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PROJECT REVIEW

Submitted for the Course

LEAN STARTUP MANAGEMENT

Course Code: MGT1022

Introducing the Idea of

SMART BINS

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PROJECT IDEA

"INTRODUCING A DESIGN OF SMART DUSTBINS TO SOLVE THE PROBLEMS OF WASTE MANAGEMENT IN CORPORATE SECTORS"

PROBLEM DESCRIPTION

To introduce the concept of SMART DUSTBINS built on a microcontroller based platform Arduino Uno board which is interfaced with NODEMCU, Ultrasonic sensor and a Smart Locking Mechanism which can gives the status of the waste present in the dustbin to the Authority.

ABSTRACT

In the recent decades, Urbanization has increased tremendously. At the same phase there is an increase in waste production. Waste management has been a crucial issue to be considered. We thus here propose the concept of SMART DUSTBINS at an easy, affordable price so these can be implemented at a large scale.

Once these smart bins are implemented on a large scale, by replacing our traditional bins present today, waste can be managed efficiently as it avoids unnecessary lumping of wastes in corporate sectors like schools, offices, hospitals, and even outside, like Public parks, Roadsides, gardens, Public places, so that not just proper disposal is taken care of, but also securing the waste properly will help get rid of unwanted lumping of wastes on roadside.

Foul smell from these rotten wastes that remain untreated for a long time, due to negligence of authorities and carelessness of public may lead to long term problems.

In order to support the dream of achieving **SWACCHH BHARAT MISSION**, we are proposing the design of a smart dustbin that can be kept in every government or private office. The dustbin costs **LESS THAN INR 1200** and is an edge in IoT.

MAXIMUM VALUE ROPOSITION

The SMART BINS THAT WE PROPOSE HERE bring a lot of value to the table UNDER JUST Rs. 2000!

1. • No Need to touch any bin part to open it (Automatically opening)
2. • People can come to know how much the bin is full just by seeing the color of LED on it.
3. • Detects theft and sends SMS to labourers+ raises a local alarm using buzzer.
4. • AFFORDABLE: JUST UNDER RS. 1200 per Unit.
5. • Smart Locking mechanism using LDR.
6. • App gives entire control to labourers, informs them which dustbin has to be emptied.

The Smart Bins that we propose here are none like the ones available in the market as of now. The Bins that we propose here provide a sense of Elegance along with being extremely affordable, with Sensors installed which would let one know the level of the waste bin filled. It is also fitted with automatic sensor Flaps, which discards the unnecessary effort of touching bins with bare hands, or trying to balance while opening the bins with feet (thus chances of it trembling and falling).

Not just this, the bins are equipped with a SMART Locking technology, which is the Show stopper of the Product. The **Anti-Theft system** is cost effective and reliable. Usually the bin's main lid will be locked, using a nut that passes through hole inside the plastic extensions coming out of bin lid and bin body. The hole will have **LDR sensor** embedded inside its rim. When someone tries to deliberately open the main lid of bin by taking out the nut from its hole, then intensity of light falling over LDR increase which leads to turning on of the bin alarm and workers get notified about the same via message.

Also, workers have the authority to switch off the alarm system before they themselves open the bin to take out the garbage. This can be done just by a click on the app button, corresponding to a particular dustbin. The alarm automatically gets activated after 5 minutes of disposal.

CUSTOMER SEGMENT

The Potential Customers to whom we can profitably sell our proposed model are:

(I) INSTITUTIONAL ZONES

Institutional zones like Public and Private schools, Colleges, Universities, and research centres can be a huge customer segment for bringing up the Smart Bin technology. A simple database can be maintained for the entire Institution that will keep records of the bins that need to be cleared out, and thus the process of waste disposal will be a lot more convenient.

Since Institutional wastes deal with a fair amount of biodegradable kitchen waste, one of the compartments could be set up for the same. A low cost chemical sensor can also be embedded into the structure to give details regarding the decomposition inside the bin. This will prevent building up of foul zones, and will also prevent air-borne diseased to be spread.

Main Zones Targeted:

- **Public Schools**
- **Private Schools**
- **Universities**

- **Colleges**
- **Research Centres**

(II) CORPORATE SECTORS

The Corporate World also calls for the need of SMART bins. Users usually do not find it convenient to use low quality plastic bins in office and work areas, and thus they usually spend a lot on sophisticated bins to match with the environment of the working zones. Instead of investing in such high-cost bins, users can go with this affordable low-cost smart bin. Not only will it please the customers with the sleek look to go with the environment, but also it can be used to properly manage the waste disposal.

