GUJRAT TECHNOLOGICAL UNIVERSITY

Chandkheda, Ahmedabad

L. D. COLLEGE OF ENGINEERING

A PROJECT REPORT ON

REMOTE CONTROL MOPPING MACHINE

UNDER PROJECT OF

DESIGN ENGINEERING –2B

BE SEMESTER – 6TH

(MECHANICAL ENGINEERING)

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GUIDE: - K. A. PATEL EXTERNAL EXAMINER H.O.D.: V.B. PATEL

ACKNOWLEDGEMENT

The success and final outcome of this project required a lot of guidance and assistance from many people and I am extremely privileged to have got this all along the competition along of our project. All that we have done is only due to such supervision and assistance and I would not forget to thank them.

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I am thankful to and fortunate enough to get constant encouragement, support and guidance from all teaching staff of mechanical department which helped us in successfully completing our project work. Also I would like to extend our sincere esteems to all staffs in laboratory for timely support.

Project associates

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2. **CHOTALIYA TRIBHOVAN HASMUKHBHAI**
3. **FULWALA AHEMADRAZA MUSABHAI**
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ABSTRACT

This abstract is providing an overview of an innovative remote control mopping machine. The project "Remote Control Mopping Machine" endeavors to create a cutting-edge robotic system tailored for automated floor cleaning. With a focus on user convenience and efficiency, this system integrates advanced sensors and algorithms to navigate indoor spaces adeptly, ensuring comprehensive coverage and obstacle avoidance. One of its standout features is the incorporation of remote control functionality, enabling users to command the machine from a distance, thereby enhancing flexibility and ease of operation. By leveraging high-quality mopping components and intelligent algorithms, the system guarantees effective removal of dirt and grime from various floor surfaces while optimizing energy consumption. Designed with user-friendliness in mind, the machine boasts an ergonomic layout and intuitive interfaces, catering to a diverse array of users. Through these innovations, the project aims to deliver a remote-controlled mopping solution that redefines convenience and performance for both residential and commercial settings.

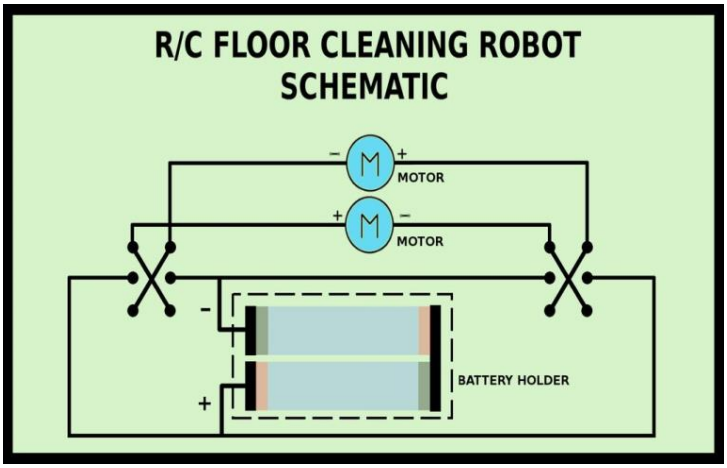
INTRODUCTION

In the realm of household chores, cleaning often stands out as a task demanding time and effort. With the continuous advancement of technology, there arises a perpetual quest for innovations that can streamline these processes, offering convenience and efficiency to users. In response to this need, our project delves into the development of a remote-controlled mopping machine-a cutting-edge solution designed to revolutionize the way we approach floor cleaning in residential settings.

This project emerges at the intersection of robotics and home maintenance, aiming to create a device that not only simplifies the cleaning process but also enhances its effectiveness. Traditional mopping methods often entail manual labor and repetitive motions, which can be both laborious and time-consuming. By leveraging the capabilities of robotics and remote-control technology, our aim is to introduce a novel approach that automates and optimizes the mopping task, ultimately providing users with more leisure time and a cleaner living environment.

Through this report, we will delve into the various aspects of our project, from its conceptualization and design to the implementation and testing phases. We will discuss the underlying technologies utilized in the development of the remote-controlled mopping machine, including sensors, actuators, and control systems. Additionally, we will explore the considerations considered during the design process, such as maneuverability, adaptability to different floor surfaces, and user interface design.

Ultimately, our endeavor seeks to offer not just a technical solution but a practical and transformative tool that addresses the evolving needs of modern households. By introducing a remote-controlled mopping machine, we aim to contribute to the ongoing discourse on smart home technologies while making a tangible difference in the everyday lives of users.



AEIOU Summary

The AEIOU summary canvas contains 5 Sections:

1.) Activity
2.) Environment
3.) Interaction
4.) Object
5.) User

1.) ACTIVITY:

- Consult a manufacturer.
- Meet the professor.
- Reading reference books.
- Take feedback from sweeper man.
- Visit DC motor manufacturing industry.
- Brainstorming.

