FINAL REPORT

TEAMID	PNT2022TMID11049
PROJECT NAME	SMART WASTE MANAGEMENT SYSTEM FOR METROPOLITAN CITIES
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1. INTRODUCTION

The rate at which solid wastes are produced in most developing countries is becoming alarming. This increase may be due to recent population growth and rural-urban migration. Garbage is made up of non-renewable resources used daily to meet our needs then throw away. As increase in consumption of paper, clothing,bottlesand product packaging increases, the generation of garbage also increases significantly. form and type of solid waste depends on a number of factors which include the living standard and life style of the inhabitants of the region and the natural resources.

1.1 ProjectOverview

The main objective of this paper is to monitor the dustbin and maintain the environment smart and clean. Nowadays people are using more products including food items, industrialproducts, medicines and, plastic materials. After expiry of these items they are put it into a dustbin for disposal. Without proper maintenance of dustbins, these expiry items can create epidemic diseases among people and pollution to the ambience. So the dustbins at cities, home, industries and hospitals have to be maintained properly to ensure cleanliness

1.2 Purpose

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

2. LITERATURESURVEY

Priyanka Mokale,"Smart Waste Management under Smart City Mission – Its Implementationand Ground Realities" published in web source 2019.The idea of smart waste managementis currently a new phenomena that is primarily used in metropolitan areas where garbageoutputishighandmanagementoftrashandawarenessofitspopulationisrelativelylow. Smart waste management contributes to a reduction in trash, which turns garbage into anenergysourceandkeepsthetidyandcleanofEveryurbanlocalbodyinthecity.Dependingon the technologies available, you'll need to invest. Spending money and developing a freshapproach to waste management is the primary goal of intelligent waste management. Thisessay is supported by both secondary and primary data. secondary information derived froma newspaper story, book, etc. As the discussion comes to a close, try to describe thevariations between garbage management in small towns and issues facing metropolitancities, how to handle them, and next present a suggestion for the handling of solid wasteimprovement.

Manju Mohan, RM. Kuppan Chetty, Vijayram Sriram, Mohd. Azeem, P. Vishal and G.Pranav,"IOT Enabled Smart Waste Bin with Real Time Monitoring for Efficient

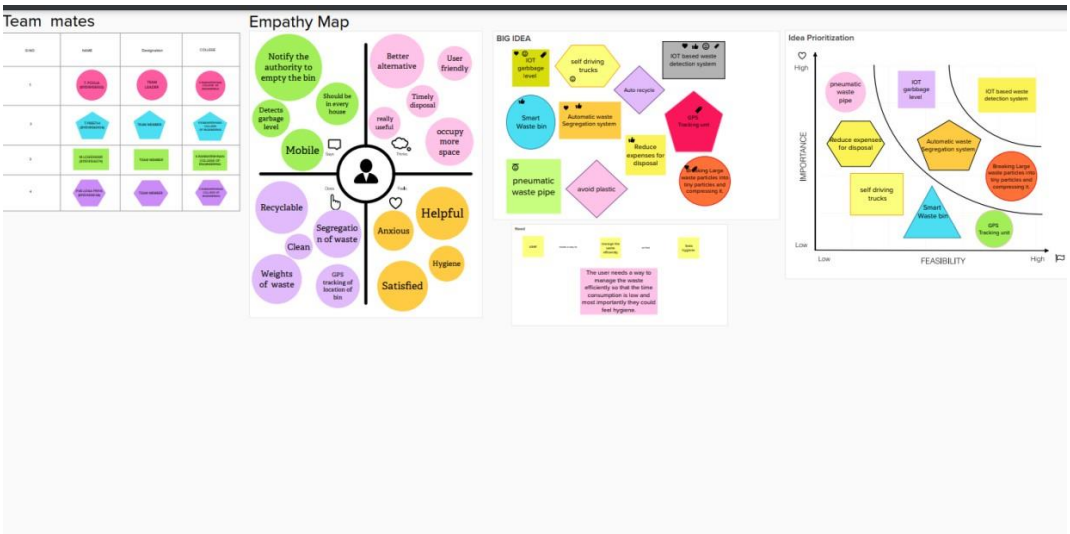
WasteManagement in Metropolitan Cities" published in web source 2019,Garbage bins have beena part of our lives for decades and most of the time their condition is overfilled due toimproperdisposal.Disposal,collection,andmanagementoftheseitemsinevitablycausefoulodours and unsanitary conditions.For environmental pollution. Therefore, in this post, wepresent a trash can design with real-time monitoring.An intelligent waste managementsystemhas also beenproposed thattakes advantage ofrecent automation andtechnological advances.Internet of Things (IoT). Capacity sensors inside the containercontinuously monitor container levels in real timeCommunicate with the central cloud towhich your containers are connected. Ultrasonic sensor is used for opening and closingBottle lids if someone is near the bottle. Such a smart bin is connected to the cloud, Thestatus of the container is the Android app or centralised server. Therefore, the designedintelligent container and the proposed waste management system have a betterlevel.Smartnessiscentralised comparedto metropolitan areas.