(III) HOSPITALS
(IV) THEATRES
(V) MALLS
(VI) HOUSEHOLDERS

DESIGN OF THE SMART DUSTBINS (PRODUCT FEATURES)

Smart dustbins, which can help customers smart bin is built on a microcontroller based platform Arduino Uno board which is interfaced with NODEMCU and Ultrasonic sensor. Ultrasonic sensor is placed at the top of the dustbin which will measure the stature of the dustbin. The threshold stature is set as 10cm. Arduino will be programmed in such a way that when the dustbin is being filled, the remaining height from the threshold height will be displayed. Once the garbage reaches the threshold level ultrasonic sensor will trigger the GSM modem which will continuously alert the required authority until the garbage in the dustbin is cleared.

(I) CHARACTERISTICS OF THE BIN

- Bin has Hard METALLIC body
- Cylindrically shaped
- 120L Volume

- Cost: INR 1200
- Has a mechanical anti-theft mechanism that uses LDR sensor to detect if the nut of the main lid of the bin has been opened without authorization (a buzzer is mounted on dustbin to alert the same and workers are notified via message and subsequent call if such thing happens)
- Segregated compartments for Plastic and Paper waste.
- 4 wheels for portability
- An RGB LED to indicate level till which bin is full
- Servo motors to automatically open or close bin mouth
- Uses NodeMCU Development board and a 8*1 MUX to control all sensors.

An APPLICATION is created which will give information to workers in real time about which all dustbins are full and if someone is trying to open the lids deliberately without permitted access.

The App allows workers to switch off the alarm when they themselves are going to open the lid for taking out the garbage, Garbage Manager of office can keep track of all bins and workers just by sitting on his computer from control room.

(II) APP AND TRACKING SYSTEM

All labourers would be provided with their personal app login credentials. The app shows in real time:

1. The level to which each dustbin is full.
   Each dustbin is given a unique name based on its location in office(E.g.- B01012 is the bin of 1st floor, room no. 12).
   Worker can exactly know which dustbin is full from its name which is displayed on his mobile screen.

2. If all the dustbin's main lids are closed or not.
   If somebody deliberately tries to open the main lid of any bin, it is detected via LDR and an immediate message notification, followed by a phone call is sent to the worker stating the exact bin address.

3. Allows workers to switch off the LDR alarm before they themselves unbolt the main bin lid to empty the garbage.

4. If a bin burglary is detected at main gate of office (as the bin carries a security tag, like other important office furniture), the worker receives a notification on app.

5. All this information can be viewed by the Garbage Manager of office in his control room on his PC. He will be exactly able to know:

   - Garbage levels of all bins of office
   - Alarms of which all bins have been turned off by which all workers.
   - Whether main lids of all bins are closed or not.
   - Location of each garbage worker.

The App will let all the workers know:
Level of Waste in each bin, prioritising each one according to the level of waste

