



Innovative Garbage Bank Technology Based on Android

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Abstract. In Indonesia, it is general to see the scavengers in shabby clothes move around to various locations to find and collect garbage. Moreover, they have to walk with uncertain goals and even not infrequently, they also get only few results. The innovations offered in this study provide a convenience platform for the garbage scavengers. Using the application proposed, the scavengers do not need to go around with no direction and purpose. Scavengers can pick up the full garbage container by seeing the information obtained from their mobile phones. The application consists of 3 important roles, namely: **garbage bank officer** as admin, **customer**, and **collector**. The admin has rights to delete collectors and users, view transaction history, and change passwords. The customer has rights to make transactions, view balances, add locations, view the amount of the garbage, change passwords, and withdraw money. Collectors have rights to view transaction history, make transactions, view list of places, and change passwords. From the testing experiment, it can be concluded that this application has been successful to be applied in the real life.

Keywords: Garbage collecting · scavengers · android · garbage bank application

1 Introduction

Garbage is one of the problems that always arise in the world [1–9]. Not only that, people often throw garbage out of place, such as throwing garbage in rivers, roads, sewers, causing waters to become closed resulting in flooding in residential areas [11, 12]. Thus, Indonesia is the second largest contributor of garbage in the world [4, 5]. Throwing garbage out of place starts from a person's habits since childhood. In Indonesia, especially in urban areas, there is still a lack of awareness of the importance of disposing and managing garbage. The government's efforts in dealing with garbage problems include providing various landfills, but this is not a solution in handling garbage that increases every day and the problem has not been resolved in various regions, especially in big cities in Indonesia.

Linking social welfare-oriented economic activities and environmental concerns is a necessity and not just a hot concept, but it is sustainable from the start. If humans

have a clean and healthy environment purely from the concern of the population, the population must have a good social welfare orientation, meaning that the population has full awareness to be responsible and able to solve problems that exist in the practice of daily life, it is very difficult to reach the point of humans having environmental concerns, even people who have very high knowledge, or people who go to high school do not necessarily have a sense of environmental concern.

The role of garbage reduction is very important to reduce the amount of garbage, as well as to improve the aesthetic value by preventing odors from arising due to piles of garbage. Garbage also has economic value by limiting garbage generation, recycling and reusing garbage or can be called Reduce, Reuse and Recycle (3R). For the initial momentum in fostering public awareness to start sorting, recycling and utilizing garbage. This is important, because garbage has a selling value and environmentally sound garbage management can become a new Indonesian culture. The biggest challenge in garbage management is the handling of plastic garbage which is not environmentally friendly. The pattern of garbage management by involving the community to play an active role in reducing the volume of garbage is the right decision in anticipating the increasing volume of garbage that continues to increase due to the increase in population.

The research team offers technological innovation in the form of the G-Cent application as a form of technological solution to garbage problems that are often found in the world, especially in Indonesia, using android electronic devices that are often used by the general public. This innovation, which consists of hardware and software that have been integrated with each other, is easy to use by the general public. In addition, this innovation indirectly invites people to care about the environment so as to create a clean and comfortable environment and can improve the economy for the community. G-Cent also has a garbage pickup feature integrated with Google Maps that allows collectors to go directly to the garbage pickup location and can make transactions directly and their use can be displayed on Android.

2 Proposed Method

2.1 Research Steps

The Steps of the G-Cent research can be seen in Fig. 1.

Based on Fig. 1, this research was conducted using some steps, such as: i) problems identification, in which the authors tried to find the problems that occur in the surroundings; ii) define the research objectives; iii) research study; iv) design of the G-Cent; v) device setting; and vi) data mining.

2.2 System Principle

The design of the G-Cent application in this device design has several specifications, including hardware design and software design that are integrated each other. The hardware design is divided into several steps of design. Figure 2 is a description of each steps.

