DES211: Creativity, and Concept in Design

Design Project (60 marks)

Faculty Mentor Name: Vikash Kumar

Group Number: 13

Group Members' Details:

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Design thinking is an iterative and non-linear process that contains Phases like:

1. The Problem
2. Empathize
3. Define
4. Ideate
5. Evaluate and Refine
6. Prototype and Test

1. The Problem

Shiv Nadar University is a sprawling campus of 286 acres. Although the academic Blocks are located nearby, there are difficulties while going to and coming from the Towers, Indoor sports complex, and Dining halls in harsh seasons like heavy rains and hot summers. Similar Problems are faced in other Places also. So, we need to design a commuting device that is portable and reduces the chances of mishandling and minimizes the maintenance

1.1 Identifying the Stakeholders and how they are affected

Many people wanted to use personal computing devices across the campus. People frequently use cycles to go from one place to other places on campus. The stakeholders are students, Faculty members, and university staff because they are mostly people who utilize the cycle system across universities or such spaces.

The common problems faced by the stakeholders while using this cycle system are they are

- They are not suitable to use in harsh seasons, mainly rainy, and even when it is too sunny,
- They are not best for traveling long distances.
- Poor maintenance system
- A lot of mishandling is possible

1.2 Urgency to Solve the Problem

An excellent Personal cycle system saves a lot of time, and physical strain can be avoided. With the present cycle system, sometimes students miss their classes and other events due to bad weather conditions and are not willing to walk long distances, and students get to classes late due to the long-distance walks and will be tired when they reach the class by walk. If the cycle system is good, even the university staff uses it, and the work will be done more efficiently. So, solving this cycle system problem is necessary

And even cycling helps to keep our health stable physically and mentally. Cycling is an exercise that's soft on our joints and is great for your sense of balance and stability, and it helps to build our length strength. And if we are feeling a bit restless, a bit of cycling helps to boost our mind and helps to focus on studying. It will help to clear your mind of mental chatter. So, solving this problem also helps to increase the productivity of the students

2. Empathy Phase

- The empathy Phase is vital. In that, we will research our user's needs. This phase is significant because it will allow us to think beyond our limitations and assumptions about the world and gain insight into users and their needs.

- In this process, we will identify the stakeholders, Analyse the Problems existing in the present cycle systems

- By the end of this phase, we could understand the problems our stakeholders are facing in existing chair designs, and it would help us design chairs that are more likable by the stakeholders

2.1. Understanding the Users

1) Problems faced by the students

- Missing the Classes due to the harsh weather conditions
- Missing the sports slots because of the long walk they must take without the cycles
- Getting physical strain due to the bad cycle designs
- Due to the mishandling, the no of good cycles reduces, and due to this, the availability of the cycles goes down whenever they are necessary
- Due to improper maintenance, the cycles get stolen

2) Problems faced by the Faculty and Staff

- As the faculty housing is far, getting to the classes in time is hard
- And they will be tired by the end of the day to use the cycles
- For the University staff getting from the gate to the working places is hard by walk without a good cycle system
- Getting physical strain due to the bad cycle designs
- Lack of availability of the cycles
- In harsh weather, when staff are required to travel from one place to another, it is hard to use the regular cycles or to go by walk

2.2 Pain and Pleasure Points

- **Pleasure Points:**
  - Using the cycles helps to reach the destination on time
  - It makes traveling easy than walking
  - Eco-friendly helpful in reducing pollution
  - Bicycles have a good balance system
  - Available at less cost
  - Good for health because cycling exercises the body

- **Pain Points:**
  - Due to a lack of frequent maintenance (Lack of air in the tubes and oiling), users face problems while using them
  - Mishandling of the cycles done by a few people decreases the availability of the cycles
  - We can’t use them in bad weather conditions, mainly when it is raining and too sunny
  - There is no automation in the cycles. When people are too tired, they feel unlikely to cycle
  - No proper luggage handlers are provided in the present cycle systems

- Water Bottle holders are not available for the many cycles
- No lights are provided, which causes the problem to travel at night

2.3. Analyze Existing Solutions

- **The SNIoE cycle system**

  Advantages:

  - Faculty, Students, and Staff can use the cycle
  - Have good balance
  - Few cycles are provided with baskets that help to carry student bags
  - Cycles are Lightweight

  Disadvantages:

  - Poor regular maintenance done
  - The existing cycle designs are poorly designed, due to which more mishandling is possible
  - Water Bottle holders are not available
  - Not suitable to use in harsh weather conditions
  - Not prescribed to use at nights
  - No automation is provided, which causes more strain
  - Few cycles are not equipped with bag holders

- **YULU Motorcycle system in Bengaluru**
  Advantages:

  - It is helpful to travel across places easily
  - Powered with electricity rather than petrol or diesel, which reduces the cost of traveling and is eco-friendly
  - It can be used in an emergency and is easy to travel in traffic
  - Having a headlight which can help in traveling at night
  - The Yulu cycles are Lightweight, so that anyone can ride them easily
  - The design is good, and it's hard to break it and reduces the chance of mishandling

  Disadvantages:

  - The bikes are hard to balance as there is no good leg space provided, and no leg rest is present

