FINAL REPORT

SMART WASTE MANAGEMENT SYSTEM

TEAM ID : PNT2022TMID05343

TEAM LEADER: SOWMYA P

TEAM MEMBER: SIVA SANKARI A

TEAM MEMBER: SHARMILA A

TEAM MEMBER: RAJEEYA B

1. **INTRODUCTION**

a. Project Overview

b. Purpose

2. **LITERATURE SURVEY**

a. Existing problem

b. References

c. Problem Statement Definition

3. **IDEATION & PROPOSED SOLUTION**

a. Empathy Map Canvas

b. Ideation & Brainstorming

c. Proposed Solution

d. Problem Solution fit

4. **REQUIREMENT ANALYSIS**

a. Functional requirement

b. Non-Functional requirements

5. **PROJECT DESIGN**

a. Data Flow Diagrams

b. Solution & Technical Architecture

c. User Stories

6. **PROJECT PLANNING & SCHEDULING**

a. Sprint Planning & Estimation

b. Sprint Delivery Schedule

c. Reports from JIRA

7. **CODING & SOLUTIONING (Explain the features added in the project along with code)**

Project Report

Team ID	**PNT2022TMID05343**
Project Name	**Smart waste management system for metropolitan cities**

1. INTRODUCTION

1.1 Project Overview:

With the increasing population and industrialization of nations throughout the globe, waste has become a great concern for all of us. Over years, researchers figured that only waste management is not enough for its proper treatment and disposal techniques to preserve our environment and keeping it clean in this era of globalization. With the help of

technology researchers have, introduced IoT based Smart Waste Management solutions and initiatives that ensures reduced amount of time and energy required to provide waste management services and reduce the amount of waste generated. Unfortunately, developing countries are not being able to implement those existing solutions due to many factors like socio-economic environment. Therefore, in this research we have concentrated our thought on developing a smart IoT based waste management system for developing countries like INDIA that will ensure proper disposal, collection, transportation and recycling of household waste with the minimum amount of resources being available

1.2 Purpose:

We amalgamate technology along with waste management in order to effectively create a safe and a hygienic environment. Smart waste management is about using technology and data to create a more efficient waste industry. Based on IoT (Internet of Things) technology, smart waste management aims to optimize resource allocation, reduce running costs, and increase the sustainability of waste services. This makes it possible to plan more efficient routes for the trash collectors who empty the bins, but also lowers the chance of any bin being full for over a week. A good level of coordination exists between the garbage collectors and the information supplied via technology. This makes them well aware of the existing garbage level and instigate them whenever the bins reach the threshold level. They are sent with alert messages so that they can collect the garbage on time without littering the surrounding area. The fill patterns of specific containers can be identified by historical data and managed accordingly in the long term. In addition to hardware solutions, mobile applications are used to overcome the challenges in the regular waste management system, such as keeping track of the drivers while they are operating on the field. Thus, smart waste management provides us with the most optimal way of managing the waste in an efficient manner using technology.

1. LITERATURE SURVEY:

2.1 Existing problem:

Waste management has become an alarming challenge in local towns and cities across the world. Often the local area bins are overflowing and the municipalities are not aware of it. This affects the residents of that particular area in numerous ways starting from bad odour to unhygienic and unsafe surroundings. Poor waste management - ranging from non-existing collection systems to ineffective disposal -causes air pollution, water and soil contamination. Open and unsanitary areas contribute to contamination of drinking water and can cause infection and transmit diseases. Toxic components such as Persistent Organic Pollutants (POPs) pose particularly significant risks to human health and the environment as they accumulate through the food chain. Animals eating contaminated plants have higher doses of contaminants than if they were directly exposed. Precipitation or surface water seeping through waste will absorb hazardous components from landfills, agricultural areas, feedlots, etc. and carry them into

surface and groundwater. Contaminated groundwater also poses a great health risk, as it is often used for drinking, bathing and recreation, as well as in agricultural and industrial activities. Landfills and waste transfer stations can attract various pests (insects, rodents, gulls, etc.) that look for food from waste. These pests can spread diseases through viruses and bacteria (i.e., salmonella and e-coli), which are a risk to human health.

2.2 References:

PAPER 1:

TITLE: IoT Based Waste Management for Smart City

AUTHOR NAME: Parkash Tambare, Prabu Venkatachalam

PUBLICATION YEAR: 2016 **DESCRIPTION:**

In the current situation, we frequently observe that the trash cans or dust cans that are located in public spaces in cities are overflowing due to an increase in the amount of waste produced each day. We are planning to construct "IoT Based Waste Management for Smart Cities" to prevent this from happening because it makes living conditions for people unsanitary and causes unpleasant odours in the surrounding area. There are numerous trash cans scattered throughout the city or on the campus that are part of the proposed system. Each trash can is equipped with a low-cost embedded device that tracks the level of the trash cans and an individual ID that will enable it to be tracked and identified.

PNT2022TMID05343

PAPER 2:

AUTHOR NAME: Mohammad Aazam, Marc St-Hilaire, Chung-Horng Lung, Ioannis Lambadaris

PUBLICATION YEAR: 2016

DESCRIPTION:

Each bin in the Cloud SWAM system that Mohammad Aazam et al suggested has sensors that can detect the amount of waste inside. There are separate bins for organic, plastic/paper/bottle/glass, and metal waste. This way, each form of waste is already divided, and it is known how much and what kind of waste is collected thanks to the status. Different entities and stakeholders may benefit from the accessibility of cloud-stored data in different ways. Analysis and planning can begin as soon as garbage is collected and continue through recycling and import/export-related activities. Timely garbage collection is provided via the Cloud SWAM

system. A timely and effective method of waste collection improves health, hygiene, and disposal.

PAPER 3:

TITLE: Arduino Microcontroller Based Smart Dustbins for Smart Cities

AUTHOR NAME: K. Suresh, S. Bhuvanesh and B. Krishna Devan

PUBLICATION YEAR: 2019

DESCRIPTION:

In this paper, a technique for cleaning up our surroundings and environment is described. The Indian government just began work on a smart city initiative, and in order for these towns to be smarter than they already are, the garbage collection and disposal system must be improved upon. Self-Monitoring Automated Route Trash (SMART) dustbins are intended for use in smart buildings such as colleges, hospitals, and bus stops, among other places. In this study, we have employed the PIR and Ultrasonic sensors to detect human presence, the Servomotor to open the dustbin lid, and the Ultrasonic sensor to detect the level of rubbish. Signals between two trash cans are transmitted using a communication module, and the GSM module sends the message to the operator.

PAPER 4:

AUTHOR NAME: Mohd Helmy Abd Wahab, Aeslina Abdul Kadir, Mohd Razali Tomari and Mohamad Hairol Jabbar

PUBLICATION YEAR: 2014

DESCRIPTION:

Proposed a smart recycle bin that can handle the recycling of plastic, glass, paper, and aluminium cans. It generates a 3R card after automatically determining the value of the trash thrown away. The recycle system makes it possible to accumulate points for placing waste into designated recycle bins. By allowing the points to be redeemed for goods or services, such a system promotes recycling activities. The system keeps track of information on disposal procedures, materials disposed of, user identification, and points accrued by the user.