2.) ENVIRONMENT:

- Dusty
- Polluted
- Monsoon
- Autumn
- Public spots

3.) INTERACTION:

- Student → Engineer
- Student → Sweeper man
- Student → DC motor manufacture
- Student → Corporation

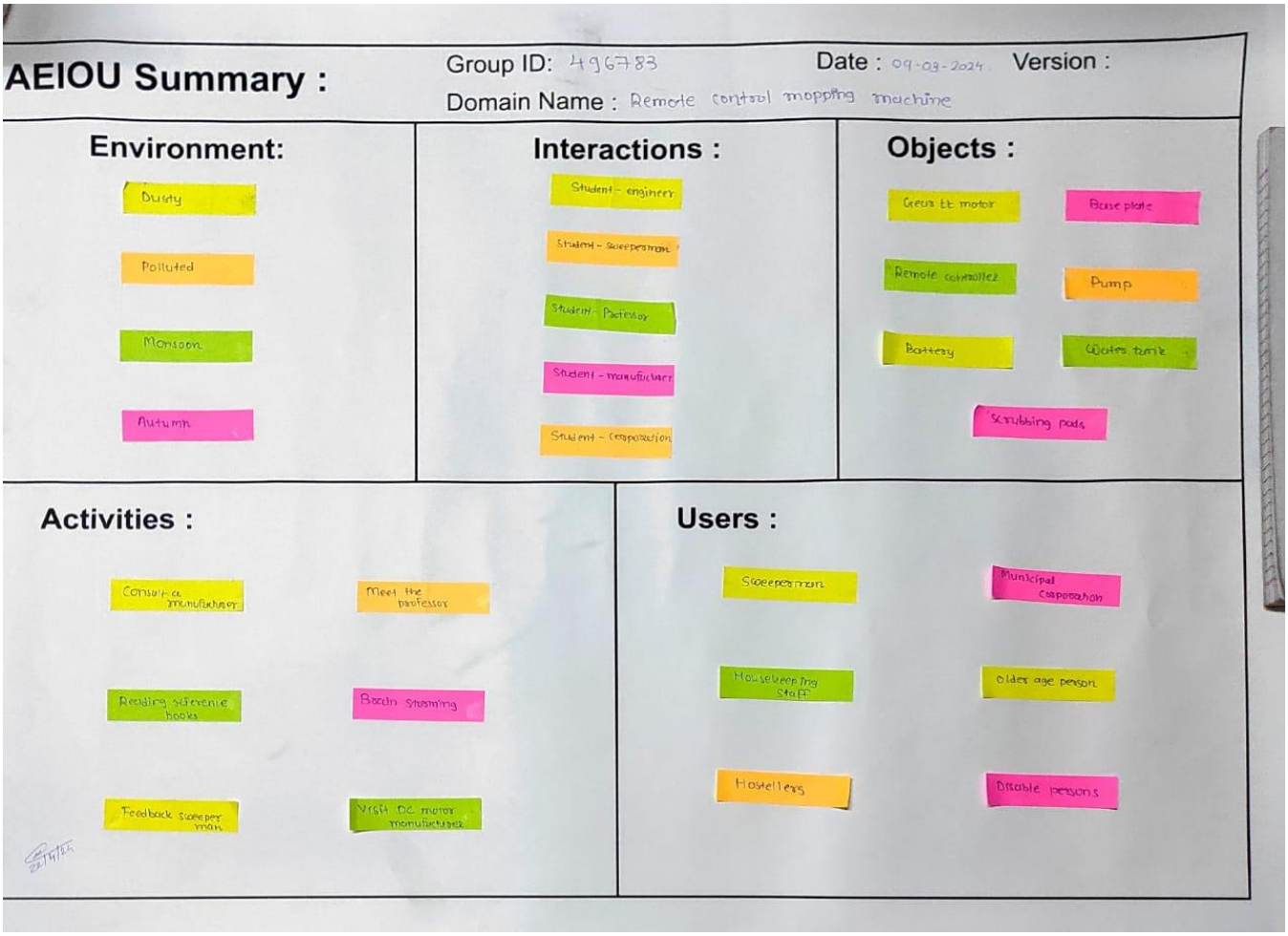
4.) OBJECTS:

- Gear TT motor
- Base plate
- Remote controller

- Pump
- Scrubbing pad
- Battery
- Water tank

5.) USERS:

- Sweeper man
- Housekeeping staff
- Municipal corporation
- Older age person
- Disabled person
- Hosteller


AEIOU Summary :
Group ID: 496783
Date : 09-03-2024
Version :
Domain Name : Remote control mopping machine
Environment:
Dusty
Polluted
Monsoon
Autumn
Interactions :
Student - engineer
Student - sweepersman
Student - Professor
Student - manufacturer
Student - corporation
Objects :
Gear DC motor
Base plate
Remote controller
Pump
Battery
Waste tank
Scrubbing pads
Activities :
Consult a manufacturer
Meet the professor
Reading reference books
Brain storming
Feedback sweeper man
Visit DC motor manufacturer
Users :
Sweepersman
Municipal corporation
Housekeeping staff
Older age person
Hostellers
Disable persons

MIND MAPPING CANVAS

1.) ACTIVITY

- Consult a manufacturer.
- Meet the professor.
- Reading reference books.
- Brainstorming.
- Take feedback from sweeper man.
- Visit DC motor manufacturing industry.

