SMART WASTE MANAGEMENT SYSTEM FOR METROPOLITAN CITIES

NALAIYA THIRAN PROJECT BASED LEARNING ON PROFESSIONAL READLINESS FOR INNOVATION, EMPLOYNMENT AND ENTERPRENEURSHIP

A PROJECT REPORT-

PNT2022TMID41040

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BACHELOR OF ENGINEERING

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

SHREE SATHYAM COLLEGE OF ENGINEERING AND TECHNOLOGY-637301

INTRODUCTION:

PROJECT OVERVIEW

- This project deals with the problem of waste management in smartcities, 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 user 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 the truck drivers.

PURPOSE

The purpose of the Smart Waste Management System for MetropolitanCities are:

- To alert the respective person to collect the overflow bins from the location using mobile application.The bin level can be monitored and tracked in mobile and there is no need to check the places often hence time consumes effectively.
- Update about the locations where the bin is placed will be sent to the respective person through mobile application.

LITERATURE SURVEY

EXISTING PROBLEM

- **Uncollected waste can lead to flooding, insects, rodents, and diseases**. Improper disposal of waste can pollute water and air, making it an important environmental challenge.
- This has serious environmental impacts like **water pollution, methane emissions, and soil degradation**. The average density of Indian municipal waste at the point of collection varies from 400 to 600 kg per cubic metre. At the landfill site, however, the density is much higher because of compaction and putrefaction.

REFERENCES

1.Joseph (2002) explain the perspectives of solid waste management in India. He explains the waste generation, and characteristics in India, then he shows the waste generation in Metropolitan cities of India, then shows the characteristics of municipal solid waste generated by metro cities like paper textile leather, plastic, metal, glass, ash earth, and others how generating that explain

2.Pamnani, Srinivasarao (2014) talking about Municipal solid waste management in India. How it is implementing in India"s Metro cities, town, class I, class II cities. Then they explain the current scenario and future direction about SWM .

3.Kaushal (2012) talking about Municipal SWM in India current status and future challenges. Then explain how because of urbanization SWM increasing in India mainly cities like Delhi, Mumbai, Kolkata, Chennai, Bangalore.

PROBLEM STATEMENT DEFINITION

Overflowing Garbage Bins: There is a chance that some days, a few garbage bins are full before their collection date which leads to overflowing.

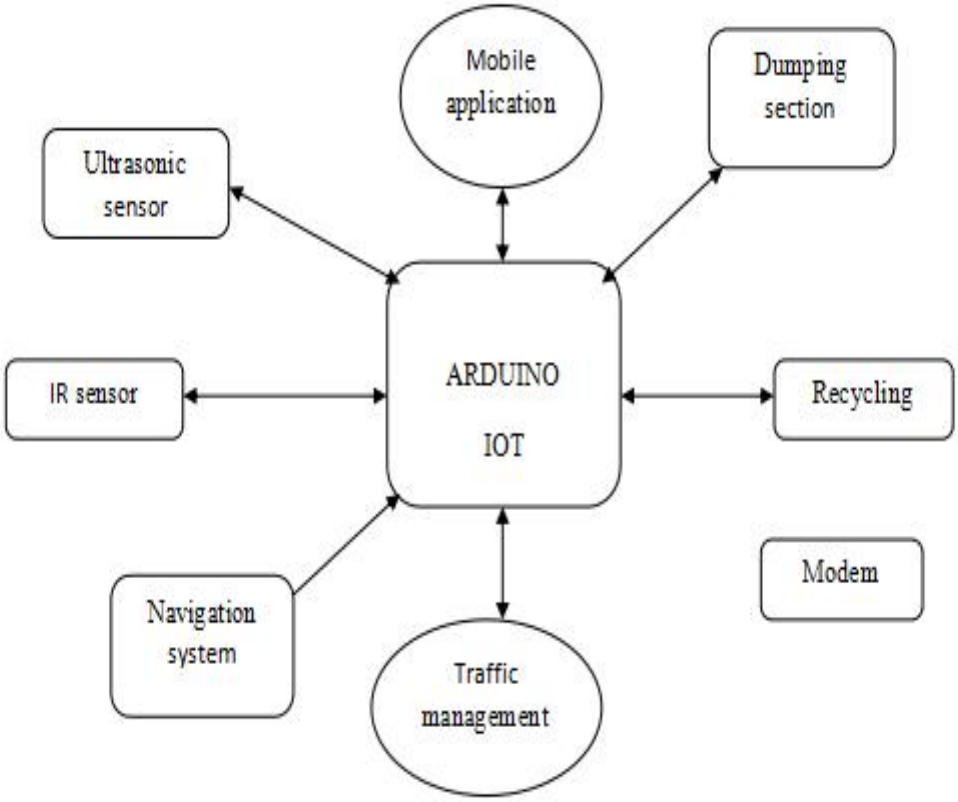
What does this problem focus on?	Lack of finance, training, leadership, lack of proper planning.
When does this occur?	smart waste management aims to optimize resource allocation,reduce running cost and increasing the sustainability of waste service.
Why do we need this?	Better health, hygiene, and disposal. The system provides shortest path to the location of waste bins.
How to do this?	smart waste management is about using technology and data to create the more efficiency.
Where it is used?	parks,camp sites,beach side areas.

IDEATION & PROPOSED SOLUTION

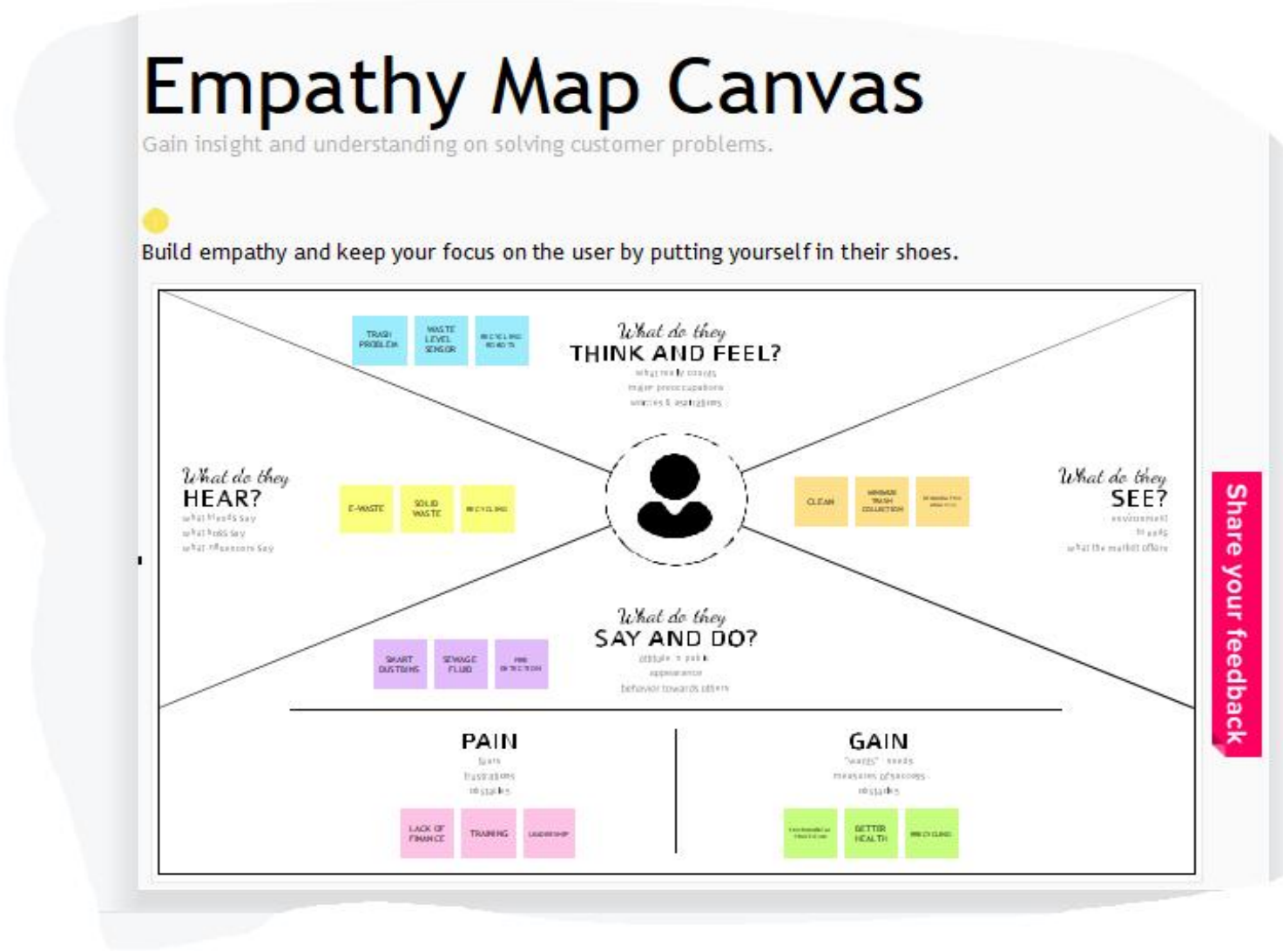
Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	A Smart waste management for metropolitan cities
2.	Idea / Solution description	Refuse,reuse, repurpose and finally,recycle.
3.	Novelty / Uniqueness	Basically smart waste is spread in many more cities.encourages recycling,improve street sanitation.
4.	Social Impact / Customer Satisfaction	Socially,many of the consumer and house hold generation waste from the products they consume.
5.	Business Model (Revenue Model)	Through the business model generates revenue through the provision of the various waste management and disposal service to commercial ,industrial
6.	Scalability of the Solution	Improve the street sanitation.