- Hard to stay in the traffic as the seat is small and the as height of the vehicle is less, so staying in one place for a long time is hard
- No place is provided to place the bags
- The maintenance and charging of the bikes are done by taking them to the respective charging spots that require extra human resources every day
- Many delivery(like zomoto, swiggy) uses these bikes for transport as they are cheap for transport and no investment required, but it is hard to place their bags in the bike and then place the legs parallelly

- **Bounce and Lona rental systems in Andhrapradesh**

  Advantages:
  - It is implemented to use them across a city in Andhra Pradesh(Vijayawada) and nearer zones to travel across places easily
  - Anyone above 16 years can use these bikes, so young people with no license can also use them
  - Powered with electricity rather than petrol or diesel, which reduces the cost of traveling and is eco-friendly
  - These bikes can be used by delivery persons for less cost and easily
  - It can be used in an emergency and is easy to travel in traffic
  - Having a headlight which can help in traveling at night
  - The bikes are Lightweight, so anyone can ride them easily
  - There are significantly fewer chances for mishandling as everything is well covered
  - Gave a provision to place the bags in the small place

  Disadvantages:
  - The bikes are hard to balance as there is no good leg space provided, and no leg rest is present
  - Hard to stay in the traffic as the seat is small and the as height of the vehicle is less, so staying in one place for a long time is hard

- The maintenance and charging of the bikes are done by taking them to the respective charging spots that require extra human resources every day

3. Define

After looking into the existing cycle systems in the university and other such spaces and analysing them, we found various flaws in every design. Some of the designs have advantages that others don't, and after seeing all the pain and pleasure points of the chair, we wanted to design a cycle or bike that solves the following problems of the existing models

- Commuting device that can be used in rainy weather too
- Design the cycle that decreases the chance of the mishandling
- Bikes that can be manufactured at low cost
- Cycles or Bikes that reduce the maintenance or frequent checks
- Cycles or bikes with proper balance and comfort
- bikes that are non-fuel based so that they will be environment-friendly

4. Ideation Phase

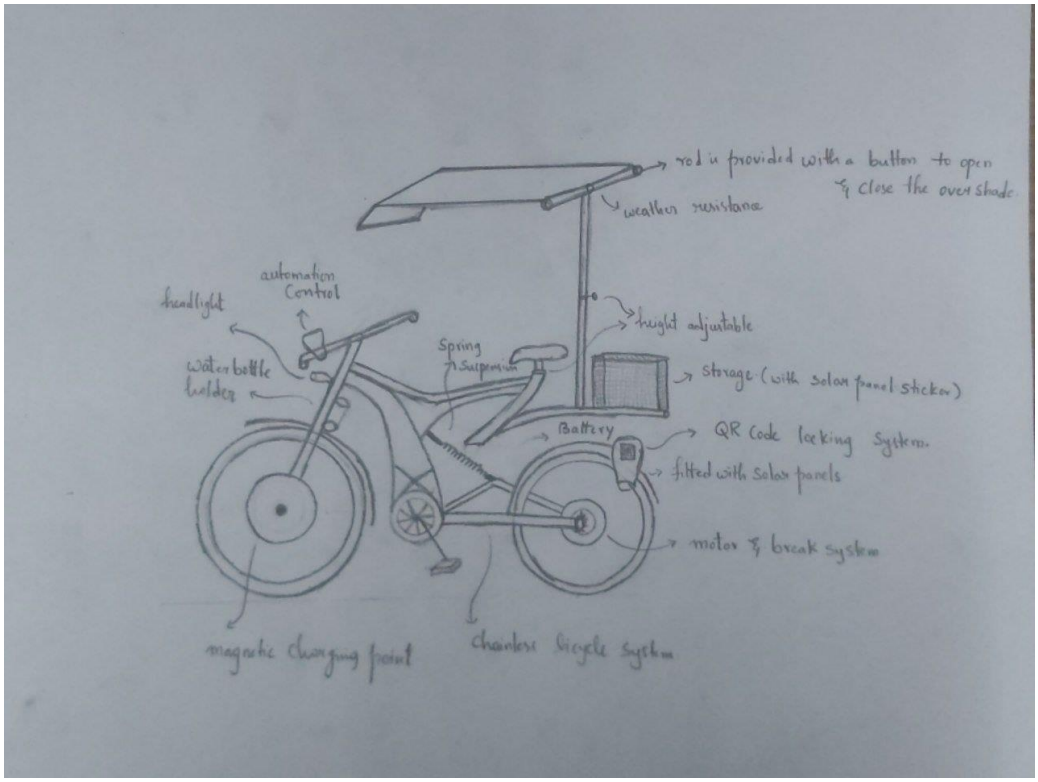
In this phase, we share the ideas we got from the individuals and then work on them to improve them. One of the standard solutions for the mishandling we got is to add the QR code for each cycle and make a specific app to scan the QR Code, and that helps us to open the lock of the bike and then this way, the person's data who are using the cycle will be saved on the server. If any mishandling happens, we can get help from the data to deal with it.We used this QR code concept to our first 4 designs as that was the common idea everyone got