V.R. Sankar Cheela, Ved Prakash Ranjan, Sudha Goel , Michele John ,BrajeshDubey,"Journal of Urban Management" published in web source 2021 , To develop smartandsustainablecities,theIndiangovernmenthaslaunchedinitiativessuchas:Smartcityandcleandevelopmentmission.SolidWasteManagement(SWM).Itisoneofthemainfocusareas of such initiatives. The Changing Dynamics of Municipal Waste Characterised byunplanned urbanisation and rapid urban population growth (cause migration) has been amajor concern for urban municipalities to develop effective waste management plans.Formulation of long-term solid waste management plan in line with governmentpolicy.Initiativegoalsrequireanunderstandingofwastequantities,propertiesandpresence of waste management practices. This white paper provides an overview of existing wastemanagement activity, Financial and Institutional Demographics in Selected 6 Indian SmartCities and Fields Survey on evaluation of waste management system according to wastemanagement regulations. partial to research.An intelligent approach to collecting data fromlocal bodies and stakeholders. Benchmark strategy.The development of the wastemanagementsystemisformulatedbasedontheresultsofthisanalysis.Pathwaydiscussionsinclude waste characterization, funding sources, data technology, and Service levelbenchmarks for planning smart city integrated waste management systems.The results ofthis study should enable local governments to speed up their waste disposalsystems.Transitioningtoinnovativeand sustainablewaste systems.

