GANDHINAGAR INSTITUTE OF TECHNOLGY

Computer Engineering Department

Design Engineering-IB(3140005)

Automatic Solar Tracker

Presented By
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OUTLINE

- Introduction of Domain
- Overview of DE-1B work
- Reverse Engineering
- Empathy Canvas-Mind Mapping
- Prior Art Search
- Ideation Canvas
- Product Development Canvas(PDC) – LNM
- Rough Prototyping
- Future Work
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INTRODUCTION

- Extracting usable electricity from the sun was made possible by the discovery of the photoelectric effect. Subsequent development of the solar cell, which is a semi-conductive material that converts visible light into a direct current.
- The solar tracker focuses on the optimization of the electric energy produced by photovoltaic cells through the development of a sun-tracking system which will result in more efficiency.

Overview of DE-1B Work

- Interfacing between hardware and microcontroller
- Inputs to microcontroller
- Controlling constraints
- Both automatic and manual

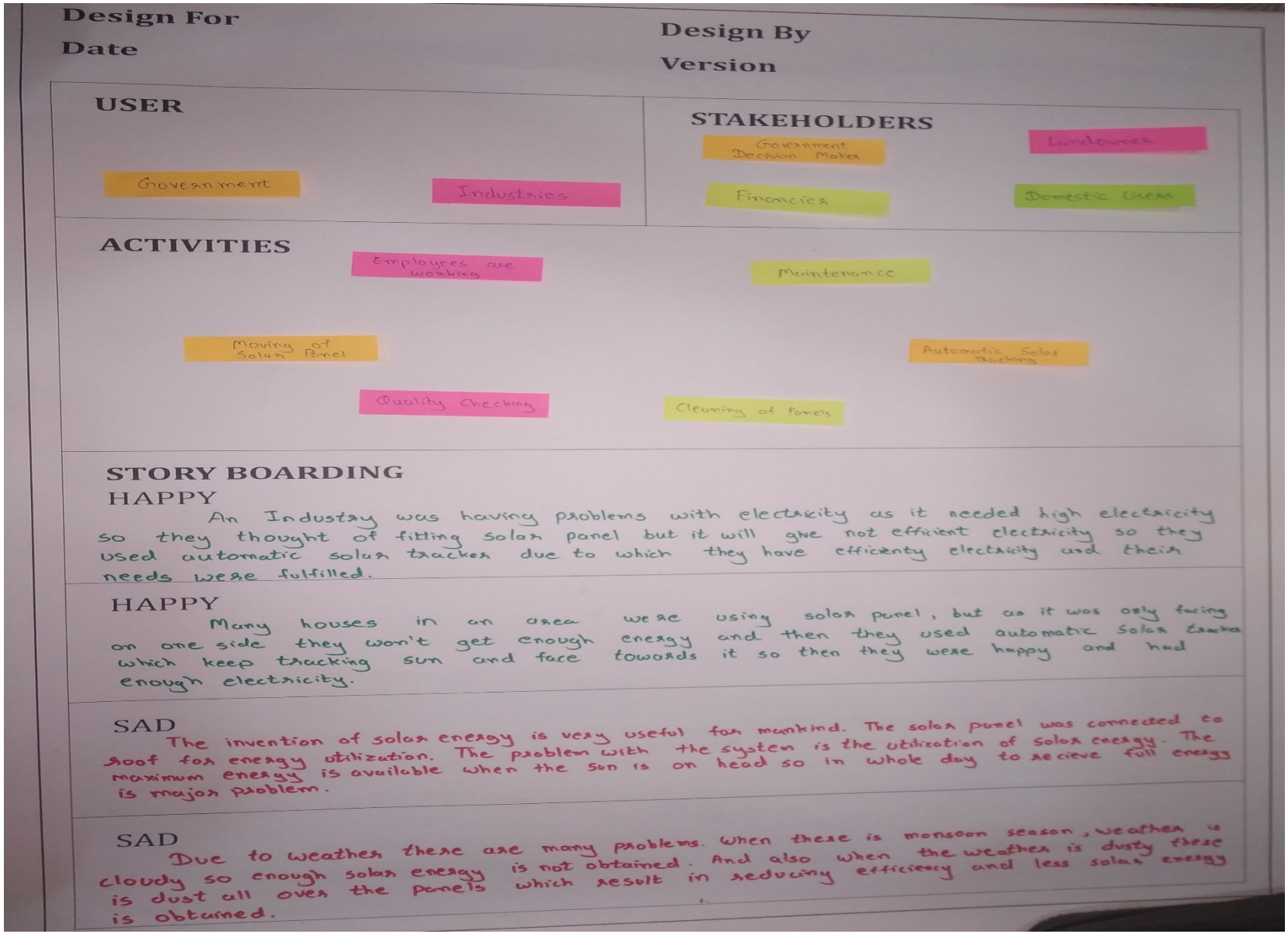
REVERSE ENGINEERING

- At first, solar panels are used which were fixed at a certain place such that maximum solar energy can be obtained at a certain angle. But due to rotation of sun the solar panels won't able to take advantage of maximum amount of solar energy.
- So with the help of automatic solar tracker we can track the rotation of sun and which results in solar panels moving automatically facing towards the sun which results in capturing more sun rays and as an output we get high efficiency of electricity.