And even we can charge the person who uses the public cycle 5 rupees by ride or something less this way, the people who are needed will use the bike, and with that small amount, we can even handle some of the maintenance charges

And every cycle will be added a GPS such that we can track and have data on where and how the bike is used, and this reduces the mishandling and theft cases

And to decrease maintenance, we can add **tubeless tires** to all designs. With this, the chance of getting punctured decreases, and air-filling maintenance can also be reduced and can be easily repaired

Idea One:



Advantages of this model:

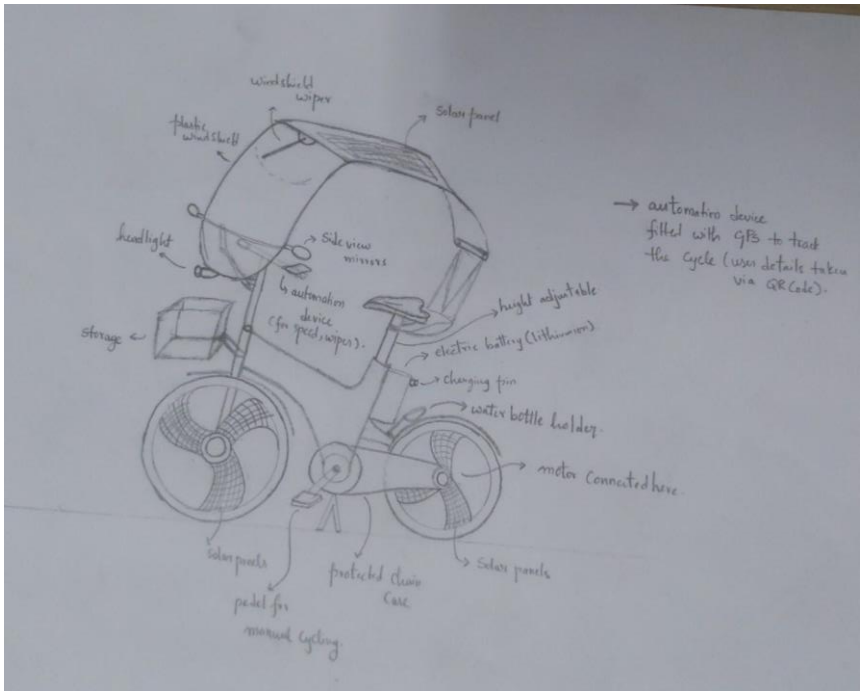
1. A magnetic induction charging option is available to the cycle, which decreases the charging timing and increases the charging durability of the cycle
2. With magnetic inducting charging, we don’t require wires to charge, which decreases the maintenance and the human power needed to take the cycles and set them every day and also decreases the mishandling and breaking of wires
3. Head Light is available to cycle so we can use them at night.
4. The cycle uses the electric motor type, which is eco-friendly
5. There is a Place to keep the storage like bags and sports stuff like Shuttle rackets, volleyball, and basketball.
6. The QR code scanning option is added to the cycle to reduce the misuse of cycles by identifying the students using it so that we can maintain it Properly.

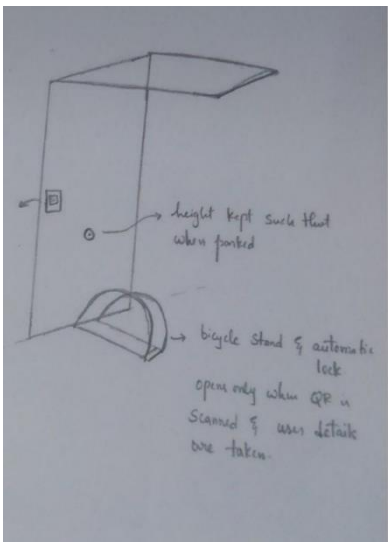
7. An alarm system is added to the cycle when someone tries to get the bike out of the parked place without scanning the QR
8. Solar Panels are added to the cycle so that we can charge it by using sunlight to reduce the pollution of the environment and make it environment friendly.
9. We used solar panel stickers instead of solar panels which help to decrease the weight and increase the efficiency
10. A sunroof is optional; we can close it when we don't need it this way, the person can enjoy the good weather
11. A height-adjustable sunroof is available to protect us in heavy rains and hot summers.
12. A water bottle holder option is available to hold water bottles.

Problems we managed to solve by this design:

1. Mishandling of the cycles Problem was solved in this design.
2. The physical strain of the stakeholder's Problem was solved in this design by implementing an electric motor system and adding solar panels
3. Adding springs to the cycle. This way, when the road has humps, the person who is riding the cycle will also be comfortable.
4. The maintenance Problem was solved in this design by implementing the electromagnetic induction charging option so that we can charge it and decreases the staff work required for it
5. Not able to use them in harsh weather Problem solved in this design so that we can also use them in rough weather.
6. By adding Headlights, we can use them at night.
7. A water bottle holder has been added to carry water bottles.

