SMART WASTE MANAGEMENT SYSTEM FOR METEROPOLITAN CITIES
(TEAM ID:PNT2022MID34892)

PROJECT REPORT

Submitted by

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CHAPTER

INTRODUCTION

Garbage may consists of the unwanted material left over from City, Public area, Society, College, home etc. This project is related to the “Smart City” and based on “Internet of Things” (IOT). So for smart lifestyle, cleanliness is needed, and cleanliness is begins with Garbage Bin. This project will helps to eradicate or minimize the garbage disposal problem. The Internet of Things (IoT) is a recent communication paradigm that envisions near future, in which the objects of everyday life will be equipped with micro controllers, transceivers for digital communication, and suitable protocol stacks that will make them able to communicate with one another and with the users, becoming an integral part of the Internet This project IOT Garbage Monitoring system is a very innovative system which will help to keep the cities clean. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a web page. For this the system uses ultrasonic sensors placed over the bins to detect the garbage level and compare it with the garbage bins depth. The system makes use of Arduino family micro controller, WiFi modem for sending data and a buzzer. The system is powered by a 12V transformer. Whereas a web page is built to show the status to the user monitoring it. The web page gives a graphical view of the garbage bins and highlights the garbage collected in color in order to show the level of garbage collected. The system puts on the buzzer when the level of garbage collected crosses the set limit. Thus this system helps to keep the city clean by informing about the garbage levels of the bins by providing graphical image of the bins via a web page

1.1 Project Overview

This project will help to eradicate or minimize the garbage disposal problem. The Internet of Things (IoT) is a recent communication paradigm that envisions near future, in which the objects of everyday life will be equipped with micro controllers, transceivers for digital communication, and suitable protocol stacks that will make them able to communicate with one another and with the users, becoming an integral part of the Internet This project IOT Garbage Monitoring system is a very innovative system which will help to keep the cities clean. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a web page. For this the system uses ultrasonic sensors placed over the bins to detect the garbage level and compare it with the garbage bins depth. The system makes use of Arduino family micro controller, WiFi modem for sending data and a buzzer. Whereas a web page is built to show the status to the user monitoring it. The web page gives a graphical view of the garbage bins and highlights the garbage. The system puts on the buzzer when the level of garbage collected crosses the set limit. Thus, this system helps to keep the city clean by informing about the garbage levels of the bins by providing graphical image of the bins via a web page

CHAPTER 2

LITERATURE SURVEY

International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8 Issue-8 June, 2019

With the increasing number of world population and the rapidly expanding globalization of the world, waste is one of the main issues that concerns many parties. The World Bank estimates that in 2025, the population of the world's urban population will reach 4.3 billion and the rate of waste production is about 1.42 kg per day for every resident.Based on World Bank reports, there is a positive relationship in which waste generated is directly proportional to the level of economic prosperity and the level of industrial growth achieved. Today a smart solid waste management system uses Internet-of-Things (IoT) technology in order to automate several traditional waste management processes. It is proven in several smart cities such as Nottingham, England and Hamburg, Germany that implementation of this system in the right way gives many benefits. In this paper, a systematic literature review methods is used to collect and analyses related works on smart solid waste management systems.Literature has been compiled based on five major databases including, IEEE Xplore, Google Scholar, Springer, Web of Science (WoS) and ACM Digital Library.Literatures were searched based on several relevant keywords and the ones selected were the ones that satisfy selection criteria defined. A total of 25 literature met the requirements set, and 12 of them are reviewed in this paper. Research gaps from an existing works have been concluded, based on the results of the study.

International Journal of Innovative Research in Computer and Communication Engineering
(An ISO 3297: 2007 Certified Organization)
Vol. 4, Issue 2, February 2016

In the present day scenario, many times we see that the garbage bins or Dust bin are placed at public
places in the cities are overflowing due to increase in the waste every day. It creates unhygienic condition for the
people and creates bad smell around the surroundings this leads in spreading some deadly diseases & human illness, to
avoid such a situation we are planning to design “IoT Based Waste Management for Smart Cities”. In this proposed
System there are multiple dustbins located throughout the city or the Campus,these dustbins are provided with low cost
embedded device which helps in tracking the level of the garbage bins and an unique ID will be provided for every
dustbin in the city so that it is easy to identify which garbage bin is full. When the level reaches

the threshold limit,
the device will transmit the level along with the unique ID provided. These details can be accessed by the concern
authorities from their place with the help of Internet and an immediate action can be made to clean the dustbins.

International Journal of Innovative Research in Technology & Science
ISSN: 2321-1156 Volume VIII Issue III, May 2020

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International Journal of Advance Research Ideas and Innovations in Technology
ISSN: 2454-132X
Impact factor: 4.295
(Volume 4, Issue 2)

Waste management is a big issue in the world. Many countries provide different methods for garbage management and maintain
cleanliness of surroundings. In India there is improper waste management and people also not maintain the cleanliness of
environment. At many places the garbage containers are overflow but GCT (Garbage Collection Truck) not arrives. Also with
the increase in the population of country current garbage collection system not capable to maintain the green environment.
There are many kinds of problems arises due to improper garbage collection like the ugliness of

environment, spread many
diseases. There are various techniques comes out for monitoring garbage collection. In this paper, we study and discuss this
various technique for garbage monitoring.

International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075, Volume-8 Issue-8 June, 2019

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Journal of Advance Research in Science and Engineering
vol.No.6, Issue No.09, September 2017

Garbage Monitoring System helps to eradicate or minimize the garbage disposal problem also helps to manage
unwanted material left over from City, College, home, Society, colonies, Public area etc. This paper provides
survey on various smart garbage monitoring existing ideas in the recent years, using IoT (Internet of Things).
IoT is developing day by day effective methods, that transparently and seamlessly a large number of different and heterogeneous end systems.

2.1 Existing problem

A big challenge in the urban cities is solid waste management. The garbage collecting authority in traditional waste management system doesn't know about the level of garbage in dustbin, if the dust bins gets full by garbage then it gets overflowed as well as spelled out from the dustbin leading to unhygienic condition in cities.