3. IDEATIONANDPROPOSEDSOLUTION

3.1 EmpathyMap Canvas

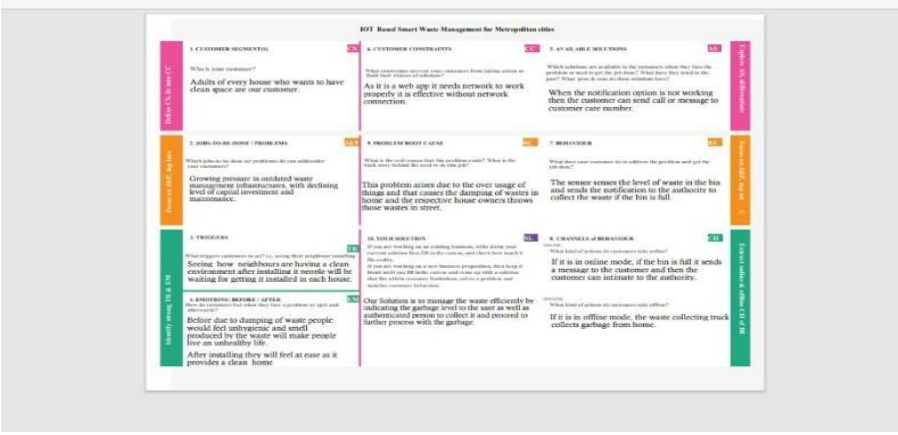
3.2 Ideation&Brainstorming



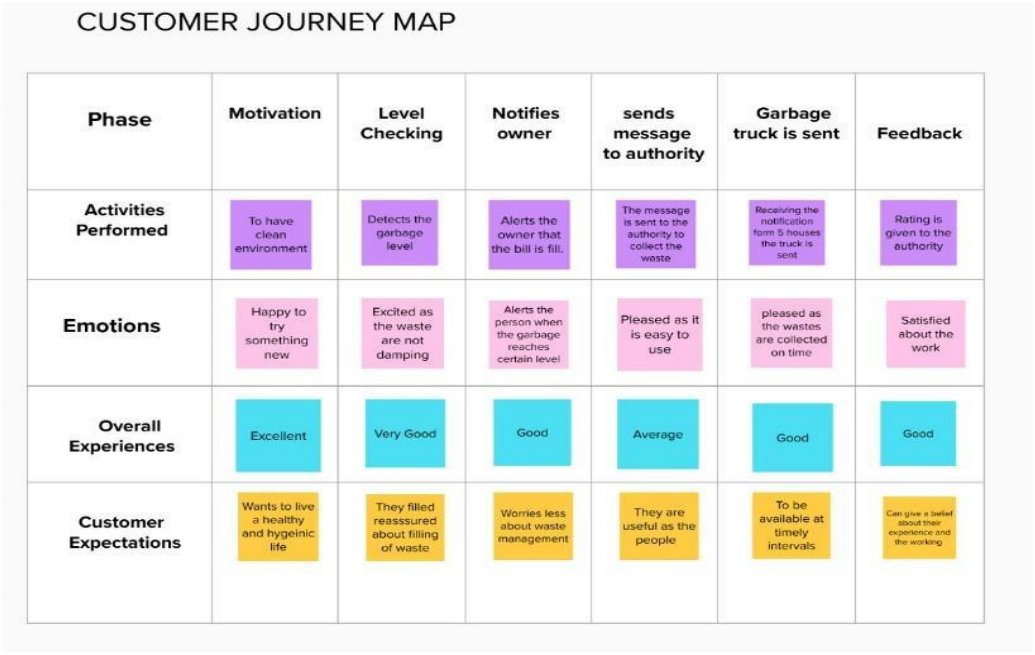
3.3 ProposedSolution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Growing pressure in outdated waste management infrastructures ,with declining level of capital investment and maintenance.
2.	Idea / Solution description	IOT based waste management system for collection of waste. It is used to find the level of garbage in the bin and intimate it in case it is full.
3.	Novelty / Uniqueness	Garbage level of the bins can be monitored through a web App. We can view the location of every bin in the web application by sending GPS location from the device.
4.	Social Impact / Customer Satisfaction	Raise public awareness of utilizing renewable energy. less manpower, emissions, fuel use and traffic congestion.
5.	Business Model (Revenue Model)	It helps businesses make their supply chain more effective, improve ordering, reduce waste materials and save money. As landfill taxes continually rise, businesses should not only look to find better solutions for waste, but also reduce the amount they create in the first instance.
6.	Scalability of the Solution	It has a good Scalabilty because it reduce the waste we produce. Provide a robust and flexible regulatory system for waste disposal and management system.