Idea Two:





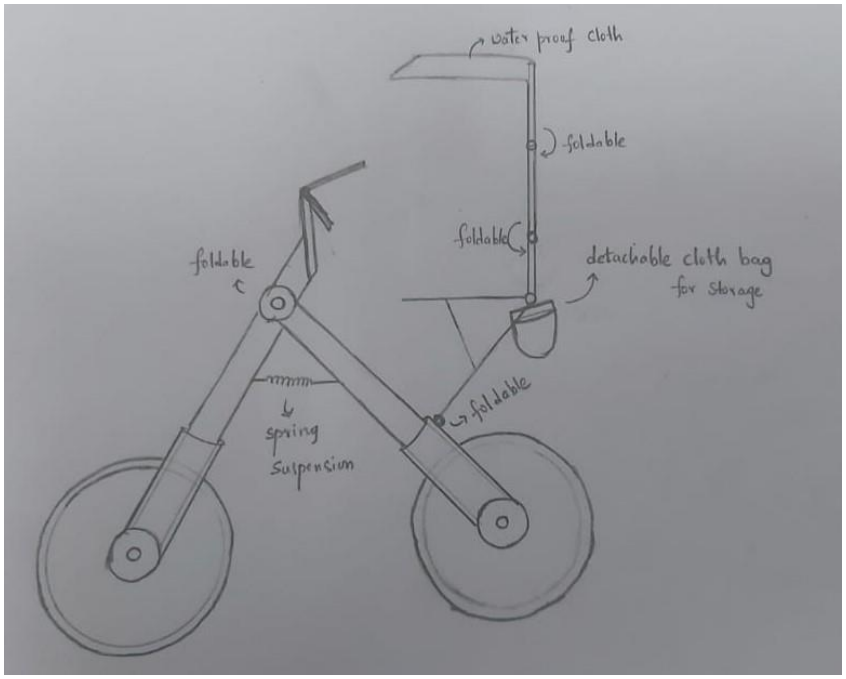
Advantages of this model:

1. The cycle is of an electric motor type so that it does not harm the environment.
2. The QR code scanning option is added to the cycle to reduce the misuse of cycles by identifying the students using it so that we can maintain it Properly.
3. Height adjustable seat is available so the stakeholder can use them comfortably.
4. In the automation motor, there is a GPS tracker So that we can track the cycles easily.
5. The storage option is available in this cycle.
6. A transparent Plastic water shield is added to the cycle as a sunroof, and a wind wiper is added to protect us from the harsh environment.
7. Solar Panel is added to the cycle to make it environmentally friendly.
8. A water bottle holder is added to the cycle.
9. Head Light is added to the cycle so that we can help us at night.

Problems we managed to solve by this design:

1. Mishandling of the cycles Problem was solved in this design by adding the QR Code scanning and the GPS tracker.
2. The physical strain of the stakeholder's Problem is solved in this design by implementing an electric motor system.
3. Storage Problem solved in this design.
4. The maintenance Problem was solved in this design by implementing the solar charging option so that we can charge it and decreases the workforce required for it
5. Not able to use them in bad weather Problem solved in this design.
6. Not able to use them at night Problem solved in this design.
7. The water bottle holder Problem was solved in this design.

Idea Three:



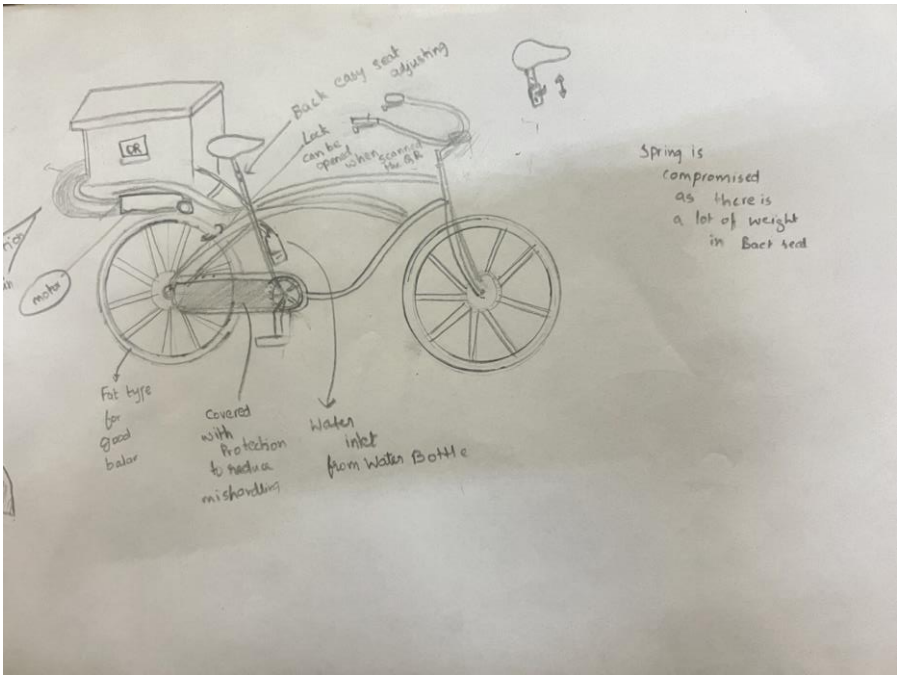
Advantages of this model:

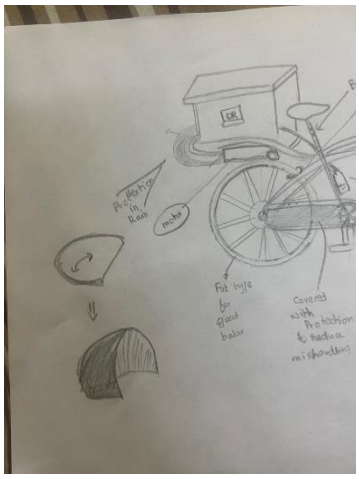
1. The cycle is Portable, so it takes less space to park than a regular cycle so that; we can park many bikes in less area.
2. The cycle is of an electric motor type, so it is eco-friendly
3. The QR code scanning option is added to the bike to reduce the misuse of cycles by identifying the students using it so that we can maintain it Properly.
4. A waterproof Storage bag is available in this cycle.
5. A portable Sunroof option is available for this cycle to protect us in a harsh environment.
6. An adjustable back seat option is available, so we can add it when needed.
7. Head Light is added to the cycle so that we can help us at night.

Problems we managed to solve by this design:

1. Mishandling of the cycle Problem is solved in this design.
2. The physical strain of the stakeholder's Problem was solved in this design by implementing an electric motor system.
3. By adding Headlights, we can use them at night.
4. We can use them in harsh weather by adding a sunroof to them.
5. Storage Problem solved in this design.

Idea Four:





Advantages of this model:

1. The cycle is Hydra electric-powered so that it does not harm the environment
2. The QR code scanning option is added to the cycle to reduce the misuse of cycles by identifying the students using it so that we can maintain it Properly.
3. Adjustable seat is available in this cycle.
4. A waterproof sunroof is available in this cycle to protect us from the harsh environment.
5. The cover to the chain is added to the design to reduce the mishandling of removal of the chains
6. The motor from the battery is removable, so we can easily remove and replace it when the bike is under maintenance

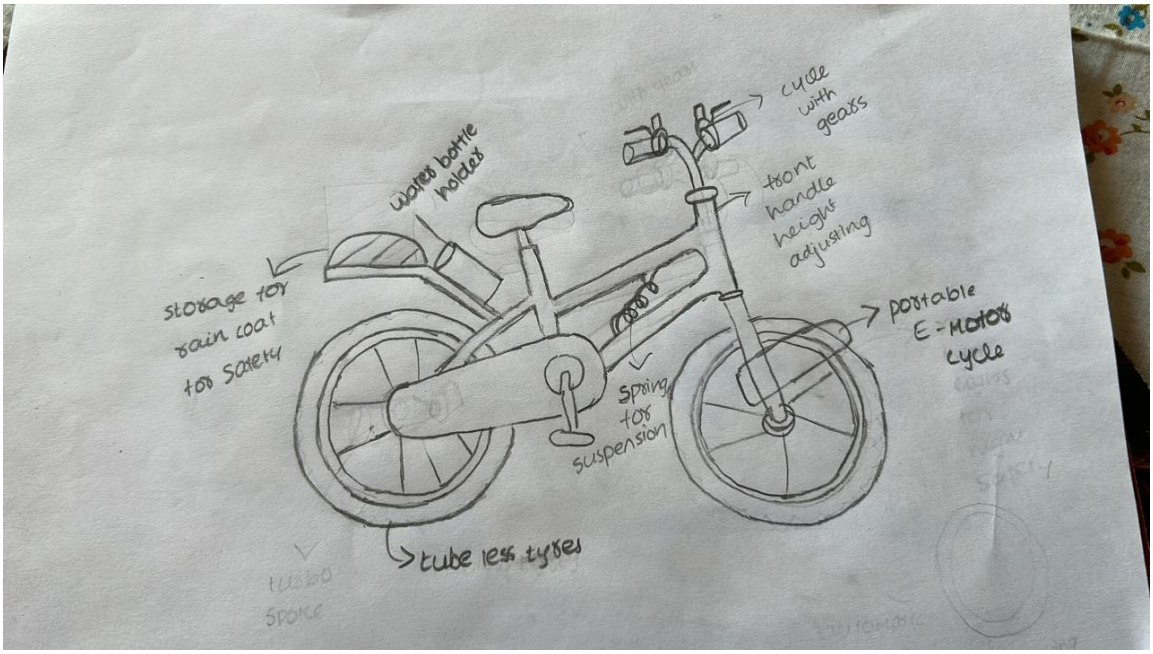
Problems we managed to solve by this design:

1. Misuse of the cycle Problem is solved in this design.
2. The stakeholder's problem's physical strain is solved in this design by implementing an electric motor system.
3. Not being able to use them is bad weather Problem is solved in this design.

