

QR Code System to Monitor Squander Segregation in PCMC Area

R. Ganesh*

Abstract

Squander administration is one of the issues confronted in nearly each city in India. One way to oversee squander is through by utilized of web-based or portable innovation. But in this way, there are still a few short comings such as to input the collected squander information since the information cannot be straight forwardly entered into the framework. The proposed strategy is utilizing the QR code for the squander administration framework. In this method, admin as it were had to be filter the QR code name joined on the squander container put away over the weighing gadget a smartphone camera. QR scanner applications based on mobile can be organically synchronized with Android smart-phones using this framework. In this way, the information input prepare can be quicker and with the utilize of QR code, more information can be put away. QR code system has to be implemented to monitor squander segregation in Ward 10. Given the aforementioned issue, the suggested system will keep track of whether or not collected household trash is segregated. To keep track of squander segregation, we created QR code tags. Smartphone's scan the QR codes to retrieve the electric meter number, and the built application dashboard includes fields such as squander type, segregation status, and so on. To ensure effective tracking, the squander collector should upload a photo of the squander based on its segregation status. If squander is not separated, processing becomes cumbersome, and squander is thrown in landfills. Squander separation and treatment can significantly reduce pollution of air, water, and soil. QR tags carry information about electric meter numbers, which can be collected using a Smartphone application.

Keywords: QR code system, Squander administration, hygiene, garbage, environment

INTRODUCTION

Squander management is one of the problems that faced in almost every city in the city India. The volume of is not proportional to the amount of squander that is transported to the disposal landfill. Squander can have negative impacts on the environment, health and socially. Garbage can pollute the environment both on land and in the water so; it can affect public health conditions. One type of squander which is difficult to decompose is plastic squander, which on average will decompose after

100 years. U.S.' National Oceanic and Atmospheric Administration (NOAA) and Woods Hole Sea Grant compare decomposition rate for man-made marine debris to biodegrade in the sea. Decomposition rate of several debris are shown in Table 1.

According to research conducted by McKinsey and Co and Ocean Conservancy, in 2019 India is the second largest producer of plastic squander in the world after China, plastic squander in India has reach 3.6 million tons in a year. Only about 30% of it is recycled.

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Received Date: April 05, 2023
Accepted Date: April 29, 2023
Published Date: May 20, 2023

Citation: R. Ganesh. QR Code System to Monitor Squander Segregation in PCMC Area. NOLEGEIN Journal of Management Information Systems. 2023; 6(1): 20–26p.

Table 1. Decomposition rate of debris.

Type of debris	Decomposition rate (years)
Plastic grocery bag	10–20
Foam cup	50
Disposable diaper	450
Plastic beverage bottle	450
Fishing line	600

One way to handle squander is by using the squander bank program. A squander bank, according to Minister of Environment Regulation Life No. 13 in 2012, is a location for sorting and collecting squander that can be recycled, reused, and/or reused that has economic worth. A garbage bank's business process is comparable to that of a bank; however, it is processed in the form of sorted inorganic squander. Through the squander bank, in addition to reduce the volume of squander at the disposal site, it also provides economic benefits to the community. To solve the issue of the squander problem is through the 3R principle (reduce, reuse, and recycle). If the people in a community learn more about how to manage squander using special containers called "squander banks," it will help reduce squander problems. Squander banks already exist in several cities in India. According to the environment ministry, there are around 7,000 squander banks spread in India with customers reaching hundreds of thousands of people. If many people use these banks, lots of money gets stored and billions of rupiah are moved every year.

