

SEP 760 - Design Thinking

Assignment 3

Student: Vinethaa Krishnaswamy Govindaraj

Oct. 24th, 2019

The Journey:

I started my journey by interviewing people who drive bike on a daily basis to commute to work. By talking to them, I have noticed a bunch of problems they face during the ride. Initially, I had difficulty in focusing on a specific problem and finding the starting point to approach. I decided to classify the problems systematically, the decision led me to the next step in filtering the problems **In Fig 13 a Line 1**. I focused on four significant problems like ergonomics, uphill biking, bicycle theft, and safety. I did the objective tree based on the four problems. As these four are a different kind of problems in a bicycle, I can't design four separate devices because it won't be user-friendly due to the cost of the fix, and sometimes it will make bicycle heavy. So, It navigated me to design a new bicycle. Then, I did a morphing chart where I had selected the functions and respective components that I need to prototype a bicycle. I started my prototype design by focusing on main objectives like handy, foldable, easy to use. I started designing accordingly. I asked a question about why the cycle should have two wheels? What if it has one wheel? I googled it to ensure my abstract idea to concrete ideas. I found that there are one wheel cycles available but people did not prefer it due to comfortability and cost issues. So I researched further and added many concrete and abstract ideas to make my new design usable, **in Figure 4**. It navigated me to design space, to make the handlebar rotatable 360 degrees. So the user can easily change their direction. The bike is foldable and handy. This made me think It may increase the chance of theft so I decided to put a number lock and a GPS tracking system that will be connected to the biker's phone shows the location of the bicycle. It leads to a question/idea of why should the bicycle have a mobile charger and a front light? So I started thinking where can I get the energy to charge? These questions increased my design space. So I decided to fix an electrical motor, an abstract idea of fixing an electric motor that stores energy in a battery and can be used by the biker when he needs speed while biking uphill. The energy can be initially generated by pedaling and a motor will convert mechanical energy into electrical energy and store that in a battery. It will be used whenever the biker needs and it is also used for mobile charging and safety front light. The purpose of the design is to avoid overuse of muscle and sudden increase in mileage which is one of the reasons for lower back pain and also to overcome the safety issues while biking at night. I designed four prototypes each one is advanced from the initial design. After completing the prototype, I realized there is a gap between the product solution and user requirements because there is no increase in the number of alternatives (**Fig 13 a: line 1 OH-NO! Moment**). Also, I realized that there is no depth of exploration due to lack of specific users. Now, I have to redesign it, **Fig 13 a (Line 1)**.

I started analyzing the mistake and got a suggestion from experts and started to redesign it from scratch. This time around I focused only on one problem - "ergonomics" for bikers with lower back pain (specific users), **in Figure 13 b (Line 2 -Aha Moment)**. I started collecting the list of issues associated with ergonomics that lead me to design a good objective tree and clearcut of functions in the morphing chart. It made me add many components to each function. I designed the 15 solutions **Fig 13 b: line 2 (primary function)** which is my breadth of exploration. Then took 5 of the 15 solutions and researched deeper, developed the ideas and increased the number of alternatives which is my depth of the exploration. Once I completed the research I felt like I have solved the ergonomic problem completely. Initially, there was a starting problem in designing the solution as I was focusing more on perfection. Later, I realized the initial ideas cannot be a perfect solution, further research is what makes them look perfect. After the completion of the morphing chart, I started designing my prototype thinking of me as a biker and focused on what I need and what will make me comfortable to bike? This design thinking process open doors to many ideas and I started applying and developing it. For example, **in Figure 7a**, In my solution 1, I designed a cycle with hand cushion, seat cushion, height adjuster and a suspension and I

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further developed it in solution 2 by adding a back supported seat with a massager, I took the approach and explored deeply came up with different types of massagers with control buttons which can be fitted on the biker's body instead of bicycle which will eventually increase the effectiveness as bikers will change their position often so it will not be effective if I fix it as a back supported that attached with saddle. I start with abstract ideas and find different possible ways and approaches to implement them in real-time. I developed a solution from figuring out the root cause of the problem **in Figure 13 b**. For example, overuse of muscles and sudden increase in speed will make contraction in calf muscles and it is one of the reasons for pain. The biker will not be aware of or identify the usage of muscles while biking. This made me think of fixing a tracking system which shows a heart rate, blood pressure rate. I improved connectivity by asking the question how does the user know from the tracking system? This question opens the door to a new idea of a warning symbol on-screen with some sound effects to notify, as bikers will be a busy focusing road **In Fig 10 b**. This idea further raised a question of why shouldn't I add a speed tracking system with a weekly mileage report? I started implementing the abstract idea. These ideas navigated me in the design space with an increased number of alternatives. This is my "AHA Point" behind the creation of 15 solutions (primary functions). I started with nowhere and ended with a good solution. The tracking system is also one of the reasons for exploring the detection of weight given in the handlebar. The more you give weight to the handlebar, the less you feel comfortability. I started focusing on the user instead of modulating the bicycle design. I analyzed the question what is the root cause for pain? If the user finds a right fit bicycle then he will enjoy the ride but why it does not happen? I searched for possible answers and came up with more solutions. **In Figure 9** One of the solutions is creating a mobile app that contains a quiz about finding the right fit bicycle. The questions are designed in such a manner to give bikers appropriate results. But this app will only work for people who are looking for getting a new bicycle what about the existing bikers? It made me develop the app furthermore with features like bikers can take the quiz if they are feeling pain in their body while biking. The quiz result will show what is the reason for pain, how to avoid that in the future, what are the treatments available and also displays people gone through with similar problems and their recovery story. **In Figure 11**, This solution is one of my deep explorations and takes me next step creating awareness in educating bikers to prevent their long term sufferings through a 2-minute animated video via social media. The diverse idea made me think of connecting people with similar interests and which in turn helps bikers to get expert advice from the experienced bikers if they are looking for suggestions related to biking. I followed the same method and explored 5 different solutions in-depth. If the user follows at least one of the 5 ideas, they can overcome the ergonomics problem completely.

To conclude, **in Figure 13 a**, my journey started with interviews and brainstorming, even though my first approach is a failure **Figure 13 a- (Line 1)**, in the second I focused on one specific problem, worked on finding the possible reasons that created the problems "**My AHA Moment**" and then made an objective tree with keeping me in mind as a biker. I focused on a specific user, created a clear cut of functions and possible components that need to resolve the problem. I developed my prototype on step by step design process by asking "what if questions" and ensure it meets my objective. I developed my ideas and jumped from one solution to others by taking reference from the solutions which I have already designed. I developed my ideas by finding and implementing a reel to real-time solutions. The decisions that I made, opened the doors for creative ideas that help in finding an effective solution. The bikers who are facing the ergonomic problems can use any of my solution to get rid from the pain completely.

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Reflection: The “Driving Aid” research provided me a **good learning**, I improved the quality of design thinking process. I faced hard time in focusing on a *specific problem*, I overcame it by using a **new technique** “systematic classification of possible problems”, In **Figure 4** through this process I avoided most of the confusions. In previous exercises, brainstorming was very helpful in generating ideas but in this exercise I used interviews as my brainstorming. In **Figure 5**, I focused on four diverse problems and *complicated the design* process as a result I *wasted most of the time* in deciding the objectives, functions and selecting the components for each functions. I had more confusions in what kind of solution or end product I will come up at the end? I felt like I used the same components to design different prototypes because the confusions *did n’t allow me to think beyond*. Later I realized that I focused on many diverse problems and trying to come up with one solution to resolve all. This **mindset** is the main reason for reaching the dead-end and stuck in the middle of the work as shown In **Figure 13 a**. Also, I realized, I’m looking for perfection at the initial stage of the prototype development. This dead-end made me realize that perfection only comes by following repeated review and developments. I reached a point where I need a break and **expert suggestions** so I reached Dr. Robert and gained some ideas in dealing with such situations. I started my design again, This time I focused on **specific problem** “Ergonomics” and for **specific user** “ bikers’ with lower back pain”. The defined problem made me **challenge ideas**. At this point I learned the tactics, to overcome how to restart the design work and how to avoid the mistake in future? This **new approach** opened doors to create new solutions. I developed **decision making processes** for example In **Figure 7b**, I came up with a solution for saddle sore, the root cause is sitting in one position for long hours is the reason for saddle sores. I came up with a solution of keeping sensor and an alarm which will notify a biker to change his position to prevent saddle sores, implemented **reel ideas in to real** situations. I **observed** that I started my work with nowhere and ended up with 15 different solutions, I developed my initial prototype and add the features **thinking me as a specific user** **Fig 13 b**. This is the mindset behind designing the 15 multiple solutions as shown In **Figure 7a**. I’m going to **follow this exact mindset** in future projects. Already, I have implemented this idea in deep exploration where I took 5 ideas and came up with further different possible solutions for example, In **Figure 10b**, I created an app to track the speed, heart rate and blood pressure of the biker then I added notification sounds to alert the biker to avoid overuse of muscles. This is also one of the reasons for creating an educational video and a bike fit quiz app which is another solution for the same problem. Initially, I experienced some kind of fear in handling the project alone and coming with the solution but now I feel like this fear has increased my confidence and I’m ready to design the product for any kind of product with issues. I developed all my solutions by asking the “**what if question?** “. For example, In **Figure 8** - I designed a “wearable electric massager”, I asked a question about what-if the user does n’t prefer an electric massager? This question provided me with many new ideas I started searching for more alternative solution and came up with accupressure as one of the solutions. **The questions, decisions and insights** that I had played an important role in developing the final product. From this exercise, I would like **to improve** the time efficiency and critical thinking skills. I observed that I have wasted my time in focusing on designing the perfect solution and that design reached a dead -end. I learnt a **new concept of systematic classification of problems** and picking up one problem based on specific user and I’m going to **implement it in my future projects**. I also learned that I need to **be open minded** and should give a try instead of looking for a perfect solution.