Example of the fuel cells we used in this design:

- https://www.wired.com/2010/10/electric-bike-runs-almost-on-water/
- https://www.financialexpress.com/life/technology/amazing-indian-scientists-create-an-artificial-leaf-that-can-power-your-car-know-how/

Idea Five:



Advantages of this model:

1. Electric Motor is added to the front Tire of the cycle that works on the battery to increase its efficiency, and we can even use the gears from the back tire
2. The QR code scanning option is added to the cycle to reduce the misuse of cycles by identifying the students using it so that we can maintain it Properly.
3. Gear has been added to the back tire of the cycle, which helps the person choose the way he wants to ride
4. Steering is height Adjustable.
5. Spring to the cycle is added to increase the rider's comfort
6. The waterproof sunroof is available in this cycle to protect us from the harsh environment.
7. The storage Problem is solved in this design.
8. The electric motor is optional, so the person who requires them only can attach them and use them

Problems we managed to solve by this design:

1. Mishandling of the cycle Problem is solved in this design.
2. The stakeholder's problem's physical strain is solved in this design by implementing an electric motor system.
3. Not being able to use them is bad weather Problem is solved in this design.
4. The storage Problem is solved in this design.
5. Maintenance has been reduced by adding the optional chargers. The people who require them can take them and attach and use them and then remove them after use, and they will get charged when no one is using them

5. Evaluate and Refine

In this phase, we are going to evaluate each design designed by our group
We Refine the best possible designs designed by our group

Evaluate Phase

The evaluation of idea1:

The majority of Problems Faced by the Stakeholders were solved in this Design Model

- Mishandling of the cycles
- Improper maintenance of the cycle
- Protection from bad weather

- The physical strain on the stakeholders
- Able to use the bicycles at night
- A place to keep Bags
- Less human power is required to maintain the cycle
- Light Weight

The problem with this design is it solves all the needed issues that are identified, but it costs a little more than the standard cycle

The evaluation of idea2:

The Problems solved in this design faced by the stakeholders are

- Mishandling of the cycles
- Improper maintenance of the cycle
- Not able to use in harsh weather
- The physical strain on the stakeholders
- Able to use the cycles at night
- A place to keep Bags

The problem with this design is it requires human power to check the cycle and charge them by connecting wire, and also, the wire sometimes gets damaged or mishandled

The evaluation of idea3:

The Problems solved in this design faced by the stakeholders are

- Mishandling of the cycles
- Not able to use in harsh weather
- The physical strain on the stakeholders
- Able to Park or carry easily due to its portable nature
- The place to keep Bags
- Added the back seat to increase the comfort of the user
- Decreases the maintenance of the tires as the tires are broad

The problem with this design is it doesn’t provide a good balance for tall people as the bike is small, and as the design doesn’t have solar or any automatic charging, we need to charge the cycle every time we use it we need extra staff is required to charge the bike

The evaluation of idea4:

The Problems solved in this design faced by the stakeholders are

- Mishandling of the cycles
- Improper maintenance of the cycle
- Not able to use in harsh weather
- The place to keep Bags
- The physical strain on the stakeholders
- Able to use the cycles at night
- The battery is eco-friendly and non-fuel

The problem with this design is that the battery needs good maintenance, and the water we use also differs, so the possibility of the battery getting spoiled is higher. And also, the battery and the motor on the back increase the weight of the cycle drastically, so it will be hard to balance

The evaluation of idea5:

The Problems solved in this design faced by the stakeholders are

- Mishandling of the cycles
- Improper Maintenance of the cycle
- Not able to use in harsh weather
- Storage of the bags Problem
- Portable motors gave an opinion to the user to carry the weight or not
- The place to keep the raincoats and stuff to use in an emergency this way, the user has the option to use the protection or not, and it will be easy for the user to use them in emergency
- Lightweight and well balanced

The problem with this design is it doesn't give provision for storage, and as the raincoat is temporary, there is a chance of stealing that easily. And for placing the electric motor as it is not fixed, if any person is in a hurry, there will be no time to keep placing and removing the engine, which will delay his work. And sometimes, if they cannot put the motor well, there will be damage to the motor and placement.