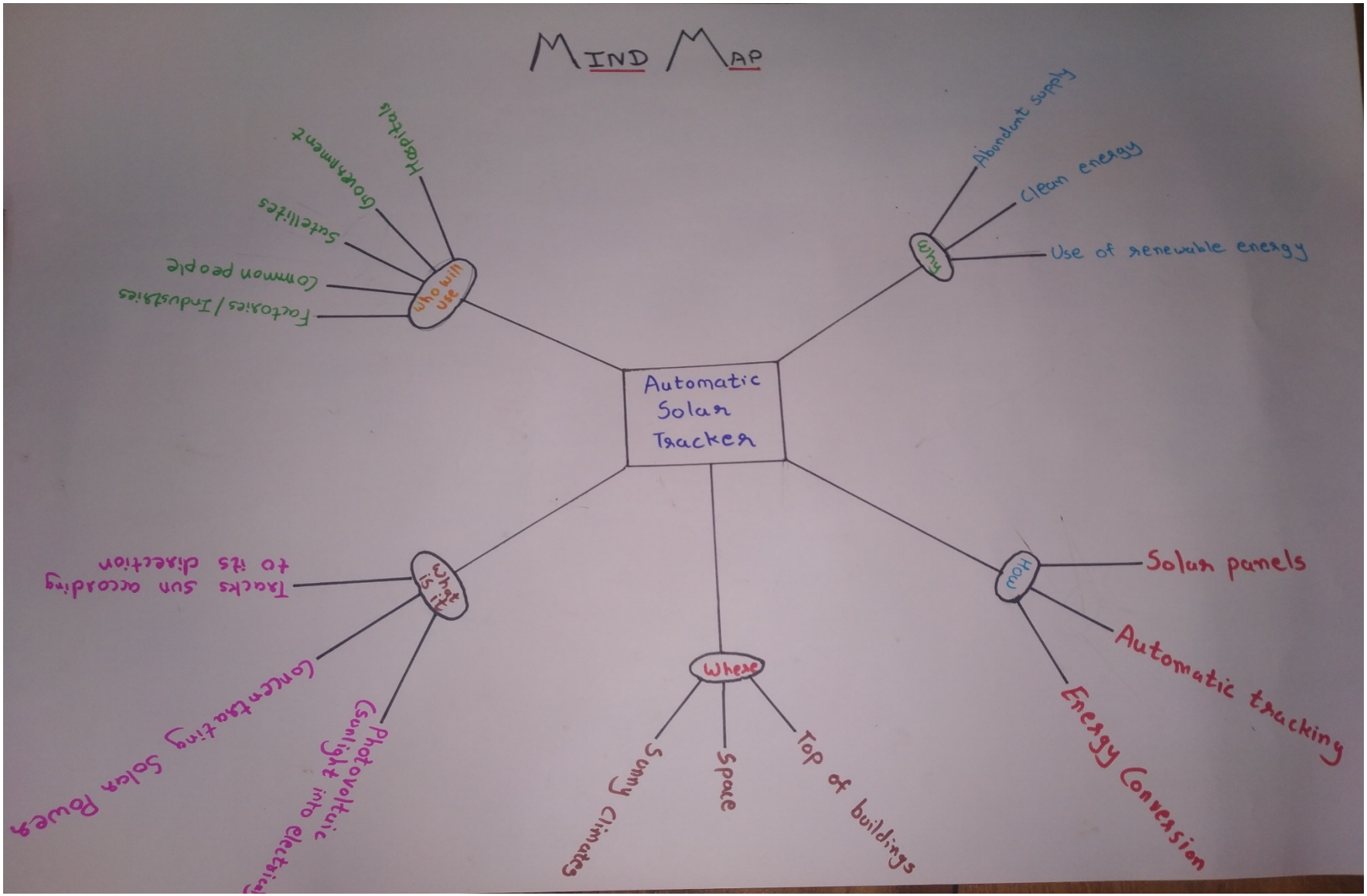
EMPATHY CANVAS

- The selected users are government, public, industries. The stake holders of the topics are domestic, financier, landowners etc.
- The users in empathy mapping had done many activities in the related of solar tracking system like: construction of the panel, employees working and maintenance, sweepers cleaning the solar panel, etc.

EMPATHY CANVAS



MIND MAPPING



PRIOR ART SEARCH

- Background Early in the 21century, Nuwayhid et al. (2001) adopted the open-loop and closed-loop tracking methods into a parabolic concentrator attached to a polar tracking system.
- In 2004, Abdallah and Nijmeh designed a two axis sun tracking system, a programmable logic controller (PLC) was used to calculate the solar vector and to control the sun tracker so that it follows the sun's trajectory. In addition, Shanmugam & Christraj (2005) presented a computer program written a Visual Basic that is capable of determining the sun's position and thus drive a paraboloidal dish concentrator (PDS) along the east-west axis or north-south axis for receiving maximum solar radiation.