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Evidence: Photographs, Notes and Graph:

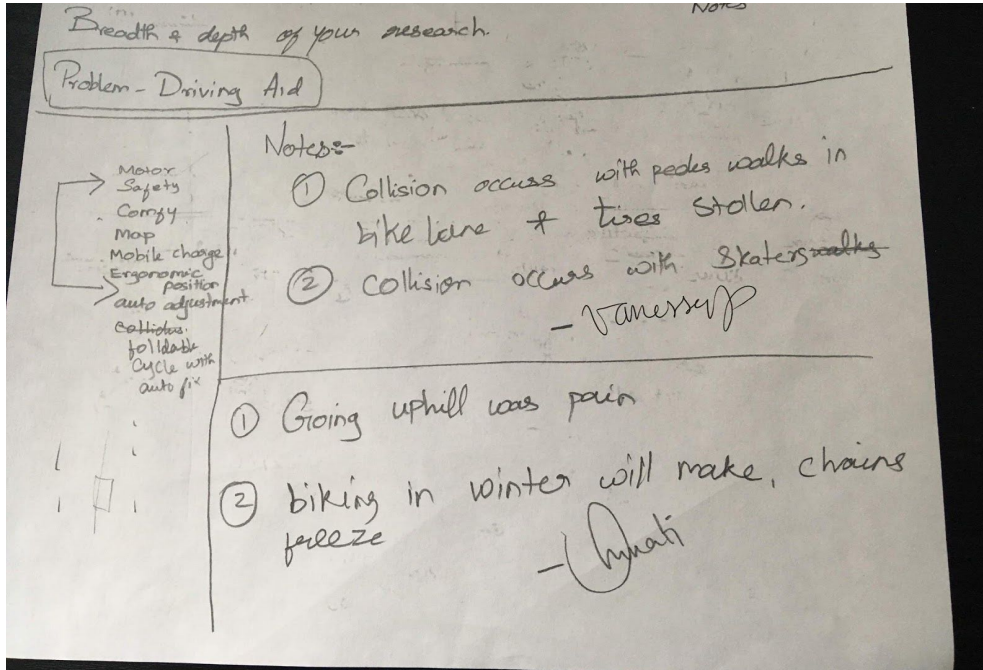


Figure 1 a: Primary Research - Interviewing people and got their sign for reference