The hardware design is divided into several design steps, starting from the preparation of the required components to the creation of circuit diagrams. In making software,

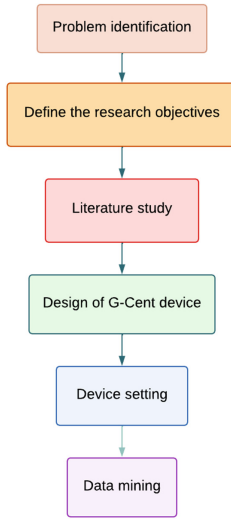


Fig. 1. Steps of the G-Cent research

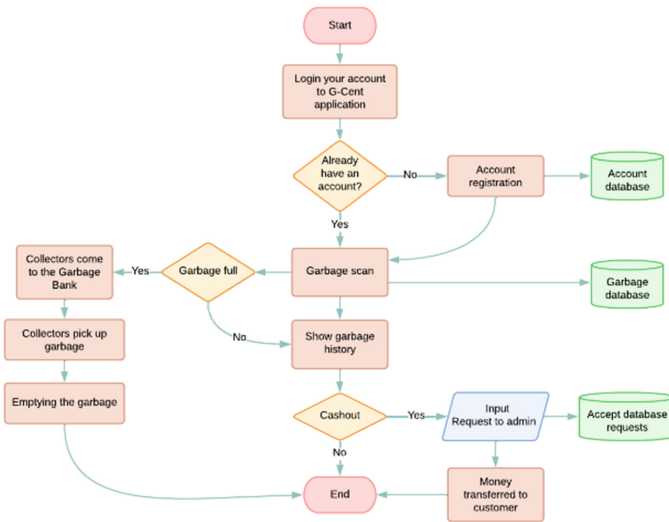


Fig. 2. G-Cent working principle

researchers use Android Studio to create an application called G-Cent. The G-Cent application can scan barcodes on garbage packaging. Packaging that has been scanned will be inputted to the customer’s garbage history. This garbage can be exchanged for the money. If the garbage container is full, the customer can call the collector to empty the trash box.

2.3 Block Diagrams

The design of the device is the process of explaining the garbage disposal system by exchanging it into android-based money. This block diagram as shown in Fig. 3 will show how the process flow of the garbage bank application technology itself.

The concept is like a garbage bank in general, however this innovation is made using an android that has a feature of monitoring the history of garbage that has been disposed, i.e., by scanning the barcode on the garbage packaging. The G-Cent application will read the barcode on the garbage packaging which will be processed by the application. Then, the scanned packaging will be inputted into the ‘garbage database’ located in php My Admin. The database itself is created manually using the PHP (Hypertext Pre-processor) programming language, where this database will store customer garbage history data.

2.4 System Design

This android-based garbage bank technology does not use many components in its manufacture. This tool uses android as a driver, and a camera to read the barcode on the packaging. For making the application, Android Studio software was used. Then, for data storage of garbage data or customer disposal history can be stored in the existing database using MySQL.

Every packaging, such as food packaging, drinks packaging, and other packaging must have a barcode. This barcode is one way to enter data into a computer. The type of barcode used in this study is using the 1D type, which is a 1D type barcode in the form of linear lines and spaces. This type of barcode can be found, such as EAN-13, UPC-A, ISBN (Fig. 4). When the barcode is scanned, it can be directly connected to the item data. The results of the barcode scanner contain data from various products, such as vendor name, product name, price and other supporting data.

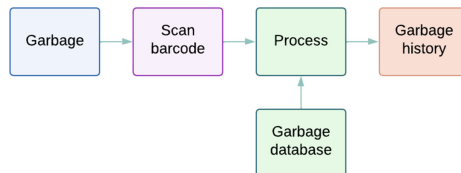


Fig. 3. Diagram block of G-Cent

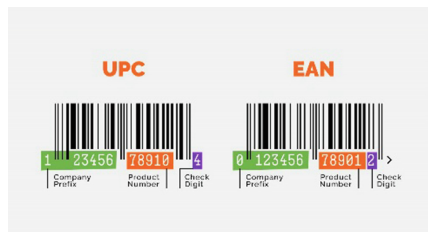


Fig. 4. 1D type barcode



Fig. 5. G-Cent application



Fig. 6. Hardware innovation

After scanning the barcode, the stored data will be inputted into the garbage database which is given a notabe as 'tbl_produk'. Then after the packaging is scanned, the android will process and enter the type of garbage product so that the customer can see the price of the garbage that will be obtained (Fig. 5).