In general, data management in garbage banks has not yet utilized information technology. Management still uses conventional methods where recording only uses books. The system has some problems like using papers to store information, data can get lost easily, and it takes time to put in data. These things cause inefficient and effective management [1] but there are also who already use web-based and mobile technologies. The purpose of this article is to design a system that using QR codes for the system squander management at a squander bank. We make a special code for each house and print it on a sticker to put on the house. When the garbage workers come to pick up your trash, they will scan a code to show that they have collected it from your home. The workers can give their thoughts in the phone app, even if the trash sorting is at the beginning or not. People living in the area can get an app to ask for their garbage to be picked up from their doorstep. The computer system shows where the houses and streets. Important people can watch in real-time when squander is being collected. After the garbage was picked up from the houses, the digital map will show the houses as green. Houses that didn't get covered will remain yellow. The people working in the main office will keep an eye on how we get rid of our squander. Cars and trucks have to drive on all the streets. People can put their garbage outside if they have to leave early for work.

LITERATURE REVIEW

Squander Bank

A squander bank acts as a bank that people in the community, sub-district and district can use to deposit squander or withdraw money from the value of squander delivered to the site [2]. In addition to managing squander based on 3R principal, the squander bank also has the aim to improve the level of the economy through community economic empowerment programs so as to increase public income [3] and sustainable squander management [4]. Squander to be processed in the squander bank in the form of inorganic squander such as plastic, paper, metal, and glass. The working mechanism of the trash bank includes squander sorting before deliver, delivery where squander is delivered to squander bank by the customer itself or pick up, squander weighing, recording, which is submitted to the savings book and sharing of squander revenue between customer and the squander bank institutions. The mechanism of squander bank can be seen in Figure 1.



Figure 1. Mechanism of squander bank.

QR Code

QR code or commonly known as QR code is a form of barcode evolution from one dimension to two dimension. A QR code is a two-dimensional matrix code, or barcode, derived from the word “Quick Response,” where the content of the code can be quickly and accurately decoded. The QR code was developed by the Japanese company Denso Wave, which appeared in 1994. QR codes quickly became popular. More and more people are adopting and using this technology every day. One of the reasons for the rapid growth of the QR code is that it is gaining momentum as Smartphone users grow worldwide and marketers use QR codes to reach mobile consumers [5]. Compared with regular barcodes, QR codes are easier to read with a scanner and can store information both horizontally and vertically. The QR code works by reading several components of the code box. The three large boxes in each corner represent a code barrier. Conversely, smaller boxes are useful for measuring large boxes. Some of the components in the middle of the code are time patterns, information data, and the version number. The scanner reads these areas and processes them to process the QR data code. An example of a QR code is shown in Figure 2.

The amount of information contained in a QR code is very large. A QR code has a high data density, about 100 times that of a barcode. A QR code can contain more information than a barcode, which is comparable to 7,000 alphanumeric characters.

Besides of its capacity, QR code has several other advantages such as freely available, follow ISO standard, dynamics, and completely measurable [6, 7]. But using the QR code can also be unsecure if the user scans for unknown QR code. Users can be attacked and directed to websites that contain viruses, worms, and trojans. It can damage the software and hardware [7].

Currently QR code has been used for several fields. Such as research of QR code application in education [8] shows that QR codes supports both independent and collaborative learning and can create an interactive learning environment and application in academic libraries to promote their service and



Figure 2. Example of QR code.

resources [6]. While researching QR codes for infectious squander management systems [9]. In the smart squander management usage QR code for intelligent bin. The QR code is used by squander management company to justify the garbage is already collected [10].

METHOD

The method used in this study is software technology using the waterfall model. The waterfall model consists of several successive steps. It flows like a waterfall. The waterfall stages are analysis, planning, implementation, and deployment. In the analysis phase, the system description is prepared and the functional requirements of the system are modeled.

System Description

The proposed method is to use the QR code of the squander information management system. Squander deposited by the customer is inorganic squander that has been sorted before. Squander is divided into four categories: plastic, paper, glass, and metal. This application is mobile and web based. Admin can manage data through computers or mobile phones, while customers use application that is installed on an android smart phone. The manager only needs to use the QR scanner camera to scan the QR code sticker attached to the bin stored above the scale. If the squander data has been stored in the database, the data will be displayed in the admin application, but if data has not been entered, it will be not displayed. The administrator then enters the mass of the weighed squander stored in the database. Each type of squander has a different price. Money received by customers will be put into savings. Customers can check saving information in real time through application mobile. In addition, the amount of squander stock in the squander bank is immediately updated in real time. The proposed system flow is shown in Figure 3.

