**Project Design Phase-II**

**Solution Requirements (Functional & Non-functional)**

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| Date | 22 October 2022 |
| Team ID | PNT2022TMID50747 |
| Project Name | Smart Waste Management For Metropolitan Cities |

**Functional Requirements:**

Following are the functional requirements of the proposed solution.

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| **FR No.** | **Functional Requirement** | **Sub Requirement** |
| FR-1 | Detailed bin inventory. | All monitored bins and stands can be seen on the map,  and you can visit them at any time via the Street View  feature from Google.  Bins or stands are visible on the map as green, orange  or red circles.  You can see bin details in the Dashboard – capacity,  waste type, last measurement, GPS location and  collection schedule or pick recognition. |
| FR-2 | Real time bin monitoring. | The Dashboard displays real-time data on fill-levels of  bins monitored by smart sensors.  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..  Sensors recognize picks as well; so you can check when  the bin was last collected.  With real-time data and predictions, you can eliminate  the overflowing bins and stop collecting half-empty  ones. |
| FR-3 | Expensive bins. | We help you identify bins that drive up your collection  costs. The tool calculates a rating for each bin in terms  of collection costs.  The tool considers the average distance depo-bindischarge in the area. The tool assigns bin a rating  (1-10) and calculates distance from depo-bin discharge. |
| FR-4 | Adjust bin distribution. | Ensure the most optimal distribution of bins.  Identify areas with either dense or sparse bin  distribution.  Make sure all trash types are represented within a  stand.  Based on the historical data, you can adjust bin capacity  or location where necessary. |
| FR-5 | Eliminate un- efficient picks. | The report shows how full the bin was when picked.  You immediately see any inefficient picks below 80%  full. |
| FR-6 | Plan waste collection routes. | The tool semi-automates waste collection route  planning. Based on current bin fill-levels and predictions  of reaching full capacity, you are ready to respond and  schedule waste collection.  You can compare planned vs. executed routes to  identify any inconsistencies. |

**Non-functional Requirements:**

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

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| **FR No.** | **Non-Functional Requirement** | **Description** |
| NFR-1 | **Usability** | IoT device verifies that usability is a special and  important perspective to analyse user requirements,  which can further improve the design quality. In the  design process with user experience as the core, the  analysis of users’ product usability can indeed help  designers better understand users’ potential needs  in waste management, behaviour and experience. |
| NFR-2 | **Security** | Use a reusable bottles  Use reusable grocery bags  Purchase wisely and recycle  Avoid single use food and drink containers. |
| NFR-3 | **Reliability** | Smart waste management is also about creating  better working conditions for waste collectors and  drivers. Instead of driving the same collection routes  and servicing empty bins, waste collectors will spend  their time more efficiently, taking care of bins that  need servicing. |
| NFR-4 | **Performance** | The Smart Sensors use ultrasound technology to  measure the fill levels (along with other data) in bins  several times a day. Using a variety of IoT networks (  (NB-IoT,GPRS), the sensors send the data to  Sensoneo’s Smart Waste Management Software  System, a powerful cloud-based platform, for data driven daily operations, available also as a waste  management app.  Customers are hence provided data-driven decision  making, and optimization of waste collection routes,  frequencies, and vehicle loads resulting in route  reduction by at least 30%. |
| NFR-5 | **Availability** | By developing & deploying resilient hardware and  beautiful software we empower cities, businesses,  and countries to manage waste smarter. |
| NFR-6 | **Scalability** | 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. |