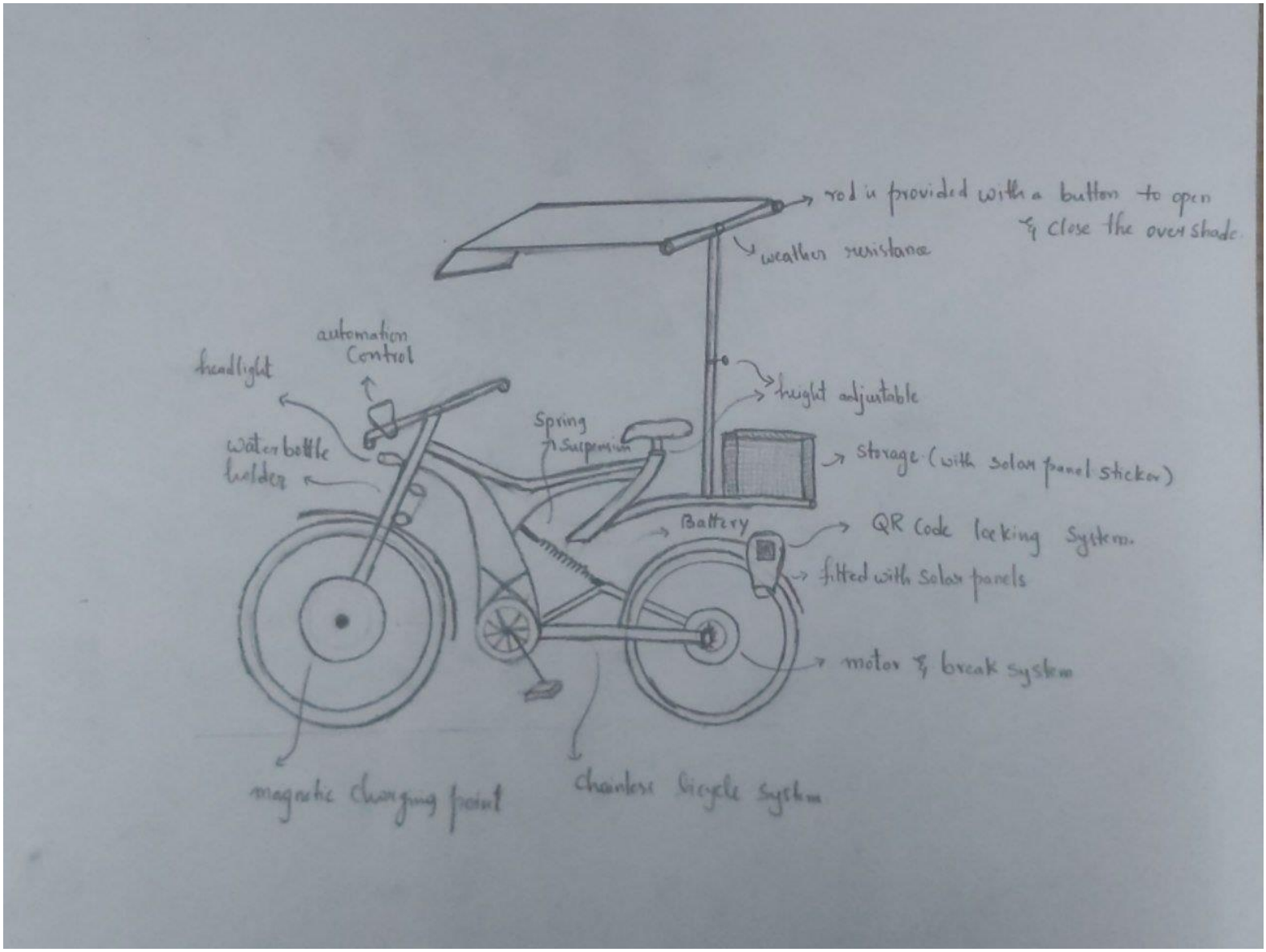
Refine Phase

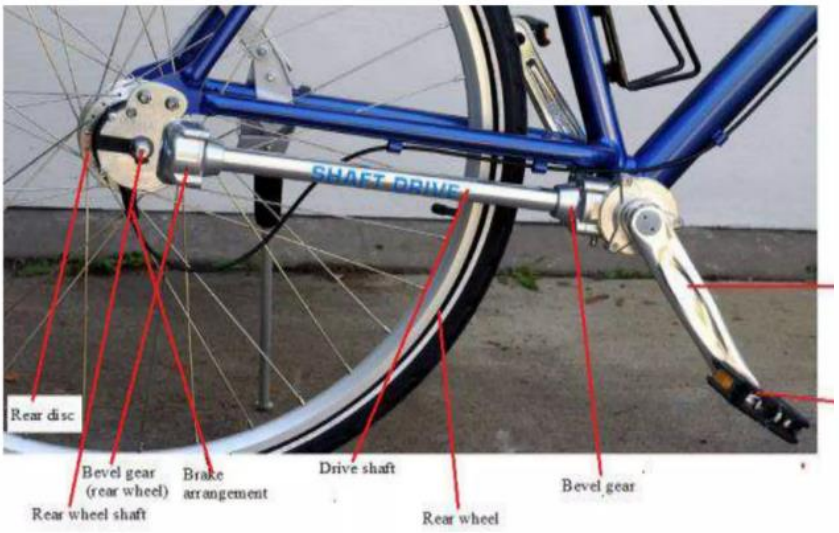
In this, we will refine the ideas based on the previous evaluations, which means we will select the best designs out of the refined ones in this phase. According to the evaluation phase done earlier, we as a group discussed and thought that idea one will satisfy all the needs of the user and the cycle is well-designed and even have less maintenance as we used the chainless design and the solar panels will keep the charging constant and can charge while riding too