System Modeling

Functional requirements modeling is created to design the proposed system. With graphical illustrates, system descriptions, and designs will be easier to understand. In this research, design modeling is used unified modeling language (UML).

Use Case Diagram

Use case diagram illustrates user interaction with the system to be created. A UML explains the functions of each system operator. UML is shown in Figure 4. There are two actors as system users, admin at the squander bank institution and squander bank customer. Admin performs the functions of managing customers, squander, and transactions. Whereas customers can only see savings updates. Before performing these functions, the admin and customer must login first.



Figure 3. Proposed system flow diagram.

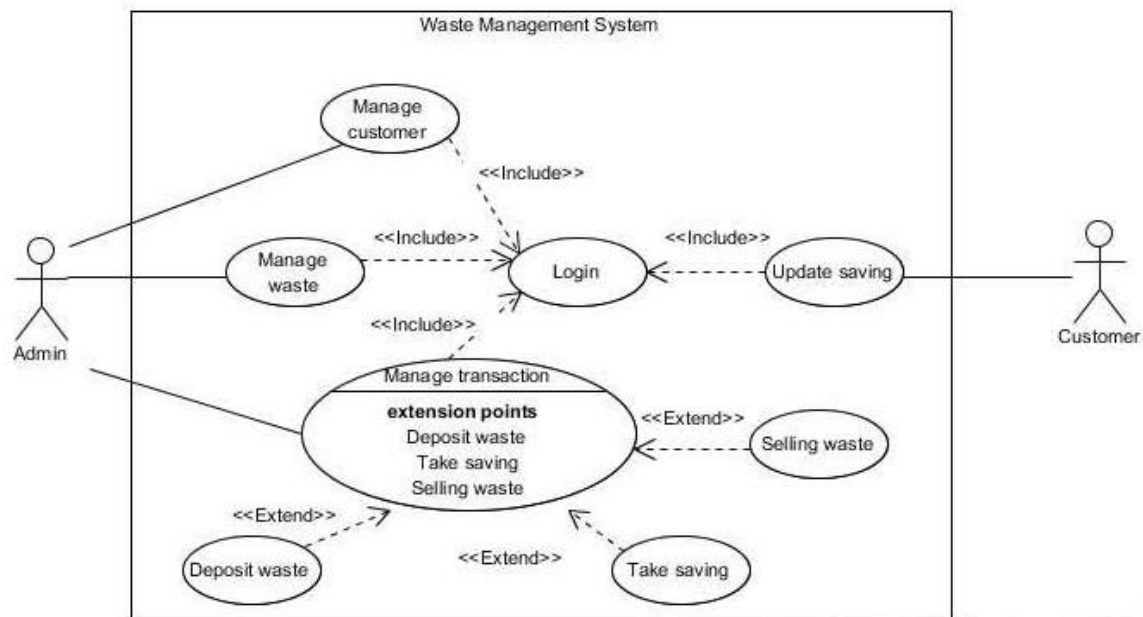


Figure 4. Use case diagram.

Activity Diagram

Activity diagram illustrates the flow of processes or activities contained in each UML of the system. Activity diagram of squander deposit management can be shown in Figure 5 and activity diagram manage squander data can be shown in Figure 6.