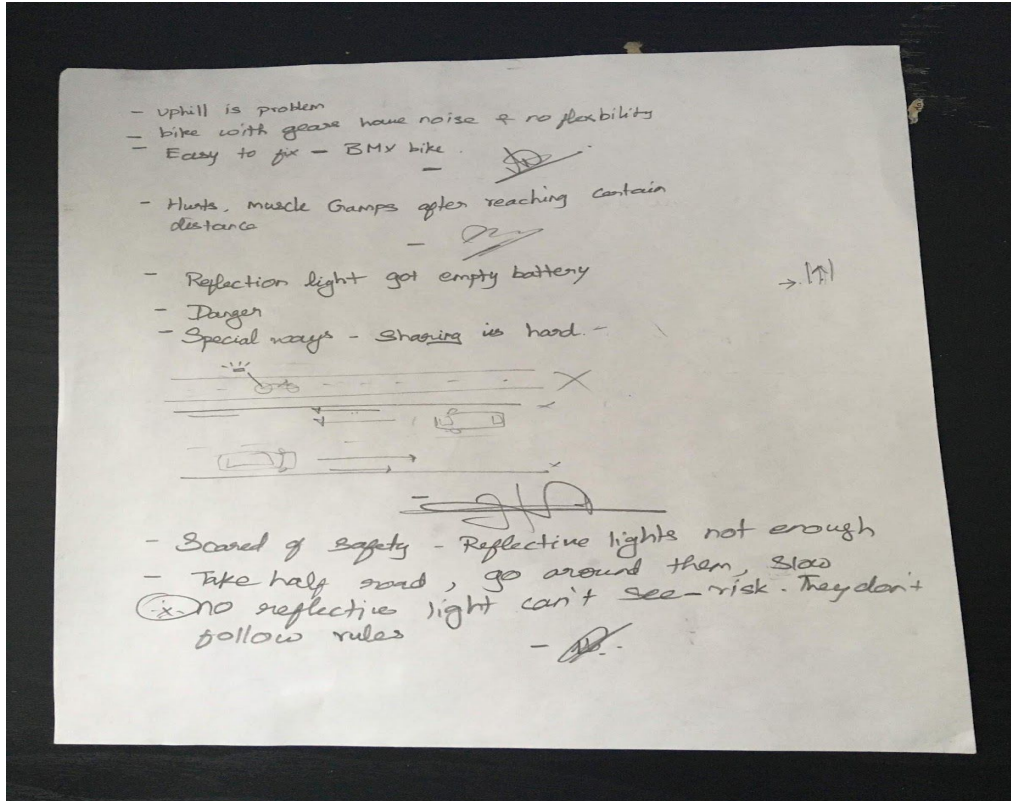


Figure 1 b: Primary Research

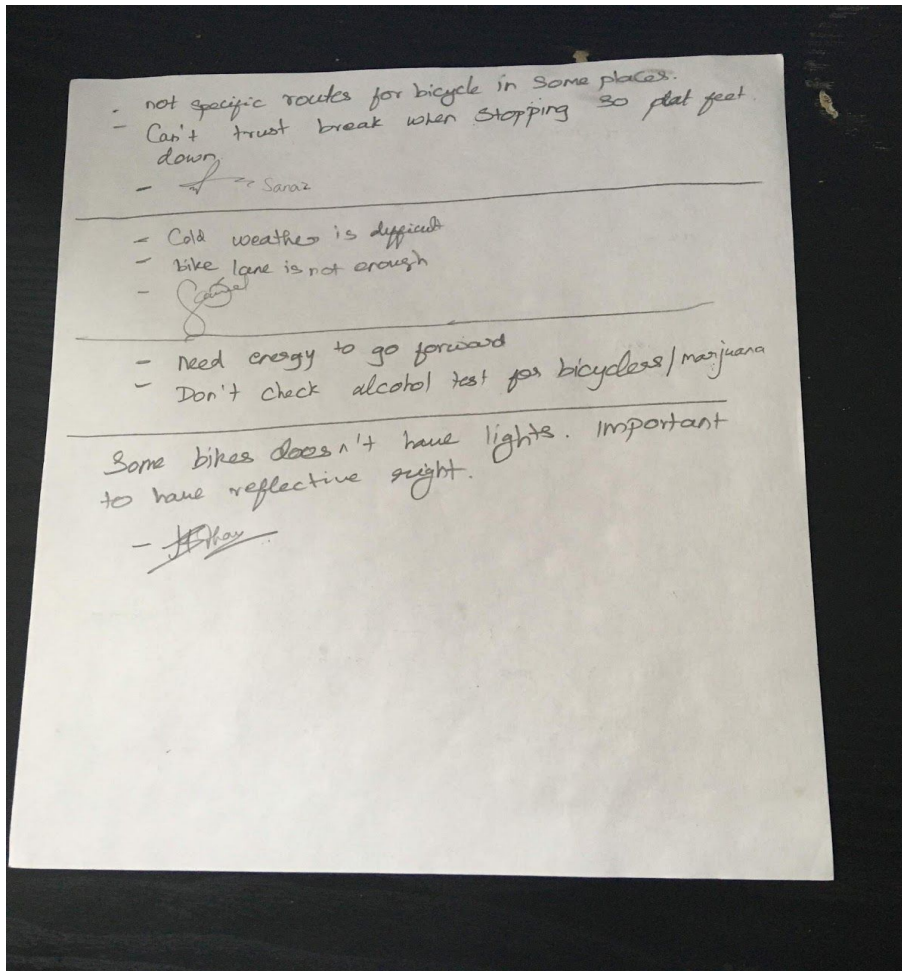


Figure 1 c: Primary Research

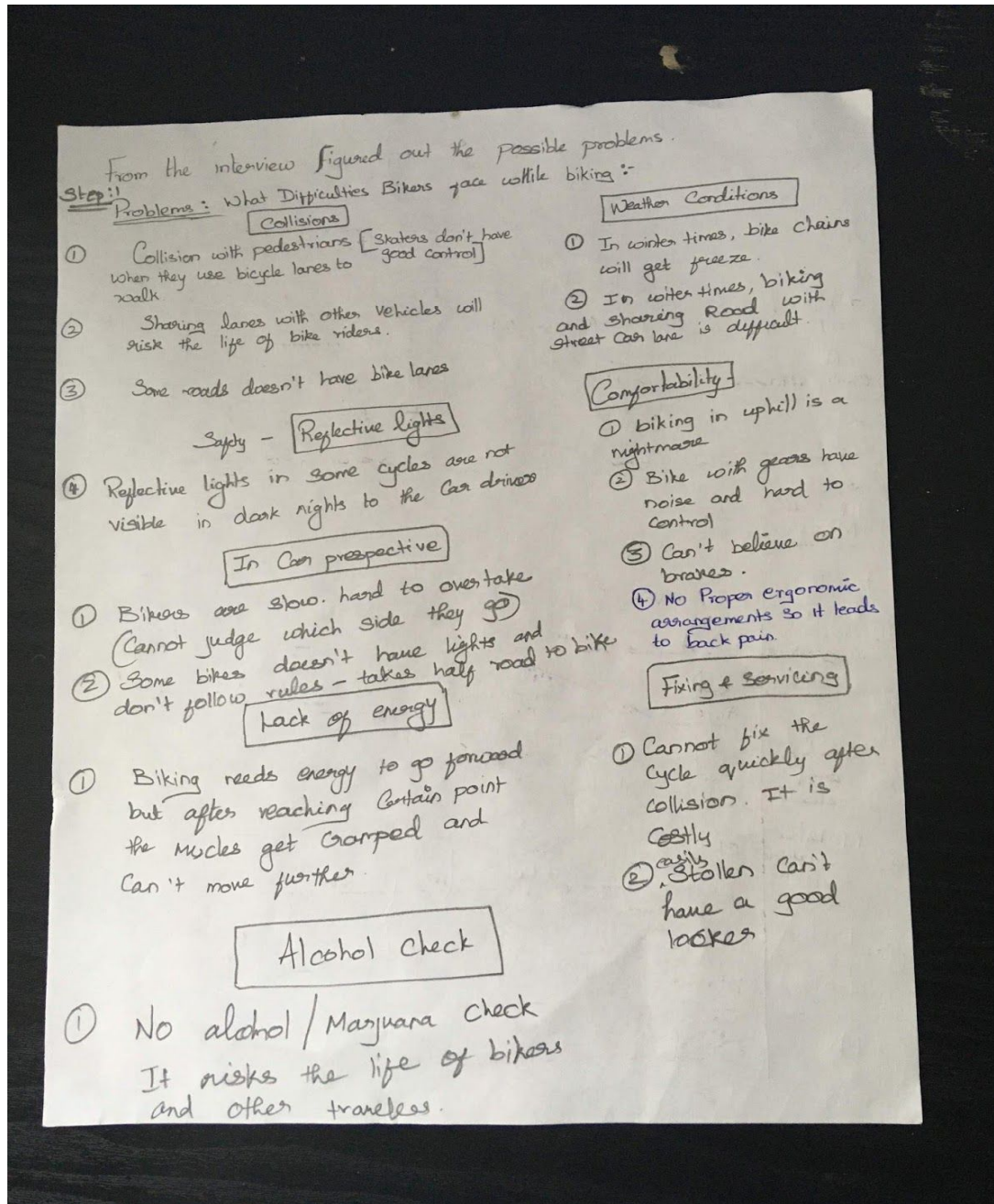


Figure 2: Identified some of the problems

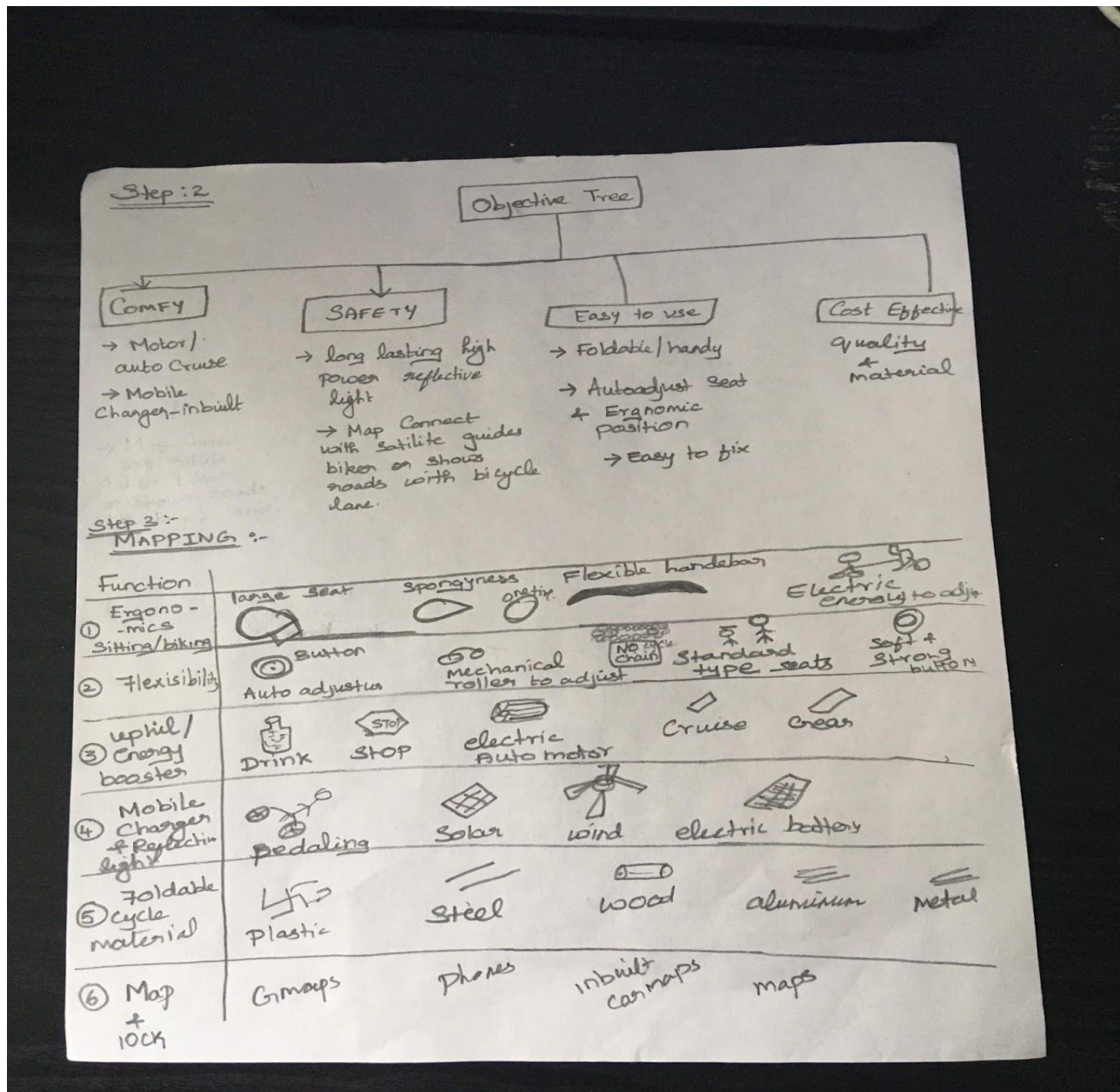


Figure 3: Objective identified and worked with morphing chart