2.) Benefits

- Faster operation
- Less time required for cleaning
- Efficient cleaning
- Reduce human effort

3.) equipment

- Gear TT motor
- Remote controller
- Battery
- Scrubbing pad
- Base plate
- Pump

5.) driving mechanism

- Conversion from electrical energy to mechanical energy
- Motorized wheels for motion

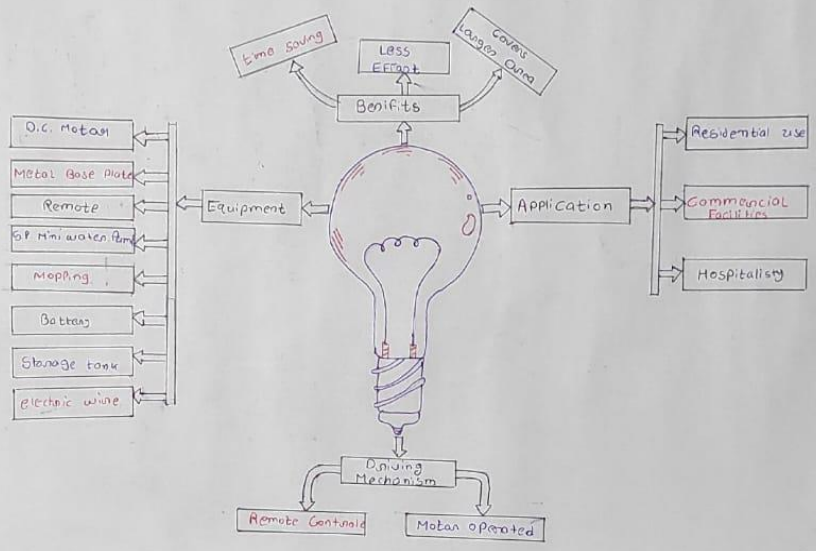
6.) application

- Cleaning the floor area without human interaction
- Cleaning in corporate offices and public spots
- Cleaning in hospitals

Mind Mapping Canvas

Group ID 496783 **Date** 15-03-24 **Version**

Domain Name Remote Control Mopping Machine



EMPATHY CANVAS

Empathy mapping canvas contain 4 sections:

1.) User
2.) Stakeholders
3.) Activity
4.) Story Boarding

1.) USERS:

- Sweeper man
- Housekeeping staff
- Older aged person

2.) STAKEHOLDERS:

- Gear TT motor manufacturer
- Battery manufacturer
- Water pump manufacturer

3.) ACTIVITIES:

- Consult a manufacturer.
- Meet the professor.
- Reading reference books.
- Brainstorming.
- Take feedback from sweeper man.
- Visit DC motor manufacturing industry.

4.) STORY BOARDING

- HAPPY

Consider Sarah, a working mother who tries to keep up with housework while earning for her children, mopping the floor frequently takes a backseat, leaving her concerned about spills and sailed appearance.

- HAPPY

  With help of remote-control mopping machine, mrunal can now clean dirt under furniture and corner with comfort of her couch while his son plays. Now she has more time for relax and play with her children during cleaning the home.

- SAD

  Consider an old men named Arthur who lives alone. He takes care to keeping his home, but he bends down to wipe the floors which is very difficult for him.

- SAD

  Mohan's present housekeeping staff leaves the floor moist and slick which makes him concerned about falling. Mohan is looking for a solution to keep his home tidy without jeopardizing his safety. Remote-control mopping machine could be solution for his problem.

Design For Remote Control mopping machine Design By Team - 496783

Date 22-03-24 Version

USER

- Sweeper mom
- Housekeeping staff
- Elderly individuals

STAKEHOLDERS

- Motor manufacturer
- Consumers

ACTIVITIES

- Brain storming
- Consult a manufacturer
- Feedback of sweeper mom
- Visit industries
- Need the professor

STORY BOARDING

HAPPY

Consider Sarah, a working single mother who tries to keep up with housework while caring for her children. Mopping the floor frequently takes a toll on her, leaving her concerned about spills and a tired appearance.

HAPPY

With us a remote controlled mopping machine Sarah can now clean under furniture and corners from the comfort of her couch while her children play. The floors sparkle, and Sarah feels a weight lifted from her shoulders. She has more time to relax and play with her children, owing to the clever development of mopping machine.

SAD

Consider an old man named Arthur who lives alone. He takes pride in keeping his home clean, but bending down to wipe the floors has grown more difficult.

SAD

Arthur present mop leaves the floor moist and slick, which makes him concerned about living. Arthur longs for a solution to keep his home tidy without jeopardizing his safety. Remote controlled mopping machine could be the solution that restores his freedom & confidence.