PAPER 5:

TITLE: Waste Management Initiatives in India For Human Wellbeing

AUTHOR NAME: Dr. Raveesh Agarwal, Mona Chaudhary and Jayveer Singh

PUBLICATION YEAR: 2015

DESCRIPTION:

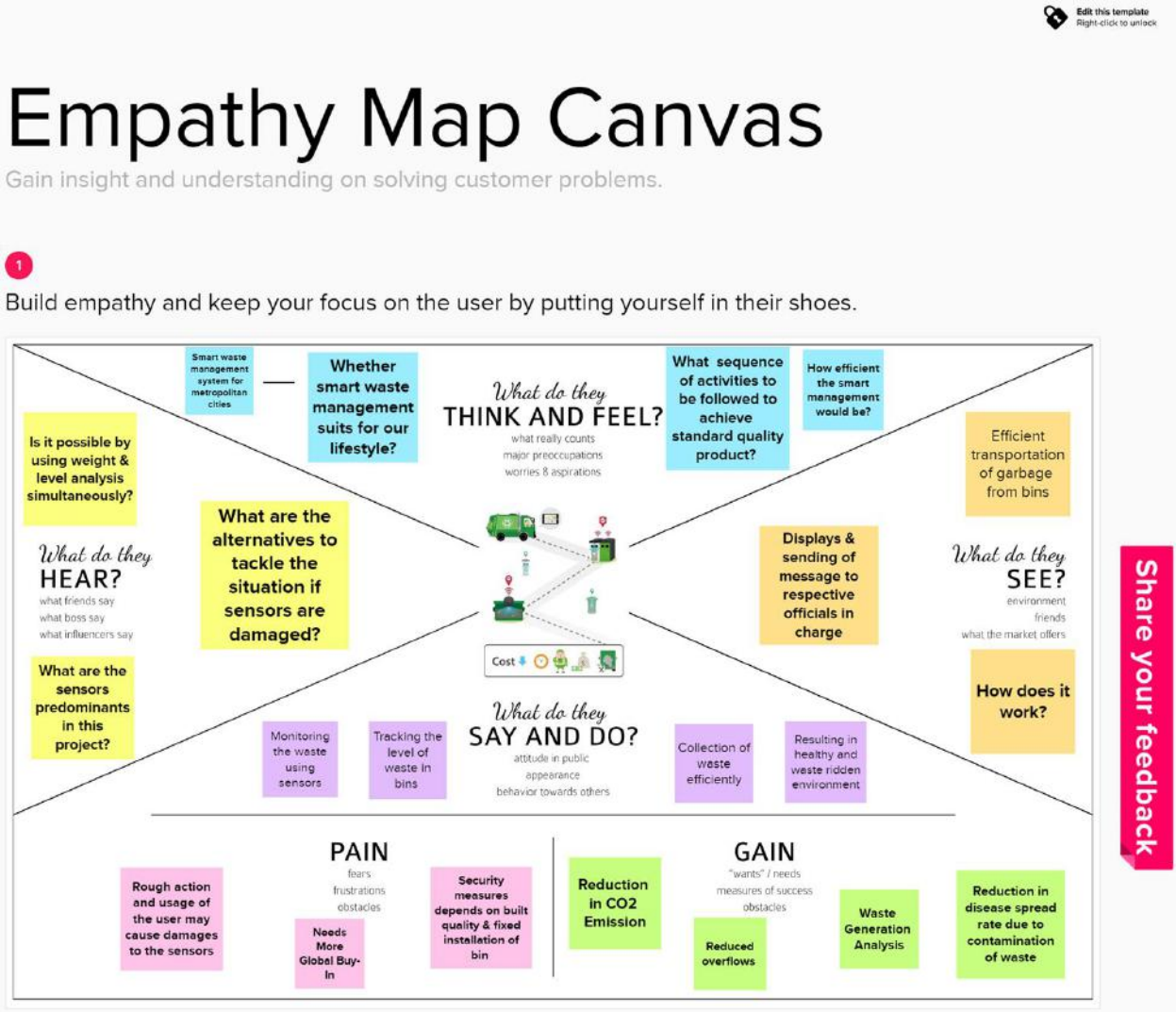
The objective of this paper is to examine the present methods used in India for the welfare of its people in different waste management efforts. The other goal is to offer advice on how to make Indian municipalities' trash disposal procedures better. On secondary research, this essay is founded. The system is improved by looking at the reports that have already been written about waste management and the suggestions made for improvement by planners, NGOs, consultants, government accountability organisations, and important business leaders. It provides in-depth understanding of the various waste management programmes in India and identifies areas where waste management might be improved for societal benefit. The essay makes an effort to comprehend the crucial part that our nation's official waste management sector plays in the waste management process.

2.3 Problem Statement Definition:

Problem Statement (PS)	**I am (Customer)**	**I'm trying to**	**But**	**Because**	**Which makes mefeel**
PS-1	Municipal Corporation Authority	Get notified when the trash cans are full and be made aware of where the full cans are located.	Don't havethe facilities atthe moment	There is no toolavailable to determine the level of bins.	Frustrated
PS-2	Individual working for a private limited Corporation	Get rid of the example of a surplus of waste	The trash cans are always filled	I occupy a metropolitan where there is acity is invariably crowd.	Worried

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming

Date of Submission: 30/09/2022

Problem Statement:

- Smart waste management system would include; a sensor attached to the trash bin that measures fill level; and a communication system that transfers this data to Cloud.
- By exploiting this data, trash collection can be planned as well as truck routes can be optimized.

Technical Architecture:

SOWMYA P

The proposed system would be able to automate the solid waste monitoring process and management of the overall collection process using IOT