EMPATHY MAP CANVAS



IDEATION AND BRAINSTORMING



PROPOSED SOLUTION

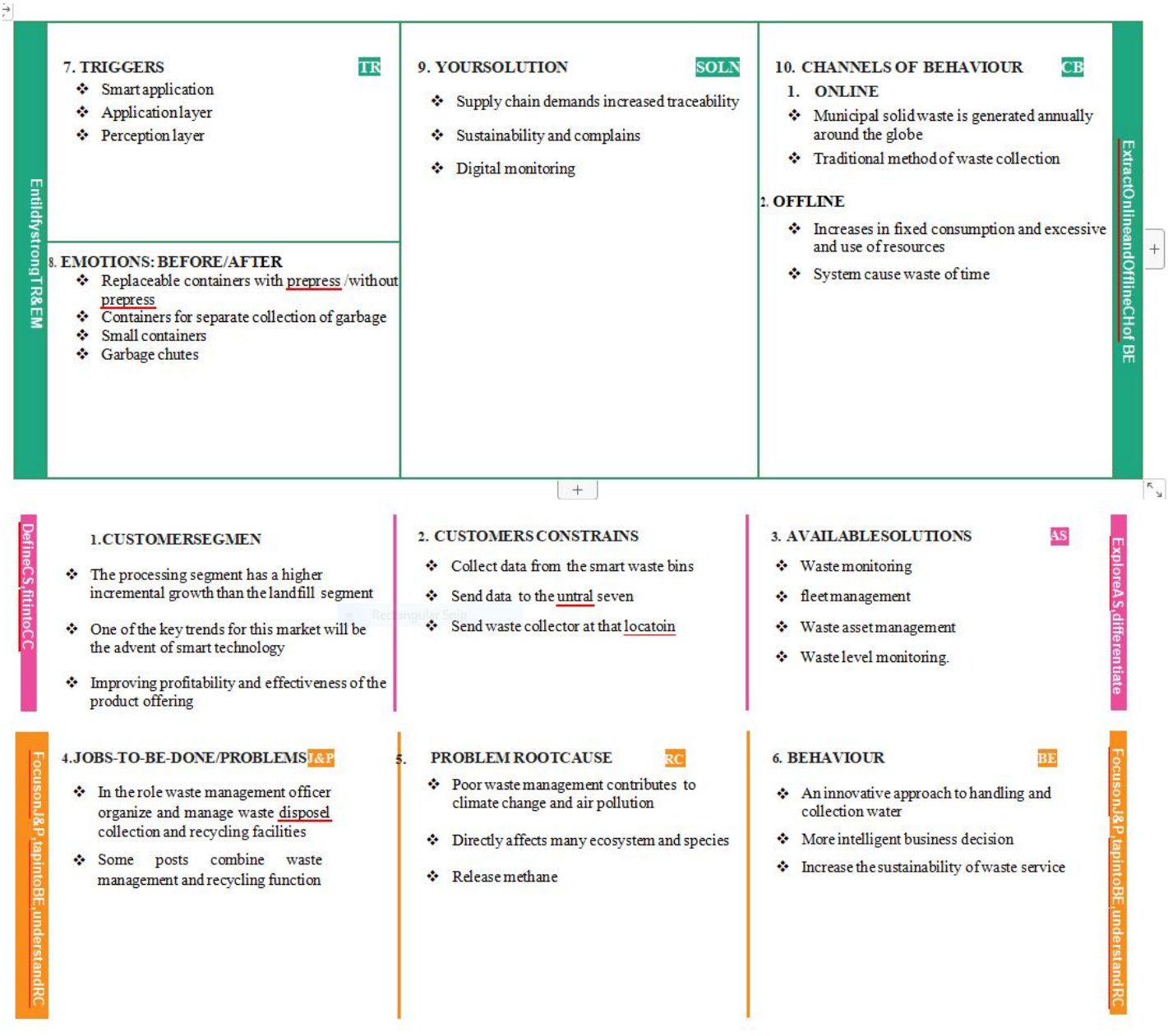
Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to besolved)	This project deals with the problem of waste management in smart cities, where the garbagecollection 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 andtime-saving route to the truck 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 using IOT (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 areaor spot. **4.** In the proposed system, the received signal indicates the waste bin status at the

		monitoringand 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 sohere our team planned to build a wrist band to them, that indicate via light blinking when thedustbin fill and this is Uniqueness we made here beside from project constrain.
4.	Social Impact / Customer Satisfaction	From the public perception as worst impacts ofpresent 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 well as various corporatefunctions.

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 proposedsystem uses sensor and communication technologies where waste data is collected from the smart bin, in real-time, and then transmitted to an online platform where citizens can access and check the availability of the compartments scattered around a city.

PROBLEM SOLUTION FIT



REQUIREMENT ANALYSIS

FUNCTIONAL REQUIREMENTS

Following are the functional requirements of the proposed solution.

FR.NO	FUNCTIONAL REQUIREMENTS	SUB REQUIREMENTS
1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIn
2	User Confirmation	Confirmation via Email Confirmation via OTP
3	Authentication	*The system sends an approval request after the user enters personal information.*
4	User Interface	It should be the connector between the various systems or between other part or unit of the system.
5	Software interface	This includes embedded application that will used in supporting the various functions of the system Eg: GPS, Web Server and Database

Non-functional Requirements

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

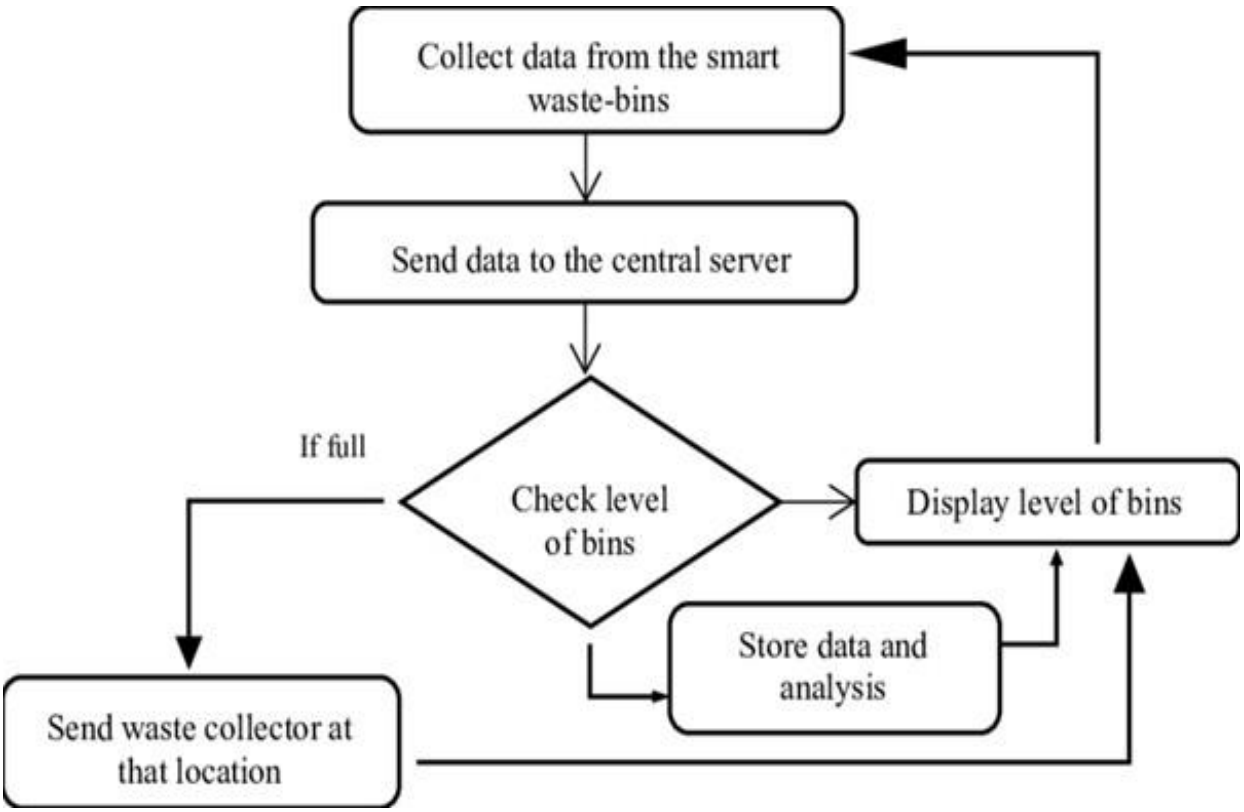
NFR. NO	NON FUNCTIONAL REQUIREMENTS	EXPLANATION
1	Usability	Ease with which the user is able to learn, operate and prepare inputs and interpret outputs through interaction with the system.
2	Security	Extend to which the system is safeguarded against deliberate and intrusive faults from internal and external sources.
3	Reliability	Extend to which the software systems consistently perform the specified functions without any failures.
4	Performance	System performance of handling capacity, throughput and response time.
5	Availability	Degree to which the users can depend on the system to be up during normal operating times.
5	Scalability	Degree to which the system is able to expandits processing capabilities upward and outward with business growth.