For the hardware circuit itself, researchers use Arduino as a processor, then the Limit Switch as input data, which indicates that the garbage container is full, so that this input will be processed by Arduino Uno and give a signal to the SIM800L module. SIM800L module has function to send a message in the form of SMS (Short Message Service) to the user's cellphone as an indication that the garbage container is full and the customer can call the collector to empty the garbage container again (Fig. 6).

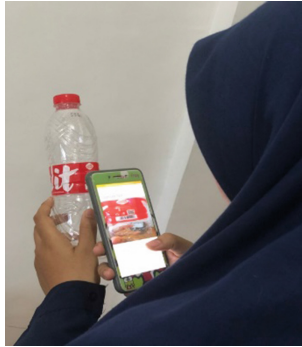


Fig. 7. Customer scans garbage

3 Experimental Result

3.1 Testing Steps

The Steps of the G-Cent research can be seen in Fig. 7. To test this device, it is necessary to take the following steps:

- a. Prepare the device to be tested.
- b. Double check the device before testing to make sure it is in good condition.
- c. Take measurements repeatedly to be more thorough.
- d. Record experimental data that will be used as a reference for analysis.
- e. The test is complete, then turn off all devices.

3.2 Running Test

For device testing on packaging, the first thing to do is login to the G-Cent application. Customers can register first before using the G-Cent application and then login again. After registration, user data in the form of “Full Name”, “Place and Date of Birth”, “Mobile Number”, and “Password” will be stored in the admin database with the notabe “tbl_user”, where the admin can delete customer accounts, view customer waste disposal history, and can disburse waste funds to customers if customers make transaction requests. After the customer logs into the G-Cent application account, the customer can scan the barcode of the garbage packaging.

Figure 7 shows the customer brings the garbage, then scans the barcode on the packaging and the customer gets the price of the scanned garbage on the product. Then to make a money transaction, the customer can make a transaction request to the admin by pressing the “Minta Bayar (in English: need redemption)” button on the screen then the request will be accepted by the admin.

And from the admin side, the admin will receive a transaction request by the customer, where the admin can disburse money to the customer (Fig. 9). Admin can press the “Cairkan (in English: cashed out)” button as attached in Fig. 8.

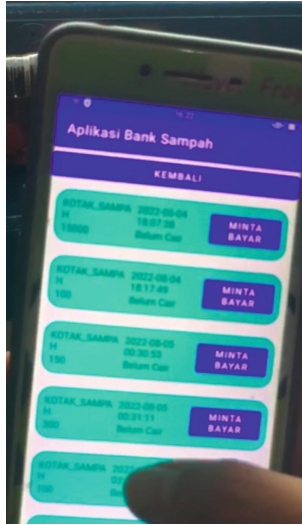


Fig. 8. Costumer makes transaction request



Fig. 9. Admin can cash out customer's money

3.3 Testing Result

After conducting trials in the previous sub-chapter, the test results obtained by scanning the barcode on the packaging show that barcode detection experiences a long delay in the range of 10–15 s. This is influenced by the reading program in accessing the application. Under certain conditions, changing the focus of the camera capture of the barcode is very important to reduce the delay in reading the barcode in the application. Light can



Fig. 10. Garbage scanning history

affect camera detection because the camera work system is the reflection of refracted light. Then, the scanning results will immediately shows the history of garbage disposal as shown in Fig. 10.

After conducting the experiments, it is known that the work of the application system itself uses the reading of the bars on the barcode which will be sorted by product name, price and other supporting data. However, with the tests that have been carried out, it can be seen that there are several factors that can affect the work of the application, such as the focus of the camera on the barcode and the lighting that interferes the detection. By the testing, it is known that the effectiveness of using this proposed device, it is known that the percentage of readings success in a dark room was in the range below 30% and in bright lighting conditions in the range of 85–100%.

4 Conclusion

Based on the results of experimental result, research and discussion G-Cent application, it can be concluded:

1. Lighting affects scanning the barcode on the packaging or the camera is blurred, so that it cannot be detected by the camera.
2. The G-Cent application can facilitate collectors in collecting garbage that was previously conducted manually and not integrated.
3. The G-Cent application can improve the community's economy and increase environmental awareness.
4. Lighting is very influential in scanning barcodes on packaging. So that effective work is obtained on devices with lighting in the 85–100% range.
5. Requires high focus to reduce delay in processing barcode readings.

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