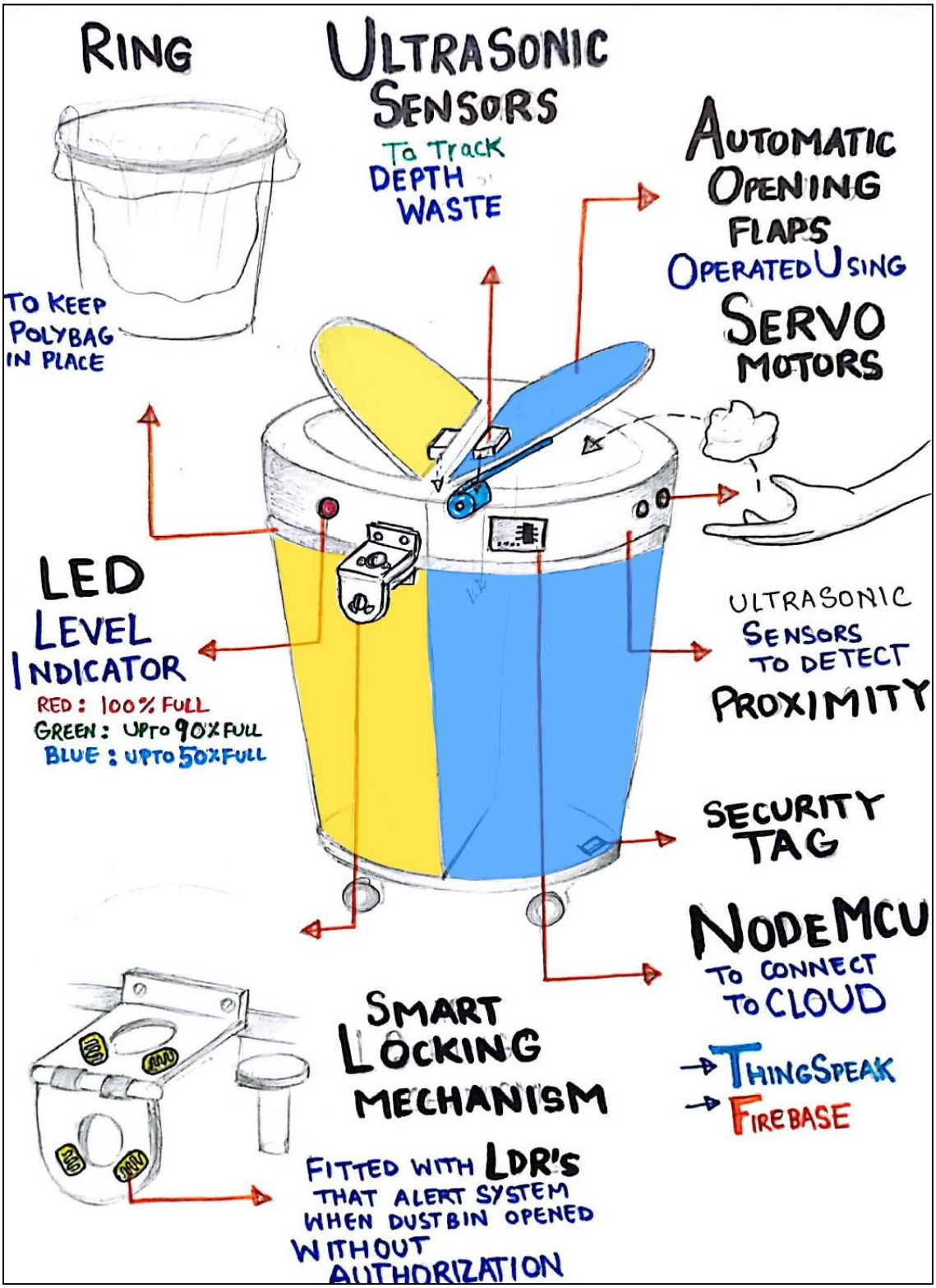
(III) IMPLEMENTATION:

We would be storing all sensor values on cloud . IOT platforms used:

- THINGSPEAK, by MATLAB
- GOOGLE FIREBASE

App would be made using MIT APP INVENTOR.

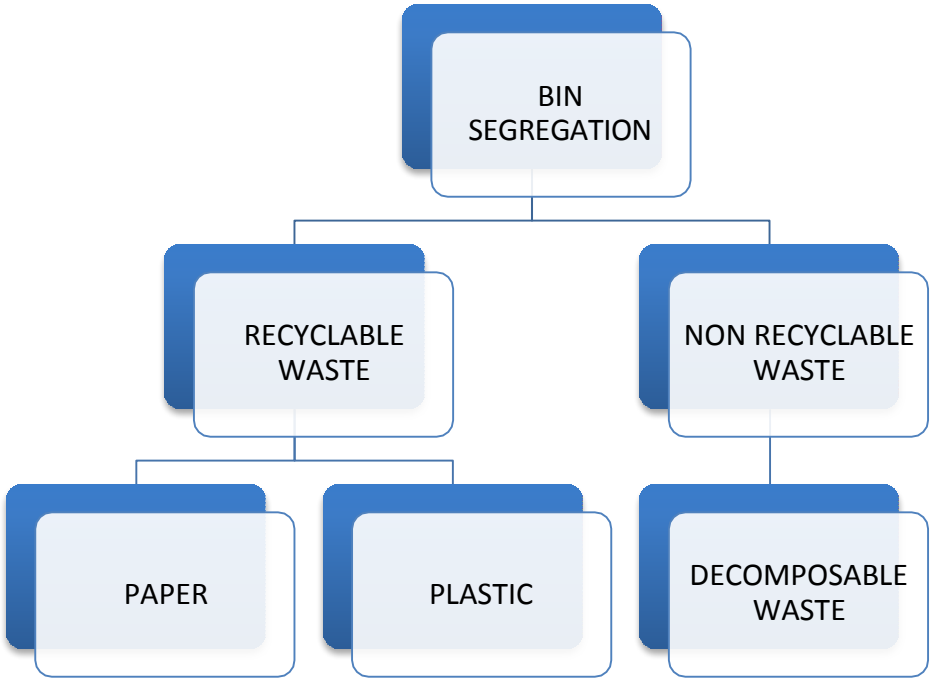
DESIGN OF THE SMART BIN



CONSTRUCTION AND FEATURES

2 Compartments:

1 compartment for **Paper waste** and 2nd compartment **for plastic waste**. This would help in segregating waste at source itself.