Placing Ultrasonic sensor to detect level of bins

SHARMILA A

Enable GPS function to locate bins easier

Waste generation analysis to understand cities usages

SIVA SANKARI A

Load cell on bottom of bins

Place Arduino board at left side of bins

RAJEEYA B

Visual fill status indicators on top of bins

solar panels for power supply for IOT devices

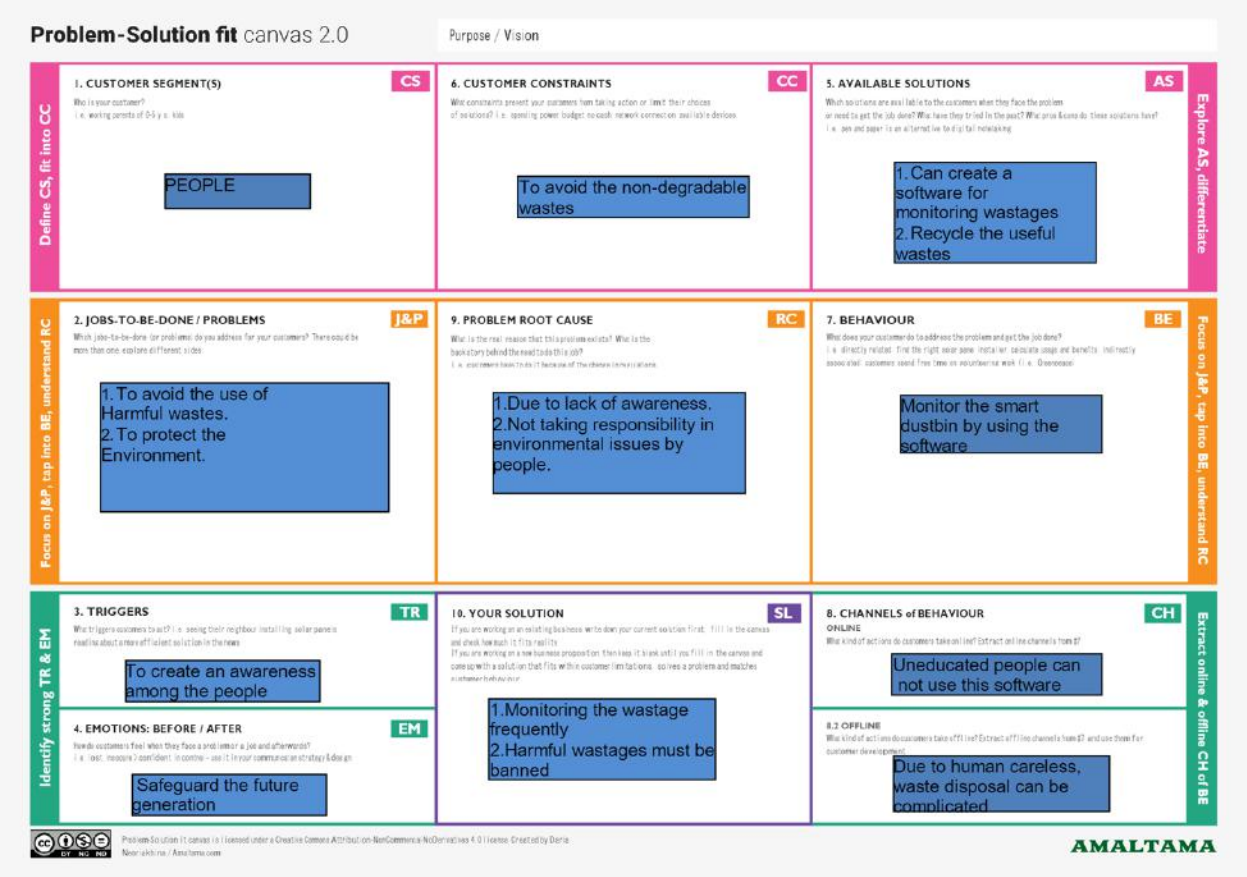
3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to besolved)	This project deals with the problem of waste management in smart cities, where the garbage collection system is not optimized. This project enables the organizations to meet their needs of smart garbage management systems. This system allows the authorised person to know the fill level of each garbage bin in a locality or city at all times, to give a cost-effective and time-saving route to thetruck drivers.
2.	Idea / Solution description	The key research objectives are as follows: 1. The proposed system would be able to automate the solid waste monitoring processand management of the overall collection process usingIOT (Internet of Things). 2. The Proposed system consists of main subsystems namely Smart Trash System(STS)and Smart Monitoring and Controlling Hut(SMCH). 3. In the proposed system, whenever the wastebin gets filled this is acknowledged by placing the circuit at the waste bin, which transmits it to the receiver at the desired place in the area or spot. 4. In the proposed system, the received signal indicates the waste bin status at the monitoring and controlling system.
3.	Novelty / Uniqueness	We are going to establish SWM in our college but the real hard thing is that janitor (cleaner) don't know to operate these thing practically so here our team planned to build a wrist band to them, that indicate via light blinking whenthe dustbin fill and this is Uniqueness we made here beside from projectconstrain.
4.	Social Impact/ Customer Satisfaction	From the public perception as worst impacts of present solid waste disposal practices are seen direct social impacts such as neighbourhood of landfills to communities, breeding of pests and

		loss in property values

5.	Business Model(Revenue Model)	Waste Management organises its operationsinto two reportable business segments: Solid Waste, comprising the Company's waste collection, transfer, recycling and resource recovery, and disposal services, which are operated and managed locally by the Company's various subsidiaries, which focus ondistinct geographic areas; and Corporate and Other, comprising the Company's other activities, including its development and operation of landfill gas-to-energy facilities in the INDIA, and its recycling brokerage services, as wellas various corporate functions.
6.	Scalability of the Solution	In this regard, smart city design has been increasingly studied and discussed around the world to solve this problem. Following this approach, this paper presented an efficient IoT-based and real-time waste management modelfor improving the living environment in cities,focused on a citizen perspective. The proposed system uses sensor and communication technologies where waste data is collected from the smart bin, in real-time, and then transmitted to an onlineplatform where citizens can access and check the availability ofthecompartments scattered arounda city.

3.4 Problem Solution fit



4. REQUIREMENT ANALYSIS

4.1 Functional requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	1. User needs to login by using the gmail to resolve thequeries 2. Registration needs to be done by giving their name, mobile number and locality

FR-2	User Confirmation	1. Confirmation about thereceived queries through message.
FR-3	Smart bin location	1. Bin can be viewed through Google maps. 2. Bins can be tracked usingGPS
FR-4	Monitoring details	1. This process givesa brief description aboutthe bins. 2. Using Capacitance sensor the level of the bin can bemeasured 3. Ultrasonic sensor is used for opening and closing of thelid for the bin 4. Using Moisture sensor it determines whether thewaste is moist or dry
FR-5	Truck driver	1. Truck drivershould login to the webportal by givingtheirname and the id, vehicle number 2. After the completion of work they should report to theadmin about the waste has been collected. 3. Verification is done by admin via Message through the truck driver portal
FR-6	Admin	1. Admin shouldmonitor the work which has been done bythetruck driver 2. In emergency situation , admin can allot the truck driver to collect the waste

4.2 Non-Functional requirements

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	IoT device verifies that usability is a special and importantperspective to analyze user requirements, which can further improve the design quality.
NFR-2	**Security**	We propose a Secure Incentive based Waste monitoringsystem to encourage garbage segregation at the initial level.
NFR-3	**Reliability**	Smart waste management is also about creating betterworking conditions for waste collectors and drivers. Instead of driving the same collection routes and servicingempty bins,waste collectors willspend their time more efficiently, taking careof bins that needservicing.
NFR-4	**Performance**	The Smart Sensors use ultrasound technology to measurethe fill levels. focuses on solving the previously mentioned solid waste management problems using sensors, intelligent monitoring systems, and mobile applications.
NFR-5	**Availability**	By developing & deploying resilient hardware and beautiful software we empower cities, businesses, and countries to managewaste smarter

NFR-6	**Scalability**	Using smart waste bins reduce the number of bins insidetown , cities as we are monitoring the whole 24 hours of7days Smart waste binsare more costefficient and scalability

5.PROJECT DESIGN

5.1 Data Flow Diagrams

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system.

A neat and clear DFD can depict the right amount of the system requirementgraphically.

It shows how data enters and leaves the system, what changes the information, and where data is stored. A smart waste management platform uses analytics to translate the data gather in your

bins into actionable insights to help you improve your waste services.

You can receive data on metric such as:

1. The first test conducted is the situation where the garbage bin is empty or its garbage level is very low

2. Then, the bin is filled with more garbage until its level has surpassed the first threshold

value, which is set to 80% then the first warning SMS is being sent, as depicted

- The first notification SMS sent by the system, once the waste reaches the level of 85% full

1. The second notification SMS sent by the system, indicating that bin is at least 95% full and **the garbage needs to be collected immediately**

2. Locations prone to overflow

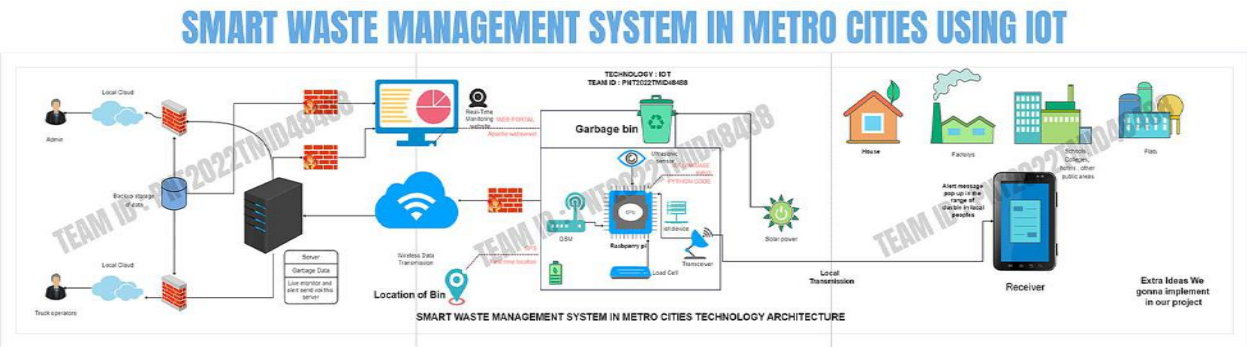
3. The number of bins needed to avoid overflowing waste