2.2 References

1.International Journal of Innovative Technology and Exploring Engineering ISSN: 2278-3075, Volume-8 Issue-8 June, 2019

2.International Journal of Innovative Research in Computer
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6.Journal of Advance Research in Science and Engineering
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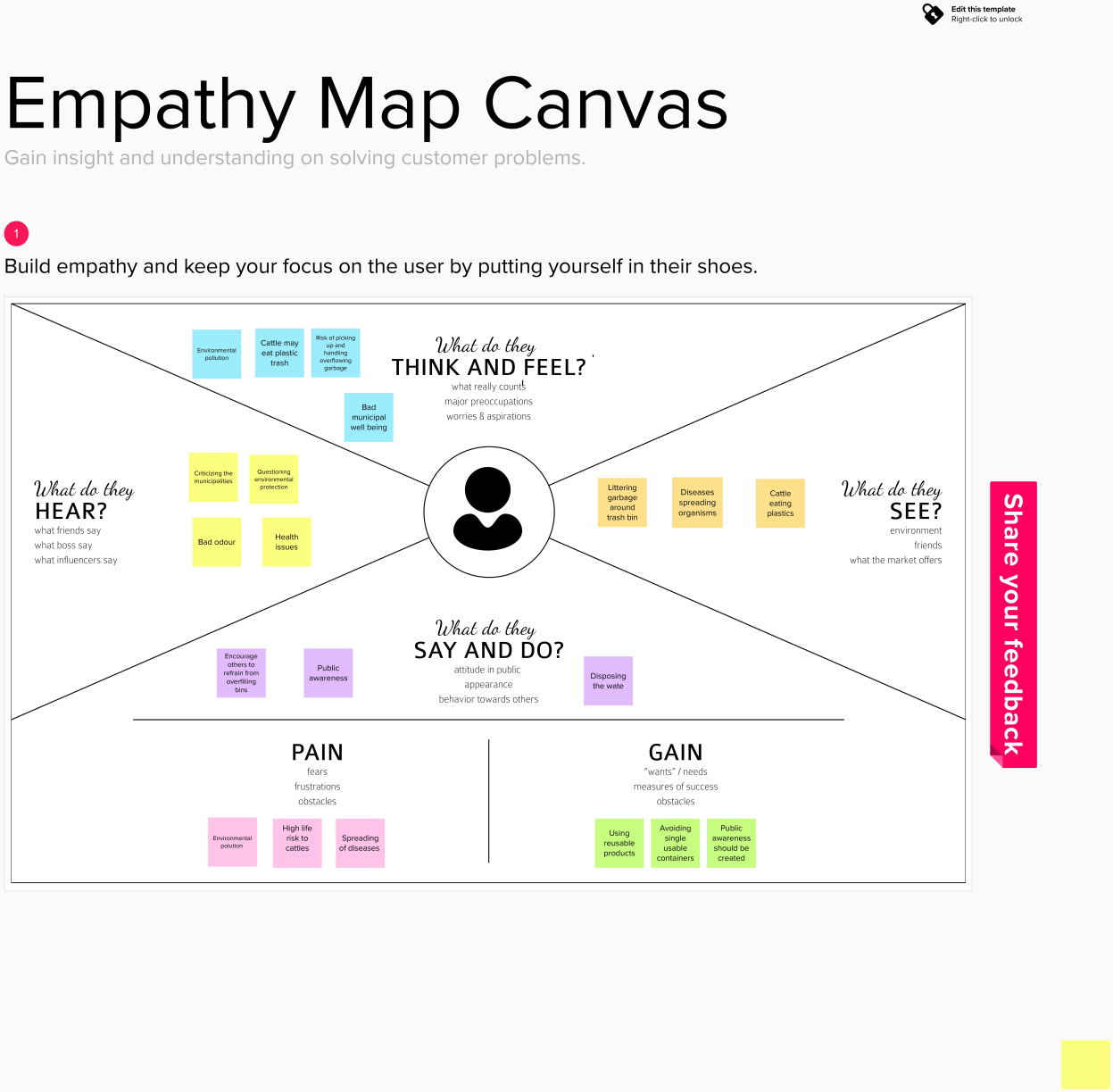
2.3 Problem Statement Definition

A big challenge in the urban cities is solid waste management. The garbage collecting authority in traditional waste management system doesn't know about the level of garbage in dustbin, if the dust bins gets full by garbage then it gets overflowed as well as spelled out from the dustbin leading to unhygienic condition in cities.

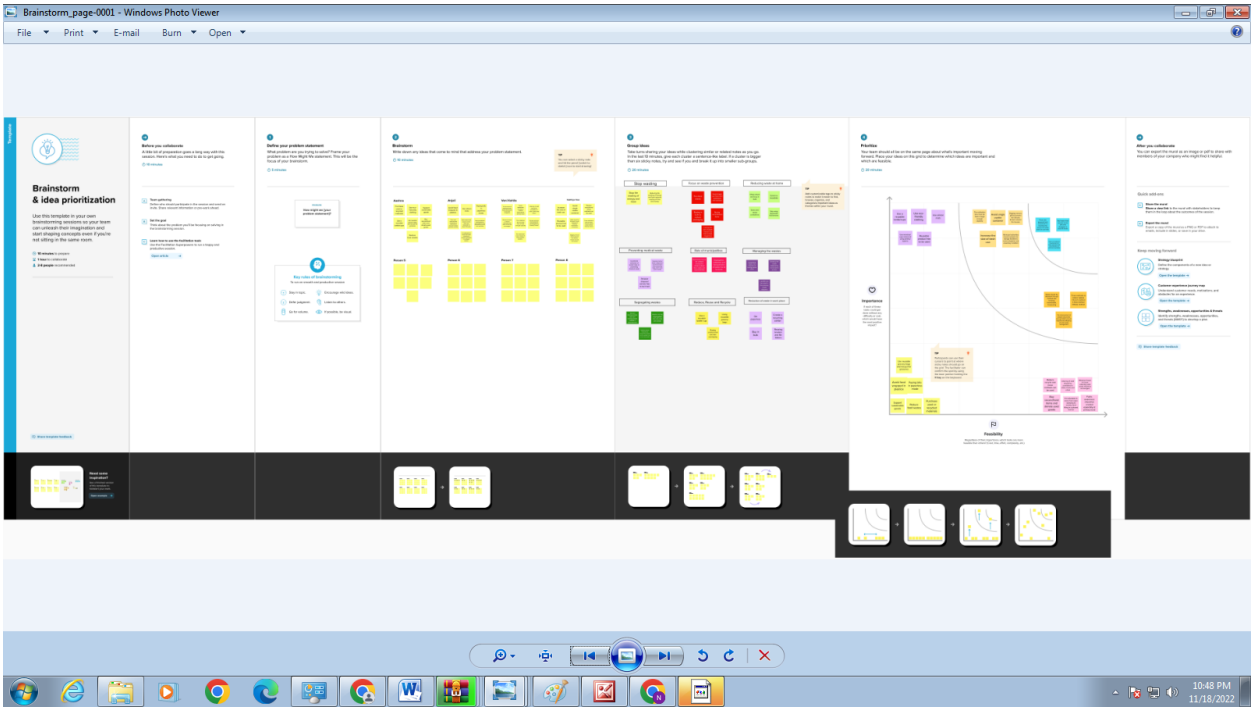
CHAPTER 3

IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming



3.3 Proposed Solution

S.No.	Parameter	Description
1	Problem Statement (Problem to be solved)	Due to lack of proper systems for disposal and collections, wastes and garbages end up in the roads and surroundings.It is impossible to manage large amount of waste waste as most of the waste ends up on the most of the roads and Public places. It is the major cause of spreading diseases. Lack of the proper system for monitoring the waste is also major issue in the waste management. The initial stage of waste management system comprises of proper disposal of collection of waste. Installing sensors in the trash bin to monitor the amount of waste would be greatly helpful to manage the wastes.
2	Idea / Solution description	There were numerous waste management initiatives which has failed to acheive significant results. Ultrasonic sensors: To its solve this problem, ultrasonic sensor which can senses upto some distance can be used. The ultrasonic sensor is on the list of most leading devices in the IoT platform. Ultrasonic sensors transmit ultrasonic waves from its