- **CAPACITY**

  "120 L" per compartment.

- **BODY**

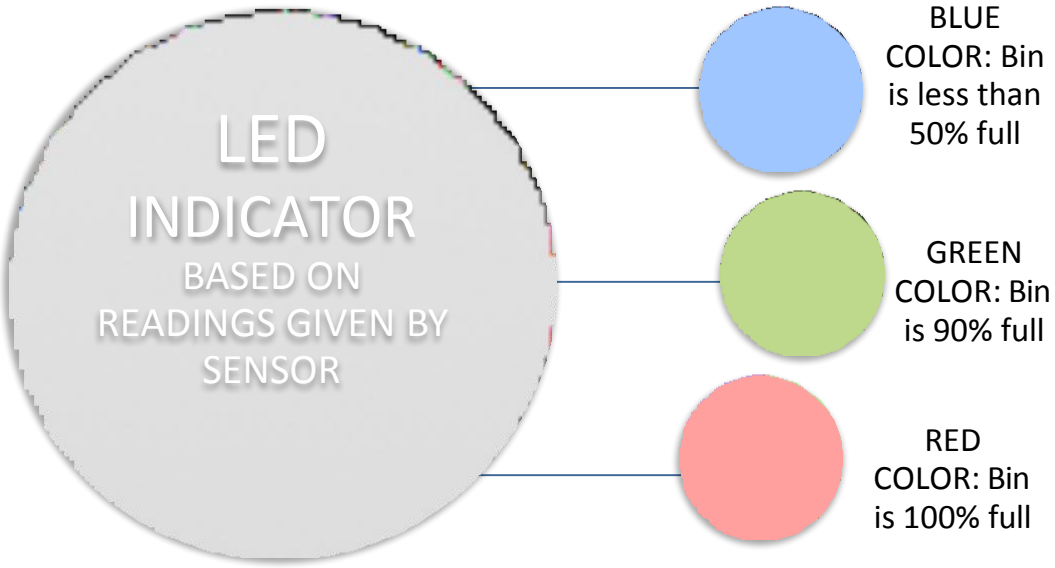
  Hard **PLASTIC BODY, CYLINDRICAL** shaped.

- **SELF OPENING**

  Ultrasonic sensors placed at appropriate positions in dustbin to detect if someone is present to throw the garbage inside. The mouth of the bin will open on its own, so employees need not touch any part of dustbin anytime. The mouth will close automatically after 10 seconds of disposal. This would be accomplished by use of 2 Servo motors put in each compartment of bin.

➢ LED INDICATOR

An RGB LED would be mounted on the bin whose colour would indicate the level of trash present in the bin. This will help in prevention of overloading of bins as employees will not throw more garbage in already full bins(signified by red LED glow).



BLUE COLOR: Bin is less than 50% full
GREEN COLOR: Bin is 90% full
RED COLOR: Bin is 100% full

➢ SENDS SMS TO LABOUR

When the Dustbin is full: 2 ULTRASONIC SENSORS (one for each compartment) would be fitted on the lid to measure the depth till which dustbin is full. After the threshold is reached, labours are alerted via SMS that they need to empty that particular bin.

➢ WHEELS

To ensure portability of the bin, 4 wheels are mounted at its bottom so that bins, which may get heavy due to garbage, can be easily carried to another location for getting it empty.