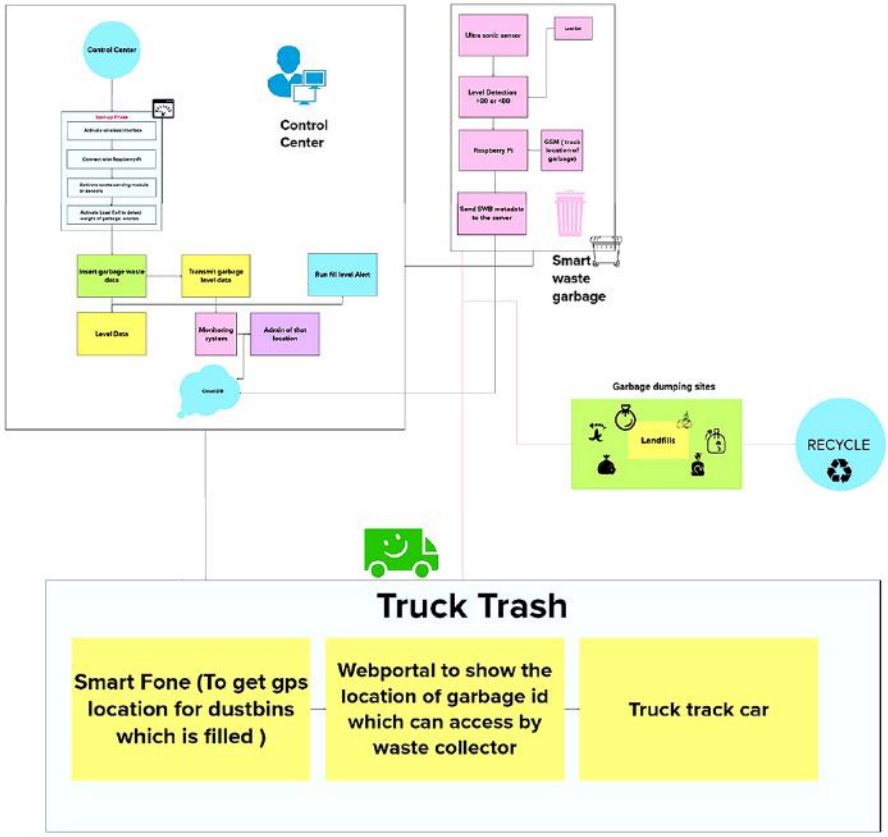
4. The number of collection services that could be saved

5. The amount of fuel that could be saved

6. The driving distance that could be saved.

5.2 Data flow diagram:





5.2 Solution & Technical Architecture:

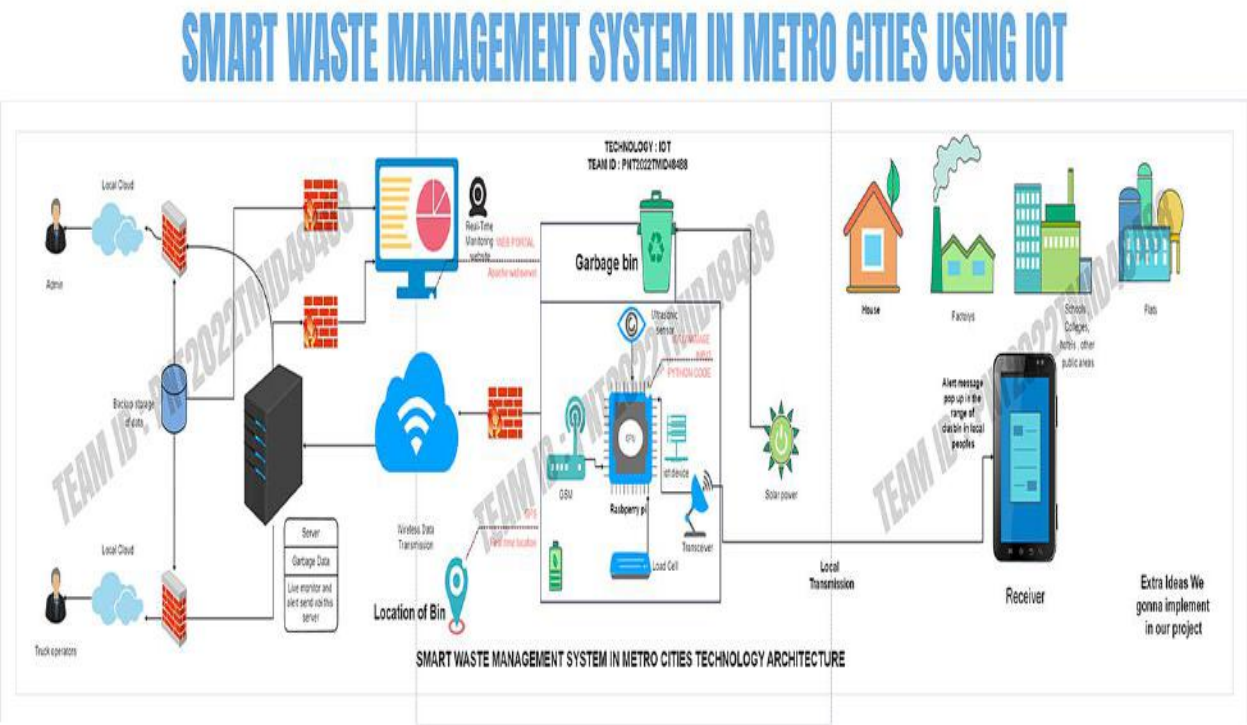


Table-1: Components & Technologies:

S.no	Component	Description	Technology
1.	User Interface	Mobile Application	HTML, CSS, JavaScript.
2.	Application Logic	Logic for a process in the application	Javascript
3.	Database	Data Type, Configurations etc.	Firebase, ibm cloud
4.	Cloud Database	Database Service on Cloud	IBM Cloud
5.	File Storage	File storage requirements	Local Filesystem and IBM cloud
6.	Infrastructure (Server / Cloud)	Application Deployment on CloudLocal Server	Local and Cloud Foundry

		Configuration	

Table-2:Application Characteristics:

S.no	Characteristics	Description	Technology
1.	Open-Source Frameworks	GitHub	Internet hosting service
2.	Security Implementations	Application security: Veracode.	Network automation
3.	Scalable Architecture	It provides the room for expansion more databaseof smart bins added additionally can be updated.	Cloud storage
4.	Availability	As the system control is connected to web server itis available 24*7 and can be accessed whenever needed.	Server, Appleixe, reple
5.	Performance	Performance is high it uses 5mb caches	Wireless Sensor Network

