Digital Waste Bank Application for Environmentally Conscious Student

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Abstract. This research aims to produce an Android-based waste bank information system in Padang City high schools. This application can help and facilitate schools in managing waste banks. The SDLC (System Development Lifecycle) method employs a waterfall model in the system's design process. Waterfall stages consist of analysis, design, implementation, integration, and testing as well as system operation and maintenance. We conduct system testing using the black box method, focusing on aspects of functionality and usability. The results of testing the information system developed get the results of the functionality value worth 1 (very good), and testing the usability aspect gets a value of 87% with very feasible criteria.

Keywords: Android, Waste bank, Waterfall

1 Introduction

The development of information technology is currently increasing rapidly, along with the increasing needs of the community for technology and information [1]. People find it easier to overcome various existing problems thanks to the convenience technology provides. This development also has a significant impact on data processing systems, including those that process waste bank data [2][3]. Schools face a challenge in effectively managing waste [4]. One of the problems that often arises is the lack of interest from humans in managing waste, causing piles of garbage around them and damaging the surrounding environment [5]. The school environment is a place for learning and teaching activities. Of course, we cannot separate these activities from the production of waste. The school produces waste from various sources, including paper, snacks from the canteen, and plants growing in the school [6] [7]. One of the effective waste management systems is to implement a waste bank system [8].

Students can participate in the waste bank initiative, which recycles waste in schools and surrounding areas under the direct supervision of teachers [9]. Teachers can convert this waste into something of economic value. A school waste bank's concept involves transforming recycled waste into final products for future sale [10][11].

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According to the researcher's observations on the official website of the Basic Education Data from the Directorate General of Early Childhood Education, Basic Education, and Secondary Education under the Ministry of Education, Culture, Research, and Technology [12], there are 100 junior high schools in Padang City, with a total of 33,745 students who have the potential to generate waste.If all junior high school students in Padang city daily consume 5 pieces of food wrapped in plastic or paper, such as ciki wrappers, drinks, or other snacks, it means that every day all junior high school students in Padang city produce 33,745 x 5 = 168,725 food and beverage wrappers. If collected per month or per year, the waste produced by students will accumulate so that it can damage the school environment. If the plastic and paper waste is collected, it will be an additional income for the school community, and therefore there is a need for a system to collect the waste data [13].

Based on observations and interviews that researchers conducted at the Education and Culture Office, the junior high schools that are Adiwiyata schools are UNP Laboratory Development Junior High School and Muhammadiyah 5 Junior High School in Padang. Each school has a number of students as shown in Table 1.

Table 1. Number Of Students

No	School Name	Status	Learners
1	Junior High School Pembangunan Laboratory UNP	Private	213
2	Junior High School Muhamad-diah 5 Padang	Private	413
		Total	626

Based on the data in table 1, there are 626 students who have the potential to produce waste every day. As part of the Adiwiyata program, the school has established a waste bank. This is a significant effort in educating students about waste management and the importance of keeping the environment clean.

Junior High School Pembangunan Laboratorium UNP and Junior High School Muhammadiyah 5 Padang still collect waste bank data using ledgers or manually so that recording takes a long time. Of course, the security of customer data using ledgers is also less guaranteed to be vulnerable to being scattered or lost and there is also no handle card regarding the amount of waste deposited by students to officers. This causes students to be less motivated to collect waste. To overcome these problems and increase student interest in collecting waste and improving the services and performance of waste banks, it is necessary to create an android-based waste bank information system for effective and efficient data management [14].

Based on the explanation above, the purpose of this research is designing a waste bank information system for secondary schools in Padang city based on android.

2 Research Methodology

This study adopts Research and Development (RnD) as its methodology, which is utilized to design new products, evaluate the effectiveness of existing ones, and develop or create innovative solutions. The research focuses on creating an Android-based waste bank information system, aimed at enhancing the quality and services of waste banks in junior high schools in Padang City.

The researchers employed observation, interviews, and documentation as data collection techniques. Testing uses the black box method by testing the functionality and usability of the system. A questionnaire, specifically focusing on functionality and usability, guides the data collection tool.

a. Functionality Aspect Analysis

This functionality aspect analysis is to see the functional quality of this system.

b. Questionnaire validation analysis

To analyze the validity of the questionnaire, use the following formula:

$$Validity\ value = \frac{total\ score\ obtained}{highest\ score} \text{ x } 100\%$$

c. Reliability Test

The reliability test uses the following formula

$$ri = \frac{k}{(k-1)} \left\{1 - \frac{\sum Si^2}{st^2}\right\}$$

3 Results and Discussion

3.1 Research Results

Test Results and Design of the Waste Bank Information System The design of the Waste Bank Information System for Junior High Schools in Padang City, based on Android, will be discussed in detail in this chapter; the results of the design process will explain the features and services possessed by this Android application. We then conduct design testing to verify the system's functionality and suitability for its intended use.

Design Results. The results of the waste bank information system design provide various features and services that can help officers and customers in making transactions. We designed the Android-based waste bank information system using PHP and MySQL programming languages. The front page of the Bank Sampah information system is like Fig. 1. For the administrator page can be seen in Fig. 2.

Fig. 1. Front Page of the Waste Bank Information System

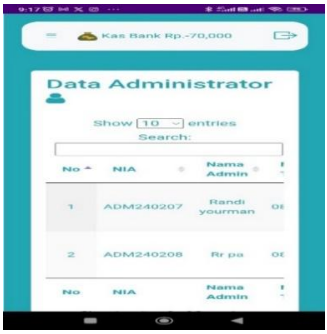

Fig. 2. Administrator Page

Figure 2 explains that the admin can add, edit and delete customer data, change prices according to the market and display reports.