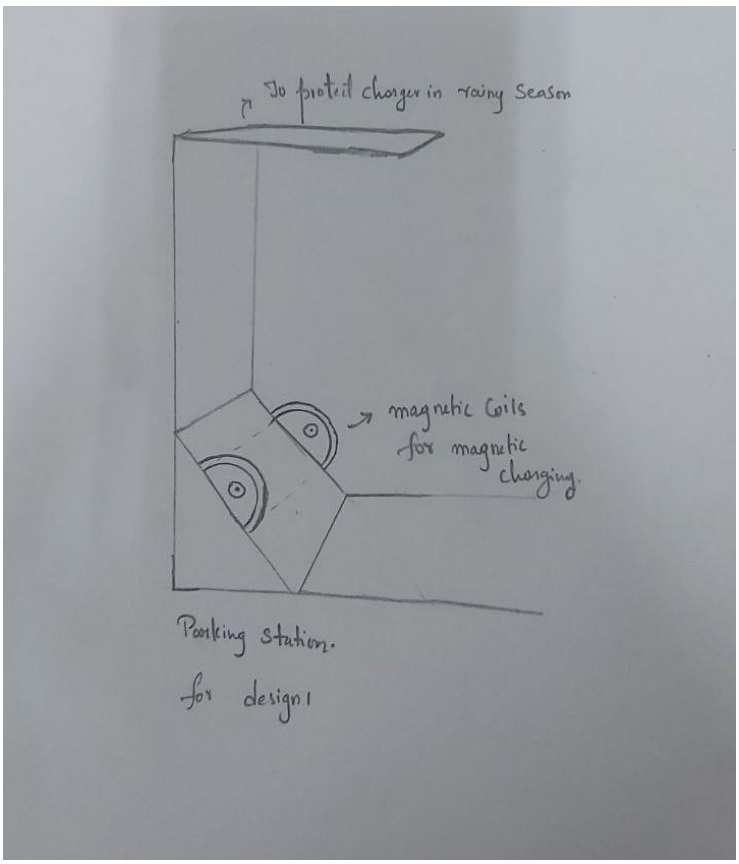
And magnetic wireless charging decreases maintenance and mishandling. The umbrella used to protect in the harsh season is also portable, can be used when necessary, and can fold after use. Idea 2 and 4 follows as the next two top designs after analyzing them in refine phase

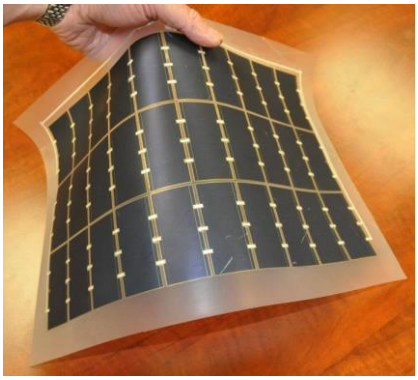
6. Prototype and Test

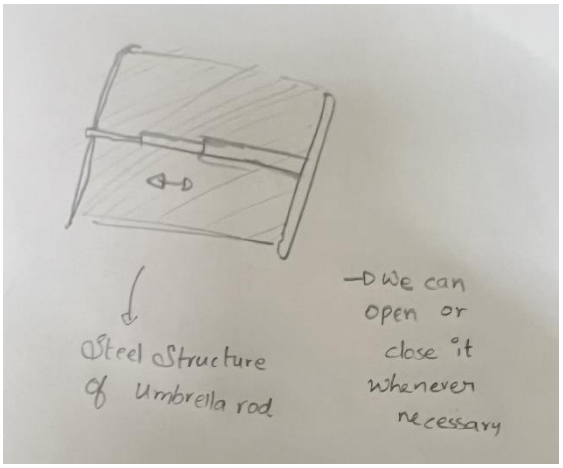
We have used the solar panel sheets(frameless solar panels) which help in decreasing the size and also increasing the efficiency and even helps to reduce the corrosion. And as for the design of the sheps we planned to increase the angle of unclination of the shed's so in rainy seasons the magnetic coils of the charger in shed's will never get damaged and also reduces the space occupied by them and gives space to the road and by adding magnetic induction charging it reduces the maintances and mishandling a lot and by chaging the normal chain system to the chainless rod system the mishandling of the cycle is completely taken off and the umbrella provides the good protection during the rains and sunny seasons


rod is provided with a button to open & close the overshade
weather resistance
automation Control
headlight
height adjustable
water bottle holder
Spring Suspension
storage (with solar panel sticker)
Battery
QR Code locking System.
fitted with solar panels
motor & break system
magnetic charging point
chainless bicycle system


SHAFT DRIVE
Rear disc
Bevel gear (rear wheel)
Brake arrangement
Drive shaft
Bevel gear
Rear wheel shaft
Rear wheel


To protect charger in raing Season
magnetic Coils for magnetic charging.
Parking station.
for design 1




Steel Structure of Umbrella rod
We can open or close it whenever necessary

7. Log of Student Contribution:

- In the first meeting, we together understood the project statement and analyzed the existing design and systems for the public transport and then prepared the problem statement and selected our stakeholders
- And we took over selves few days and decided to get three designs per person for the next meeting; in between, we met our faculty advisor and took help on the process and got guidance on the project
- And in the next meeting, we analyzed our existing designs and then eliminated the similar ideas we got, and changed a few things to meet the problem statement, and then we divided into two teams, one to make the report and the other to draw the sketches
- And in the final meeting, we sat together and made the changes required and found the mistakes made by others, and worked out together
- Pavan Kumar took responsibility for making the report, and Kartheek and Ramakrishna Naidu, Arun Mihir and Atiq Ahmed took responsibility for sketching the designs

Member Name	**Contribution**
Kartheek Kotha	made the report and got the idea of 1
A Pavan Kumar	made the report and got the idea of 3
Ramakrishna Naidu Bhupathi	Sketched drawings 1,2,3 and got the idea of 2
P.S.Arun Mihir	Sketched drawing 5 and got the idea of 5
Mir Ahmed	Sketched drawing 4 and got the idea of 4