3.4 ProposedSolution Fit



3.5 Customer Journey Map



4. REQUIREMENTANALYSIS

4.1 Functionalrequirement and Non-Functionalrequirements

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Sensors	Ultrasonic-level sensor and gas sensor which automatically sense the hazardous gases and the maximum limit of waste.
FR-4	Notifies management	User sends a message to the management to collect the waste. Authority collects the waste after receiving on average number of receivers from a particular area.
FR-5	Waste Segregration	Segregrates the waste into biodegradable and non-biodegredable
FR-6	Location Tracker	Location is tracked using GPS location tracker enabled in the app

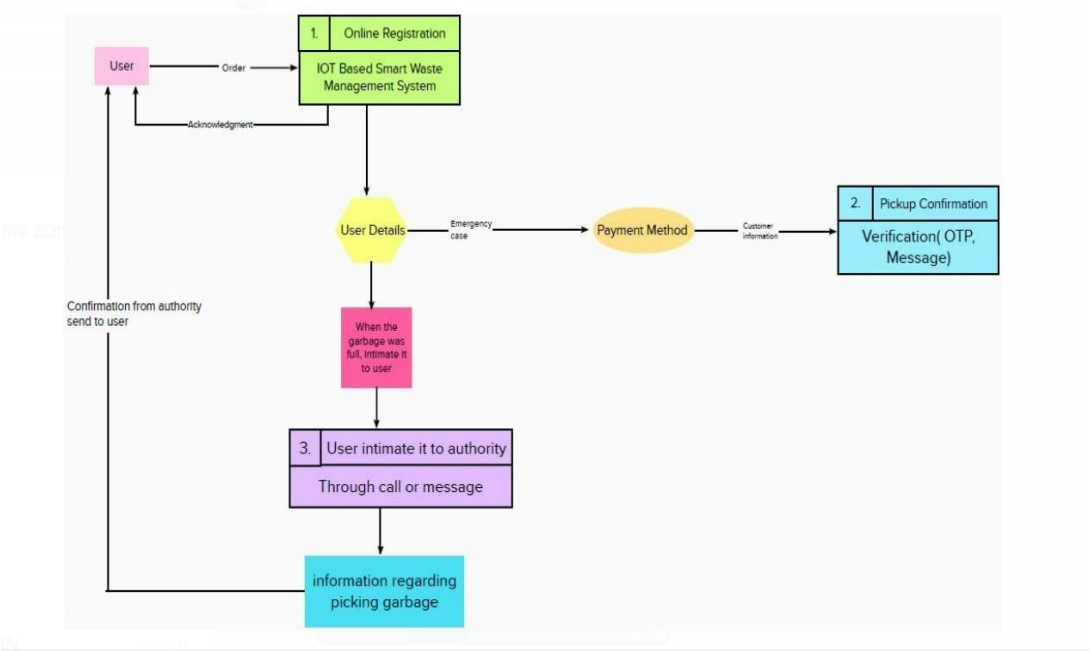
Non-functional Requirements:

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

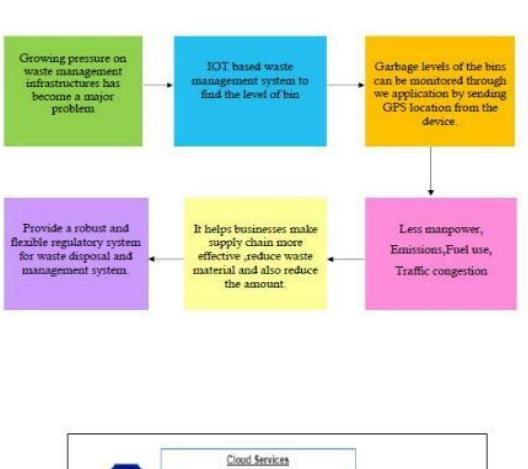
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	A distinctive number that identifies the location of each trash can is used to track them.
NFR-2	Security	The eccentric method easily contacts the appropriate authority and provides all information relating to the physical state of a specific bin.
NFR-3	Reliability	Environmental protection – from pollution or contamination. Money generation – companies may buy recyclable materials due to their value.
NFR-4	Performance	Used to detect the level of garbage in the bin and intimate it in case it is full.
NFR-5	Availability	In case if notification is not working then the user can send a message or call the authority using customer care number.