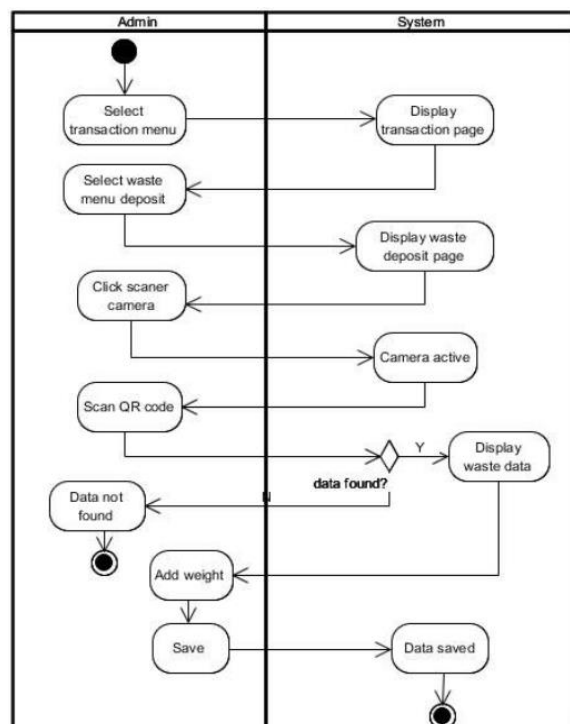


Figure 5. Activity diagram squander deposit.

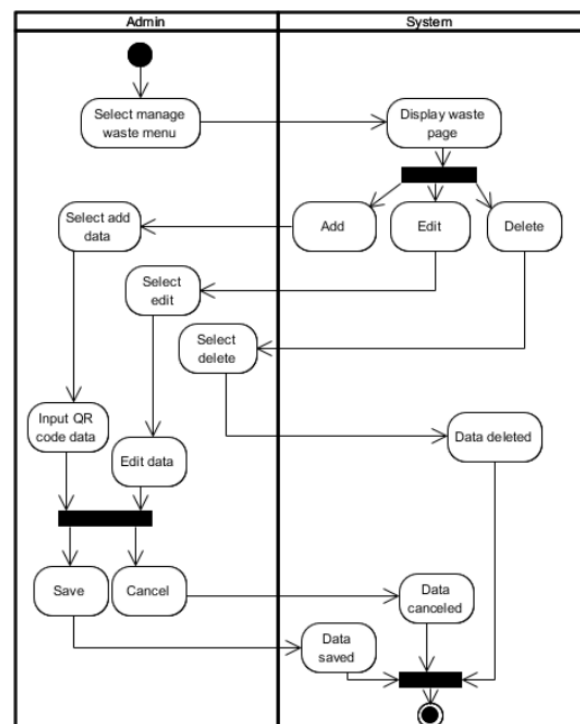


Figure 6. Activity diagram manage squander data

RESULT AND DISCUSSION

The result of this research is the design of a squander management system using a QR code. There are two results of the basic design in the form of QR code and user interface design.

QR Code Design

QR code labels can be made easily and free. There are several websites that can create QR codes, such as at <https://www.the-qrcode-generator.com/>. The QR code created is dynamic so that information can be changed according to need. The information contained in the QR code consists of the code, type, name, price, and description of the squander. Examples of designed QR codes are shown in Table 2.

The user interface is the interface between the user and the system. Figure 7 shows the interface design for the transaction and squander deposit function. On the transaction menu, there are several options such as deposits, selling squander, and taking savings. QR code scanning can be found in the squander deposit menu using the QR scanner connected to the mobile camera.

Table 2. QR code design.

QR Code	Information	
	Code	: P01
	Type	: Plastic
	Item	: Mineral water plastic cup
	Price	: Rp 5000-/kg
	Description	: Clear plastic cup with cut end
	Code	: P01
	Type	: Paper
	Item	: Archive
	Price	: Rp 1700-/kg
	Description	: HVS, book without cover, long cut white paper