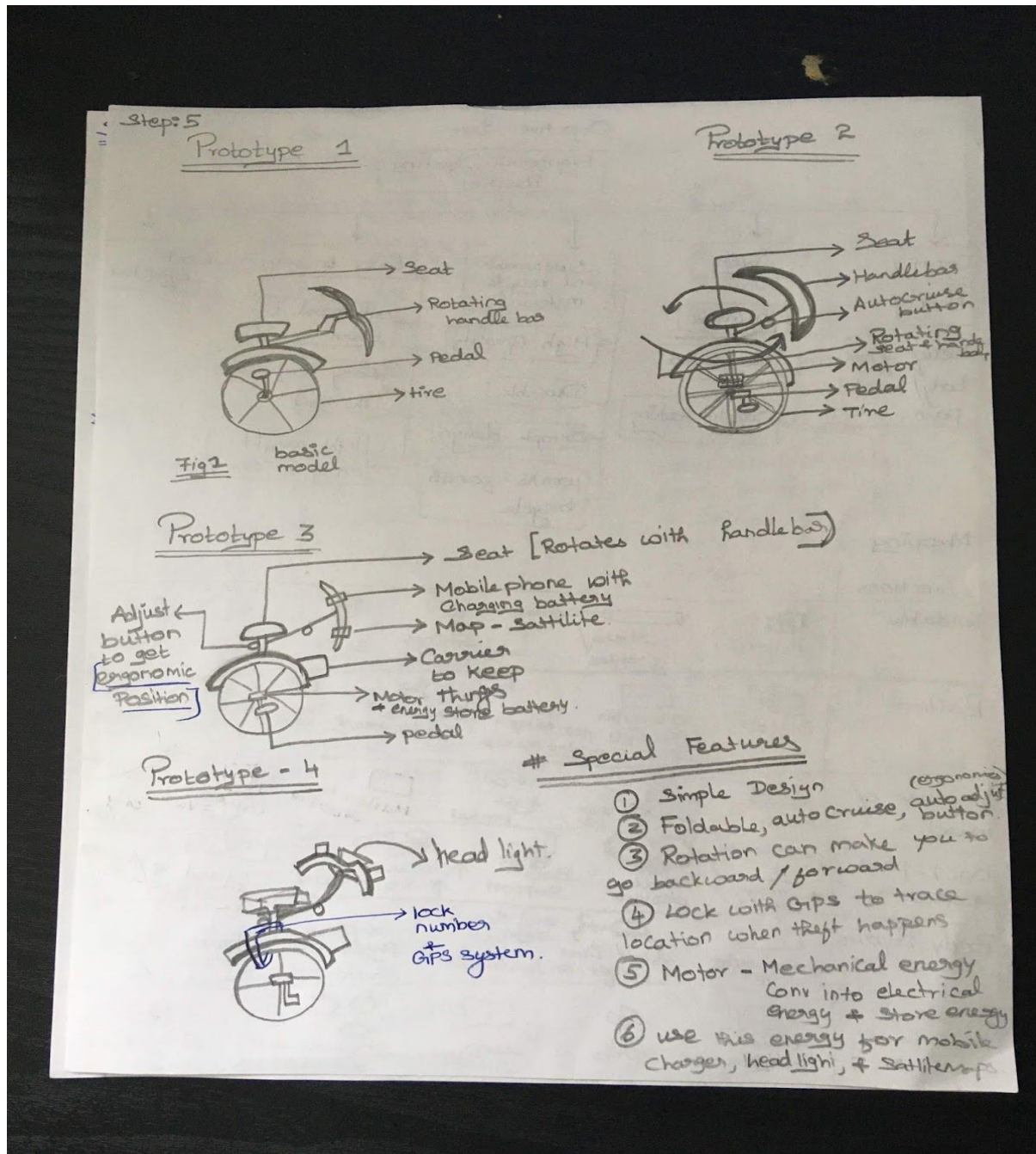


Figure 4: Designed prototypes

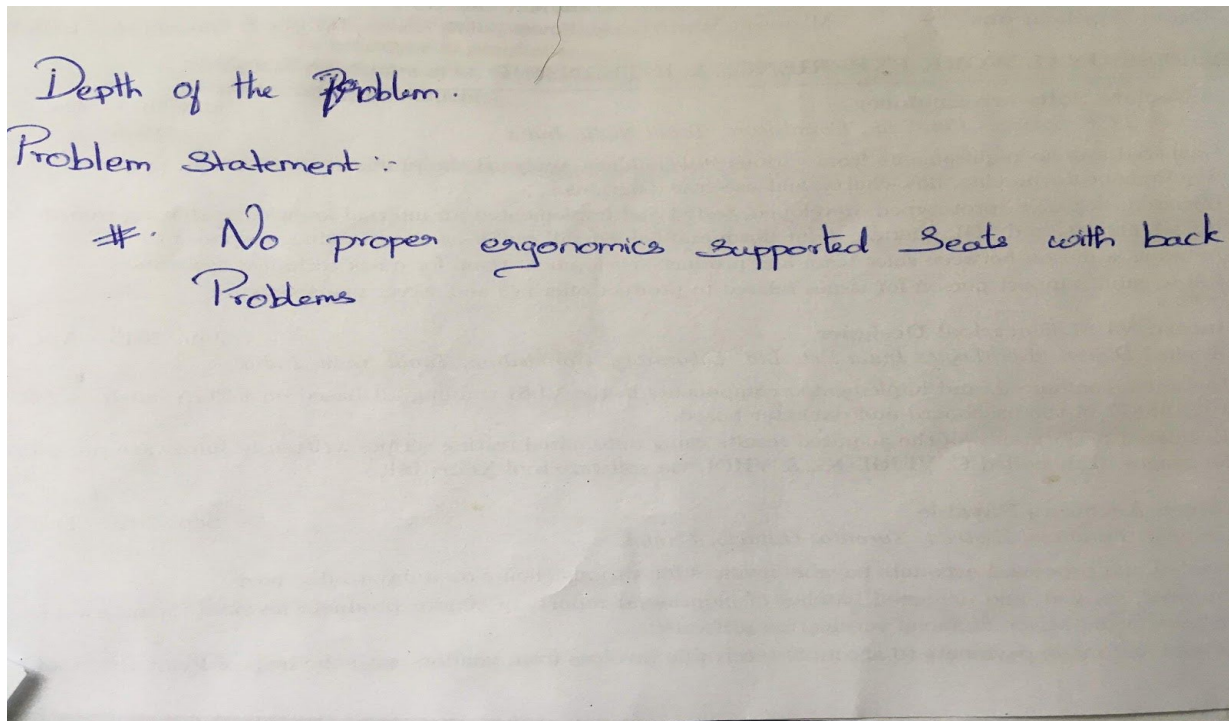


Figure 5: Focused on one specific problem for the bikers with back pain (Specific users)

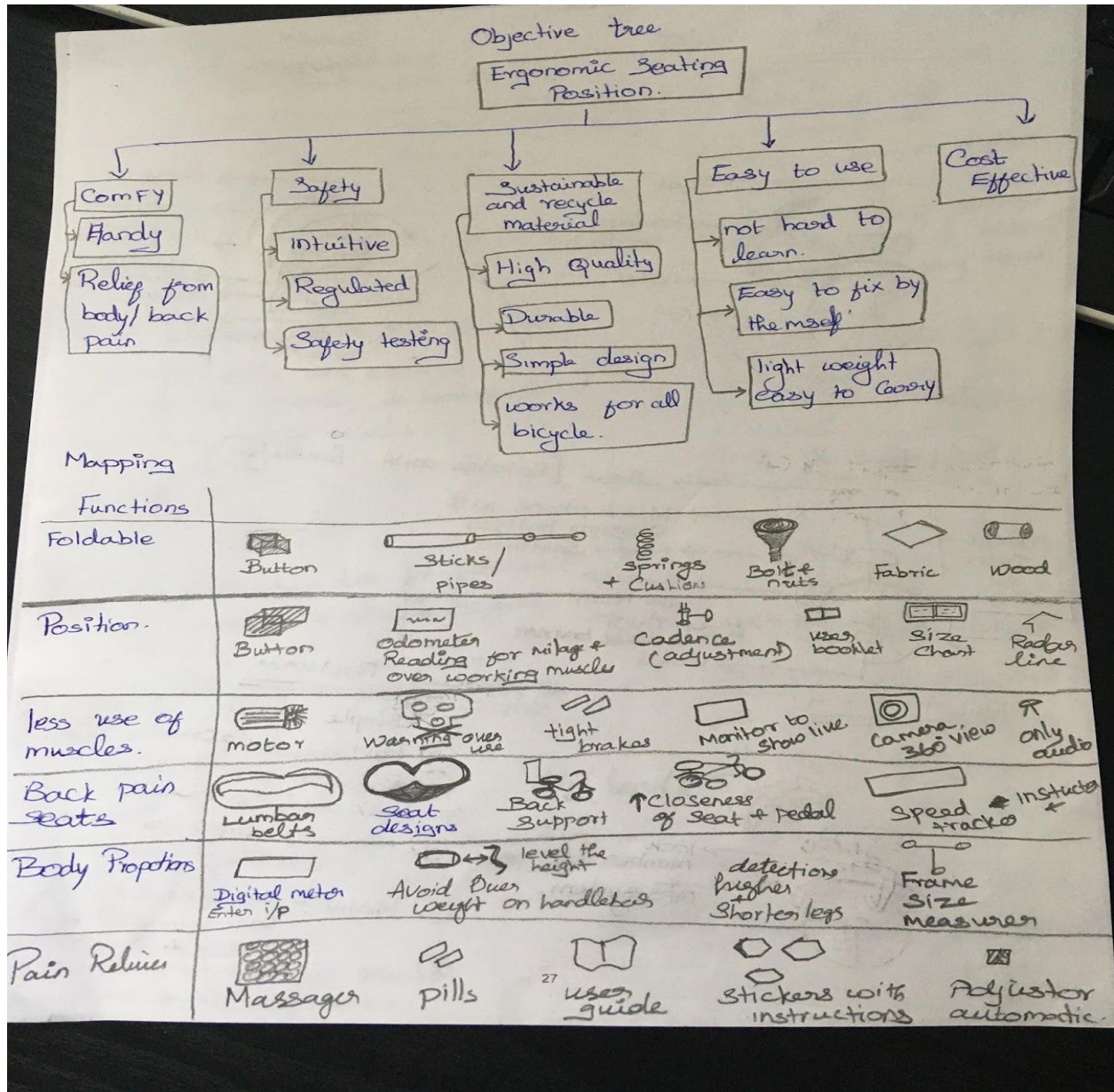


Figure 6: Objective and The Morphing Chart for the specific problem - "Ergonomics"