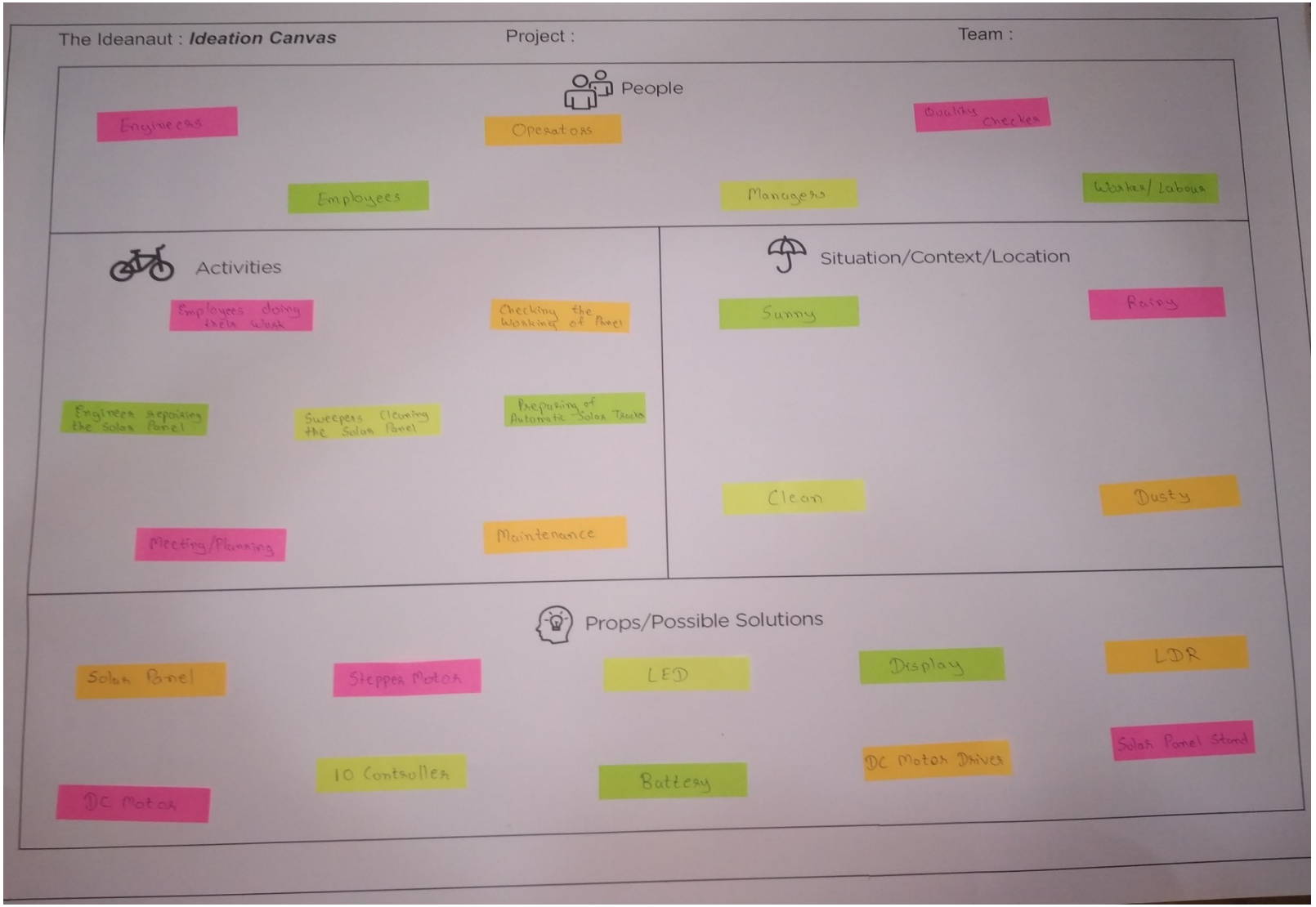
PRIOR ART SEARCH

- In 2007, Ali Al-Mohamad designed a Sun-tracking system, whereby the movement of a photovoltaic module programmable logic-controller (PLC) unit.
- Also, Mohanad Alata, M.A. Al-Nimr and Yousef Qaroush demonstrated the design and simulation of time controlled step sun tracking systems. In Rajshahi University of engineering & Technology a project was done by Md. Rokunuzzaman whereby the movement of a photovoltaic module was controlled to follow the Sun's radiation using a CMOS logical circuit.

IDEATION CANVAS

- The set of people mentioned in the ideation canvas are the workers, engineer, operators, owner, manager, employees.
- The activities like employs are working their work, sweepers are cleaning the solar panel, engineer repair the solar panel etc...
- Different situation/context/location mentioned in the ideation canvas is listed as sunny, clean, dusty, rainy etc.
- The props/possible solutions are mentioned in the ideation canvas are solar panel , dc motor , microcontroller , dc motor driver , wires , stepper motor , etc.

IDEATION CANVAS



PRODUCT DEVELOPMENT CANVAS

Purpose:-

- The main purpose of solar tracking system is use of renewable energy and change the direction of solar panel to produce high electricity.

People:-

- Public
- Worker
- Manager
- Quality checker
- Labour

Product Experience:-

- The solar tracking system experience is this product is more efficient, easy operation, safe and energy improvement.