Design Testing. System testing is carried out after the system is built, with the aim of testing whether the system is running as expected. There are two system testing methods used, namely:

a. Functionality

This test aims to evaluate the functionality of the system under development. In this test, a validator evaluates the system and completes the provided functionality questionnaire. The validator is Ashabul Khairi, M.Kom from the Bung Hatta University Informatics and Computer Engineering Education Lecturer. Functional testing has two points: “Yes” (appropriate) and ‘No’ (not appropriate). The survey test sheet tests whether each feature and service in the system works as expected. The testing has ensured that all functions and services in the system work properly, allowing us to continue using and researching the Waste Bank Information System.

After the validator conducts the functionality testing process for the waste bank application at Padang City Junior High School, the validator gives advice for this system to continue research.

Table 2. Result of the functionality test

Formula	Results	Description	Formula
X = 1-A/B	1	Memenuhi Syarat	X = 1-A/B

Based on the table 2, the result of the functionality test is 1 with a qualified statement.

b. Usability

We carry out usability testing to determine whether the functions and services of the created system are suitable for users. Usability testing begins with system testing analysis, or validity and reliability testing. The data processing results indicate that variable X yields an r-count value greater than the r-table value (0.4132). Therefore, we can conclude that all the instruments used in this study are valid.

Reliability testing is done to measure how consistent the research results are when repeated using the same method, and how reliable the system is, based on a survey of system users (respondents). Researchers conducted this reliability trial in class 8A at SMP Muhammadiyah 5 Padang with 23 students (see table 3).

Table 3. Reliability test

N of items	Cronbach Alpha	Information
15	0.872	Reliable

Based on the data processing results in Table 22, it can be concluded that the Cronbach's alpha for all question items of each variable exceeds 0.70. Specifically, the Cronbach's alpha value for variable X is 0.872, indicating that the questionnaire is reliable.

The results of the usability test of the waste bank application were obtained using a usability questionnaire which was tested on class 7A SMP Muhammadiyah 5 Padang with students in class 7A as many as 29 students.

Table 4. Result of the usability test.

No	**Assessment indicators**	**Total Score**	**Score Max**	**%**	**Information**
1	Reliability	386	435	88%	Very Good
2	Responsiv	388	435	89%	Very Good
3	Assurance	372	435	85%	Very Good
4	Empathy	379	435	87%	Very Good
5	Tangibles	382	435	87%	Very Good

Based on the table 4, it can be concluded that overall, the assessment of users of the Android-based Bank Sampah information system is in the very good category. This demonstrates the feasibility of this waste bank application and its potential for advancement to the next stage.

The data analysis reveals the results of a questionnaire usability test conducted by users on the junior high school waste bank information system in Padang city. The questionnaire divides usability testing into five indicators: reliability, responsiveness, assurance, empathy, and tangibles. The diagram below illustrates the division of the usability analysis per indicator.

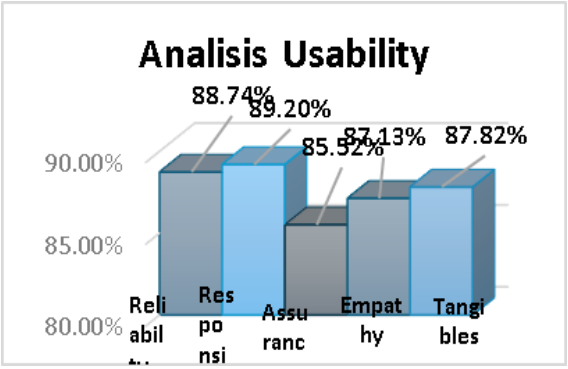

Fig. 3. The division of the usability analysis per indicator.

In the reliability indicator, this waste bank application gets a score of 88.74% with very feasible criteria, so this application can be said to be reliable. The responsive indicator of this waste bank application gets a value of 89.20% with very feasible criteria with this application can be said to be able to provide fast and responsive service to users.

According to the findings [15], web-based information systems can be accepted and implemented according to user needs; this system makes it easier for officials and managers to carry out business processes, and customers get convenience. The assurance indicator of this waste bank application gets a score of 85.52% with very feasible criteria; with this application, it can be said that it can provide precise information. The empathy indicator of this waste bank application gets a value of 87.13% with very feasible criteria. With this, it can be said that this application can understand the wants and needs of users. The tangible indicator of this application achieves a value of 87.84%, demonstrating its ability to display an attractive design.

4. Conclusions

The conclusion from the research results that have been obtained is that they have succeeded in designing an Android-based junior high school waste bank information system. This test uses two methods, namely functionality and usability tests, to produce data that is unfortunately good. Auditors tested the app's functionality and found that it worked correctly. The app for the trash got an average score of 87% on usability tests that used criteria that were easy to understand and follow. This Android-based waste bank information system can be accessed by users anywhere and anytime

with a reliable internet connection, making it easier to manage and monitor applications safely and easily.

Researchers suggest that before using this application, it is hoped that users will use a reliable internet connection. When using this application, the user must install the application on Android and agree to the commands that appear. Researchers hope to add the name of the automation to the certificate given to the customer. Researchers hope that this waste bank application can be included in the Play Store so that users are safer in downloading.

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