The case studies, presented in the following pages were prepared by three teams of Faculty Members in a few evenings. These problems are the very first attempt made by the teams. One can use these as a sample and one may be able to build his/ her design engineering problems, which may be much better.

Case 1: **Emotion-based Music Player**: Mood based automatic music player, gesture based automatic track change etc.

Pages 2- 5

Case2: **Farmers Friend:** To help the agricultural department manage soil test report data and help the farmer choose a crop to plant while increasing productivity and monetary gain.

Pages 6-10

Case 3: **Operating System for Gujarati Language**

Pages 11- 16

These Case studies can also be refered through the following YouTube link:

https://www.youtube.com/playlist?list=PLnNDkCrMqsxkfUJ0ISzT0IXAlOu3-WO65

You can also go through the YouTube links of various projects in the YouTube channel of GTU Innovation Council.

If you succeed in making a better design problem, please send it to Hima Bhatt at pa1tovc@gtu.edu.in so that it may be put on the YouTube-site for the others to see.

"Case study based on Faculty Development Programme on Design Engineering, a subject introduced in 3rd Semester of Engineering."

Date: 15th to 19th September 2014

Venue: 126, ACPC Building, LDCE Complex, Ahmedabad-15

Team : Computer Engineering
Prof. Sweta R. Garasia(GIT-012)
Prof. Mansi Vithalani(GIT-012)
Prof. Krunal Shah(GIT-012)

Engineering is a branch of Science and Technology where society expects lots of innovation and creativity from engineers. But today's education system has become very stereotype which just follows the traditional teaching learning process. This needs to be change in order to have maximum contribution from engineering students to the Society.

Design engineering is an initiative taken by Gujarat Technology University in this direction with the help and guidance of the professors of IITs and the GTU Innovation Council we are looking ahead in moving on the path of innovation.

This FDP is training session for all the Faculties affiliated to GTU so that we can convey correct methods and strategies to our Students so here we present the case study of the activities performed by us.

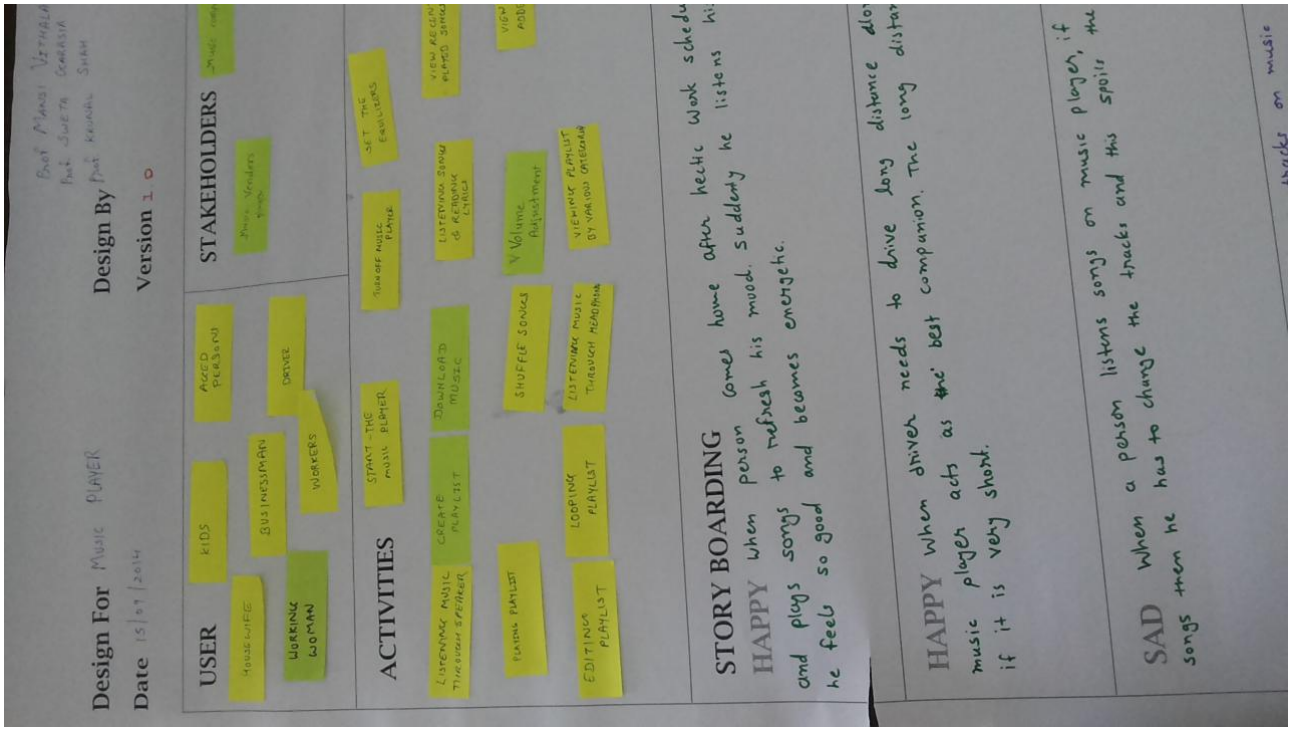
Design Engineering is a general term that covers multiple engineering disciplines including electrical, mechanical, chemical engineer, aeronautical engineer, civil, Computer Engineering, Information Technology and structural/building/architectural engineers. The uniting concept is a focus on applying the 'engineering design process, *in which engineers develop new products or processes with a primary emphasis on functional utility.*