PROJECT DESIGN

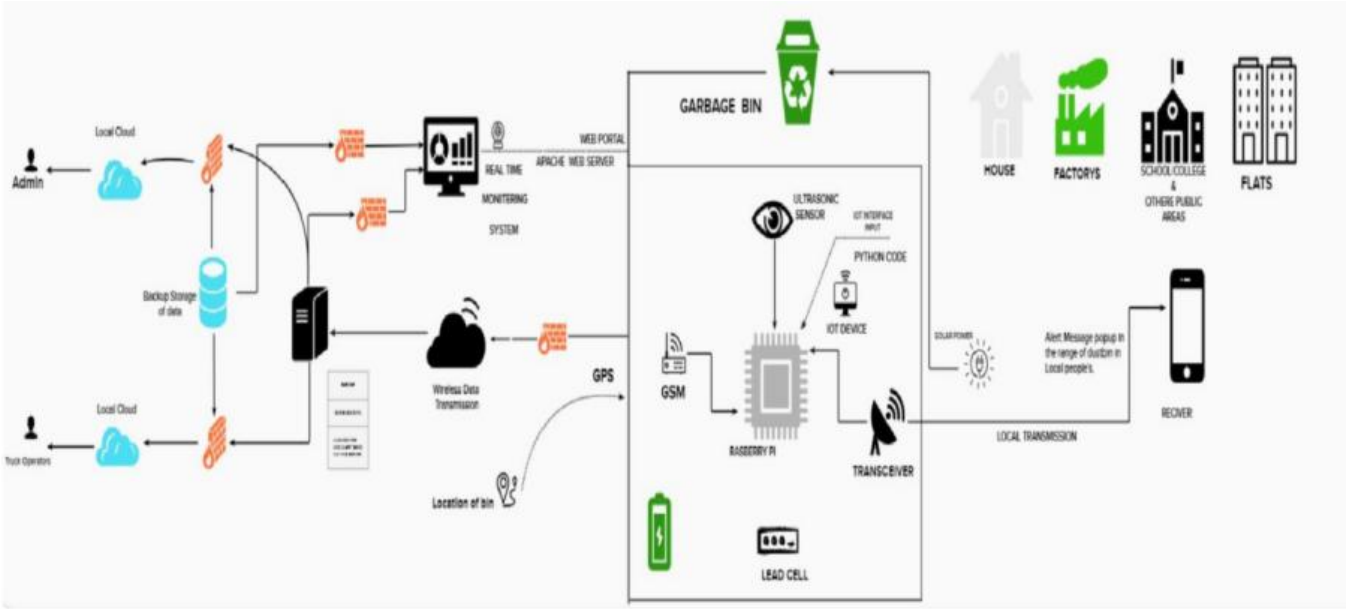
DATA FLOW

DIAGRAMS

A Data Flow Diagram (DFD) is a traditional visual representation of theinformation flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and wheredata is stored.


Collect data from the smart waste-bins
Send data to the central server
If full
Check level of bins
Display level of bins
Store data and analysis
Send waste collector at that location

SOLUTION & TECHNICAL ARCHITECTURE



USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I created an account in the application provided.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I registeredusing my gmail.	I can receive confirmation email .	High	Sprint-1
		USN-3	As a user, I successfully installed the app and login to see the bin level in myarea.	I can register & access the dashboard .	Low	Sprint-2
	Login	USN-4	As a user, I login using my gmail andpassword easily.	The login process was easy and simpleto access the dashboard.	High	Sprint-1
Customer (Web user)		WUSN-1	As a web user I can see whether the bins in the locality are filled or not only afterloging in using my gmail account.	The website mustwork properly so that no error occursin the info.	High	Sprint-2

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
CustomerCare Executive		CCE-1	A customer care executive will always be available for the interaction with the customer to clarify the queries.	An executive will clarify the doubts and note down thecomplaints of the application if any .	High	Sprint-2
Administrator		ADMIN-1	I as a Admin can access the data or information providedby the customers to analyse their needs and provide the required service.	The details of the locality of the user is provided to the municipal corporation when acomplaint is received.	High	Sprint-1

PROJECT PLANNING AND SCHEDULING

SPRINT PLANNING & ESTIMATION

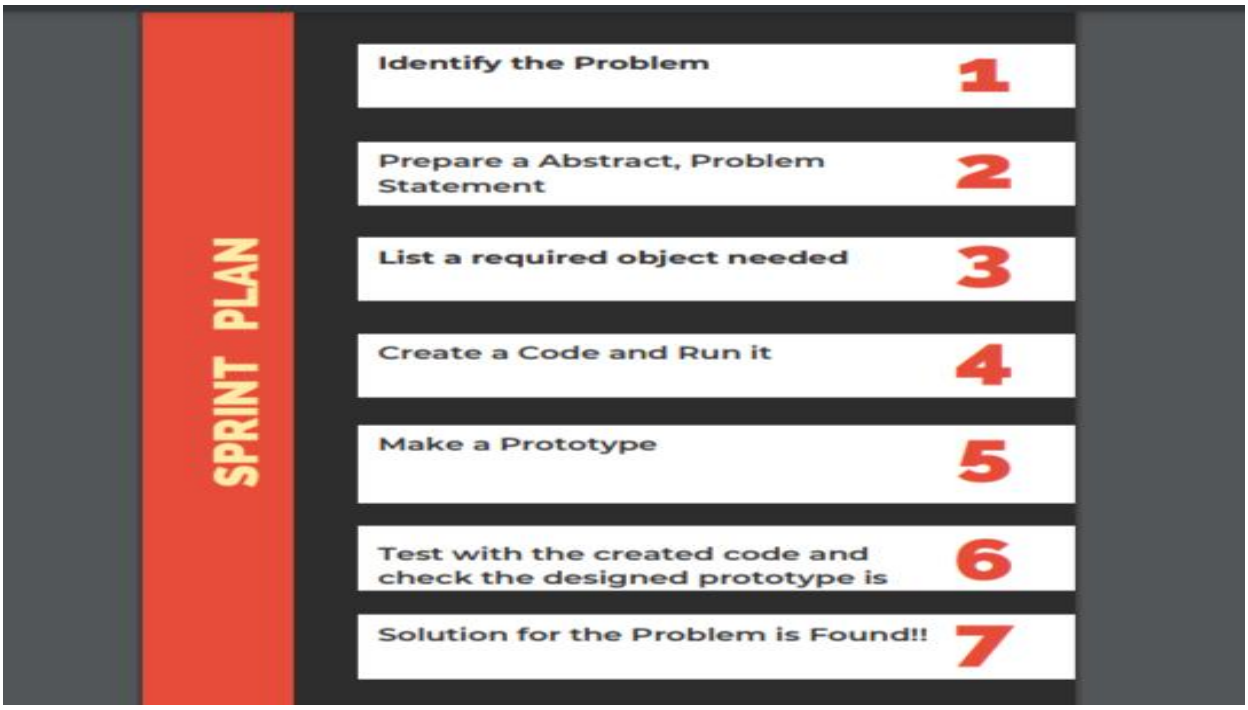
Product Backlog, Sprint Schedule, and Estimation