IDEATION CANVAS

Ideation canvas contain 4 sections:

1.) People
2.) Activities
3.) Situation/Context/Location
4.) Props/Possible Solution

1.) PEOPLES:

- Sweeper man
- Housekeeping staff
- Older aged person
- Disabled person
- Hostellers

2.) ACTIVITIES:

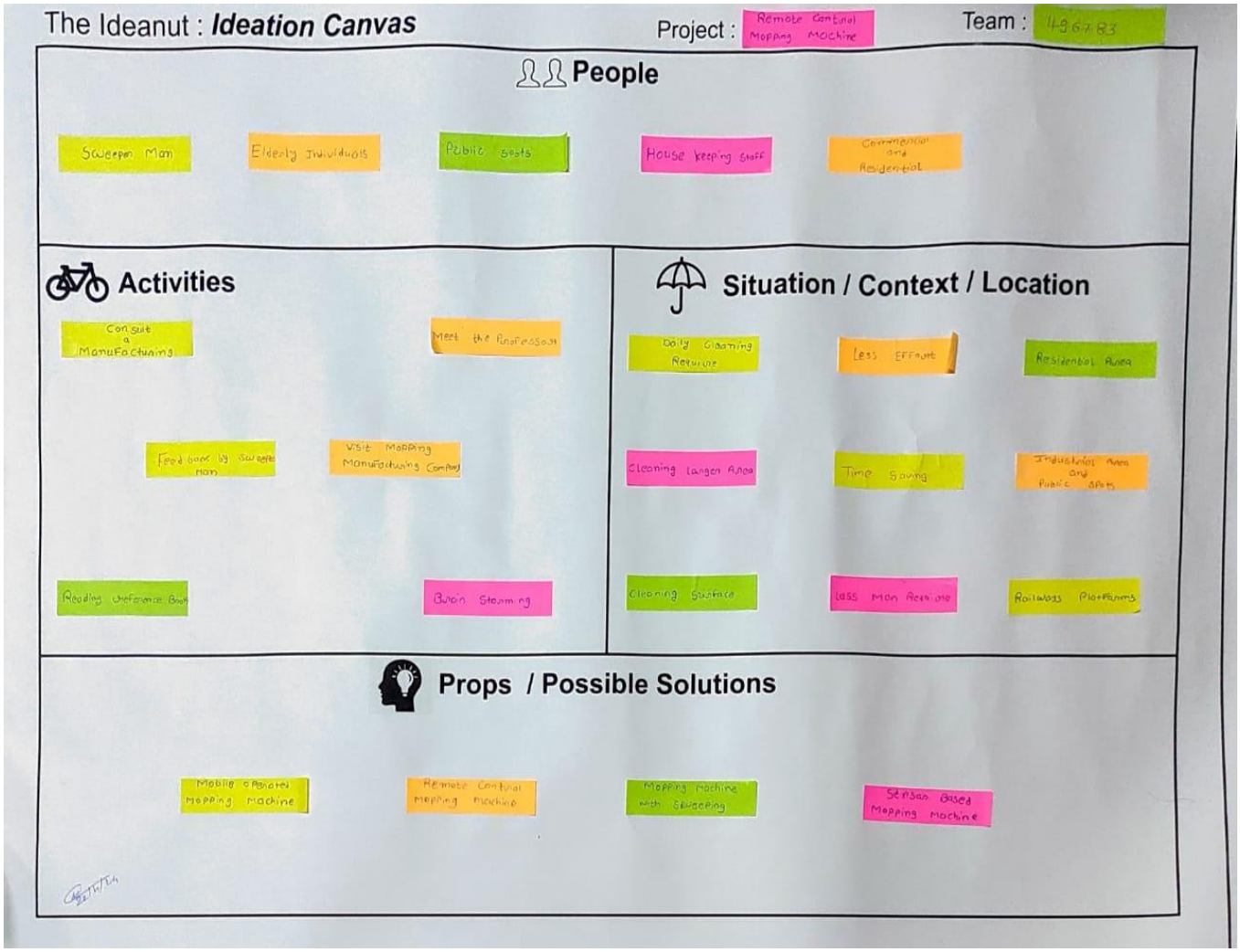
- Consult a manufacturer.
- Meet the professor.
- Reading reference books.
- Brainstorming.
- Take feedback from sweeper man.
- Visit DC motor manufacturing industry.

3.) SITUATION/CONTEXT/LOCATION:

- Daily cleaning / remove dust & foreign particles / Residential area
- Cleaning larger floor/ time saving / industry or factory
- Cleaning platforms/ less human effort / railway station

4.) PROPSIBLE:

- Mobile operated mopping machine.
- Remote control mopping machine.
- Floor scrubber dryer machine.


The Ideanut : Ideation Canvas
Project : Remote Control Mopping Machine
Team : 496783
People
Sweeper Man
Elderly Individuals
Public Seats
House keeping staff
Commercial and Residential
Activities
Consult a ManuFacturing
Meet the Professor
Feed back by sweeper man
Visit Mopping Manufacturing Company
Reading Reference Book
Brain Storming
Situation / Context / Location
Daily Cleaning Routine
Less Effort
Residential Area
Cleaning Langer Area
Time Saving
Industrial Area and Public Spots
Cleaning Surface
Less Man Resource
Railways Platforms
Props / Possible Solutions
Mobile Operated Mopping Machine
Remote Control mopping machine
Mopping machine with Sweeping
Sensor Based Mopping Machine

PRODUCT DEVLOPMENT CANVAS

- PEOPLES:
  - Sweeper man
  - Housekeeping staff
  - Older aged person
  - Disabled person
  - Hosteller

- PURPOSE:
  - To clean the floor
  - To reduce human effort
  - Effective and accurate cleaning

3.) PRODUCT FUNCTION:
  - Our product typically sprays water or cleaning solution then scrubs the floor, vacuum up dirt and clean the floor

4.) PRODUCT FEATURES:
  - Automatic cleaning
  - Movement through remote control
  - Scrubbing brushes
  - Adjustable setting
  - Drying feature