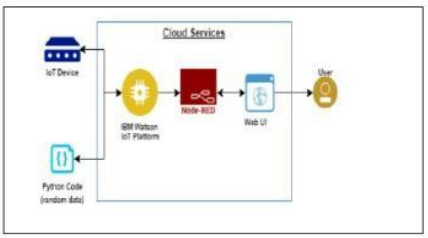
5. PROJECTDESIGN

5.1 DataFlow Diagrams



5.2 Solution&TechnicalArchitecture





6. PROJECTPLANNING&SCHEDULING

6.1 SprintPlanning&Estimation

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

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	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my mail and password.	2	High	POOJA T
Sprint-1		USN-2	The user will receive confirmation email once I have registered for the application	1	High	POOJA T LOGESWARI M
Sprint-1		USN-3	As a user, I can register for the application through Facebook	2	Low	LOGAPRIYA P.Ve
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	PREETHI T
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	1	High	LOGAPRIYA P.Ve PREETHI
Sprint-1	Dashboard	USN-6	As a user, I can log into the application by entering email & password and access all the resources and services available	2	High	POOJA T LOGESWARI M

7. CODING&SOLUTION

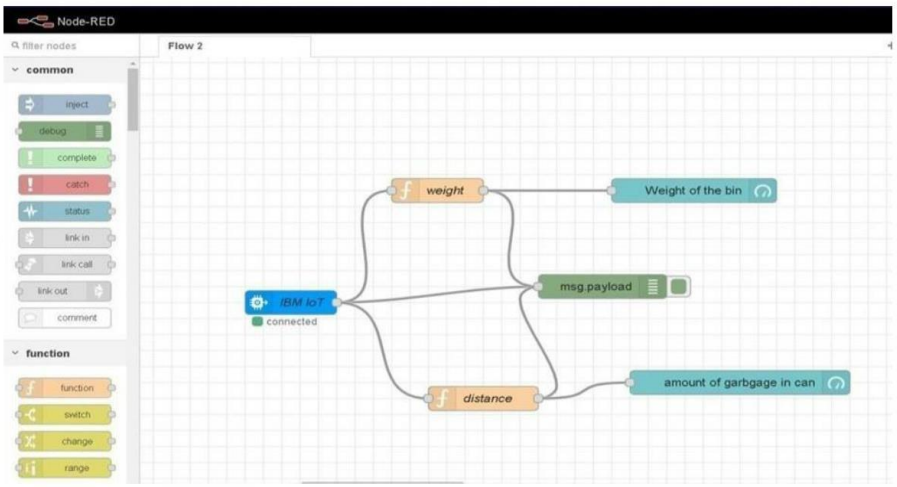
7.1 Code

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
organization = "ytb5k8"
deviceType = "Pooja"
device Id = "1234567890s"
authMethod = "use-token-auth"
authToken = "6bu071Fgydbg*5F85L"
def myCommandCallback(cmd):
print("Command received: %s" % cmd.data['command']) status=cmd.data['command']
if status=="smart bin opened":
print ("The Smart Bin is Open now")
else :
print ("The Smart Bin is Close now")
try:
deviceOptions = {"org": organization, "type": deviceType, "id": deviceId,
"auth-method": authMethod, "auth-token": authToken}
deviceCliibmiotf.device.Client(deviceOptions)

except Exception as e:
print("Caught exception connecting device: %s" % str(e))sys.exit()
deviceCli.connect()
while True:
distance=random.randint(0,200)
 weight=random.randint(0,10)
data = { 'distance' : distance, 'weight': weight }
def myOnPublishCallback():
print ("Published Data to IOT Watson: \n     Distance= %s cm\n" %distance, "      Weight = %s
Kg\n" % weight)
success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
on_publish=myOnPublishCallback)
if not success:
print("Not connected to IoTF")
time.sleep(10)
deviceCli.commandCallback = myCommandCallbackdeviceCli.disconnect()
```

7.2 Output

7.3 NODE RED



8. DEMO LINK

https://youtu.be/Y6LV8pKJPPI