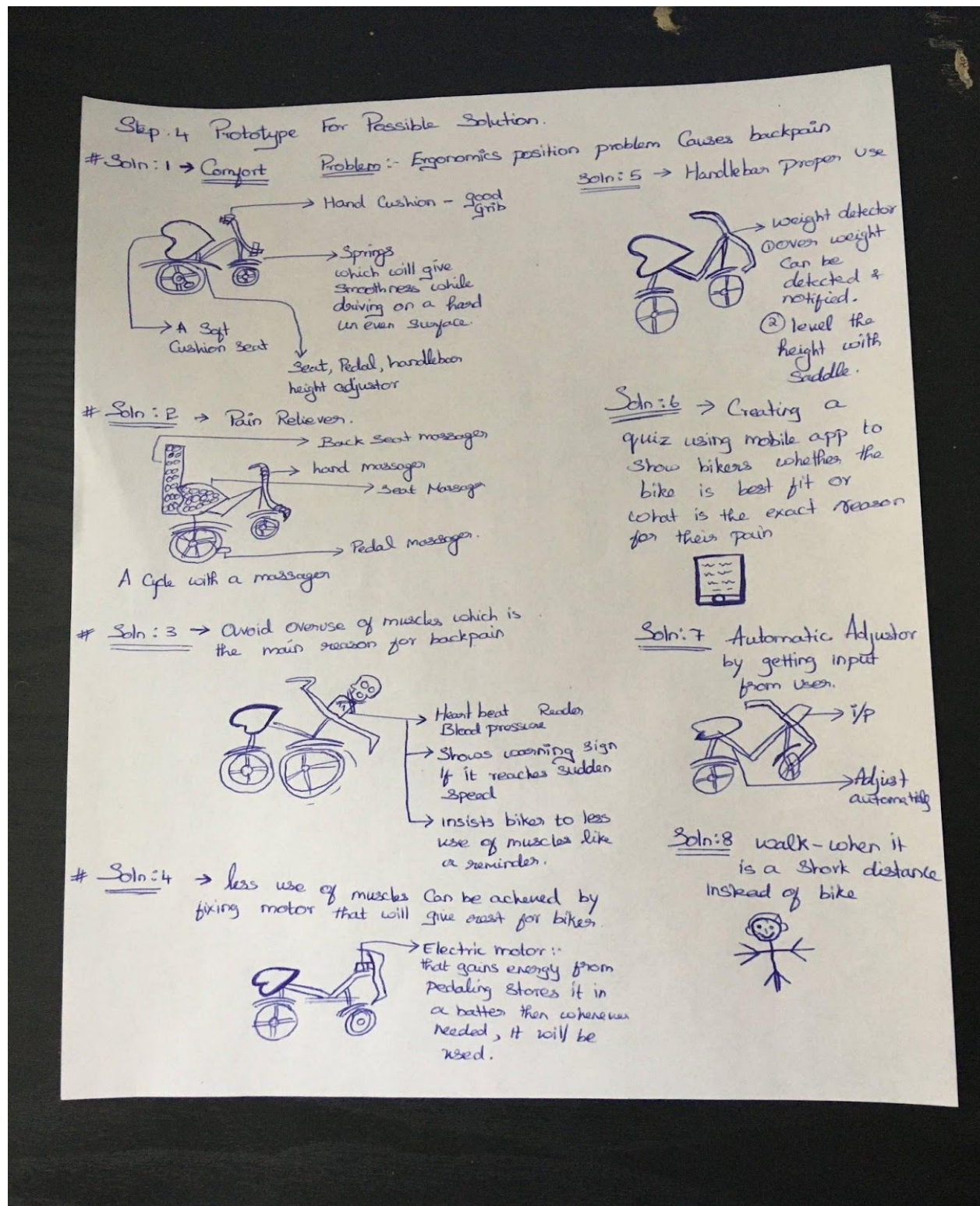


Figure 7 a: Prototype - possible solution - "Breadth of the Exploration"

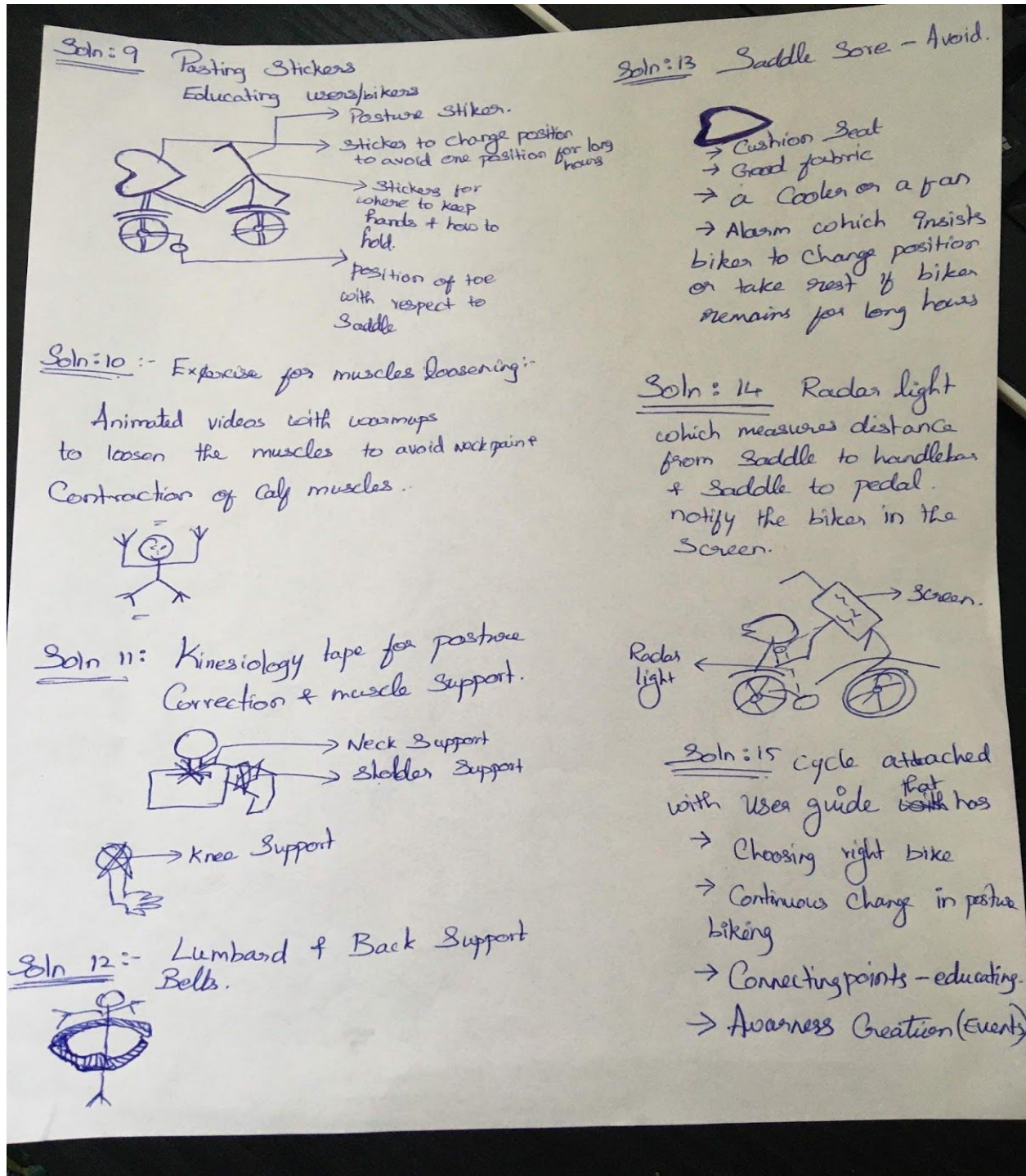


Figure 7 b: Prototype - solutions " Breadth of the Exploration"