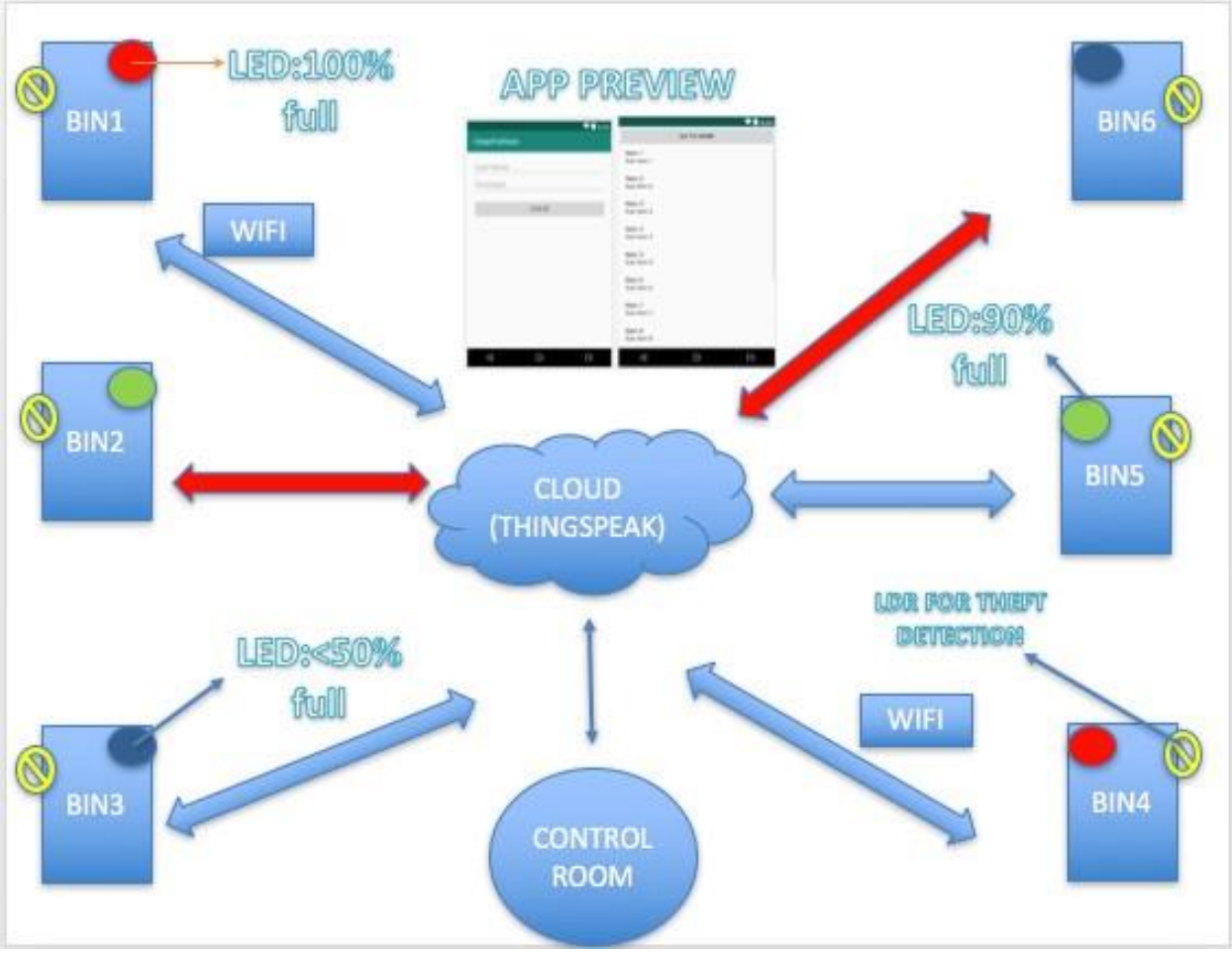
➢ ANTI THEFT SYSTEM

To prevent access of opening of the bin by anybody other than labourers, a *mechanical system* is provided that contains a thick nut grooved inside a hole. Flat Plastic part with a hole protrude out of bin lid and bin body that are secured together by the nut (so that they are locked),and a series of **LDRs** are put at hole rims . If a person tries to unbolt the bin by hand (open it by taking out the nut),the light intensity on LDR increases which will raise a *local buzzer alarm* mounted on bin lid and inform the labours via a message that somebody had tried to unbolt the particular bin.

- Any labour can switch the alarm ‘ off ‘ before he himself tries to unbolt the bin’s lid(in order to empty the garbage) just by a click on his smart phone. The alarm system will again become active after 5 minutes of being turned off by a labour.

- **<u>SECURITY TAG:</u>**

Bin would be carrying a security tag that can easily be detected at office entrance if somebody tries to physically displace the bin out of the office.



LAYOUT OF THE MODEL

FINANCIAL PLANNING

I) INITIAL EXPENDITURE

- Cost to Setup the Warehouse for Work: **Rs. 20,000** (Plot Area 3700 square feet)
- All Initial Equipment Total Investment: **Rs. 18,000**
- Labour Cost: **Rs. 20,000**
- Total Initial Setup Cost:

COST TO DEVELOP ONE UNIT OF BIN

BODY: Rs. 350

2 ULTRASONIC SENSORS: Rs. 160

2 Servo motors: Rs. 44

1 Nodemcu development board: Rs. 170

4 wheels: Rs. 80

8 LDRs: Rs. 16

1 MULTIPLEXER: Rs 33

Small buzzer: Rs. 10

Residual cost: Rs. 37 (Wires,Nuts,Gum)

MRP: Rs. 1200

Maintenance Costs: Rs. 100 (Maintaining Relations with the Customer)

