

**Project Design Phase-II**  
**Solution Requirements (Functional & Non-functional)**

Date	10 October 2022
Team ID	PNT2022TMID05219
Project Name	Smart Waste Management System For Metropolitan Cities
Maximum Marks	4 Marks

**Functional Requirements:**

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	<b>Fitting IoT device in the trashcans</b>	<ul style="list-style-type: none"><li>➤ The IoT device need to be fixed in the dustbin with Water proof safety.</li><li>➤ The IoT device consists Ultrasonic sensor, IR sensor, Weight sensor.</li><li>➤ To send data to the cloud GPRS/GSM is used.</li></ul>
FR-2	<b>Detailed bin inventory</b>	<ul style="list-style-type: none"><li>➤ All monitored bins and stands can be seen on the map, and you can visit them at anytime via the Street View feature from Google.</li><li>➤ Bins or stands are visible on the map as green, orange or red circles.</li><li>➤ You can see bin details in the Dashboard – capacity, waste type, last measurement, GPS location and collection schedule or pick recognition.</li></ul>
FR-3	<b>Real Time Bin monitoring</b>	<ul style="list-style-type: none"><li>➤ The Dashboard displays real-time data on fill-levels of bins monitored by smart sensors.</li><li>➤ In addition to the % of fill-level, based on the historical data, the tool predicts when the bin will become full, one of the functionalities that are not included even in the best waste management software.</li></ul>

		<ul style="list-style-type: none"> <li>➤ Sensors recognize picks as well; so you can check when the bin was last collected.</li> <li>➤ With real-time data and predictions, you can eliminate the overflowing bins and stop collecting half-empty ones.</li> </ul>
FR-4	<b>Expensive bins</b>	<ul style="list-style-type: none"> <li>➤ We help you identify bins that drive up your collection costs.</li> <li>➤ The tool calculates rating for each bin in terms of collection costs.</li> <li>➤ The tool considers the average distance depo-bin-discharge in the area.</li> <li>➤ The tool assigns bin a rating(1-10) and calculates distance from depo-bin discharge</li> </ul>
FR-5	<b>Eliminate unefficient picks</b>	<ul style="list-style-type: none"> <li>➤ Eliminate the collection of half-empty bins.</li> <li>➤ The sensors recognize picks.</li> <li>➤ By using real-time data on fill-levels and pick recognition, we can show you how full the bins you collect are.</li> </ul>
FR-6	<b>Predictions for bin fullness</b>	<ul style="list-style-type: none"> <li>➤ It is a 24x7 monitoring system is designed for monitoring the dumpster.</li> <li>➤ If either of the containers is full then an alert message is sent from the dustbin to employees and the cloud. In turn, employees can clear the corresponding dumpster.</li> <li>➤ The bin has Sensors that can recognize picks as well; so you can check when the bin was last collected. With real-time data and predictions, you can eliminate the</li> <li>➤ overflowing bins and stop collecting half-empty ones.</li> </ul>
FR-7	<b>Plan waste collection routes</b>	<ul style="list-style-type: none"> <li>➤ Based on current bin fill-levels and predictions of reaching full capacity, you are ready to respond and schedule waste collection.</li> <li>➤ You can compare planned vs. executed routes to identify any inconsistencies.</li> </ul>

## Non-functional Requirements:

Following are the non-functional requirements of proposed solution

FR No.	Non-Functional Requirement	Description
NFR-1	<b>Usability</b>	<ul style="list-style-type: none"><li>➤ A smart solution has been proposed to make the waste by sorting more simple and accurate and improve the user experience, usability, and satisfaction.</li><li>➤ It aims to optimize ease of use while offering maximum functionality.</li></ul>
NFR-2	<b>Security</b>	<ul style="list-style-type: none"><li>➤ Building and deploying IoT-based smart waste management in cities can be a complex, time consuming and resource-intensive process.</li><li>➤ Many municipal IT departments will not have the resources or in-house skills to support such a project internally.</li></ul>
NFR-3	<b>Reliability</b>	<ul style="list-style-type: none"><li>➤ Smart waste management is also about creating better working conditions for waste collectors and drivers.</li><li>➤ Operates in a defined environment without failure resulting in less manpower, emissions, fuel use and traffic congestion.</li></ul>
NFR-4	<b>Performance</b>	<ul style="list-style-type: none"><li>➤ The system will provide accurate reports, thus increasing the efficiency of the system.</li><li>➤ The real-time monitoring of the garbage level with the help of sensors and wireless communication will reduce the total number of trips required of Garbage collecting truck.</li><li>➤ This will reduce the total expenditure associated with the garbage collection.</li></ul>
NFR-5	<b>Availability</b>	<ul style="list-style-type: none"><li>➤ Another purpose of this project is to make the proposed waste management system as cheap as possible.</li><li>➤ By this we empower cities, businesses, and countries to manage waste smarter.</li></ul>

NFR-6	<b>Scalability</b>	➤ Using smart waste bins reduce the number of bins inside town , cities coz we able to monitor the garbage 24/7 more cost effect and scalability when we moves to smarter.
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