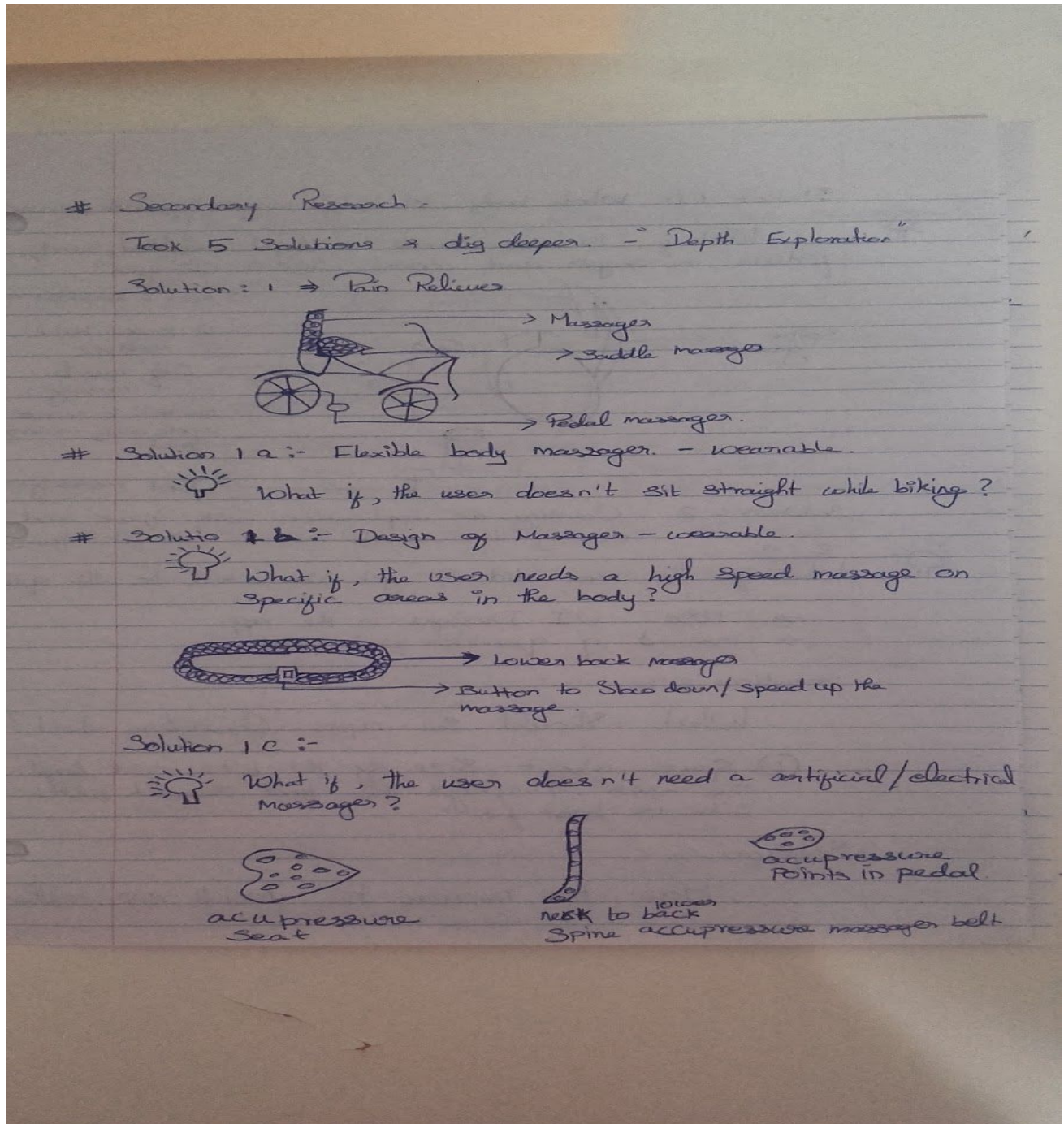


Figure 8: The depth of the exploration - worked deeper in solution "Pain Reliever"

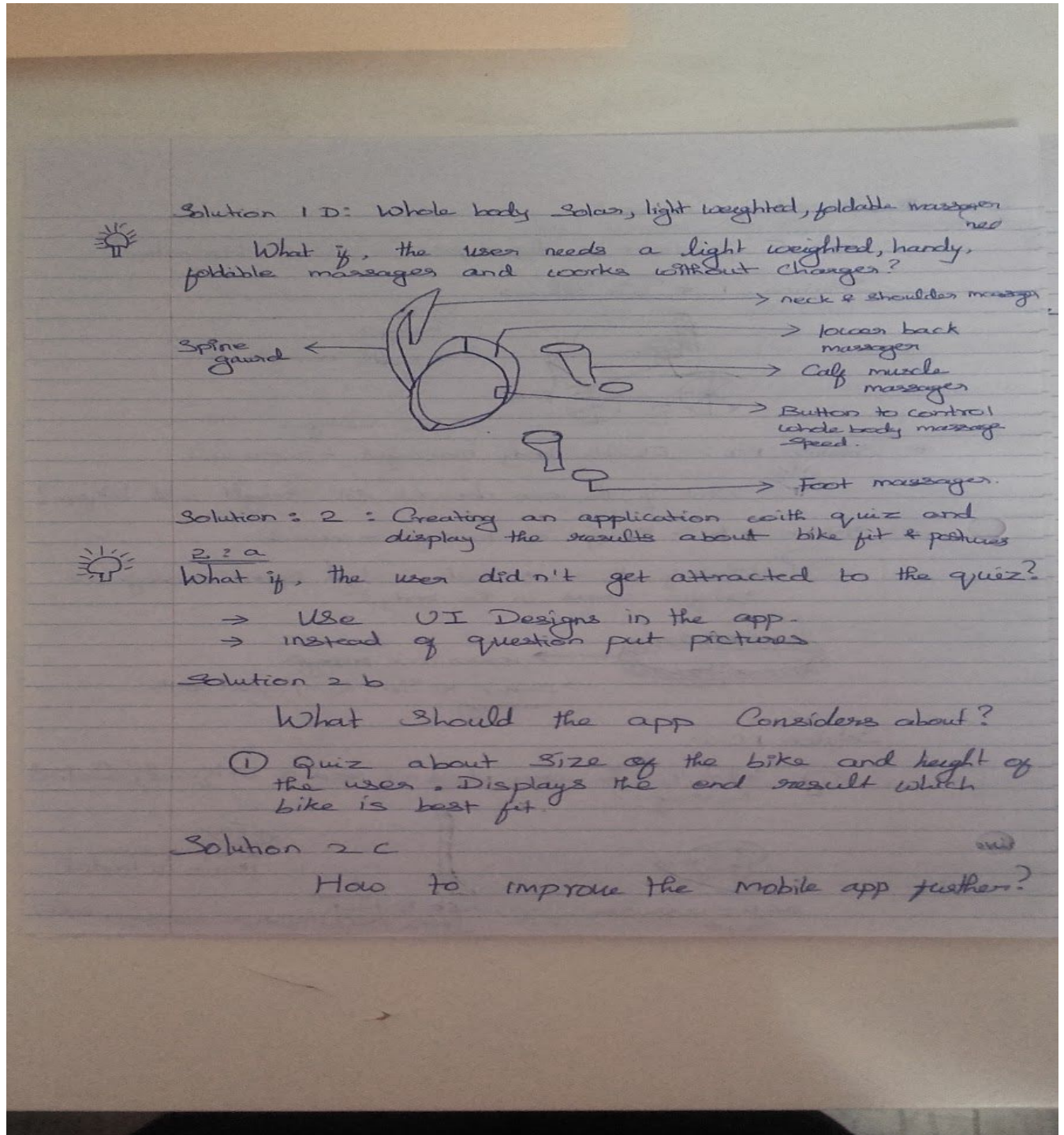


Figure 9: Worked deeper in the solution "Mobile Application"