Use the below template to create product backlog and sprint schedule

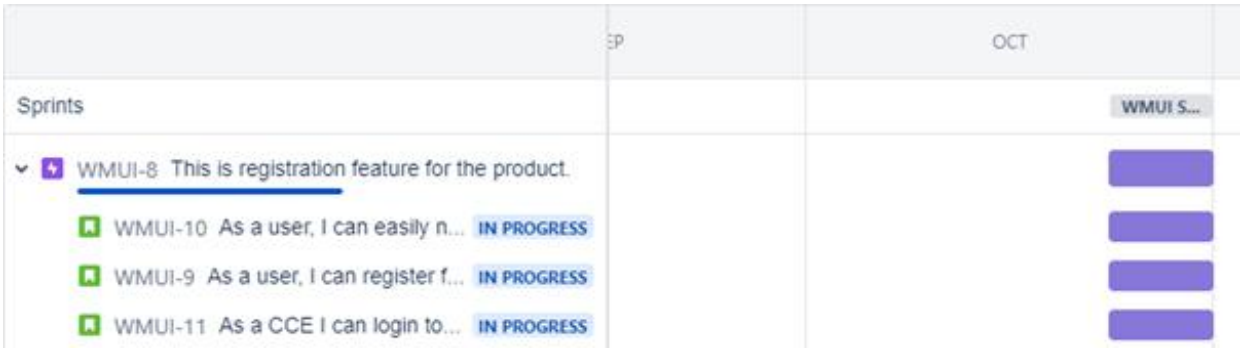
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Login	USN-1	As a Administrator, I need to give user id and passcode for ever workers over there in municipality	2	High	Nijanthan S Mangaiyarkarasi R Sudhalakshmi G Jayakumar N Sandhiya G
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 trash truck with location of bin with bin ID	2	High	Nijanthan S Mangaiyarkarasi R Sudhalakshmi G Jayakumar N Sandhiya G
Sprint-2	Dashboard	USN-3	As a Truck Driver, I'll follow Co-Admin's Instruction to reach the filling bin in short roots and save time	2	High	Nijanthan S Mangaiyarkarasi R Sudhalakshmi G Jayakumar N Sandhiya G
Sprint-3	Dashboard	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	2	High	Nijanthan S Mangaiyarkarasi R Sudhalakshmi G Jayakumar N Sandhiya G

Sprint-4	Dashboard	USN-5	As a Municipality officer, I'll make sure everything is proceeding as planned and without any problems	2	High	Nijanthan S Mangaiyarkarasi R Sudhalakshmi G Jayakumar N Sandhiya G

SPRINT DELIVERY SCHEDULE



REPORTS FROM JIRA


EP
OCT
Sprints
WMUI S...
WMUI-8 This is registration feature for the product.
WMUI-10 As a user, I can easily n... IN PROGRESS
WMUI-9 As a user, I can register f... IN PROGRESS
WMUI-11 As a CCE I can login to... IN PROGRESS

CODING & SOLUTIONING

FEATURE 1:

SOURCE CODE:

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

#Provide your IBM Watson Device Credentials
organization = "3f3tah"
deviceType = "sensor"
deviceId = "123456"
authMethod = "token"
authToken = "1234567890"#
Initialize GPIO
def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
```

```
    if status=="binfull":
        print ("-----EMPTY THE BIN IMMEDIATELY----------")
 #print(cmd)try:
        deviceOptions = {"org": organization, "type": deviceType, "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 "hello" with value "world" into the cloud asan event of type "greeting" 10 times
deviceCli.connect()
while True:
       #USING RANDOM FUNCTIONS TO SIMULATE BINLEVEL
       binlevel=random.randint(10,100)
      locationId=random.randint(1,5)
      district="Tirunelveli"
      state="Tamilnadu" country="India"
       if locationId == 1:
          latitude=8.7060581
```

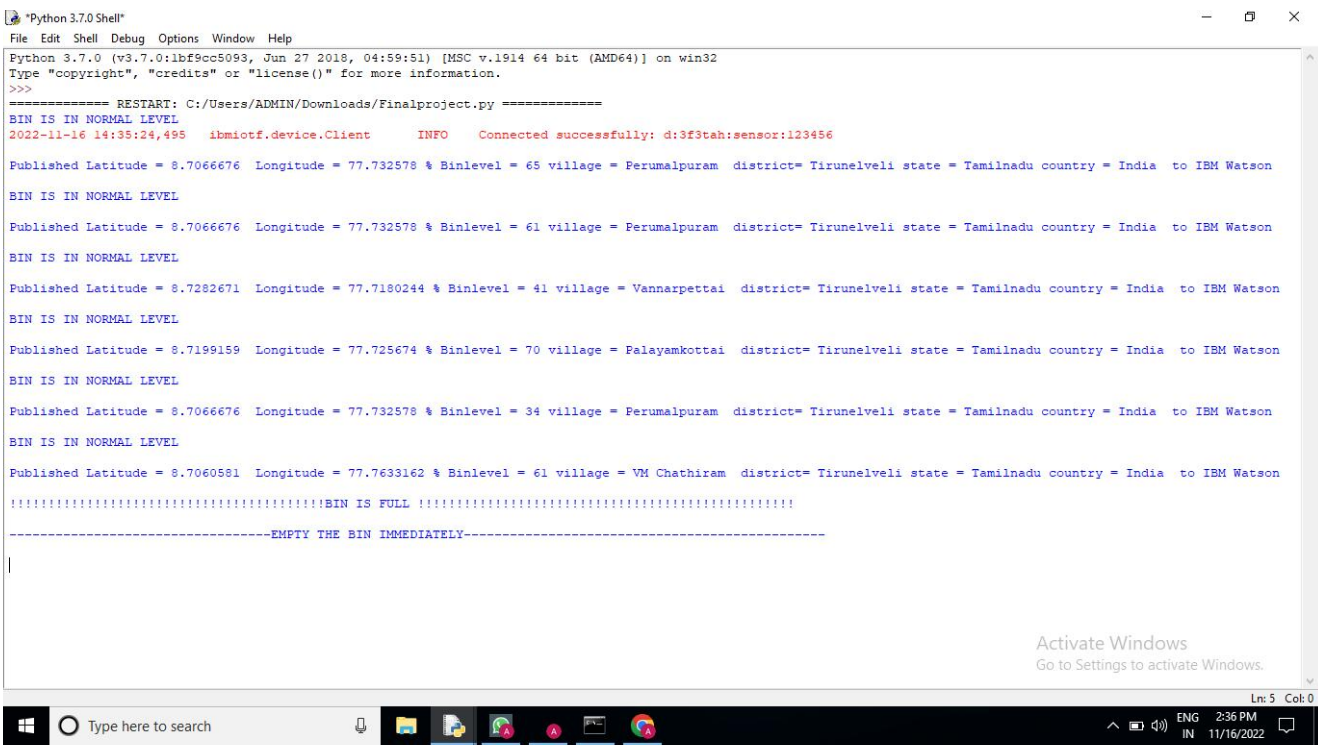
```
    longitude=77.7633162
    village="VM  Chathiram"
elif locationId == 2:
    latitude=8.7066676
    longitude=77.732578
    village="Perumalpuram"
elif locationId == 3:
    latitude=8.7199159
    longitude=77.725674
    village="Palayamkottai"
elif locationId == 4:
    latitude=8.7282671
    longitude=77.7180244
    village="Vannarpettai"
elif locationId == 5:
    latitude=8.7289086
    longitude=77.6745726
    village="Nellai Town"
else:
     print("No location Found!!")