		sensor head and again receives the ultrasonic waves reflected from an object. By measuring the length of time from the transmission to reception of the sonic wave, it detects the position of the object. Ultrasonic sensors are devices that use electrical– mechanical energy transformation to measure distance from the sensor to the target object. Ultrasonic waves are longitudinal mechanical waves which travel as a sequence of compressions and rarefactions along the direction of wave propagation through the Ardino board: An ardino board is also used in the management system. Arduino is an opensource prototyping platform based on easy-touse hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino

		Software (IDE), based on Processing. The sensing element is fastened on to the bread board. The affiliation between the Arduino board and sensing element is created with the assistance of connecting wires. The operating program is fed into the Arduino board. The GSM module is additionally connected to identical Arduino board with the assistance of wires. the facility offer to the system is given with the assistance of a battery. LCD : LCD (Liquid Crystal Display) is the technology used for displays in notebook and other smaller computers. Like light emitted diode(LED) and gas-plasma technologies, LCDs allow displays to be much thinner than cathode ray tube(CRT) technology. LCDs consume much less power than LED and gas- displays because they work on the principle of blocking light rather than emitting it. The sensors senses the signal and gives to the output and it in turns gives the signal to the LCD display. An LCD is a small low cost display. Its is easy to interface with a microcontroller because of an embedded controller(the black blob on the back of the board).

		This controller is standard across many displays which means many microcontrollers have libraries that make displaying messages as easy as a single line of code. LCDs with a small number of segments, such as those used in digital watches and pocket calculators, have individual electrical contacts for each segment. An external dedicated circuit supplies an electric charge to control each segment. This display structure is unwisely for more than a few display elements. Internet of Things: The term IoT, or Internet of Things, refers to the collective network of connected devices and the technology that facilitates communication between devices and the cloud, as well as between the devices themselves. This technology can be used efficiently in the management of wastes.
3	Novelty / Uniqueness	We have proposed a novel idea of introducing sensors in the trash bin to sense level of garbage. The idea in the Proposed system would be able to automate the Process solid and waste management monitoring process and management of the Overall collection process using IOT

		(Internet of things). The received signal indicates the waste bin status at the monitering controlling system. Whenever Waste bin gets filled this is acknowledged by placing the circuit at the waste bin, the which transmits it to the the receiver at the desired place in the area or spot .
4	Social Impact / Customer Satisfaction	India faces challenges related to waste policy, waste technology selection and the availability of appropriately trained people in the waste management sector. Until these fundamental requirements are met, India will continue to suffer from poor waste management and the associated impacts on public health and the environment. There are major issues associated with public participation in waste management and there is generally a lack of responsibility towards waste in the community. There is a need to cultivate community awareness and change the attitude of people towards waste, as this is fundamental to developing proper and sustainable waste management systems. Sustainable and economically viable waste management must ensure maximum resource

		extraction from waste, combined with safe disposal of residual waste through the development of engineered landfill and wasteto-energy facilities. Population growth and particularly the development of megacities is making SWM in India a major problem. The current situation is that India relies on inadequate waste infrastructure
5	Business Model (Revenue Model)	The developed system provides improved database for garbage collection time and waste amount at each location. The environmentalists felt the great use of this when it comes to use. This makes it possible to plan more efficient routes for the trash collectors who empty the bins, but also lowes chance of any the bin being full. The initial up front investment can be substantial however, the long run as well as maintained system can lower the insurance cost thus lower the insurance cost.
6	Scalability of the Solution	This proposed solution is scalable enough to fit the device in the trash bin. The cost of the device with sensors may be high. It can be used in management of Waste in metropolitan cities.

3.4 Problem Solution fit

Project Design Phase-I - Solution Fit Template

Project Title: SMART WASTE MANAGEMNET SYSTEM FOR METROPOLITAN CITIES

Team ID: PNT2022TMID34892

Define CS, fit into CC

CUSTOMER SEGMENT(S)

The customers of smart waste management system are Municipal officers , Common people , Families and Cooperation.
A smart waste management system allows sanitation workers and employees to obtain real-time data, which helps prevent the bins from overflowing, contributing to healthier and smarter cities.

CUSTOMER CONSTRAINTS

- Lack of waste collecting points
- Inadequate waste collecting vehicles
- Limited access to waste bins
- Irregularity of waste collection
- Large amount of waste and space limitations

AVAILABLE SOLUTIONS

- Reduce, Reuse and Recycling method .
- Segregation of wates
- Focus on waste prevention.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

JOBS-TO-BE-DONE /PROBLEMS

Proper employee placement

Employee retention

Excessive downtime

Overcoming poor quality recyclables

RC

PROBLEM ROOT CAUSE

Improper waste management

Rising population

Urbanization and through industrial waste

Hospitals and drug companies

Construction that includes dust, cement , rocks etc.

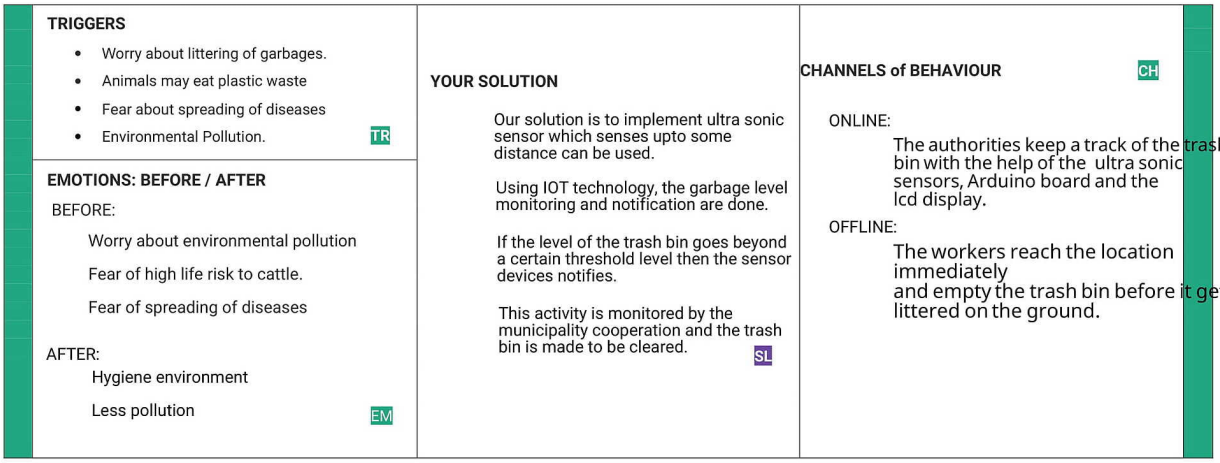
BE

BEHAVIOUR

The customer will be notified if the bin gets filled and it can be emptied before the waste gets littered on the ground. Notification will be given to the customer whenever the trash bin is about to fill.