5.3 User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Admin	Login	USN-1	As an administrator, I assigned user namesand passwords to each employee and managed them.	I can control my online account and dashboard.	Medium	Sprint-1
Co-Admin	Login	USN-2	As a Co-Admin, I'll control the waste level monitor. If a garbage filling alert occurs, I will notify the trash truck of	I can handle the waste collection.	High	Sprint-1

			the location and rubbish ID.			
Truck Driver	Login	USN-3	As a Truck Driver, I'll follow Co Admin'sinstruction to reach the filled garbage.	I can take the shortest path to reach the waste filled route specified.	Medium	Sprint-2
Local Garbage Collector	Login	USN-4	As a Local Garbage Collector, I'II gather all the waste from the garbage, load it onto a garbage truck, and deliver it to Landfills	I can collect the trach, pullit to the truck, and send it out.	Medium	Sprint-3
Municipalit yofficer	Login	USN-5	As a Municipality officer, I'll make sure everything is proceeding as planned andwithout any problems.	All of these processes areunder my control.	High	Sprint-4

Project Planning Phase

Project Planning Template (ProductBacklog, Sprint Planning, Stories, Story points)

Date	18 October 2022
Team ID	PNT2022TMID05343
Project Name	Smart waste management system
Maximum Marks	8 Marks

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Product Backlog, SprintSchedule, and Estimation (4 Marks)

Use the below template to create productbacklog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members

Sprint -1	Login	USN-1	As a Administrator, I need to give user id andpasscode for ever workers over there in municipality	1 0	High	Sowmya P
Sprint -1	Login	USN-2	As a Co-Admin, I'll control the waste level by monitoring them vai real time web portal. Once the filling happens, I'll notify trashtruck withlocation of bin with bin ID	1 0	High	Sharmila A
Sprint -2	Dashboard	USN-3	As a Truck Driver, I'll follow Co-Admin's Instruction to reachthe filling bin in short rootsand save time	2 0	Low	Siva Sankari A
Sprint -3	Dashboard	USN-4	As a Local Garbage Collector, I'll gather all the wastefrom the garbage, load it onto a garbage truck, and deliver it to Landfills	2 0	Medium	Rajeeya B Sowmya P
Sprint -4	Dashboard	USN-5	As a Municipalit y officer, I'll make sure everything is proceeding as planned andwithout any problems	2 0	High	Sowmya P Rajeeya B Siva Sankari A Sharmila B

6.2. Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

Velocity:

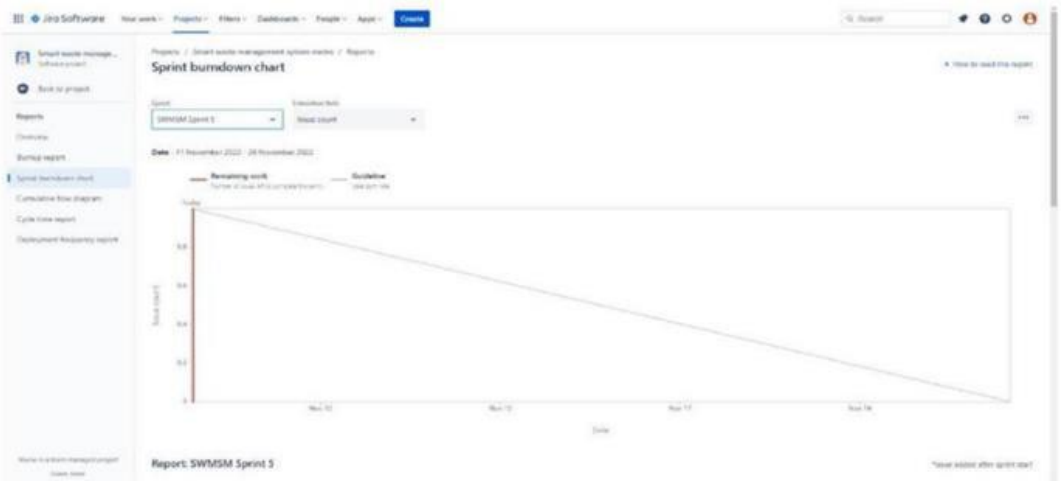
Imagine we have a 10-daysprint duration, and the velocityof the team is 20 (points per sprint).

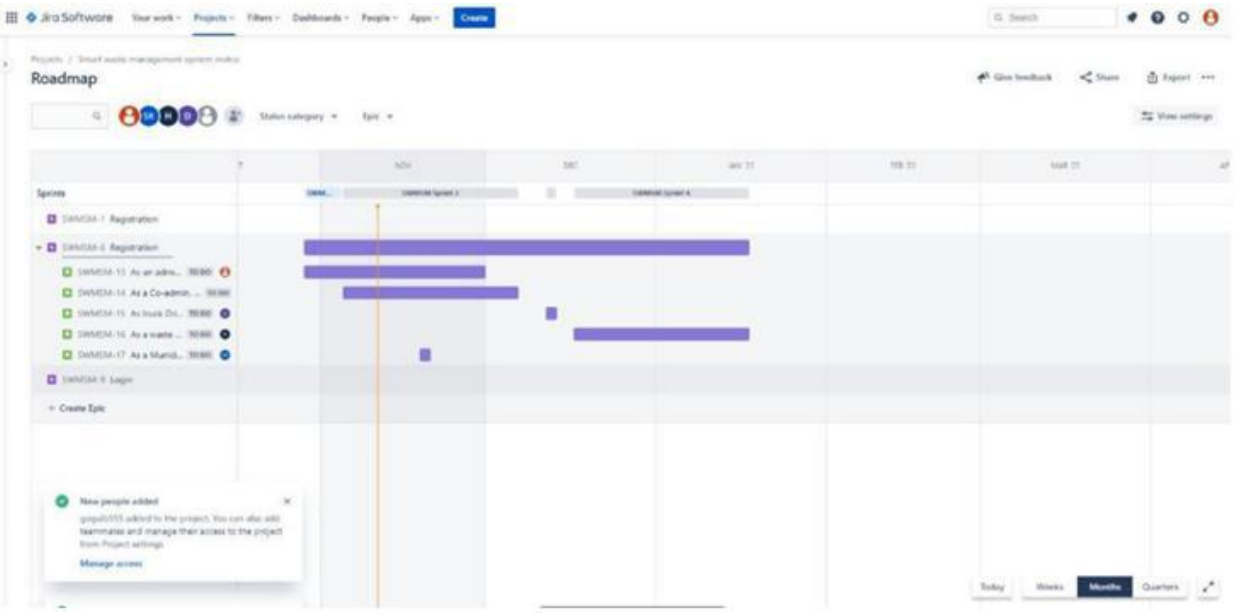
Let'scalculate the team'saverage velocity (AV) per iterationunit (story points per day)