data = { 'latitude' : latitude, 'longitude': longitude,'binlevel':
```

```
binlevel,'village':village,'district':district,'state':state,'country':country  }#print
        data
        def myOnPublishCallback():
            print ("Published Latitude = %s " % latitude, "Longitude = %s %%" %
longitude, "Binlevel = %s" % binlevel,"village = %s " % village,"district= %s" %
district,"state = %s" % state,"country = %s " % country, "to IBM Watson\n")
        if binlevel >= 90:
            data={'Latitude':latitude, 'Longitude':longitude, 'Binlevel':binlevel,
'Village':village, 'District':district, 'State':state,'Country':country}
            print("!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!BIN  IS  FULL
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!\n")
            print("---------------------------------EMPTY  THE  BIN  IMMEDIATELY----------
_____\n")
            deviceCli.commandCallback = myCommandCallback
            time.sleep(5)
        else:
            print("BIN IS IN NORMAL LEVEL\n")
            time.sleep(5)
success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
on_publish=myOnPublishCallback)
        if not success:
            print("Not connected to IoTF")
# Disconnect the device and application from the device
Cli.disconnect()
```

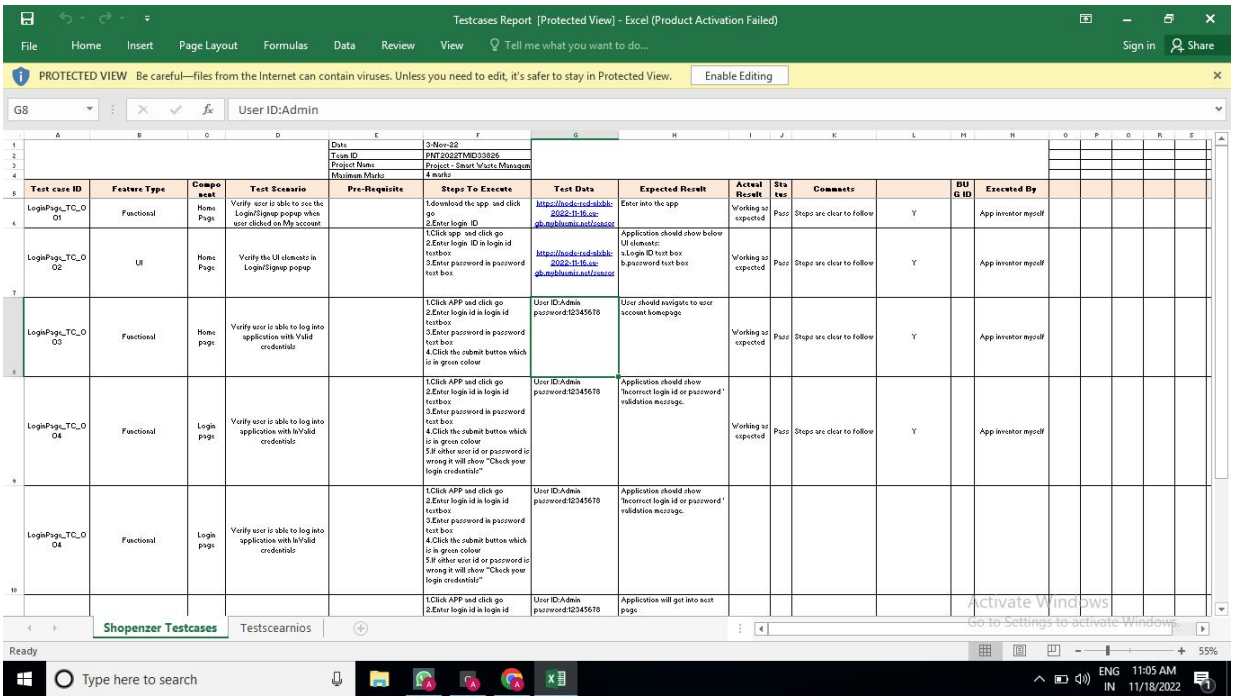
FEATURE 2:

OUTPUT SCREEN



TESTING

TEST CASES



Testcases Report [Protected View] - Excel (Product Activation Failed)

Date	3-Nov-22
Team ID	PNT2022TMID33826
Project Name	Project - Smart Waste Management
Maximum Marks	4 marks

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments		BUG ID	Executed By
LoginPage_TC_001	Functional	Home Page	Verify user is able to see the Login/Signup popup when user clicked on My account		1.download the app and click go 2.Enter login ID	https://node-red-ablbk-2022-11-16.us-gb.mybluemix.net/cancer	Enter into the app	Working as expected	Pass	Steps are clear to follow	Y		App inventor myself
LoginPage_TC_002	UI	Home Page	Verify the UI elements in Login/Signup popup		1.Click app and click go 2.Enter login ID in login id textbox 3.Enter password in password text box	https://node-red-ablbk-2022-11-16.us-gb.mybluemix.net/cancer	Application should show below UI elements: a.Login ID text box b.password text box	Working as expected	Pass	Steps are clear to follow	Y		App inventor myself
LoginPage_TC_003	Functional	Home page	Verify user is able to log into application with Valid credentials		1.Click APP and click go 2.Enter login id in login id textbox 3.Enter password in password text box 4.Click the submit button which is in green colour	User ID:Admin password:12345678	User should navigate to user account homepage	Working as expected	Pass	Steps are clear to follow	Y		App inventor myself
LoginPage_TC_004	Functional	Login page	Verify user is able to log into application with InValid credentials		1.Click APP and click go 2.Enter login id in login id textbox 3.Enter password in password text box 4.Click the submit button which is in green colour 5.If either user id or password is wrong it will show "Check your login credentials"	User ID:Admin password:12345678	Application should show 'Incorrect login id or password ' validation message.	Working as expected	Pass	Steps are clear to follow	Y		App inventor myself
LoginPage_TC_004	Functional	Login page	Verify user is able to log into application with InValid credentials		1.Click APP and click go 2.Enter login id in login id textbox 3.Enter password in password text box 4.Click the submit button which is in green colour 5.If either user id or password is wrong it will show "Check your login credentials"	User ID:Admin password:12345678	Application should show 'Incorrect login id or password ' validation message.						
					1.Click APP and click go 2.Enter login id in login id	User ID:Admin password:12345678	Application will got into next page						

Shopenzer Testcases | Testscearnios

Ready

Activate Windows
Go to Settings to activate Windows.

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Type here to search

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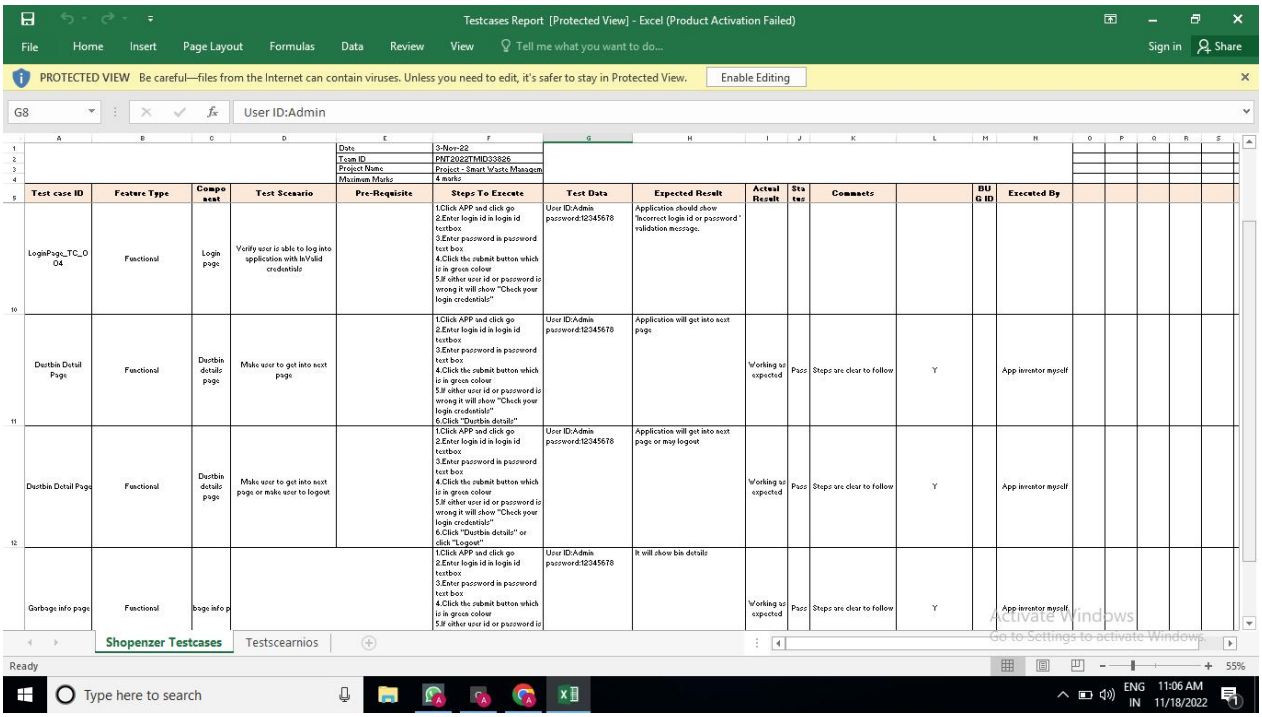
Testcases Report [Protected View] - Excel (Product Activation Failed)
PROTECTED VIEW Be careful—files from the Internet can contain viruses. Unless you need to edit, it's safer to stay in Protected View.
Enable Editing
G8
User ID:Admin
Date 3-Nov-22
Team ID PNT2022TMID33826
Project Name Project - Smart Waste Managem
Maximum Marks 4 marks
Test case ID | Feature Type | Compo nent | Test Scenario | Pre-Requisite | Steps To Execute | Test Data | Expected Result | Actual Result | Sta tus | Comments | BU G ID | Executed By