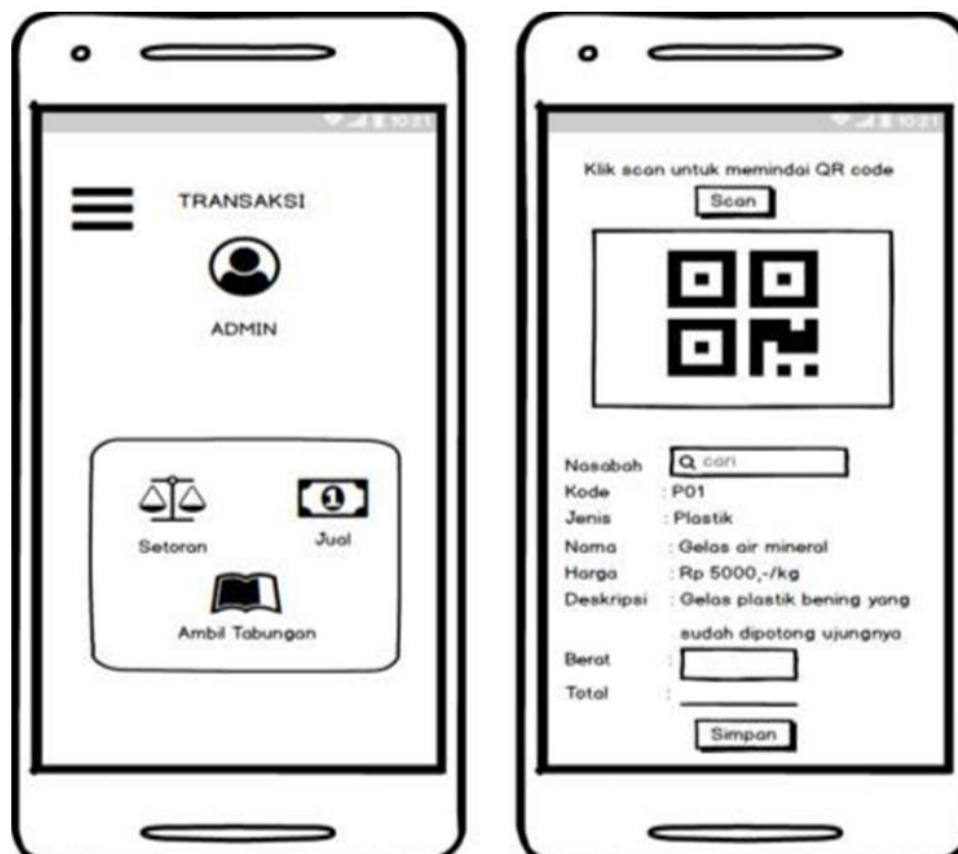


Figure 7. Interface design of transaction.

CONCLUSION

The door-to-door phase of collecting squander from people by sending collection trucks to collect both dry and wet squander was not fully effective. Disputes between collection workers and residents were reported over unorganized squander collection. The workers were too much trouble to separate the garbage later when all the garbage was collected. And because of mixed squander, recycling is difficult to recycle and also creates problems in landfills. This leads to squanders piling up in landfills and more and more illegal dumps in the city taking up more space in the squanders landfill.

Garbage makes work difficult because it requires a lot of manual or mechanical sorting, which endangers the health of the workers. In particular, hazardous squander can cause long-term health problems, and squander poured into the compressor is not completely separated. Due to the collected unsorted squander, packaging becomes difficult and its isolation takes time and leads to a lot of squander in the departments. The squander collected by the PCMC is then compacted in landfills and landfills far from the residential area, but due to improper squander sorting and recycling process, the landfills pile up, leading to illegal dumps and landfills.

The squander collected by the PCMC is then compacted in landfills and landfills away from residential areas, but due to improper squander sorting and recycling processes, the landfills pile up, leading to illegal dumps and landfills. time to squander business. The communities surrounding the landfills face problems with drinking water due to leaking landfills, improper separation of wet and dry squander, and the health and hygiene of workers suffer even more. More detailed analyzes were made using the responses collected through well-structured questionnaires, from which we learned that in most areas there is no squander sorting and this increases the amount of squander going to landfills. To identify them, we developed a Smartphone app and also designed QR code labels to scan trash cans.

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