Total Expense: Rs. 1100

Manufacturing Cost: Rs. 900
SELLING PRICE: Rs. 1200
Maintenance Cost: Rs. 100

TOTAL PROFIT ON ONE UNIT: Rs. 200- Rs. 300

II) RUNNING EXPENSES

Manufacturing Cost of One Unit**: Rs. 900**
(Including Raw Materials)
Selling Price of One Unit: **Rs. 1200**

- Profit Margin on one Bin: **Rs.200- Rs.300**

Number of Units Expected to be sold in One Month: **50-150**
Profit Earned in one Month: **Rs.10,000 to Rs.45,000**

- Labour Costs Per Month: **Rs.20,000**
- Quality Check Cost: **Rs.7,000 per year**
- Advertisement and Marketing Cost: **Rs. 8,000 per year**

Total Profits Expected in One Month = Rs.20,000 to Rs.50,000
TOTAL PROFITS EXPECTED IN ONE YEAR = RS. 2.4 LACS TO 6 LACS
(Excluding Maintenance Charges)

II) MAINTENANCE COSTS

- Funds Expected to Reach Market Areas**: Rs.1750/Month**
- Funds needed to Publicize the Product: **Rs.750/Month**
- Funds needed to MAINTAIN RELATION WITH CUSTOMERS (After-Sales Services) : **Rs.30,000/year** (This gives, Total Expense per Month**: Rs. 2500)**

Total Expense per Year**: Rs. 60,000** (Maintenance overall cost)
Considering all the above three costs, the final MARGIN sums up to be:

NET PROFIT(per year) **= Rs. 1.8 LACS to Rs. 5.4 Lacs**

MARKETING STRATEGY

The Smart trash bin market is segmented on the lines of its products, end user, retail format and regional. Based on end user segmentation it covers residential segment and commercial segment. The Smart trash bin market on geographic segmentation covers various regions of India.

Each geographic market is further segmented to provide market revenue for India as the use of trash can replacements will be reduced. Also, it offers employment to people in sensor technology for research and development.

STEP1

Maintaining a consistent brand and message.

Since the importance of consistency in the brand and message of start-ups cannot be overemphasized, it is often thought that consistency and discipline are important only for the biggest enterprises. But this is not true.

We shall aim for the consistent branding.

While our start-up will undergo minor changes over time, consistency is key as it in stills confidence and credibility, especially for our customers.

STEP2

Determining our target audience.

Identifying who are the customers for our SMART BINS. The Major Customers Identified are covered in the CUSTOMER SEGMENT.

STEP3

Find the social channel for our start-up.

Each social media channel serves different personalities and audience. And those audiences engage with each channel differently.

Some of the channels and their behaviors that we tend to land at, include:

- ***FACEBOOK:***
  This is the powerhouse of social media. We'll likely find all audience types on this platform. But one is not in business for everyone, so we must determine where we can find our targets and reach out to them.

- ***INSTAGRAM:***
  This is a great tool for native advertisement purposes. Since the algorithm is optimized for valuable content, we'll likely gain a natural following of our target audience if you provide quality content.

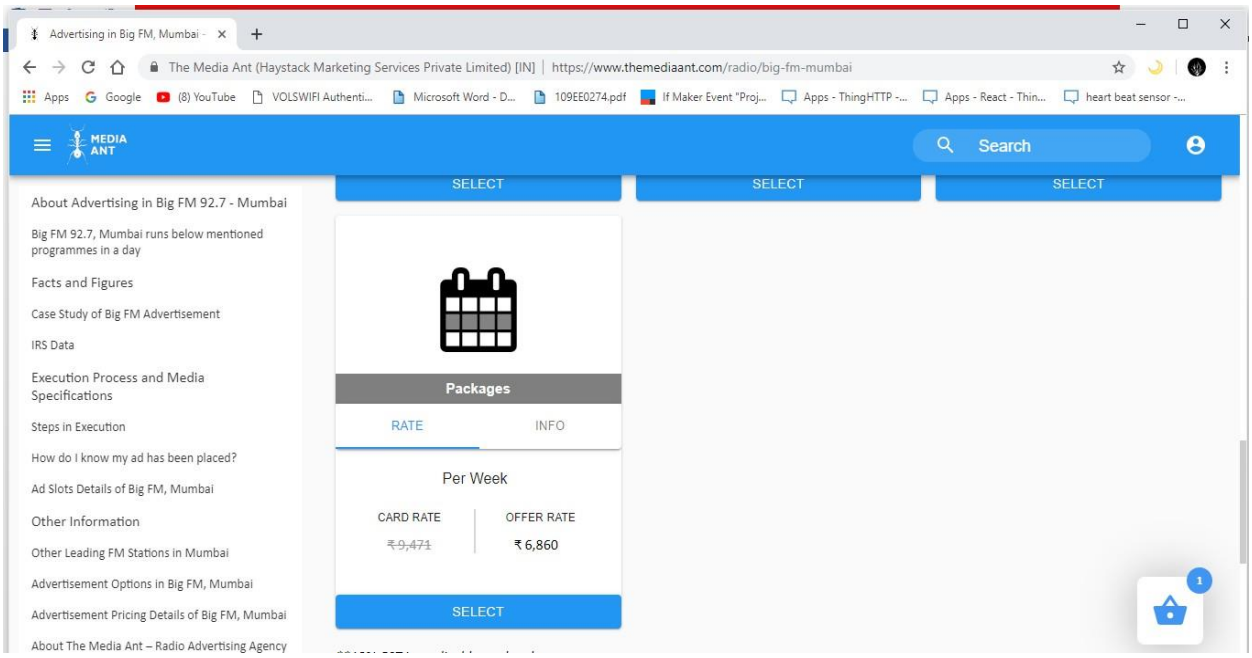
Several Instagram pages holding millions of followers offer advertisement at very cheap rates.