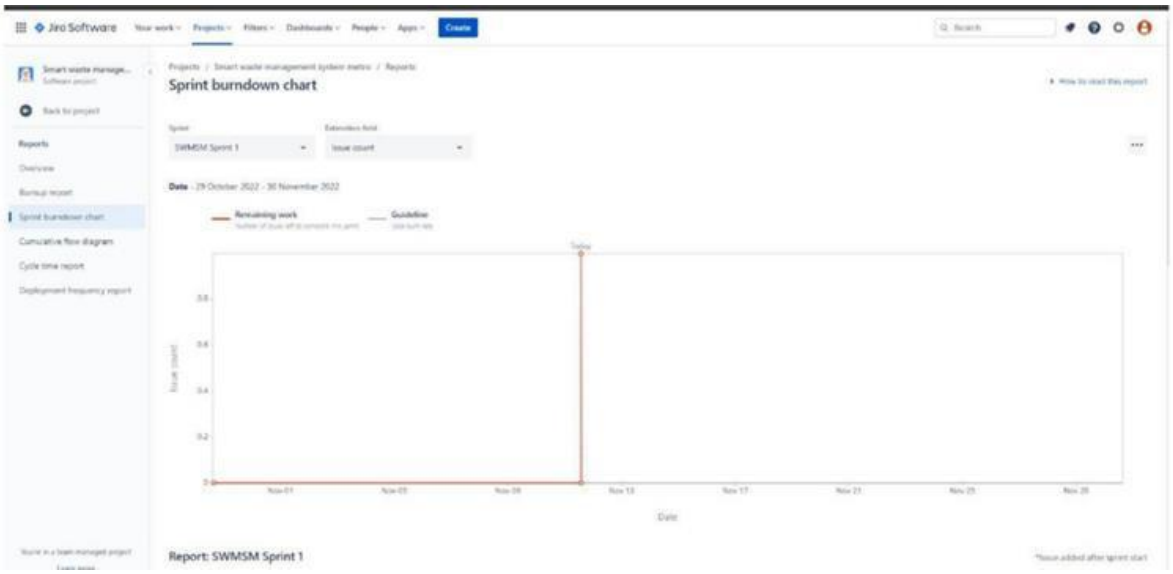
$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

6.3 Reports from JIRA

BURNDOWN CHART

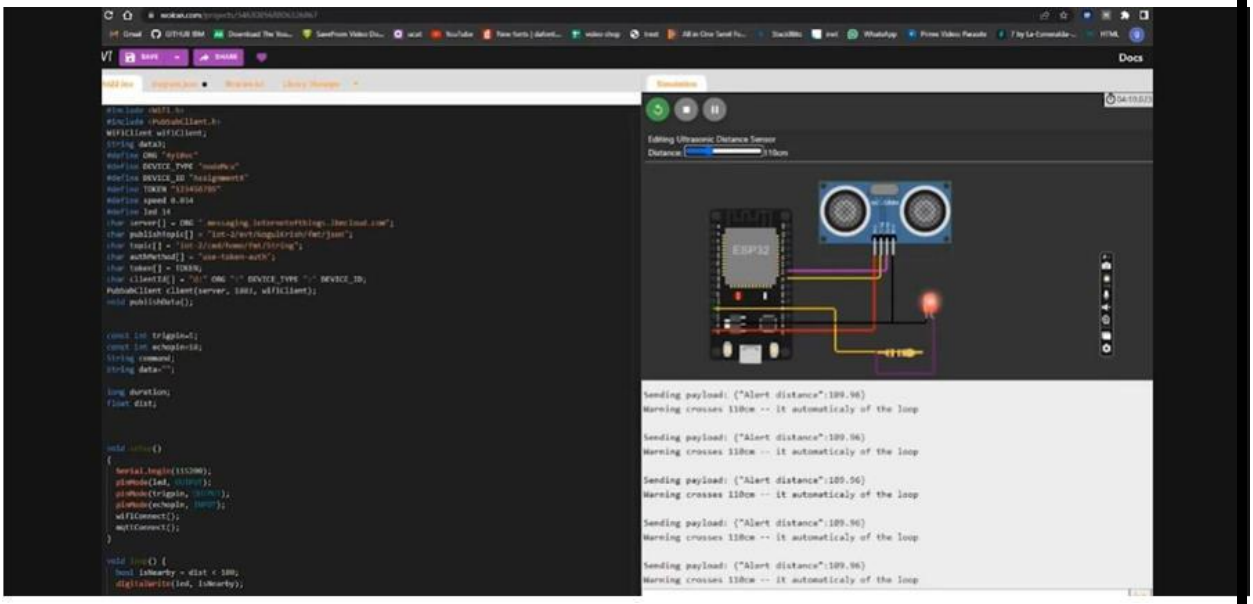






7. CODING & SOLUTIONING (Explain the features added in the project along with code)

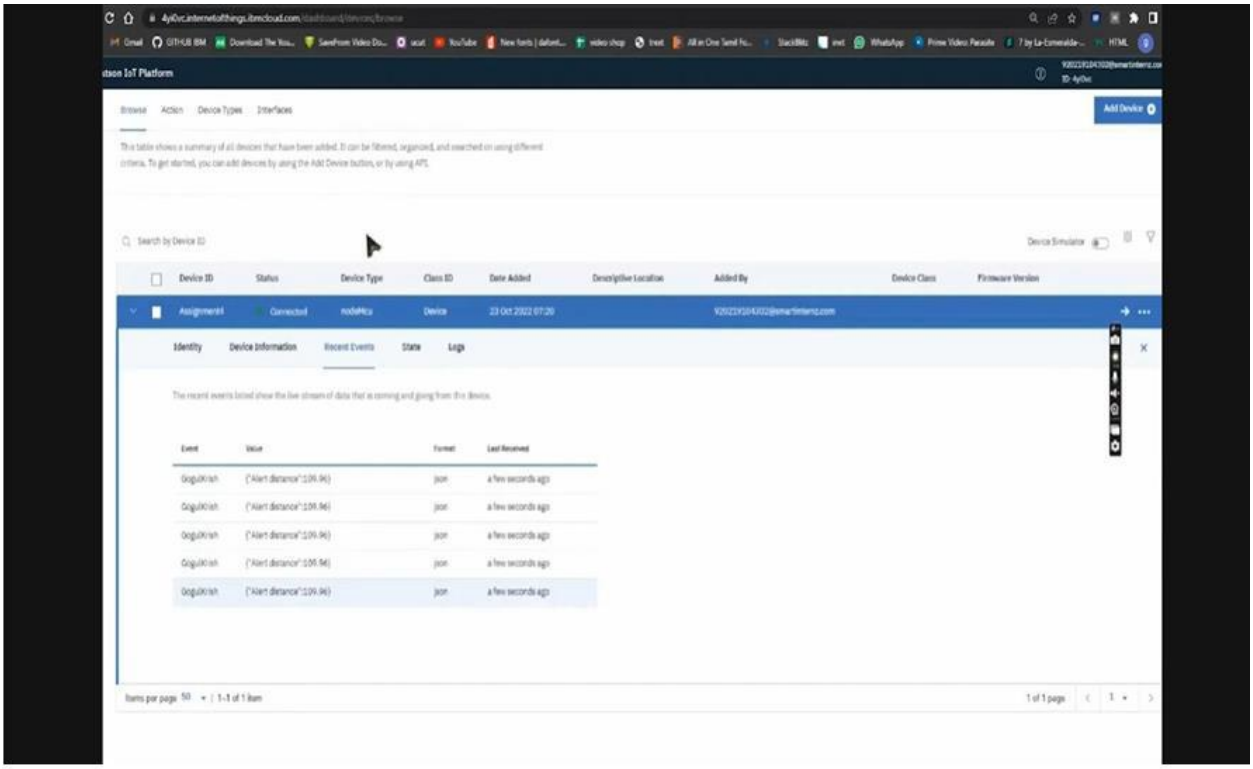
7.1 Feature 1



7.2 Feature 2- LIVE UPDATE ON COLLECTED DATA

With ultrasonic sensor nodemcu with a constant of a to allot admin when it crosses 100 cm right and real-time CM values are also shown in IBM cloud and node
Pick up this was appointed to points3 points 16 over 100 cm each source normal in alert message on crossover 102 change show warning Vijay up to 110 CM 16 also cross 110 CM it hit the circuit will temporarily V to please state and the output is possible to IBM cloud and nodemcu interface is also my show in screen right now adjustable to transform this It's between hundred rate normal distance once it crosses hundred it will show some warning Right you got the screenPlay 16411 you can travel on cm It will certainly of the said to temporarily and the City the Ultrasonic waves below below the trouble on said it will again on and so the warning message toThanks for thanks for the time chairs

7.3 DATABASE SCHEMA



8.Testing

8.1Test Cases

Unit Testing

Unit testing involves the testing of each unit or an individual component of the software application. It is the first level of functional testing. The aim behind unit testing is to validate unit components with its performance.