Focus on J&P, tap into BE, understand RC

Iden



CHAPTER 4
REQUIREMENT ANALYSIS

4.1 Functional Requirements

FR No	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Learning & Detection	SQL database for pushing the data. A cloud based management system is used to find the waste collection schedule to maximize the collection.
FR-2	Testing & Alert	The data passed through the system are recorded in a database, thus each data submitted by the user is tested and it can be used to send the alert to the authorities.
FR-3	User interface	It should be the connector between the various system and the system or between other part or unit of the system
FR-4	Hardware Requirements	Ultrasonic Sensor Jumper Wire Jumper Wire

		USB Cable Breadboard Node MCU
FR-5	Software Requirements	Windows 7 or higher Arduino IDE XAMPP Local Server MySQL Database Cloud Server Hosting
FR-6	Other requirements	IBM cloud login Chrome extension features User interfaces

4.2 Non-functional Requirements

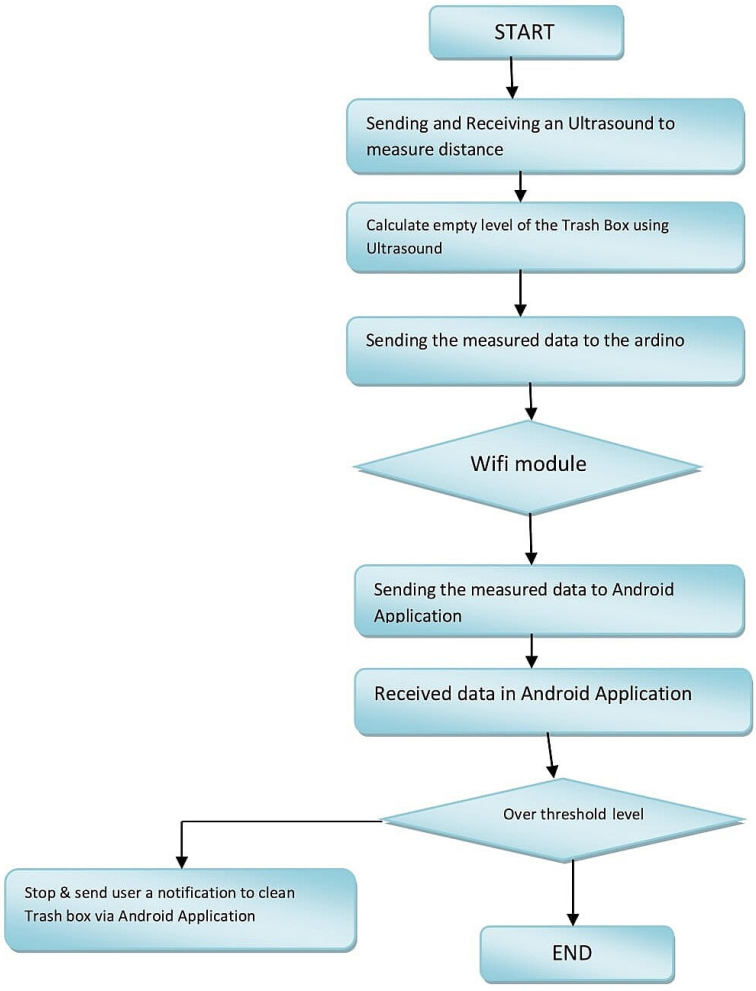
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The usefulness and ease of use of Smart Waste Management System are been analysed through several questions. Moreover, the satisfaction of user and security level of Smart Waste Management System also are determined by asking few questions through the questionnaire
NFR-2	**Security**	The system should allow a secured communication between server, Admin, and users. These two dimensions produce a 2×2 framework that hypothesizes which technologies and data-applications in smart cities are likely to raise people's privacy concerns, distinguishing between raising hardly any concern (impersonal data, service purpose), to raising controversy (personal data, surveillance purpose). Specific examples from the city of Rotterdam are used to further explore and illustrate the academic

		and practical usefulness of the framework. It is argued that the general hypothesis of the framework offers clear directions for further empirical research and theory building about privacy concerns in smart cities, and that it provides a sensitizing instrument for local governments to identify the absence, presence, or emergence of privacy concerns among their citizens
NFR-3	**Reliability**	The performance of the system would be accurate. Probability of giving false and delayed information is very low. As the system is working based on the deep learning algorithm, it would easily predict and give the perfect information.
NFR-4	**Performance**	Performance of the system is indeed slow for cases in which the number of bins is high, so even though it is feasible to adapt it anywhere, it is necessary to keep in mind the amount of time required per simulation
NFR-5	**Availability**	The availability of the solution is effective and it should be helpful in a great way to prevent us personal littering of waste in the ground.
NFR-6	**Scalability**	This proposed solution is scalable enough to fit the device in the trash bin. The cost of the device with sensors may be high. It can be used in management of Waste in metropolitan cities.