According to Forrester research, Instagram has about 10x the interaction with a brand than Facebook does. Instagram has an even more substantial lead on the other social networks. This gives great opportunities for our product to communicate with their followers

.

- ***TWITTER:***
  Twitter is another top-notch social media channel. However, consistency is paramount in order to gain and maintain a significant audience. The ultimate goal should be to provide content that is relevant to our audience.

For a minimal amount of money, we can also invest in a sponsored campaign.



These are the rates of FM Radio Mumbai for 10 seconds add per day 2 times.

STEP4

Creating ads that appeal to people's emotions.

A number of studies have revealed that emotional advertisement outsells logic. Emotions factor heavily into buying decisions for consumers, not just facts and information.

STEP5

SWACHH BHARAT ABHIYAN

We can go to the audience assuring that they are sharing their part to this campaign through our product. As we all know that this campaign has now become the sensation among the whole countrymen so this will directly trigger the emotions of the customers, that atleast they are doing their share to keep INDIA clean and green.

CHANNELS OF DISTRIBUTION

We can evaluate a new distribution channel or improve our channel marketing / management at any time. It's especially important to think about distribution when we going after a new customer segment, releasing a new product, or looking for ways to aggressively grow our business.

EVALUATING HOW OUR END-USERS NEED TO BUY

Our distribution strategy should deliver the information and service your prospects need. For each customer segment, consider:

- How and where they prefer to buy
- Whether they need personalized education and training
- Whether they need additional products or services to be used along with ours
- Whether our product needs to be customized or installed
- Whether our product needs to be serviced

MATCHING END-USER NEEDS TO A DISTRIBUTION STRATEGY

If our end-users need a great deal of information and service, our company can deliver it directly through a sales force. We can also build a channel of qualified resellers or consultants. The size of the market and your price will probably dictate which scenario is best.

If the buying process is fairly straightforward, We can sell direct via a website/catalog or perhaps through a wholesale/retail structure. We may also use an inbound telemarketing group or a field sales team.

If We need complete control over your product's delivery and service, adding a channel probably isn't right for us.

IDENTIFYING NATURAL PARTNERS

If we want to grow beyond the direct model, we'll look for companies that have relationships with our end-users. For example, we have HOME APPLIANCE SELLERS. If consultants, wholesalers or retailers already reach our customer base, they're natural partners.

BUILDING OUR DISTRIBUTION CHANNEL

We are setting up a distribution channel with one or more partners, treat it as a sales process:

- Approach the potential channel partner and "sell" the value of the partnership.
- Establish goals, service requirements and reporting requirements.
- Deliver info and sales/support materials.
- Train the partner.
- Run promotions and programs to support the partner and help them increase sales.

MINIMIZING PRICING CONFLICTS

We shall map out the price for each step in our channel and include a fair profit for each type of partner. Then compare the price that the end-user will pay; if a customer can buy from one channel at a lower price than from another, our partners will rightfully have concerns. Pricing conflict is common, and it can jeopardize our entire strategy, so we shall try our level best to reduce costs at each level.

DRIVING REVENUE THROUGH THE CHANNEL

We shall service our channel partners as we would service our best customers and work with them to drive revenue. For example, provide them with AFTER-SALES Services to promote our products. Later we shall run campaigns to generate leads and forward them to prospective partners.

AFTER DESIGNING OUR DISTRIBUTION CHANNELS

We need a pricing strategy and a sales process. When our channel is up and running, we can start launching marketing campaigns to channel partners and end-users.

