that uses waste management services on the research object to be observed with a survey as a measuring parameter.

The Android-based application model that is proposed through the Android interface system is as figure 2.

Figure 2: Account registration management system



The registration system can comprehensively identify the type of user and the ability of the user to access the application either as a regulator, garbage collector, or waste manager in the research object environment. Then on the collection of information and data by conducting surveys and documentation studies. In this case, the author interviewed residents (users) and managers in the city's villages as object research. For User registration, it can be seen in Figure 2, and In the Registration Display in Figure 2, there is also the application's name at the top of the screen (Khokhlov et al., 2021). In this view, there are five text fields to enter personal data for users who have never registered in this application. And there is also a map display at the bottom of the telephone text field that functions as user navigation to get a more accurate position in determining the address.

Data Design is a means to clarify the database on the application. This android application uses a MySQL database and will be hosted by connecting to the database through the application in figure 3.

On Android, system management displays the structure of the user tab table, which is opened via localhost/PHPMyAdmin. This table structure consists of field, type, null, key, default, extra. The primary key is the user id field in the user tab table, and all values in the user tab table are not null.

On Android, the system management displays the structure of the report tab table, which is opened via localhost/PHPMyAdmin. This table structure consists of field, type, null, key, default, extra. In the report tab table, the primary key is the scheduling tab field, and id labor will store the identity of each garbage report input by the user.

Figure 3: Scheduling on waste management system



On Android, system management displays the garbage collector on the tab table structure opened via localhost/PHPMyAdmin. This table structure consists of field, type, null, key, default, extra. In the garbage collector tab table, the garbage collector tab field is the primary key.

Perform integration of waste management processes with handheld devices on information technology. This session explains how software and its impact on society will be defined thoroughly into a survey as a qualitative measure of the effectiveness of using this app.

Based on the sample survey results on the use of the management method, to test its effectiveness until 87%. It is a model of one Ward in one city with a total of 6 community units and 50 neighborhood units with 2,975 houses was taken 10% as a qualitative survey sample with an average effectiveness result of the use method about 87% percent to improve the existing conventional waste management.

#### 4. CONCLUSION

This research concludes that the information management method directly touches the community as users of handheld devices, namely mobile devices based on Android and IOS, which are empirically very close to the community. Based on the sample survey results on the use of the management method, to test its effectiveness. It is a model of one Ward in one city with 6 community units and 50 neighborhood units with 2,975 houses was taken 10%. Qualitative survey sample with an average effectiveness result of the use method about 87% percent to improve conventional waste management. Thus this method provides an effective solution to the current methods that occur in urban areas in Indonesia.

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