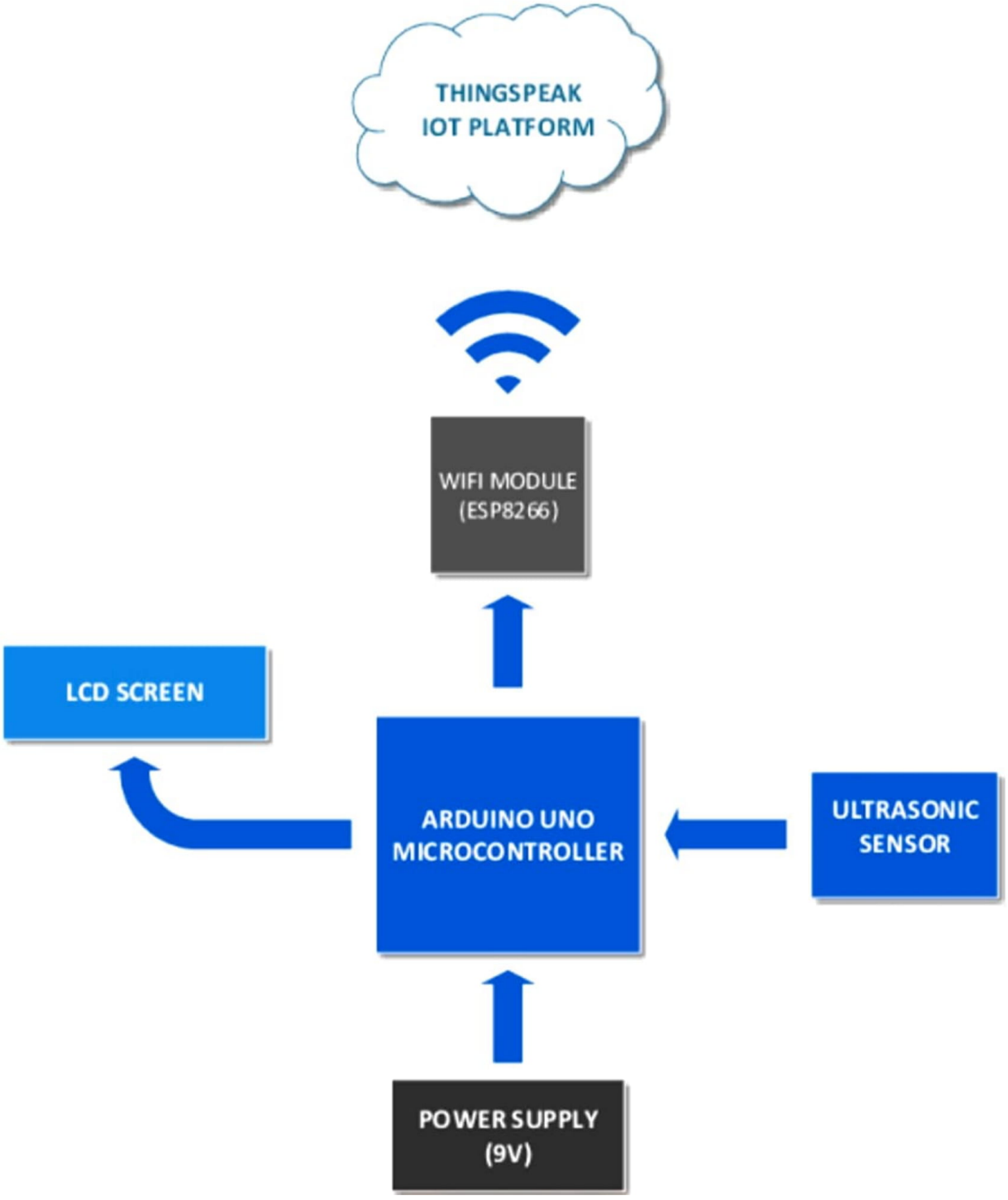
CHAPTER 5

PROJECT DESIGN

5.1 Data flow diagams



5.2 Solution Architecture



5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (mobile user)	register	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password	I can access my account / dashboard	High	Sprint-1
	Verify/log in	USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
	Monitoring	USN-3	As a user ,I can monitor the level of bin to access	I can do it from any place	High	Sprint-2
	Altering	USN-4	As a user, I can use	I can monitor	Medium	Sprint-2

			or process the application through Gmail	level of bin		
	Dashboard		All the login process and activities done will be displayed on the dashboard	Helpful for reminding the actions	High	Sprint-2
Customer (official Web user)	Getting information	USN-5	As a user ,I need to gather in the information from the real scenario	I can collect all the Information	High	Sprint-1
Administrator	ordering	USN-7	As a user, I would order my officers to help clear the bin	I order them to clear the bin	High	Sprint-2
		USN-8	As a user, I will monitor the bin. If bin gets filled, I will surely	I will monitor the bin	High	Sprint-2

			take actions to avoid			
	Obeying orders	USN-9	As a user, I need to obey my higher officers command and take measures mentioned by them	I am in the way to obey the orders	Medium	Sprint-2

CHAPTER 6

PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	Requirement (Epic)	User Story / Task	Story Points	Priority	Team Requirement (Epic) Number Members
Sprint-1	Login	USN-1	As a admin, I need to give access to both users and drivers for carrying out the waste management	20	HIGH	Aashna N K

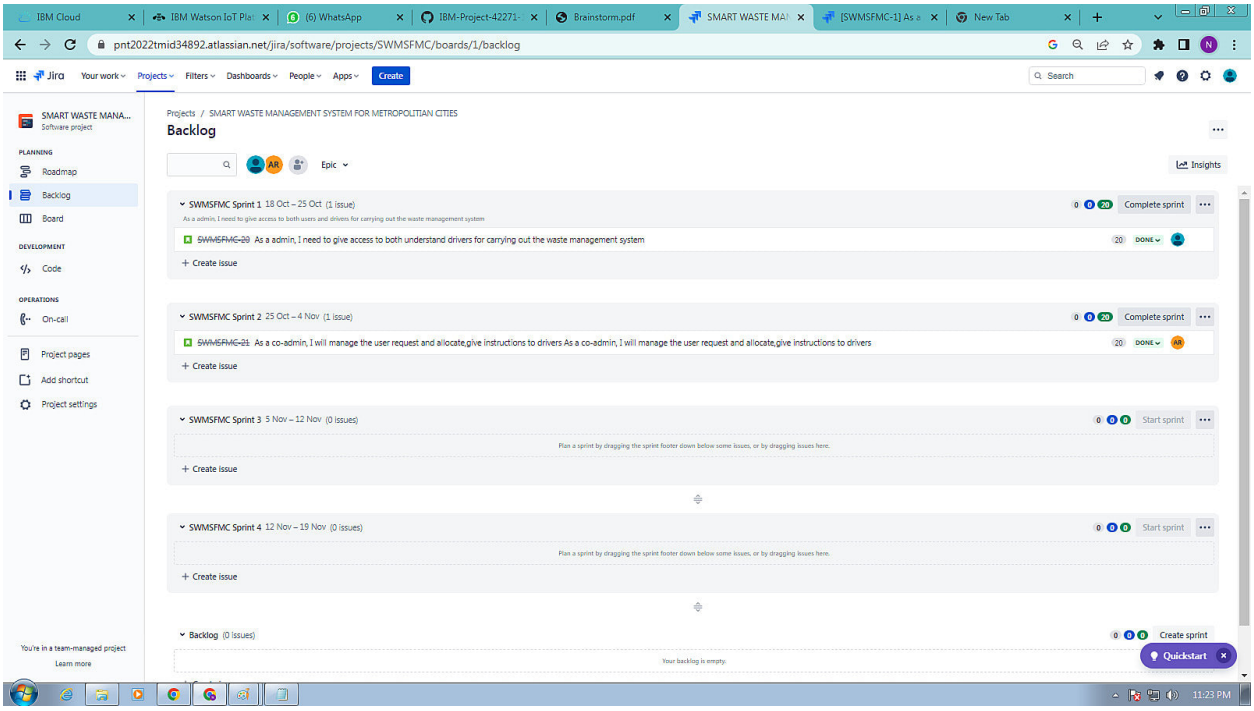
			system and control the waste by monitoring it and notify trash truck			
Sprint-2	Dashboard	USN-2	As a co-admin, i will manage the user request And allocate, give instructions to drivers	20	LOW	Anjali R
Sprint-3	Dashboard	USN-3	As a Truck Driver, I'll follow Admin's Instruction to reach the filling bin in short roots and save time	20	MEDIUM	Sakthiya Sree S S
Sprint-4	Dashboard	USN-4	As a officer. I will take care of reports	20	HIGH	Veni Kohila S

