K J Somaiya College of Engineering
A Constituent College of Somaiya Vidyavihar University

Template for Problem formulation

Need Statement: Design an automatic machine for efficient cleaning that can be used by organisations hosting large scale events.

Roll Number	Name of Student	Role played
16010422234	Chandana Galgali	Designer
16010622114	Sanjana Somani	Client
16010322056	Saloni Shahasane	Client
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16010622084	Vedika Surve	Designer

Table 1: List of The sample Questionnaire to design the problem

Questions such as	This question helps the designer to
1. How much area should each cleaning machine be able to cover?	**Identify client's objective**
2. What should be the range of cost of the cleaning machine?	
3. How many cleaning machines are required?	
4. What does "efficient cleaning" entail?	
5. What are the expected features in the machine?	
1. What should be the maximum weight of the cleaning machine?	**Identify constraints**
2. What materials should be used to make the machine?	
3. What should be the size of the cleaning machine?	
1. How should one control the cleaning machine?	**Establish functions**
2. What features of the cleaning machine can be controlled?	
3. What is the preferable source of energy to power the machine?	

Table 2: The information obtained through basic research and Survey

Observation and from Lit. Survey	Requirements
1. Based on the weight of the suction pump in the vacuum cleaner, sweeping broom, mop, etc.;	The weight of the machine should be about 4 to 5 kilograms.
2. The cleaning machine can be connected to android/i-phone(s);	It can be operated with the help of voice assistants like Google Home and Amazon Alexa.
3. Batteries form the main input source of power and they are rechargeable;	A suitable battery adapter needs to be provided.
4. The machine has sensors that detect obstacles and navigates around the place that is to be cleaned;	A gyroscopic motion sensor mechanism that runs on light-powered rotations to detect objects in its path and thus navigate accordingly.
5. Based on the cost of the competing products in the market;	Cost of the machine should lie within the range of Rs.21,600 – Rs.27,350

1.1 Establish client's objectives:

- The cleaning machine should be able cover an area of about 48.209 acres.
- The cost of the cleaning machine should not exceed Rs.35,000.
- The required number of cleaning machines is 5.
- Cleaning should be efficient in the terms that the cleaning machine should be able to clean sharp corners and curved edges both.
- The cleaning machine should be easy to operate.

1.2 Identify constraints:

- The weight of the cleaning machine should not exceed 6 kg.
- Some of the corrosion-resistant materials that can be used to make the machine parts are stainless/galvanized steel and aluminium oxide. The sweeping brush should have flagged-end bristles with frayed tips, made of synthetic fibres as they last longer than corn/horsehair ones.
- The size of the machine should not exceed the dimension:(436×118×358)mm.

1.3 Establish functions:

- One should be able to control the cleaning machine using their mobile phone.
- Being able to switch between a mop, a sweeping broom and a vacuum cleaner, timing the machine to automatically shut down after a certain inputted time, speed at which the machine operates are some of the features that one should be able to control.
- The most preferable are batteries that can be recharged to power the cleaning machine.

Revised Problem Statement:

"*Design an automatic machine for efficient cleaning which can be operated using mobile phones. Cost of the machine should range between Rs.21,600 to Rs.27,350. The weight should not exceed 6kg. The materials used should be corrosion-resistant and long-lasting. The machine should power using rechargeable batteries.*"