COMPETITORS

Some notable Competitors realised in the SECTOR are:

- RADIOSTUDIO TECH PVT. LTD.

  RadioStudio Tech Pvt. Ltd. is focused towards incorporating smart features in the trash bins such as LoRaWAN devices, which enables the city authorities to monitor and maintain cleanliness in the cities.

- COMPOLOGY

  A San Francisco-based start-up, Compology has developed sensors that monitor the garbage levels and notify the garbage removal trucks. These sensors are incorporated with the Dubbed Waste operating system that offers real-time information pertaining to dumpster capacity and historical usage data.

- JOSEPH

  Joseph, a prominent houseware manufacturer based in the U.K. has developed trash compactor – Titan 30, which offers a hygienic compaction system. This trash compactor is equipped with the anti-tear design, which will not pinch or stretch the replaceable odour filter to neutralize the unpleasant smell of the bins.

The SMART BIN Technology though has a scope of innovation, it still is under development in INDIA. Thus, we can have a fair advantage of introducing the technology at an affordable price to the Customers.

KEY PARTNERS

The key partners for our project will be:

(1) Customers who want to make their rooms smart
(2) Officials of the municipal corporation
(3) Developers of the software and hardware installers
(4) Authorities of hospital, colleges, malls, theatre etc
(5) Manufacturers of the following sensors :

GARBAGE CONTAINER MANUFACTURERS

A waste container is a container for temporarily storing waste, and is usually made out of metal or plastic.

ULTRASONIC SENSOR MANUFACTURERS

A special sonic transducer is used for the ultrasonic proximity sensors, which allows for alternate transmission and reception of sound waves. The sonic waves emitted by the transducer are reflected by an object and received back in the transducer.

ARDUINO MANUFACTURERS

The Arduino project provides the Arduino integrated development environment(IDE), which is across-platform application written in the

programming language Java. It originated from the IDE for the languages Processing and Wiring.

NODEMCU MODULE MANUFACTURERS

NUDEMCU is a standard developed by the European Telecommunications Standards Institute(ETSI) to describe the protocols for second-generation (2G) digital cellular

networks used by mobile phones. This module provides connectivity for IOT Implementation.

KEY ACTIVITIES

The Key Activities for our undergoing PROJECT include:

- Managing the distribution of the product;
- Creating a branding strategy;
- Marketing and promotion of the BIN;
- Product and packaging design.

(I) RESEARCH and DEVELOPMENT

- **Product Development:** Researching about the new designs of smart bins being brought out in the market. Researching about what the design of the bin should be, the expected production costs and how long it will take to produce sufficient amounts of the bins. We'll also look into how much customers want or need the product.
- **Updating the existing BIN design:** Looking into existing models of bins to see if they require an upgrade based on evolving consumer needs or new entrants into the product category in the market.
- **Quality Checks:** Conducting Quality checks or collaborating with the Quality Assurance team to evaluate whether all products are up to the quality standards.

(II) PRODUCTION

- **Selection of product and design**
- **Selection of Production Process**
- **Selecting Right Production Capacity**
- **Production Planning**

- **Production Control**
- **Quality and Cost Control**
- **Inventory Control**
- **Maintenance and Replacement of Machines**

(III) MARKETING

- Already Covered in the Marketing Section.

(IV) SALES and CUSTOMER SERVICES

Ensuring to build a cadre of repeat customers who will become our advocates in the market and drive more business in through word of mouth.

- **Handling Problems:** Dealing with the problems that the customers may face one they buy our product is a must. It maintains long-term customer-ship.
- **Assisting in Sales:** Customer representatives are also depended upon to help increase the sales of the organization. They may do this by educating customers on the value propositions the product offers.

FUTURE GOALS

1. The Prototype can be made more Durable, by making it compact and cost effective.
2. Wet waste can be decomposed and be used for developing biogas.
3. We can put camcorder for security purpose which will again add a unique feature to it.

CONCLUSION

This project work is the implementation of Automatic Garbage Fill Alerting system using Ultrasonic sensor, Arduino Uno, Buzzer and Wi-Fi module. This system assures the cleaning of dustbins soon when the garbage level reaches its maximum. It will take power supply with the help of Piezoelectric Device. If the dustbin is not cleaned in specific time, then the record is sent to the Sweeper or higher authority who can take appropriate action against the concerned contractor.

This system also helps to monitor the fake reports and hence can reduce the corruption in the overall management system. This reduces the total number of trips of garbage collection vehicle and hence reduces the overall expenditure associated with the garbage collection. It ultimately helps to keep cleanliness in the society. Therefore, the Automatic Garbage Fill Alerting system makes the garbage collection more efficient.

DEMO UNIT

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