A unit is a single testablepart of a software systemand tested duringthe development phase of the application software.

The purpose of unit testing is to test the correctness of isolated code. A unit component is an individual function or code of the application. White box testing approach used for unit testing and usually done by the developers.

Whenever the application is ready and given to the Test engineer, he/she will start checking every componentof the module or moduleof the application independently or one by one, and this process is known as **Unit testing** or **components testing**.

8.2User Acceptance Testing

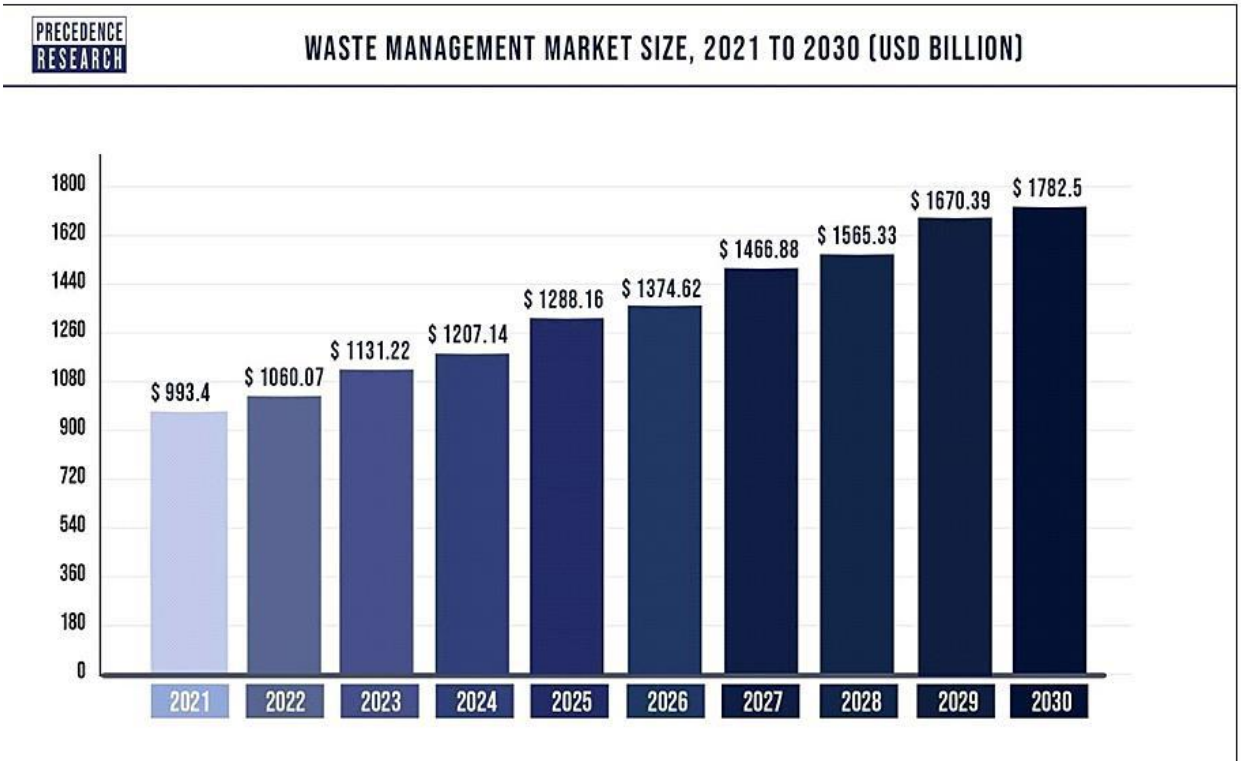
Table-1: Components & Technologies:

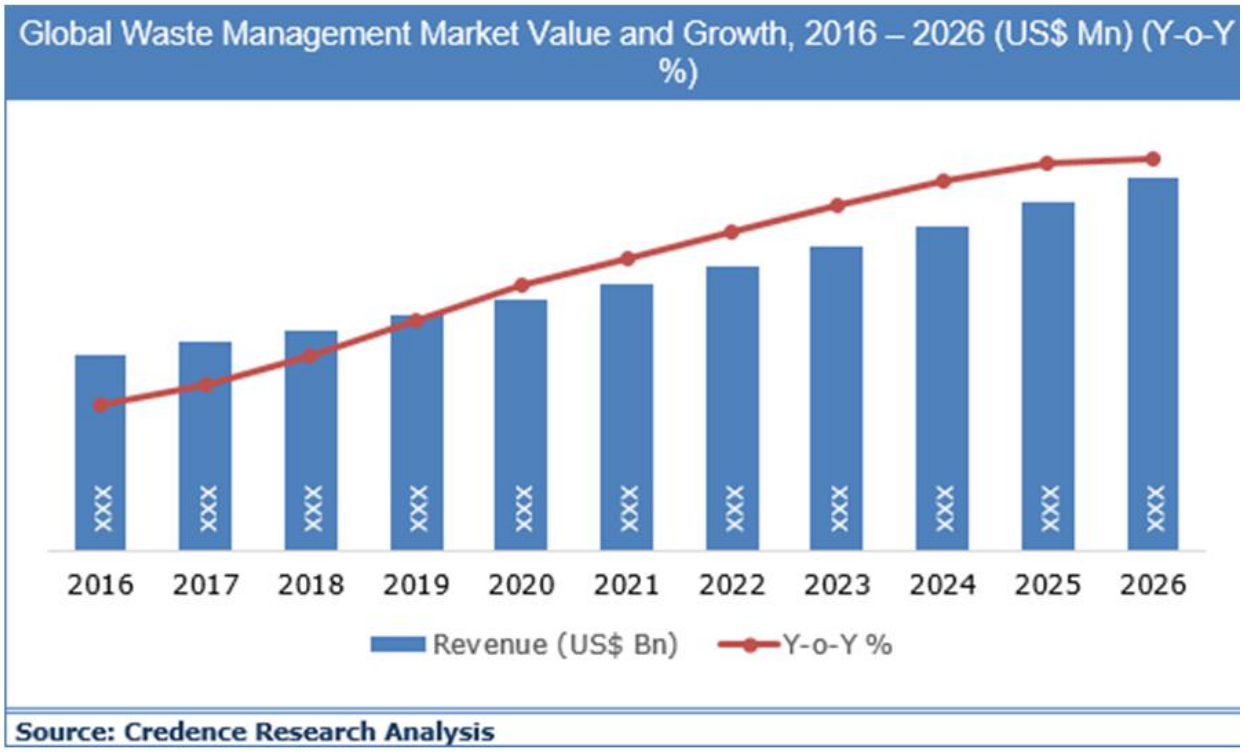
S.no	Component	Description	technology
1.	User Interface	Mobile Application	HTML, CSS,JavaScript.
2.	Application Logic	Logic for a process in the application	Java
3.	Database	Data Type, Configurations etc.	MySQL
4.	Cloud Database	Database Serviceon Cloud	IBM Cloud
5.	File Storage	File storage requirements	Local Filesystem and IBM cloud