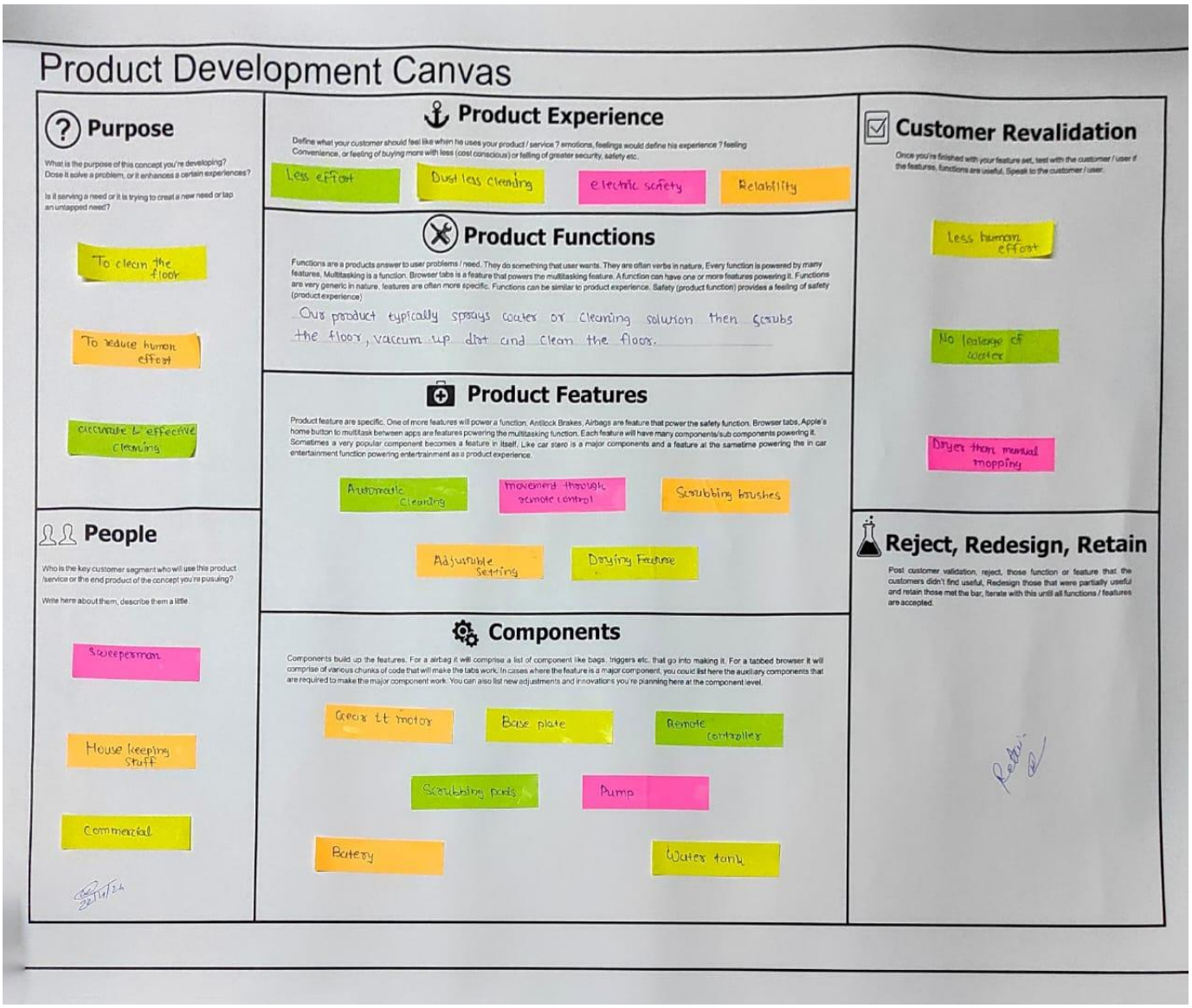
5.) COMPONENTS:
  - Gear TT motor
  - Remote controller
  - Battery
  - Scrubbing pad
  - Base plate
  - Pump
  - Water tank

6.) CUSTOMER REVALIDATION:
  - Require less efforts in cleaning

- No leakage of water
- Easily dryer than manual mopping

7.) REJECT, REDISGN, RETAIN:

- Retain


Product Development Canvas
Purpose
What is the purpose of this concept you're developing?
Dose it solve a problem, or it enhances a certain experiences?
Is it serving a need or it is trying to creat a new need or tap an untapped need?
To clean the floor
To reduce human effort
effective & effective cleaning
People
Who is the key customer segment who will use this product /service or the end product of the concept you're pusuing?
Write here about them, describe them a little.
Sweepermen
House keeping staff
Commercial
Product Experience
Define what your customer should feel like when he uses your product / service ? emotions, feelings would define his experience ? feeling Convenience, or feeling of buying more with less (cost conscious) or felling of greater security, safety etc.
Less effort
Dust less cleaning
electric safety
Relability
Product Functions
Functions are a products answer to user problems / need. They do something that user wants. They are often verbs in nature, Every function is powered by many features, Multitasking is a function. Browser tabs is a feature that powers the multitasking feature. A function can have one or more features powering it. Functions are very generic in nature, features are often more specific. Functions can be similar to product experience. Safety (product function) provides a feeling of safety (product experience)
Our product typically sprays water or cleaning solution then scrubs the floor, vaccum up dirt and clean the floor.
Product Features
Product feature are specific. One of more features will power a function. Antilock Brakes, Airbags are feature that power the safety function. Browser tabs, Apple's home button to multitask between apps are features powering the multitasking function. Each feature will have many components/sub components powering it. Sometimes a very popular component becomes a feature in itself. Like car stero is a major components and a feature at the sametime powering the in car entertainment function powering entertainment as a product experience.
Automatic Cleaning
movement through remote control
Scrubbing brushes
Adjustable Setting
Drying Feature
Components
Components build up the features. For a airbag it will comprise a list of component like bags, triggers etc. that go into making it. For a tabbed browser it will comprise of various chunks of code that will make the tabs work. In cases where the feature is a major component, you could list here the auxiliary components that are required to make the major component work. You can also list new adjustments and innovations you're planning here at the component level.
Gear it motor
Base plate
Remote controller
Scrubbing pads
Pump
Battery
Water tank
Customer Revalidation
Once you're finished with your feature set, test with the customer / user if the features, functions are useful. Speak to the customer / user.
Less human effort
No leakage of water
Dryer than manual mopping
Reject, Redesign, Retain
Post customer validation, reject, those function or feature that the customers didn't find useful, Redesign those that were partially useful and retain those met the bar, Iterate with this until all functions / features are accepted.

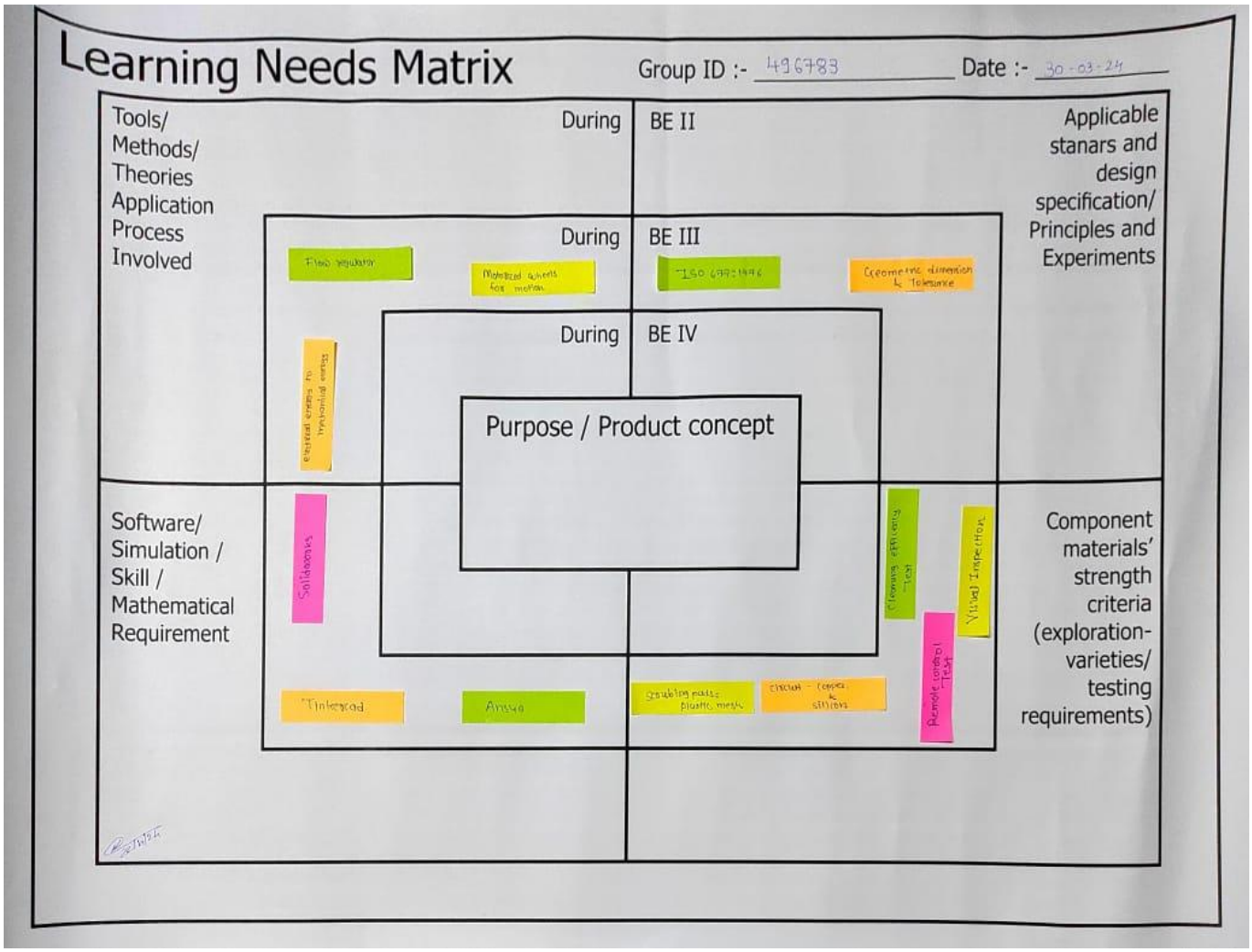
LEARNING NEEDS MATRIX

1. TOOLS/METHODS/THEORIES/APPLICATION PROCESS INVOLVED
    - Flow regulator
    - Motorized wheel for motion
    - Conversion from electrical energy to mechanical energy.