PRODUCT DEVELOPMENT CANVAS

Product Function:-

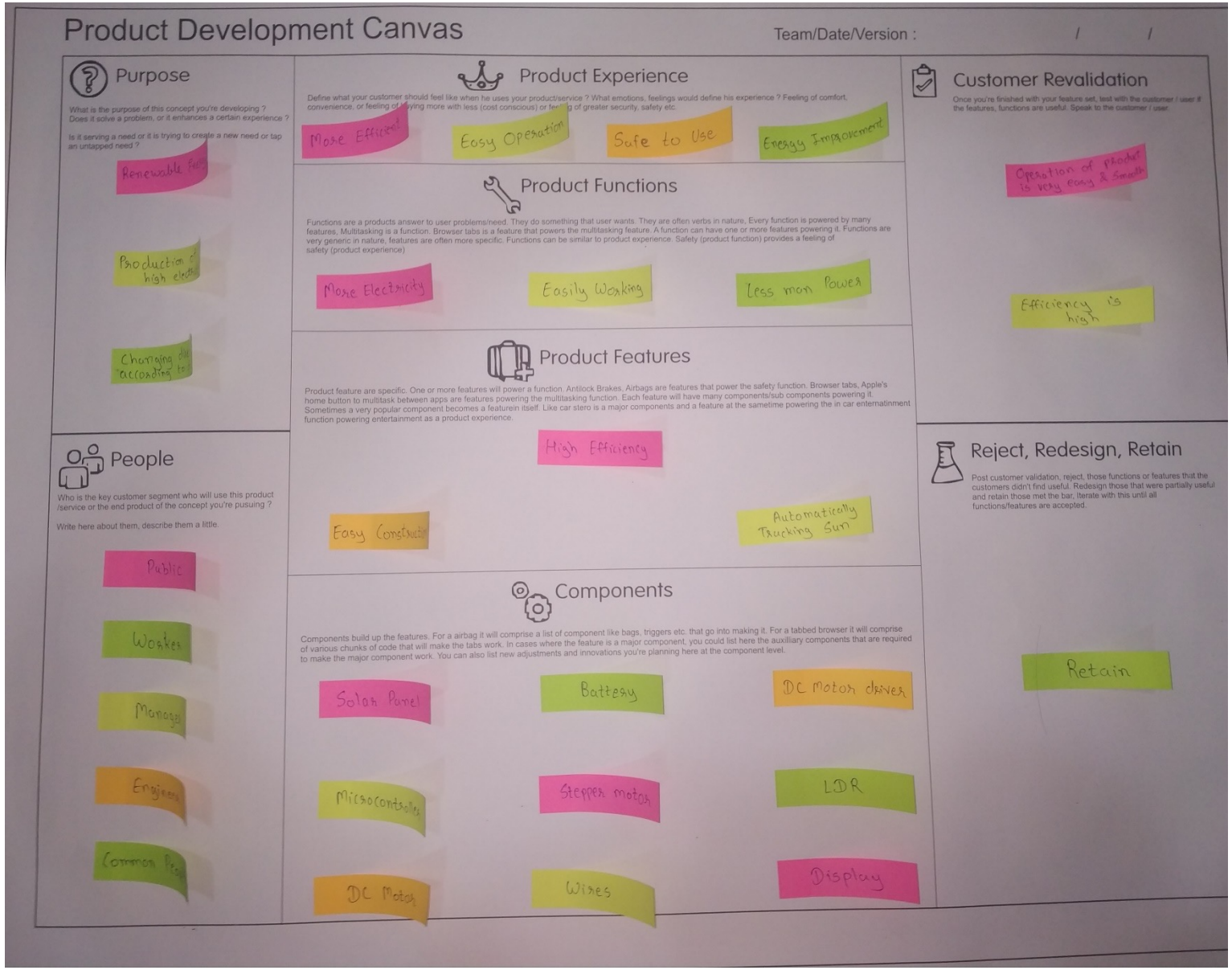
- The product function is producing more electricity, easily working and less man power.