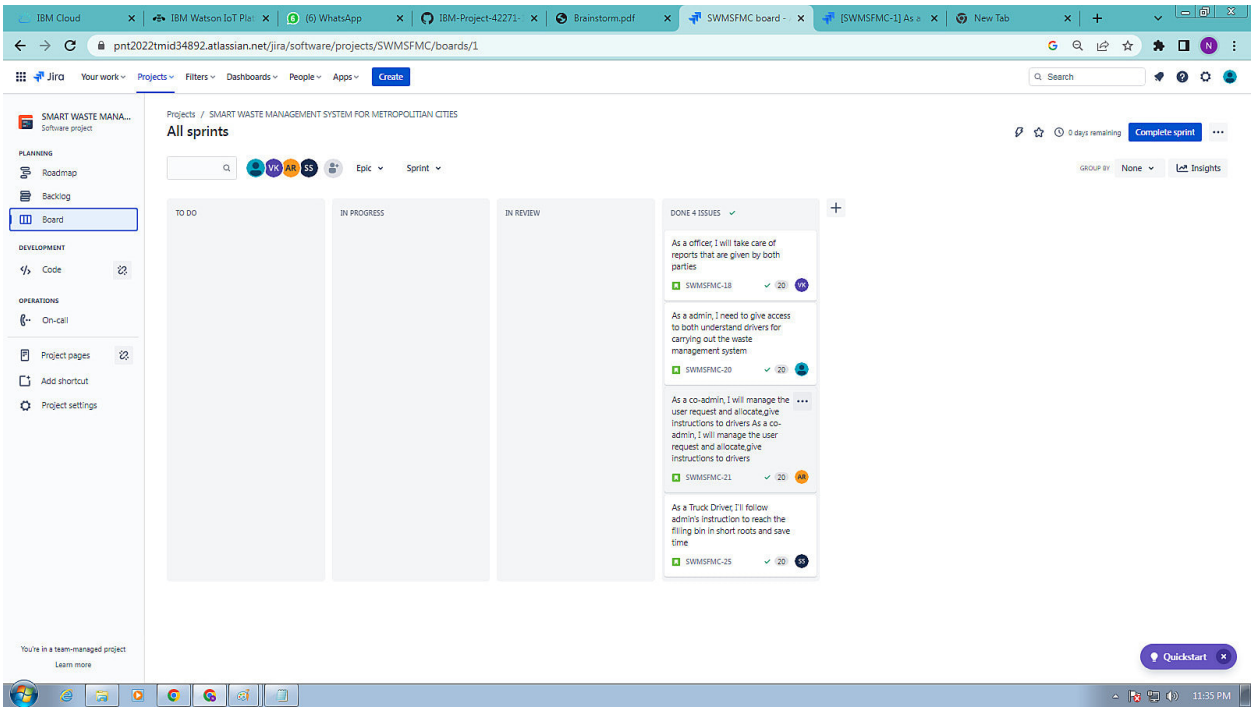
			That are given by both the parties			

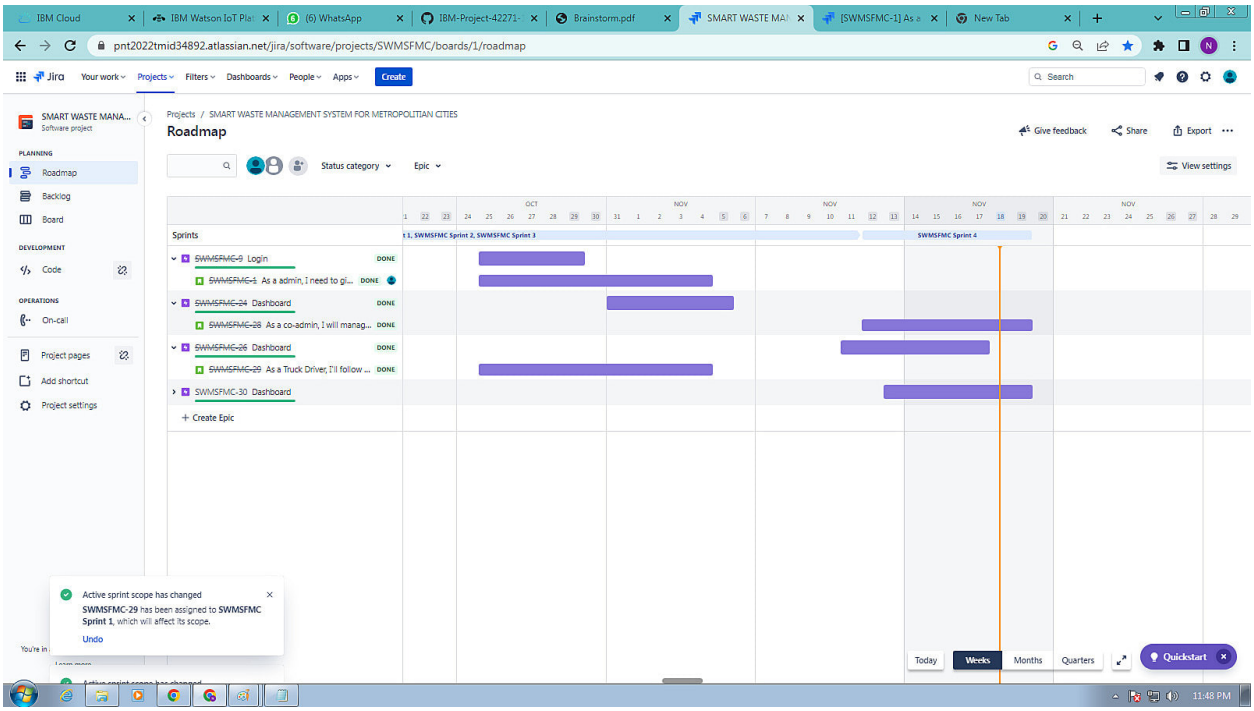
6.2 Sprint Delivery Schedule

Sprint	Total Story	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned)	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

6.3 Reports from JIRA



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Project pages
Add shortcut
Project settings
Projects / SMART WASTE MANAGEMENT SYSTEM FOR METROPOLITIAN CITIES
Roadmap
Give feedback
Share
Export
Status category
Epic
View settings
OCT
NOV
NOV
NOV
NOV
Sprints
SWMSFMC Sprint 4
SWMSFMC-9 Login
DONE
SWMSFMC-1 As a admin, I need to gi...
SWMSFMC-24 Dashboard
SWMSFMC-28 As a co-admin, I will manag...
SWMSFMC-26 Dashboard
SWMSFMC-29 As a Truck Driver, I'll follow ...
SWMSFMC-30 Dashboard
Create Epic
Active sprint scope has changed
SWMSFMC-29 has been assigned to SWMSFMC Sprint 1, which will affect its scope.
Undo
Today
Weeks
Months
Quarters
Quickstart
11:48 PM