LoginPage_TC_OO4 | Functional | Login page | Verify user is able to log into application with InValid credentials | 1.Click APP and click go 2.Enter login id in login id textbox 3.Enter password in password text box 4.Click the submit button which is in green colour 5.If either user id or password is wrong it will show "Check your login credentials!" | User ID:Admin password:12345678 | Application should show "Incorrect login id or password " validation message.
Dustbin Datail Page | Functional | Dustbin details page | Make user to get into next page | 1.Click APP and click go 2.Enter login id in login id textbox 3.Enter password in password text box 4.Click the submit button which is in green colour 5.If either user id or password is wrong it will show "Check your login credentials!" 6.Click "Dustbin details" | User ID:Admin password:12345678 | Application will get into next page | Working as expected | Pass | Steps are clear to follow | Y | App inventor myself
Dustbin Datail Page | Functional | Dustbin details page | Make user to get into next page or make user to logout | 1.Click APP and click go 2.Enter login id in login id textbox 3.Enter password in password text box 4.Click the submit button which is in green colour 5.If either user id or password is wrong it will show "Check your login credentials!" 6.Click "Dustbin details" or click "Logout" | User ID:Admin password:12345678 | Application will get into next page or may logout | Working as expected | Pass | Steps are clear to follow | Y | App inventor myself
Garbage info page | Functional | bage info p | 1.Click APP and click go 2.Enter login id in login id textbox 3.Enter password in password text box 4.Click the submit button which is in green colour 5.If either user id or password is | User ID:Admin password:12345678 | It will show bin details | Working as expected | Pass | Steps are clear to follow | Y | App inventor myself
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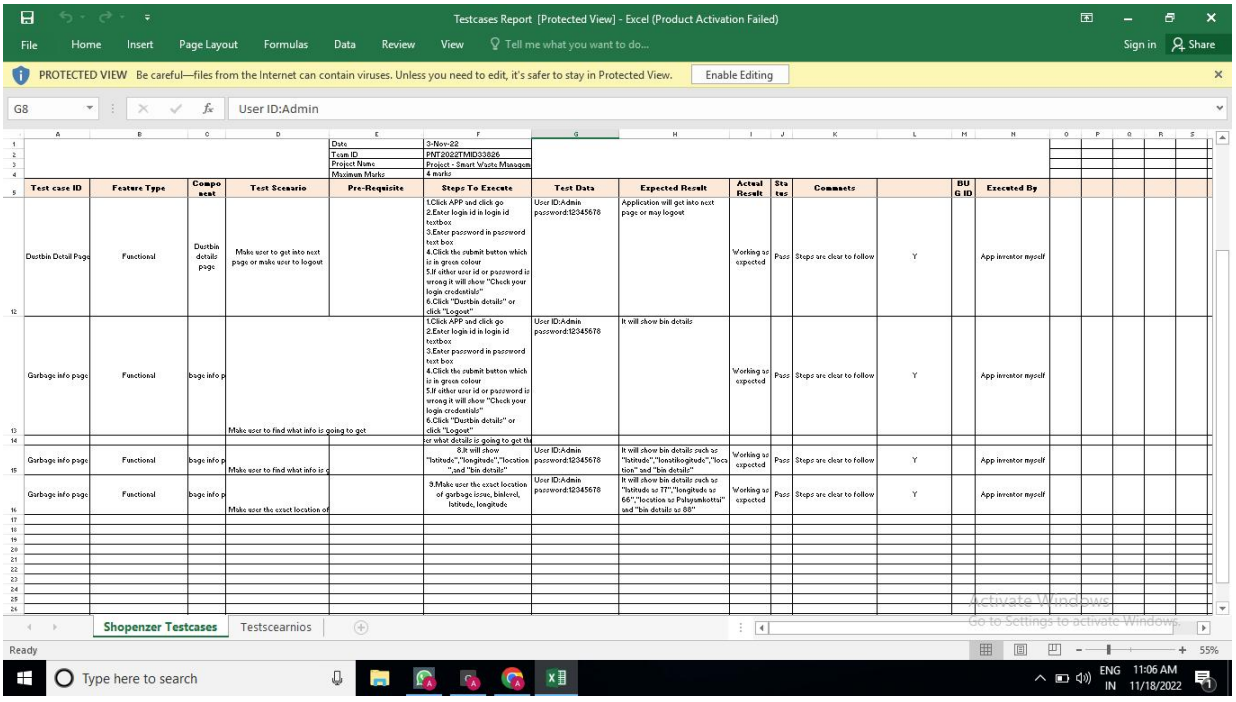
Testcases Report [Protected View] - Excel (Product Activation Failed)
PROTECTED VIEW Be careful—files from the Internet can contain viruses. Unless you need to edit, it's safer to stay in Protected View.
Enable Editing
G8
User ID:Admin
Date 3-Nov-22
Team ID PNT2022TMID33826
Project Name Project - Smart Waste Managem
Maximum Marks 4 marks
Test case ID | Feature Type | Compo nent | Test Scenario | Pre-Requisite | Steps To Execute | Test Data | Expected Result | Actual Result | Sta tus | Comments | BU G ID | Executed By
Dustbin Datail Page | Functional | Dustbin details page | Make user to get into next page or make user to logout | 1.Click APP and click go 2.Enter login id in login id textbox 3.Enter password in password text box 4.Click the submit button which is in green colour 5.If either user id or password is wrong it will show "Check your login credentials!" 6.Click "Dustbin details" or click "Logout" | User ID:Admin password:12345678 | Application will get into next page or may logout | Working as expected | Pass | Steps are clear to follow | Y | App inventor myself
Garbage info page | Functional | bage info p | Make user to find what info is going to get | 1.Click APP and click go 2.Enter login id in login id textbox 3.Enter password in password text box 4.Click the submit button which is in green colour 5.If either user id or password is wrong it will show "Check your login credentials!" 6.Click "Dustbin details" or click "Logout" | User ID:Admin password:12345678 | It will show bin details | Working as expected | Pass | Steps are clear to follow | Y | App inventor myself
Garbage info page | Functional | bage info p | Make user to find what info is g | 9.It will show "latitude","longitude","location ",and "bin details" | User ID:Admin password:12345678 | It will show bin details such as "latitude","longitude","location" and "bin details" | Working as expected | Pass | Steps are clear to follow | Y | App inventor myself
Garbage info page | Functional | bage info p | Make user the exact location of | 9.Make user the exact location of garbage icon, bin level, latitude, longitude | User ID:Admin password:12345678 | It will show bin details such as "latitude as 77°,"longitude as 66°,"location as Palayamkottai" and "bin details as 88" | Working as expected | Pass | Steps are clear to follow | Y | App inventor myself
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USER ACCEPTANCE TESTING

Purpose of Document:

The purpose of this document is to briefly explain the test coverage and open issues of the **Smart Waste Management System for Metropolitan Cities** project at the time of the release to User Acceptance Testing (UAT).

5.Defect Analysis:

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	4	0	0	4
Client Application	3	0	0	3