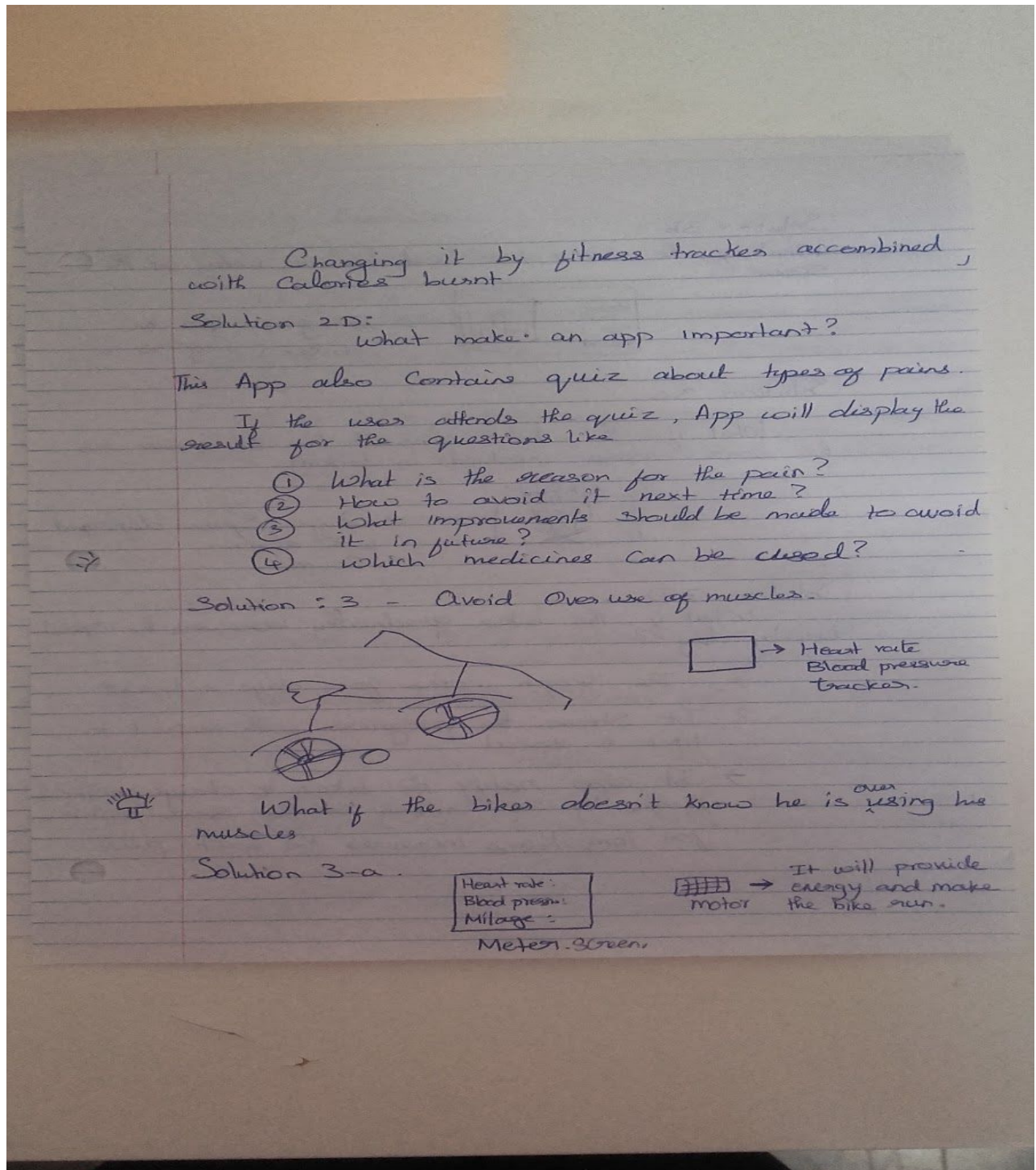
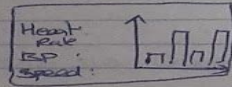


Figure 10 a: Worked in the solution for "Avoid over muscle use"

Solution 3b

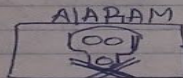
What if the user has hard time in reading at the screen.



Bar graph for the bikes progress

Solution 3c

What if the bikes doesn't see the screen as he was more involved in biking



Dangers Symbol displayed with alarm sound.

Solution 3D

What if, the bikes gradually increases the speed day by day?

- The graph works for days & hours
- It shows the progress with respect to time & speed.
- It also notify the bikes to change positions frequently as sitting in the same posture for long hours increases the back pain.

Figure 10 b: Developed the promising real solution - The depth exploration

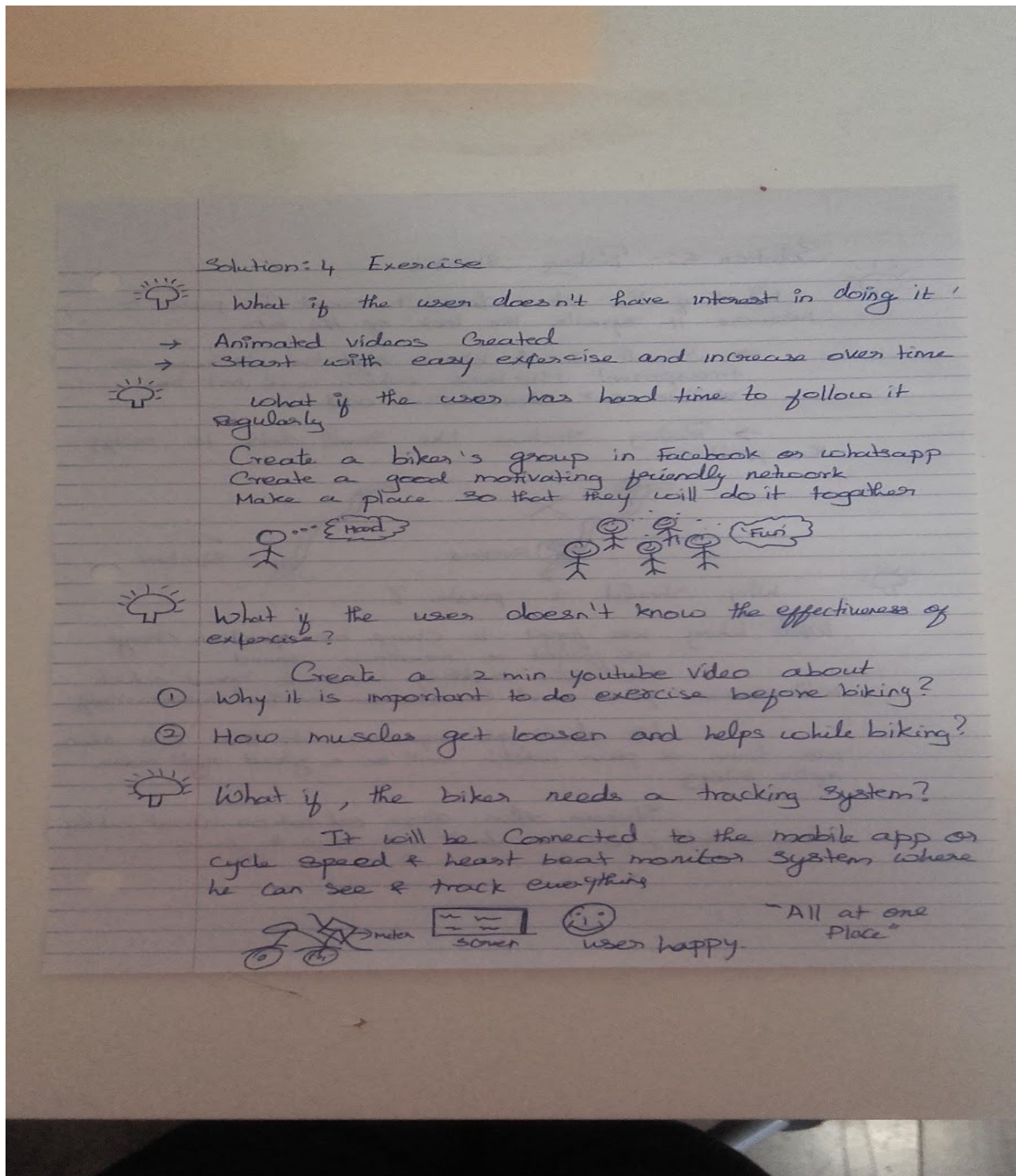


Figure 11: Worked in-depth in the solution "Exercise"