CHAPTER 7

CODING & SOLUTIONING

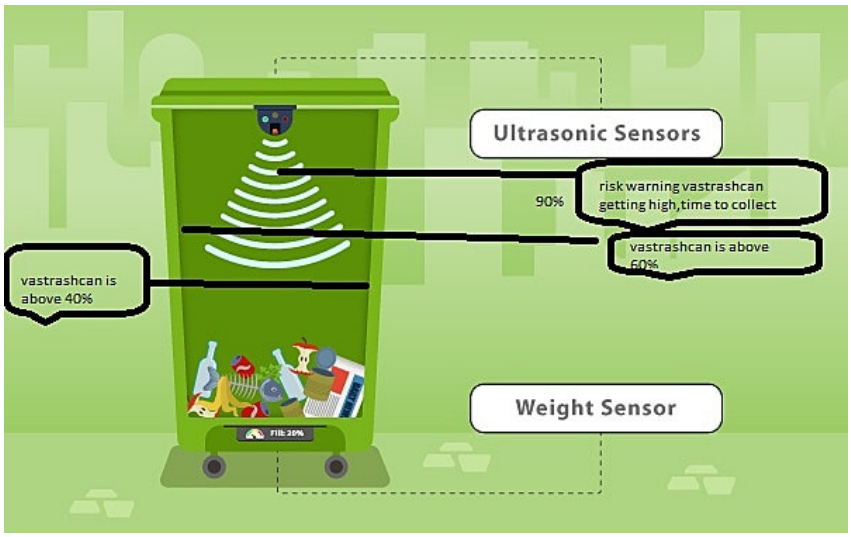
Python script

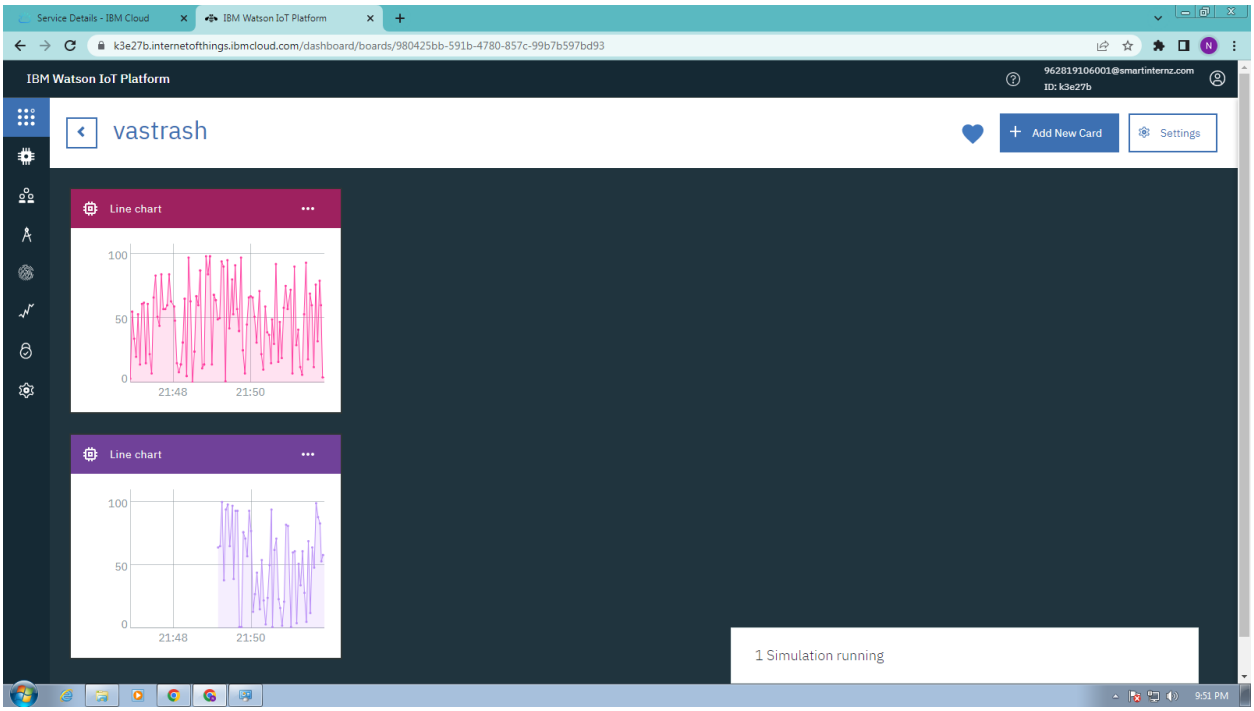
```
import requests
import json
import ibmiotf.application
import ibmiotf.device
import time
import random
import sys

# watson device details

organization = "4yi0vc"
devicType =  "BIN1"
deviceId = "BIN1ID"
authMethod= "token"
authToken= "123456789"

#generate random values for randomo variables (temperature&humidity)




            load = "0 %"

        if distance < 15:
            dist = 'Risk warning:' 'Dumpster poundage getting high, Time to collect :) 90 %'


        elif distance < 40 and distance >16:
            dist = 'Risk warning:' 'dumpster is above 60%'

        elif distance < 60 and distance > 41:
            dist = 'Risk warning:' '40 %'
        else:
            dist = 'Risk warning:' '17 %'



        if load == "90 %" or distance == "90 %":
            warn  = 'alert :' ' Dumpster poundage getting high, Time to collect :)'

        elif load == "60 %" or distance == "60 %":

            warn = 'alert :' 'dumpster is above 60%'
        else :
            warn = 'alert :' 'No need to collect right now '
        def myOnPublishCallback(lat=10.678991,long=78.177731):
            print("Gandigramam, Karur")
            print("published distance = %s " %distance,"loadcell:%s " %loadcell,"lon = %s " %long,"lat = %s" %lat)
            print(load)
            print(dist)
            print(warn)

        time.sleep(10)


        success=deviceCli.publishEvent ("IoTSensor","json",warn,qos=0,on_publish= myOnPublishCallback)
```

```
    success=deviceCli.publishEvent ("IoTSensor","json",data,qos=0,on_publish= myOnPublishCallback)



    if not success:
        print("not connected to ibmiot")
    time.sleep(30)



    deviceCli.commandCallback=myCommandCallback
#disconnect the device
deviceCli.disconnect
```

```
def myCommandCallback(cmd):
    global a
    print("command recieved:%s" %cmd.data['command'])
    control=cmd.data['command']
    print(control)

try:
        deviceOptions={"org": organization, "type": devicType,"id": deviceId,"auth-method":authMethod,"auth-
token":authToken}
        deviceCli = ibmiotf.device.Client(deviceOptions)
except Exception as e:
        print("caught exception connecting device %s" %str(e))
        sys.exit()

#connect and send a datapoint "temp" with value integer value into the cloud as a type of event for every 10 seconds
deviceCli.connect()

while True:

    distance= random.randint(10,70)
    loadcell= random.randint(5,15)
    data= {'dist':distance,'load':loadcell}


    if loadcell < 13 and loadcell > 15:
        load = "90 %"

    elif loadcell < 8 and loadcell > 12:
          load = "60 %"

    elif loadcell < 4 and loadcell > 7:
          load = "40 %"
    else:
```