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	**Severity 1**	**Severity 2**	**Severity 3**	**Severity 4**	**Sub Total**
By Design	5	9	6	7	27
Duplicate	10	7	6	7	30
External	6	5	3	5	19
Fixed	4	7	8	6	25

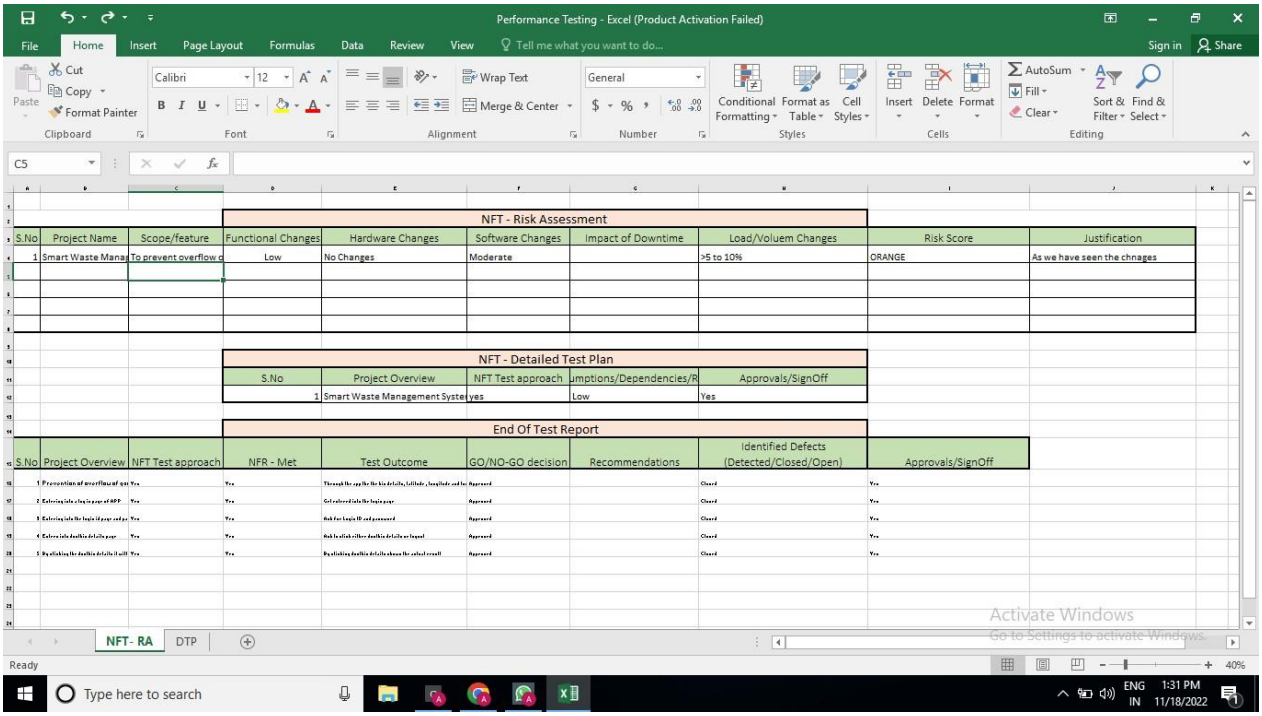
Not Reproduced	4	3	2	0	9
Skipped	5	4	3	0	12
Won't Fix	0	0	0	1	1
Totals	34	35	28	26	123

6. Test Case Analysis:

This report shows the number of test cases that have passed, failed, and untested

Security	3	0	0	3
Outsource Shipping	2	0	0	2
Exception Reporting	2	0	0	2
Final Report Output	4	0	0	4
VersionControl	5	0	0	5

PERFORMANCE METRICS



Performance Testing - Excel (Product Activation Failed)

NFT - Risk Assessment

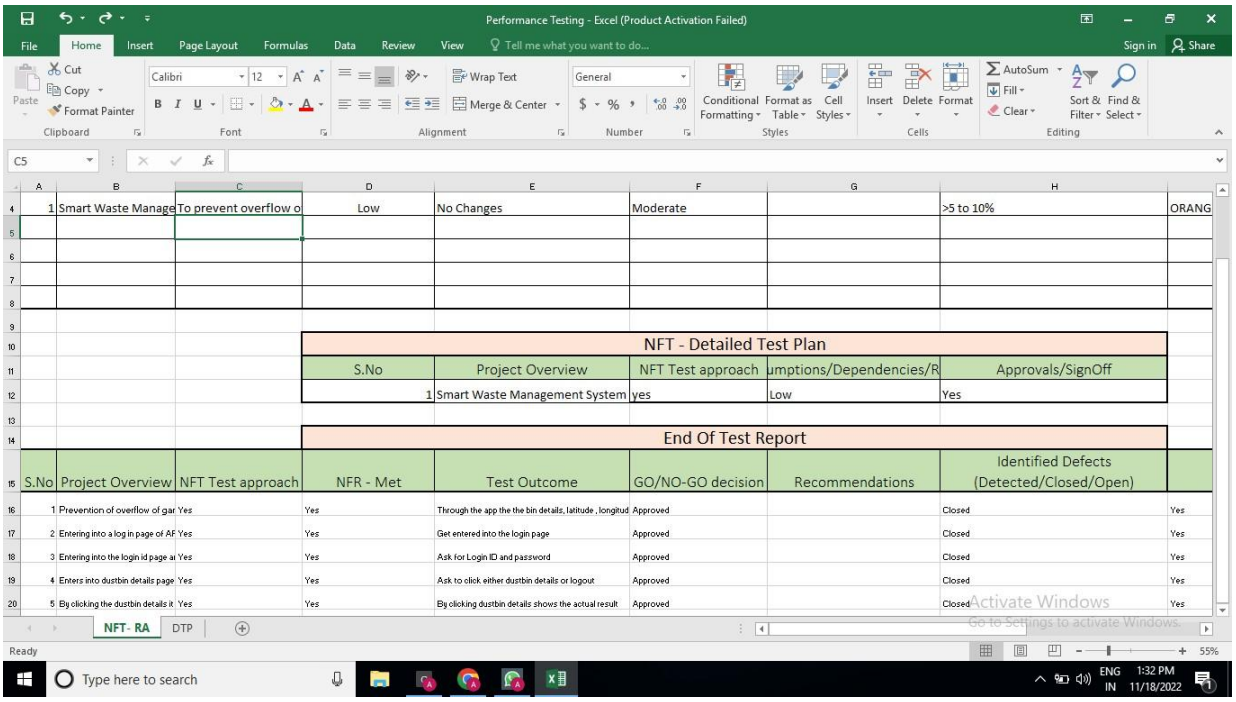
S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Voluem Changes	Risk Score	Justification
1	Smart Waste Manag	To prevent overflow o	Low	No Changes	Moderate		>5 to 10%	ORANGE	As we have seen the chnages

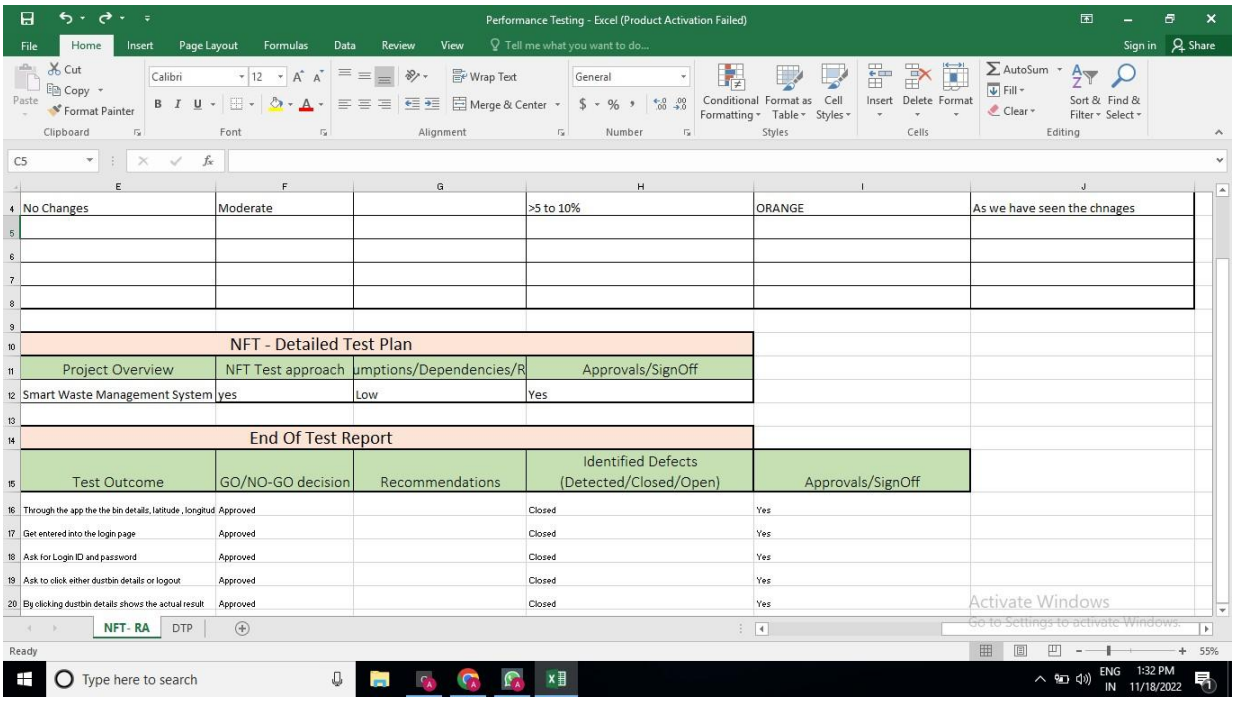
NFT - Detailed Test Plan

S.No	Project Overview	NFT Test approach	umptions/Dependencies/R	Approvals/SignOff
1	Smart Waste Management Syste	yes	Low	Yes

End Of Test Report

S.No	Project Overview	NFT Test approach	NFR - Met	Test Outcome	GO/NO-GO decision	Recommendations	Identified Defects (Detected/Closed/Open)	Approvals/SignOff
1	Prevention of overflow of gar	Yes	Yes	Through the applic the bin details, latitude, longitude and ba	Approved		Closed	Yes
2	Entering into a bin is page of MIP	Yes	Yes	Get redirected to the login page	Approved		Closed	Yes
3	Entering into the login id page and pa	Yes	Yes	Ask for Login ID and password	Approved		Closed	Yes
4	Entering into dustbin details page	Yes	Yes	Ask to click either dustbin details or layout	Approved		Closed	Yes
5	By clicking the dustbin details it will	Yes	Yes	By clicking dustbin details shows the actual result	Approved		Closed	Yes


Performance Testing - Excel (Product Activation Failed)
NFT - Detailed Test Plan
S.No
Project Overview
NFT Test approach
umptions/Dependencies/R
Approvals/SignOff
1
Smart Waste Management System
yes
Low
Yes
End Of Test Report
S.No
Project Overview
NFT Test approach
NFR - Met
Test Outcome
GO/NO-GO decision
Recommendations
Identified Defects (Detected/Closed/Open)
1 Prevention of overflow of gar Yes Yes Through the app the the bin details, latitude , longitud Approved Closed Yes
2 Entering into a log in page of AF Yes Yes Get entered into the login page Approved Closed Yes
3 Entering into the login id page ai Yes Yes Ask for Login ID and password Approved Closed Yes
4 Enters into dustbin details page Yes Yes Ask to click either dustbin details or logout Approved Closed Yes
5 By clicking the dustbin details it Yes Yes By clicking dustbin details shows the actual result Approved Closed Yes
NFT- RA
DTP
Ready
Type here to search



Performance Testing - Excel (Product Activation Failed)

No Changes	Moderate		>5 to 10%	ORANGE	As we have seen the chnages

NFT - Detailed Test Plan			
Project Overview	NFT Test approach	umptions/Dependencies/R	Approvals/SignOff
Smart Waste Management System	yes	Low	Yes

End Of Test Report				
Test Outcome	GO/NO-GO decision	Recommendations	Identified Defects (Detected/Closed/Open)	Approvals/SignOff
Through the app the the bin details, latitude , longitud	Approved		Closed	Yes
Get entered into the login page	Approved		Closed	Yes
Ask for Login ID and password	Approved		Closed	Yes
Ask to click either dustbin details or logout	Approved		Closed	Yes
By clicking dustbin details shows the actual result	Approved		Closed	Yes

ADVANTAGES

Reduction in Collection Cost

- The solution reduces waste collection frequency dramatically, enabling you to save on fuel, labor, and fleet maintenance costs. It has been seen that the solution has reduced the operational cost of municipalities up to 80%.

No Missed Pickups

- Using the solution, the managers, as well as the garbage truck drivers, can see which garbage containers are not picked up and needs to be picked. So, there will be no missed pickups, keeping theresidents away from the disease which occurs due to bacteria, vermin and insects prosper from the garbage.

Reduced Overflows

- One of the ill effects of overflowing garbage containers is air pollution, which causes lung diseases and numerous health problemsas contaminants are absorbed from lungs into other parts of a human body. Another malicious effect is on the waste collection staffand it is the risk of picking up and handling overflowing garbage which can cause them infections or chronic diseases.
- The solution takes care of this issue by allowing the waste collectors to keep track of every bin's fill status and schedule the pickup ontime.

Waste Generation Analysis