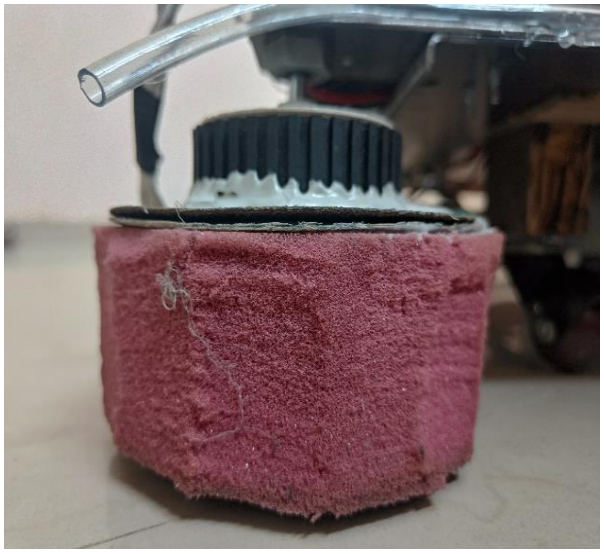
2. SOFTWARE/SIMULATION/SKILLS/MATHEMATICALREQUIRMENTS
    - Solid-works
    - ANASY
    - Tinder CAD

3. COMPONENT/MATERIALS/STRENGTH CRITERIA (EXPLORATION-VARIETIES/TESTING REQUIREMENTS
    - Scrubbing pad – plastic mesh
    - Circuit – copper & silicon
    - Cleaning efficiency test
    - Remote control test
    - Visual inspection

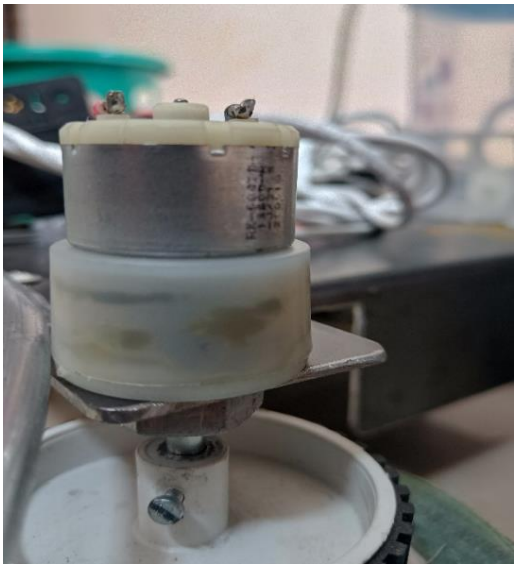
4. APPLICABL STANDARDS AND SPECIFICATIONS/ PRINCIPLES AND EXPERIMENTS
    - Geometric dimensioning and tolerance
    - Iso 677: 1976


Learning Needs Matrix
Group ID :- 496783
Date :- 30-03-24
Tools/ Methods/ Theories Application Process Involved
During
BE II
During
BE III
During
BE IV
Applicable stanars and design specification/ Principles and Experiments
Purpose / Product concept
Software/ Simulation / Skill / Mathematical Requirement
Component materials' strength criteria (exploration-varieties/ testing requirements)
Flow regulator
Material sheets for motion
ISO 6971:1996
Geometric dimension & Tolerance
External forces to mechanical energy
Solidworks
Cleaning efficiency Test
Visual Inspection
Remote control Test
Tinkercad
Ansys
Circuit - resistor & sliders