Product Feature:-

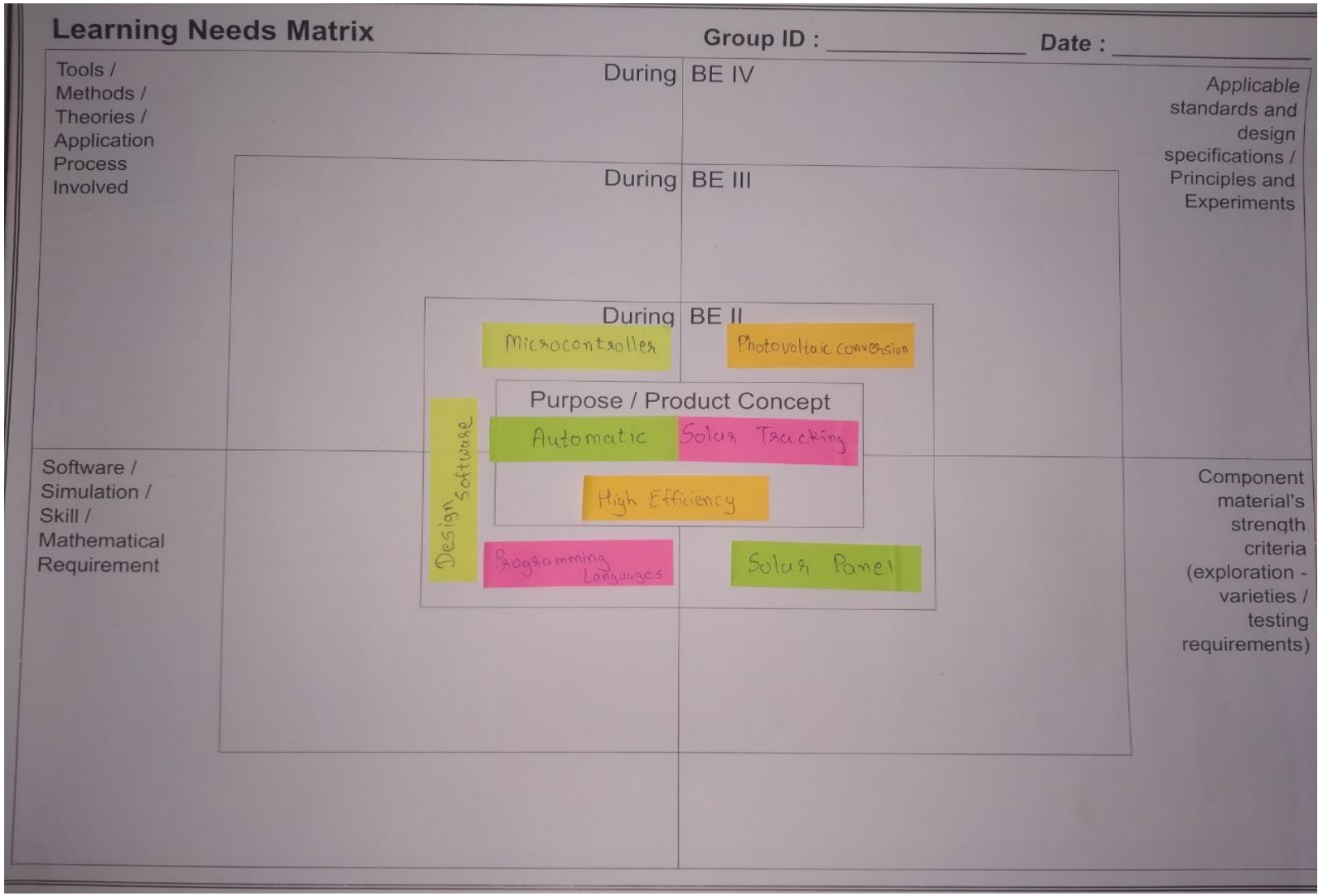
- The Product feature is easy construction and high efficiency.