CHAPTER 8
TESTING





CHAPTER 10

RESULTS

In this project, an integrated system of Wi-Fi modem, IoT, Ultrasonic Sensor is introduced for efficient and economic garbage collection. The developed system provides improved database for garbage collection time and waste amount at each location. We analysed the solutions currently available for the implementation of IoT. By implementing this project, we will avoid over flowing of garbage from the container in residential area which is previously either loaded manually or with the help of loaders in traditional trucks. It can automatically monitor the garbage level & send the information to collection truck. The technologies which are used in the proposed system are good enough to ensure the practical and perfect for solid garbage collection process monitoring and management for green environment**.**

CHAPTER 10

ADVANTAGES & DISADVANTAGES

Advantages:

- A reduction in the number of waste collections needed by up to 80%, resulting in less manpower, emissions, fuel use and traffic congestion
- A reduction in the number of waste bins needed
- Analytics data to manage collection routes and the placement of bins more effectively
- Improved environment (i.e. no overflowing bins and less unpleasant odours)

Disadvantages:

- System requires more 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.

- It reduces man power requirements which results into increase in unemployments for unskilled people.

CHAPTER 11

CONCLUSION

Improper disposal and improper maintainance of domestic waste create issues in public health and environment pollution thus this paper attempts to provide practical solution towards managing the waste collaborating it with the use of IOT i.e. providing free internet facilities for a specific time once the trash is dumped into the bin. the proposed system will definitely help to overcome all the serious issues related to waste and keep the environment clean .

CHAPTER 12

FUTURE SCOPE

The main aim of this project is to reduce human resources and efforts along with the enhancement of a smart city vision. We have often seen garbage spilling over from dustbins on to streets and this was an issue that required immediate attention. The proverb “Cleanliness is next to god and clean city is next to heaven” inspired us to conceptualized the project. Smart dustbin helps us to reduce the pollution. Many times garbage dustbin is overflow and many animals like dog or rat enters inside or near the dustbin. This creates a bad scene. Also some birds are also trying to take out garbage from dustbin. This project can avoid such situations. And the message can be sent directly to the cleaning vehicle instead of the contractor’s office. Swatch Bharat Abhiyan (English: Clean India Mission and abbreviated as SBA or SBM for "Swatch Bharat Mission") is a national campaign by the Government of India, covering 4,041 statutory cities and towns, to clean the streets, roads and infrastructure of the country. In our system, the Smart dustbins are connected to the internet to get the real time information of the smart dustbins. In the recent years, there was a rapid growth in population which leads to more waste disposal. So a proper waste management system is necessary to avoid spreading some deadly diseases.

CHAPTER 13

APPENDIX

Source Code

Source code

HTML code

1)Main page

```
<!DOCTYPE html>
<html>
   <head>
      <link rel="stylesheet" href="mycss.css">
      <title>
         Vas Trash
      </title>
      <link rel="icon" href="logo/img/Bin.png">
   </head>
   <body>
      <h1 align="center">
         <img src="logo/img/Bin.png" alt="logo" />
         VAS TRASH
      </h1>
      <div id="bg"></div>

<form method="POST" action="submit.html" >
  <div class="form-field">
    <input type="email" placeholder="Email" required/>
  </div>
```

```
  <div class="form-field">
    <input type="password" placeholder="Password" required/>
  </div>
  <div class="form-field">


    <button class="btn" type="submit">Submit</button>
  </div>
</form>


    </body>
</html>
```

2)Submit page

```
<!DOCTYPE html>
<html>
  <head>
    <title>BIN MONITORING</title>
  </head>
  <body>
    <h1>Bin level exceeds threshold</h1>
    <p>The Bin has to be cleared</p>
    <img src="logo/img/output.jpg" width="800" height="500" alt="img"/>
  </body>

</html>
```

CSS code

```
body {
   background-color: powderblue;
 }
 h1 {
   color: rgb(49, 6, 6);
 }
 @import url("https://fonts.googleapis.com/css?family=Lato:400,700");


body {
 font-family: 'Lato', sans-serif;
 color: #4A4A4A;
 display: flex;
 justify-content: center;
 align-items: center;
 min-height: 100vh;
 overflow: hidden;
 margin: 0;
 padding: 0;
}


form {
 width: 350px;
 position: relative;
```

```
}
form .form-field::before {
  font-size: 20px;
  position: absolute;
  left: 15px;
  top: 17px;
  color: #888888;
  content: " ";
  display: block;
  background-size: cover;
  background-repeat: no-repeat;
}
form .form-field:nth-child(1)::before {
  background-image: url(img/user-icon.png);
  width: 20px;
  height: 20px;
  top: 15px;
}
form .form-field:nth-child(2)::before {
  background-image: url(img/lock-icon.png);
  width: 16px;
  height: 16px;
}
form .form-field {
```

```
  display: -webkit-box;
  display: -ms-flexbox;
  display: flex;
  -webkit-box-pack: justify;
  -ms-flex-pack: justify;
  justify-content: space-between;
  -webkit-box-align: center;
  -ms-flex-align: center;
  align-items: center;
  margin-bottom: 1rem;
  position: relative;
}
form input {
  font-family: inherit;
  width: 100%;
  outline: none;
  background-color: #fff;
  border-radius: 4px;
  border: none;
  display: block;
  padding: 0.9rem 0.7rem;
  box-shadow: 0px 3px 6px rgba(0, 0, 0, 0.16);
  font-size: 17px;
  color: #4A4A4A;
```

```
  text-indent: 40px;
}
form .btn {
  outline: none;
  border: none;
  cursor: pointer;
  display: inline-block;
  margin: 0 auto;
  padding: 0.9rem 2.5rem;
  text-align: center;
  background-color: #47AB11;
  color: #fff;
  border-radius: 4px;
  box-shadow: 0px 3px 6px rgba(0, 0, 0, 0.16);
  font-size: 17px;
}
```

GitHub Link :

https://github.com/IBM-EPBL/IBM-Project-42271-1660657976

Project Demo Link:

https://drive.google.com/file/d/1bSEDMSPpPzUZzZwgpTu9xZjmPjHNC5dg/view?usp=drivesdk