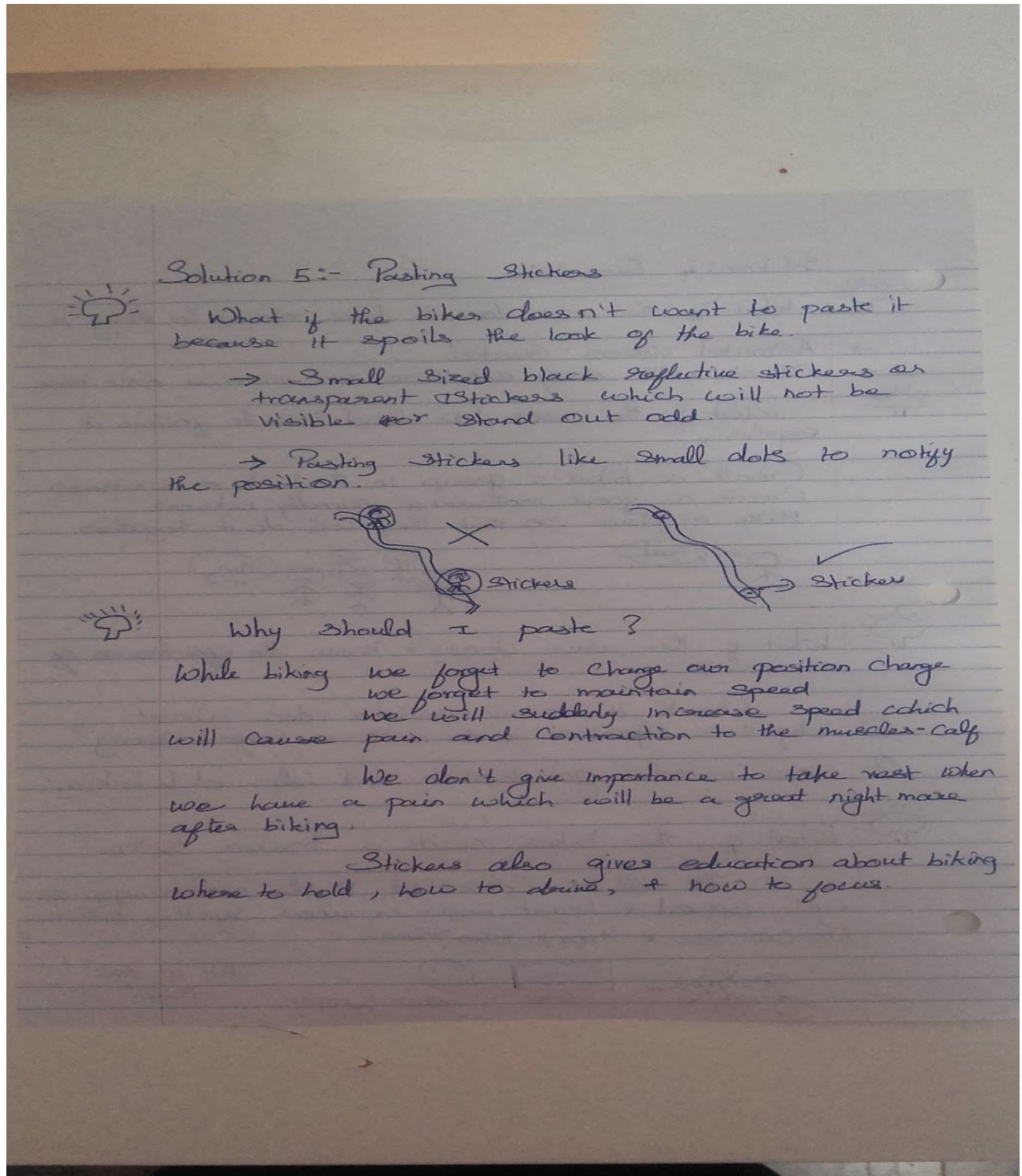


Figure 12: Worked in solution "Pasting Stickers" and developed the idea.

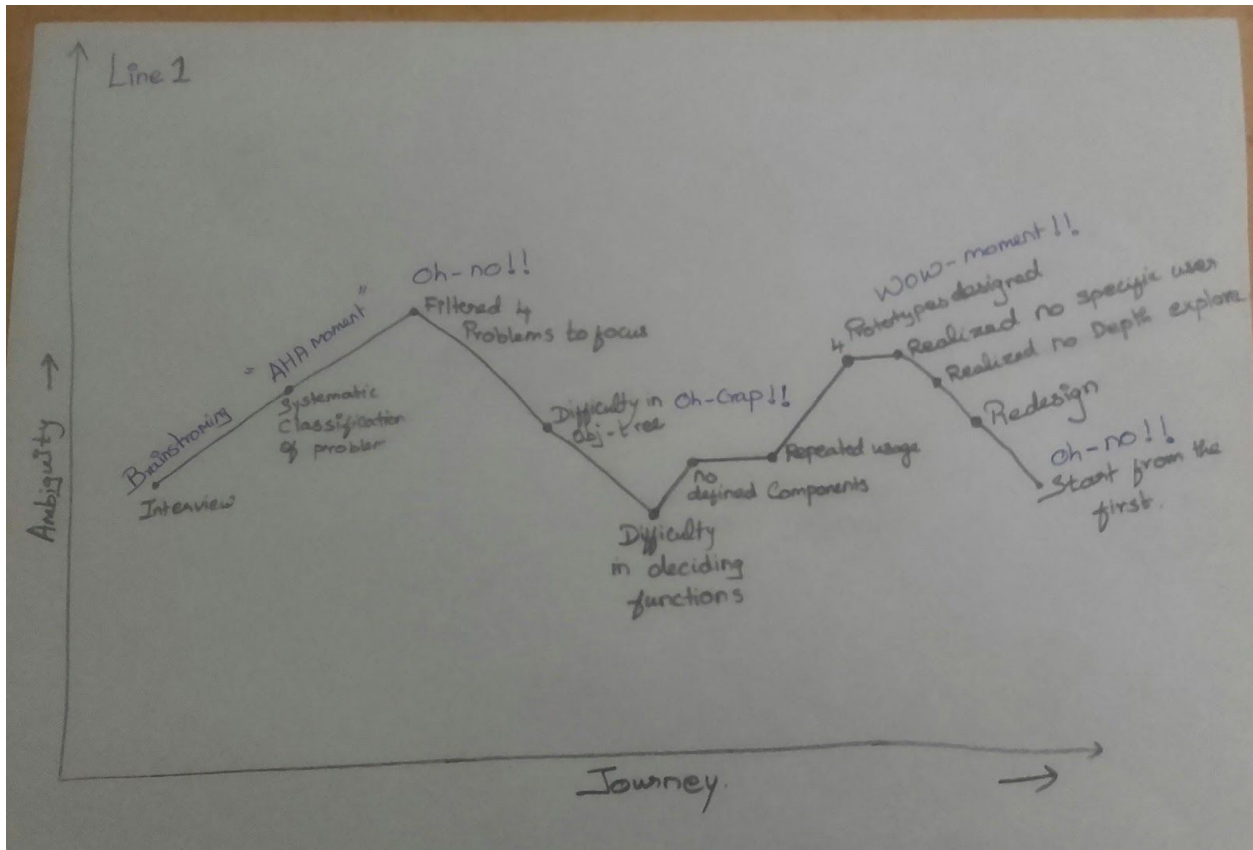


Figure 13 a : Line1- The work progress reached the dead end.

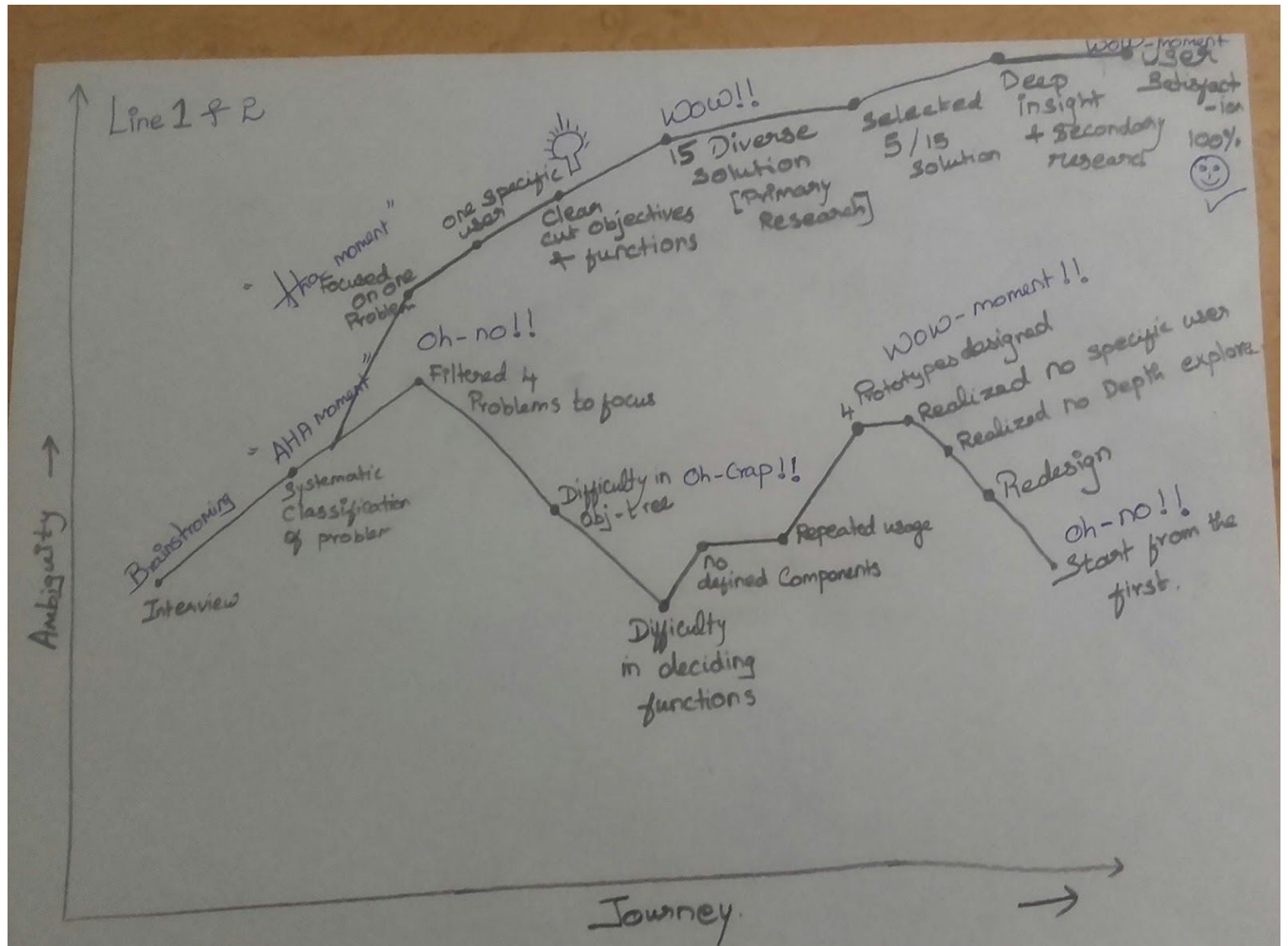


Figure 13 b: Line 2: Work progress graph that reached the 100% user satisfaction.