MAIN COMPONENETS



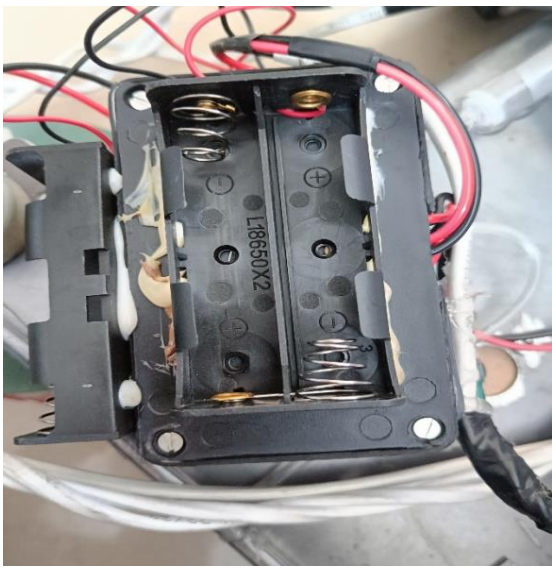
Scrubbing pad



Gear TT motor

Water tank

Wheels

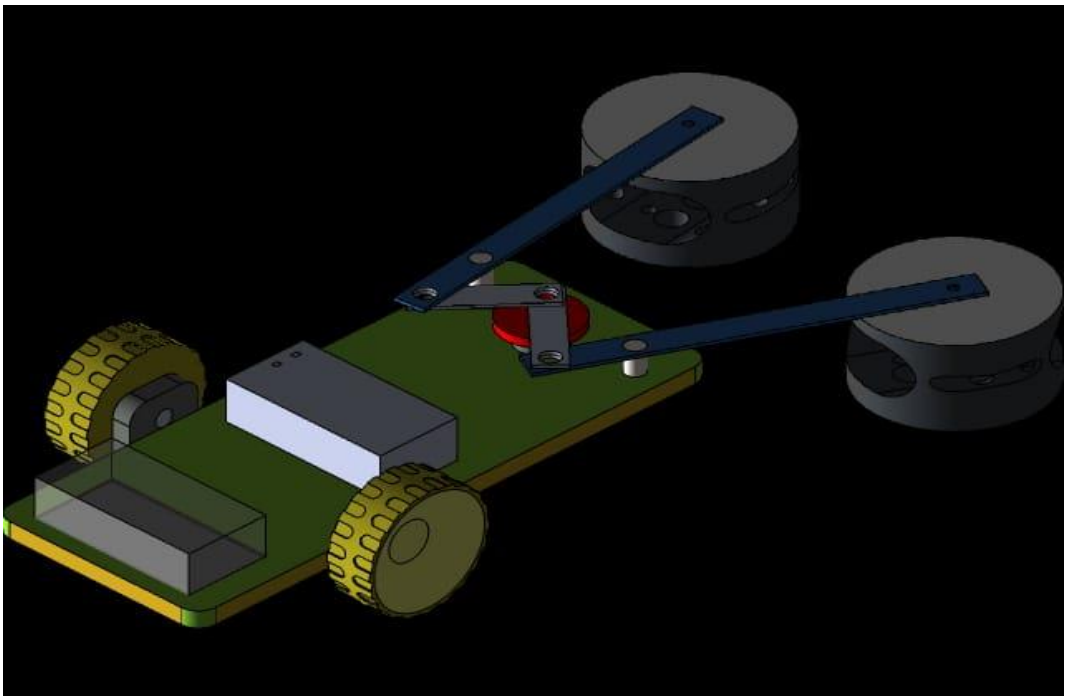


battery cell socket

remote controller

Water pump and tube

CAD model and working prototype



PROTOTYPING

- To prototype a remote-control mopping machine, first, clearly define the project's requirements, outlining factors like size, floor compatibility, battery life, and remote-control range. Next, conceptualize the design, considering how the mopping mechanism will function and integrate with remote control capabilities
- Select appropriate components such as motors, sensors, micro-controller, and batteries, ensuring they meet project specifications and are compatible.
- Test the prototype extensively on various floor types, identifying any shortcomings or areas for improvement. Iterate on the design based on testing feedback, refining components, code, and overall functionality.

- COMPONENT COST

NO.	COMPONENT NAME	QUANTITY	UNIT PRICE	PRICE (INR)
1	DC gear TT motor	2	115	230
2.	Scrubbing pad	2	50	100
3.	Water tank	1	60	60
4.	Water pump and tube	1	165	165
5.	Wheels	4	25	100
6.	Battery cell (3.7v & 2000mah)	2	40	80
7.	Remote controller	1	280	280
8.	Battery cell socket	1	25	25
9.	Base plate	1	20	20
10.	Wire	2 meters	25/meter	50

FUTURE SCOPE

.

- scope of remote-control mopping machines holds considerable potential for revolutionizing household and commercial cleaning practices. As technology continues to advance, these machines are poised to become more sophisticated, efficient, and accessible. One avenue of development lies in the integration of artificial intelligence and machine learning algorithms, enabling mopping machines to adapt to different floor surfaces, adjust cleaning patterns based on usage trends, and even autonomously navigate complex environments. Additionally, advancements in sensor technology could enhance the machines' ability to detect and avoid obstacles, prevent collisions, and ensure thorough cleaning coverage.

- The proliferation of smart home ecosystems presents opportunities for remote control mopping machines to seamlessly integrate with other connected devices, allowing for centralized control and automation. Furthermore, improvements in battery technology could extend operating times and reduce charging intervals, enhancing overall productivity and user convenience. With growing emphasis on sustainability, future iterations of these machines may prioritize eco-friendly cleaning solutions and materials, minimizing environmental impact.

REFERENCES

- https://youtu.be/FpNmaW3-AcE?si=6OjlqjWUE8-YcRuV
- https://www.amazon.in/xcluma-Shaft-DC3V-6V-Motor-Smart/dp/B0974XG5TK/ref=sr_1_3?sr=8-3
- REFERENCE BOOKS

PROJECT: REMOTE CONTROL MOPPING MACHINE

TEAM ID: 496783

LOGBOOK

Date	Task Description
19/01/2024	Selection of Problem, Causes of Problem
02/02/2024	Prior Art of Solving this Problem Concept
09/02/2024	Concept of solving this problem
16/02/2023	List of different components
01/03/2024	Gathering Knowledge Components
15/03/2024	Design of Solution Model
22/03/2023	Gathering limitations of project
05/04/2024	Cost Comparison between different Solution available in the market versus our project
12/04/2024	Preparation of Documents
19/04/2024	Final Submission