- The solution does not limit to allowing the managers to set up the pickup routes. The solution also features Advanced Data Analyticsthrough which the waste collection managers can know the futurewaste generation and can plan the resources accordingly.

CO2 Emission Reduction

- The solution decreases the fuel consumption which ultimately reduces carbon emission by up to 70%. This is indeed a huge reduction both in terms of finance and environmental impact.

DISADVANTAGES

- System requires more number of waste bins for separate waste collection as per population in the city. This results into high initialcost due to expensive smart dustbins compare to other methods.
- Sensor nodes used in the dustbins have limited memory size.
- Wireless technologies used in the system such as zigbee and wifi have shorter range and lower data speed. In RFID based systems, RFID tags are affected by surrounding metal objects (if any).

  It reduces man power requirements which results into increase in

unemployments for unskilled people.

- The trainining has to be provided to the people involved in the smartwaste management system.

CONCLUSION

- **The collection of waste is possibly the most important process for waste management systems**.
- Route optimization could be the greatest point to be able to cut costs for the operation of managing solid waste. Operating costs like labor, fuel, and equipment can lower as efficiency increase.

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 thiswas 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 totake 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 abbreviatedas 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.

APPENDIX

SOURCE CODE

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



#Provide your IBM Watson Device Credentials
organization = "3f3tah"
deviceType = "sensor"
deviceId = "123456"
authMethod = "token"
authToken  =  "1234567890"#
Initialize GPIO
def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
    if status=="binfull":
        print ("-----EMPTY THE BIN IMMEDIATELY----------")
```

```
 #print(cmd)try:
        deviceOptions = {"org": organization, "type": deviceType, "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 "hello" with value "world" into the cloud asan event of type "greeting" 10 times
deviceCli.connect()

while True:
    #USING RANDOM FUNCTIONS TO SIMULATE BINLEVEL
    binlevel=random.randint(10,100)
    locationId=random.randint(1,5)
    district="Tirunelveli"
    state="Tamilnadu"
    country="India"
    if locationId == 1:
      latitude=8.7060581
```

```
    longitude=77.7633162
    village="VM  Chathiram"
elif locationId == 2:
    latitude=8.7066676
    longitude=77.732578
    village="Perumalpuram"
elif locationId == 3:
    latitude=8.7199159
    longitude=77.725674
    village="Palayamkottai"
elif locationId == 4:
    latitude=8.7282671
    longitude=77.7180244
    village="Vannarpettai"
elif locationId == 5:
    latitude=8.7289086
    longitude=77.6745726
    village="Nellai Town"
else:
     print("No location Found!!")

data = { 'latitude' : latitude, 'longitude': longitude,'binlevel':
```

```
binlevel,'village':village,'district':district,'state':state,'country':country  }#print
        data
        def myOnPublishCallback():
            print ("Published Latitude = %s " % latitude, "Longitude = %s %%" %
longitude, "Binlevel = %s" % binlevel,"village = %s " % village,"district= %s" %
district,"state = %s" % state,"country = %s " % country, "to IBM Watson\n")
        if binlevel >= 90:
            data={'Latitude':latitude, 'Longitude':longitude, 'Binlevel':binlevel,
'Village':village, 'District':district, 'State':state,'Country':country}
            print("!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!BIN  IS  FULL
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!\n")
            print("---------------------------------EMPTY  THE  BIN  IMMEDIATELY----------
_____\n")
            deviceCli.commandCallback = myCommandCallback
            time.sleep(5)
        else:
            print("BIN IS IN NORMAL LEVEL\n")
            time.sleep(5)



        success  =  deviceCli.publishEvent("IoTSensor",  "json",  data,  qos=0,
on_publish=myOnPublishCallback)
        if not success:
            print("Not connected to IoTF")
```

```
        time.sleep(1)
    # Disconnect the device and application from the cloud
    deviceCli.disconnect()
```

GITHUB LINKS:

NIJANTHAN S(LEADER) :
https://github.com/Nijanthan6124/Nijanthan6124

MANGAYARKARASI R : https://github.com/mangaiyarkarasi6124

SANDHIYA G: https://github.com/sandhiya6124

SUTHALAKSHMI G: https://github.com/suthalakshmi6124

JAYAKUMAR N: https://github.com/jayakumar6124

PROJECT DEMO LINK

https://drive.google.com/file/d/1dtYO7JySMcEP3wuCFgF3Z1iCybARz8ym/view?usp=drivesdk