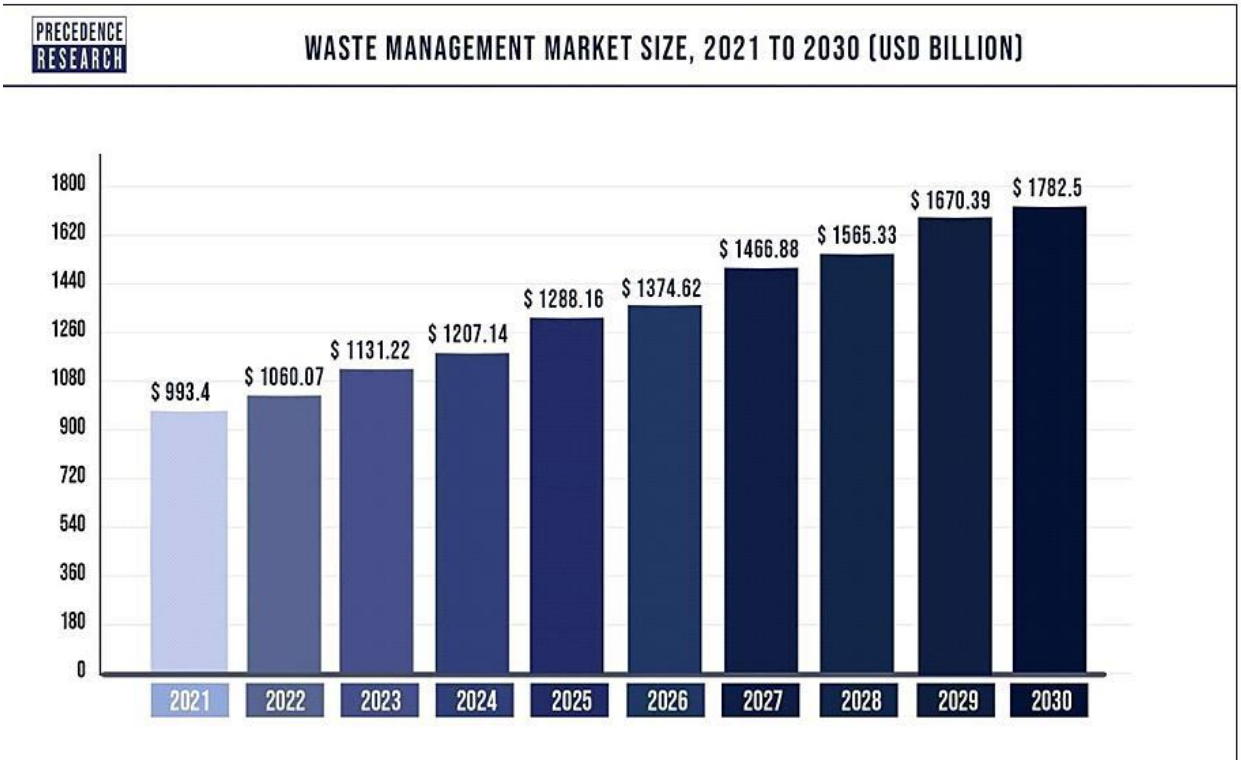
6.	Infrastructure (Server / Cloud)	Application Deployment on Cloud Local Server Configuration	Local and Cloud Foundry

9.Results

9.1 PERFORMANCE METRICS







10. ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

Reduction in Collection Cost
No Missed Pickups
Reduced Overflows
Waste Generation Analysis
CO2 Emission Reduction

DISADVANTAGES:

System requires a greater number of waste bins for separate waste collection as per population in the city.
This results into high initial cost due to expensive smart dustbins compare to other methods.
Sensor nodes used in the dustbins have limited memory size.

11. CONCLUSION

A Smart Waste Management system that is more effective than the one in use now is achievable by using sensors to monitor the filling of bins. Our conception of a "smart waste management system" focuses on monitoring waste management, offering intelligent technology for waste systems, eliminating human intervention, minimizing human time and effort, and producing a healthy and trash-free environment. The suggested approach can be implemented in smart cities where residents have busy schedules that provide little time for garbage management. If desired, the bins might be put into place in a metropolis where a sizable container would be able to hold enough solid trash for a single unit. The price might be high.

12.FUTURE SCOPE

There are several future works and improvements for the proposed system, including the following:

1. Change the system of user authentication and atomic lock of bins, which would aid in protecting the bin from damage or theft.

    a. The concept of green points would encourage the involvement of residents or end users, making the idea successful and aiding in the achievement of collaborative waste management efforts, thus fulfilling the idea of Swachh Bharath.

1. Having case study or data analytics on the type and times waste is collected on different days or seasons, making bin filling predictable and removing the reliance on electronic components, and fixing the coordinates.

    a. Improving the Server's and Android's graphical interfaces

13.APPENDIX

SOURCE CODE

```
<!DOCTYPE html>
<html>

<head>
  <link rel="stylesheet"
href="https://cdn.jsdelivr.net/npm/bootstrap@4.3.1/dist/css/boo
t strap.min.css" integrity="sha384-
ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9J
v oRxT2MZw1T" crossorigin="anonymous">
        <metacharset="utf-8">
        <meta name="viewport" content="width=device-width">
        <title>Garbage Management System</title>
        <link rel="icon" type="image/x-icon"
href="/Images/DUMPSTER.png">
        <link href="style.css" rel="stylesheet" type="text/css" />
        <script
src="https://www.gstatic.com/firebasejs/8.10.
1/firebase- app.js"></script>
        <script
src="https://www.gstatic.com/firebasejs/8.10.
1/firebase- database.js"></script>

        <script>
```

```
        varfirebaseConfig =
        {
            apiKey:
"AIzaSyB9ysbnaWc3IyeCioh- aJQT_UCMd5CBFeU",
            authDomain: "fir-test-
            923b4.firebaseapp.com",
            databaseURL: "https://fir-test-
            923b4-default-
rtdb.firebaseio.com",
            projectId: "fir-test-923b4",
            storageBucket: "fir-test-923b4.appspot.com",
            messagingSenderId: "943542145393",
            appId:
"1:943542145393:web:9b5ec7593e6a3cbd7966d0",
            measurementId: "G-BN7JNX1Q7B"
        };
        firebase.initializeApp(firebaseConfig)
    </script>
    <script defer src="database.js"></script>
```

```
</head>

<bodystyle="background-color:#1F1B24;">
        <script src="map.js"></script>
                <div id="map_container">
                        <h1 id="live_location_heading"
>LIVE LOCATION</h1>
                        <div id="map"></div>
                        <div id="alert_msg">ALERT MESSAGE!</div>
   </div>
        </div>
<center><a href="https://goo.gl/maps/G9XET5mzSw1ynHQ18"
 type="button" class="btn btn-dark">DUMPSTER</a></center>
        <script


        src="https://maps.googleapis.com/maps/api/js?key=AI


        zaSyB
```

```
BLyWj-
3FWtCbCXGW3ysEiI2fDfrv2v0Q&callback=myMap"></script></div
>
</body>
</html>

Database code:

const cap_status =
document.getElementById('cap_status'); const
alert_msg =
document.getElementById('alert_msg');

var ref = firebase.database().ref();
ref.on("value", function(snapshot)
 {
   snapshot.forEach(function
      (childSnapshot) { var value =
      childSnapshot.val();

            constalert_msg_val = value.alert;
            constcap_status_val = value.distance_status;
```

```
                alert_msg.innerHTML=`${alert_msg_val}`;
        });
    }, function (error) {
        console.log("Error: " +
        error.code);
    });
```

GITHUB LINK:
https://github.com/IBM-EPBL/IBM-Project-8874-1658935691