Components:-

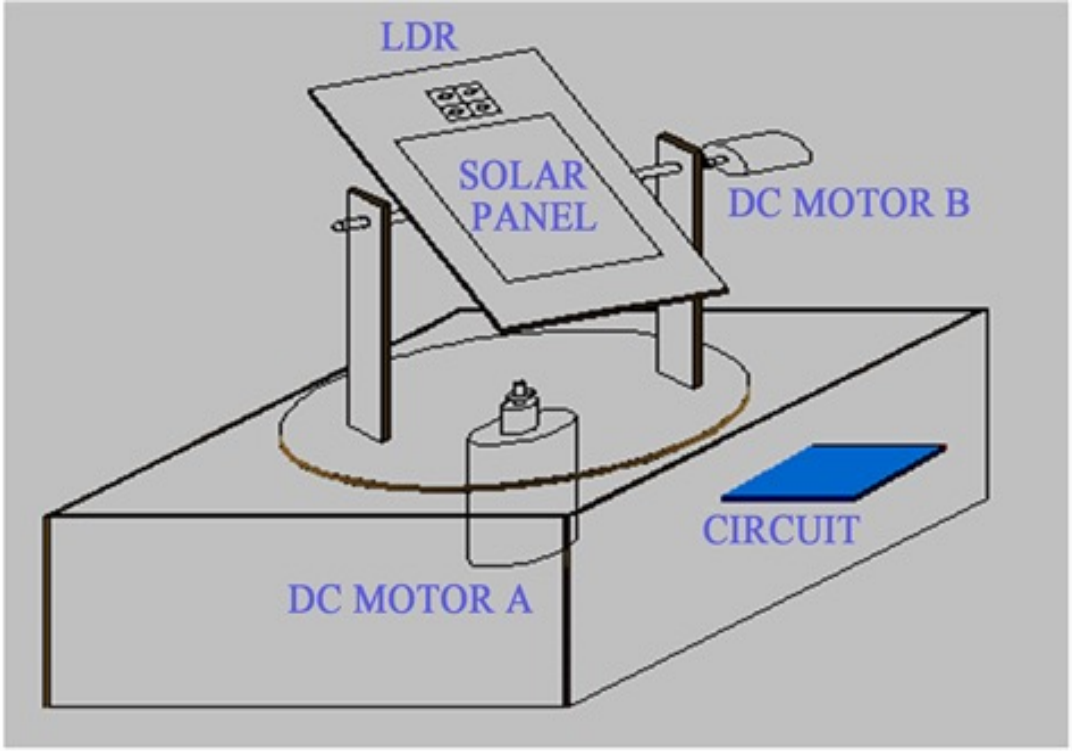
- Solar panel
- Microcontroller
- Dc motor
- Battery
- Stepper motor
- Wires
- Dc motor driver
- LDR


Product Development Canvas
Team/Date/Version :
Purpose
What is the purpose of this concept you're developing ? Does it solve a problem, or it enhances a certain experience ?
Is it serving a need or it is trying to create a new need or tap an untapped need ?
Renewable
Production of high electr
Charging dif according to
Product Experience
Define what your customer should feel like when he uses your product/service ? What emotions, feelings would define his experience ? Feeling of comfort, convenience, or feeling of saying more with less (cost conscious) or fe g of greater security, safety etc.
More Efficient
Easy Operation
Safe to Use
Energy Improvement
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)
More Electricity
Easily Working
Less man Power
Product Features
Product feature are specific. One or more features will power a function. Antilock Brakes, Airbags are features 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 featurein itself. Like car stero is a major components and a feature at the sametime powering the in car enternatinment function powering entertainment as a product experience.
High Efficiency
Easy Constructio
Automatically Tracking Sun
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 auxilliary 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.
Solar Panel
Battery
DC Motor driver
Microcontroller
Stepper motor
LDR
DC Motor
Wires
Display
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.
Operation of product is very easy & Smooth
Efficiency is high
Reject, Redesign, Retain
Post customer validation, reject, those functions or features 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.
Retain
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.
Public
Worker
Manager
Engineers
Common Peop

LEARNING NEEDS MATRIX



ROUGH PROTOTYPING



FUTURE WORK

- In future with the help of artificial intelligence we can know if there is any part of solar panel is damaged due to any cause so that it can mention how much percentage of solar panel is working.
- If there is too much dust on the solar panel with which efficiency of solar panel decreases than it cleans itself with automated machines.

ADVANTAGES

- Solar tracking systems continually orient photovoltaic panels towards the sun and can help maximize your investment in your PV system.
- One time investment, which provides higher efficiency & flexibility on dependency over other sources.
- Tracking systems can help reducing emissions and can contribute against global warming.
- Bulk implementations of tracking systems help reduced consumption of power by other sources.
- It enhances the clean and emission free power production.

References

- www.studymafia.org
- www.wikipedia.com
- www.google.com
- www.electrical4u.com
- www.tutorialspoint.com

Thank You