While industrial designers may be responsible for the conceptual aesthetic and ergonomic aspects of a design, the design engineer usually works with a team of engineers and other designers to develop conceptual and detailed designs. He may work with industrial designers and marketers to develop the product concept and specifications, and may direct the design effort.

DAY 1: Hands on exercise on Story Boarding Canvas

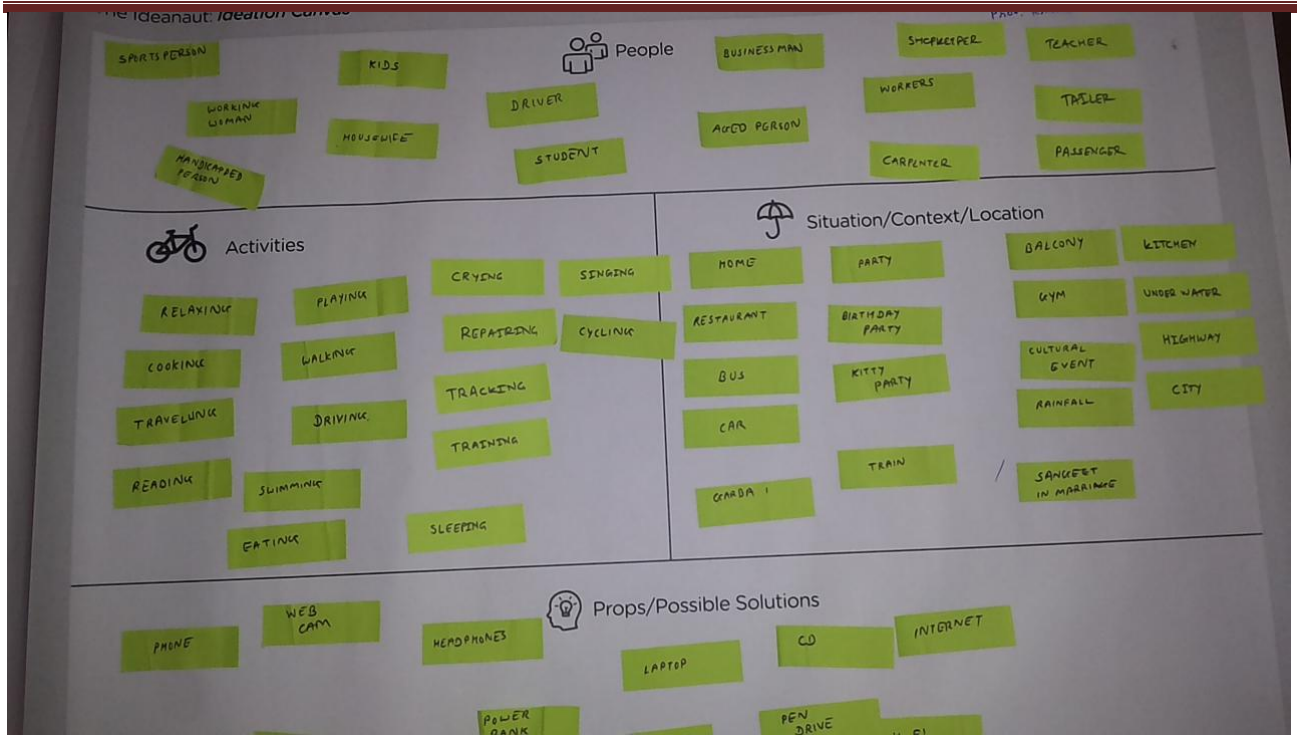
Understanding the problem of society is one of the biggest challenges for engineering student as till now they were making project on imaginary ideas. So the day 1 session was based on understanding the domains of the problem in broader sense which emphasized on interacting with

the people of your domain area which included more of casual talk rather than technical session. It focused on making people comfortable in discussing their problem with our students. And this activity was named as Story boarding canvassing. Here we would like to explain the aspects of this canvas with the help of the example taken up by our team. Our domain was Music Player, as we know there are a number of people that, despite not being professional musicians, are extremely moved by music and for whom music play a paramount role. We started with identify the people related to our domain directly and indirectly. Then list out the activities which are required for music player. As we need to focus on peoples emotions we wrote happy and Sad Story which helps us to get more attached with user.



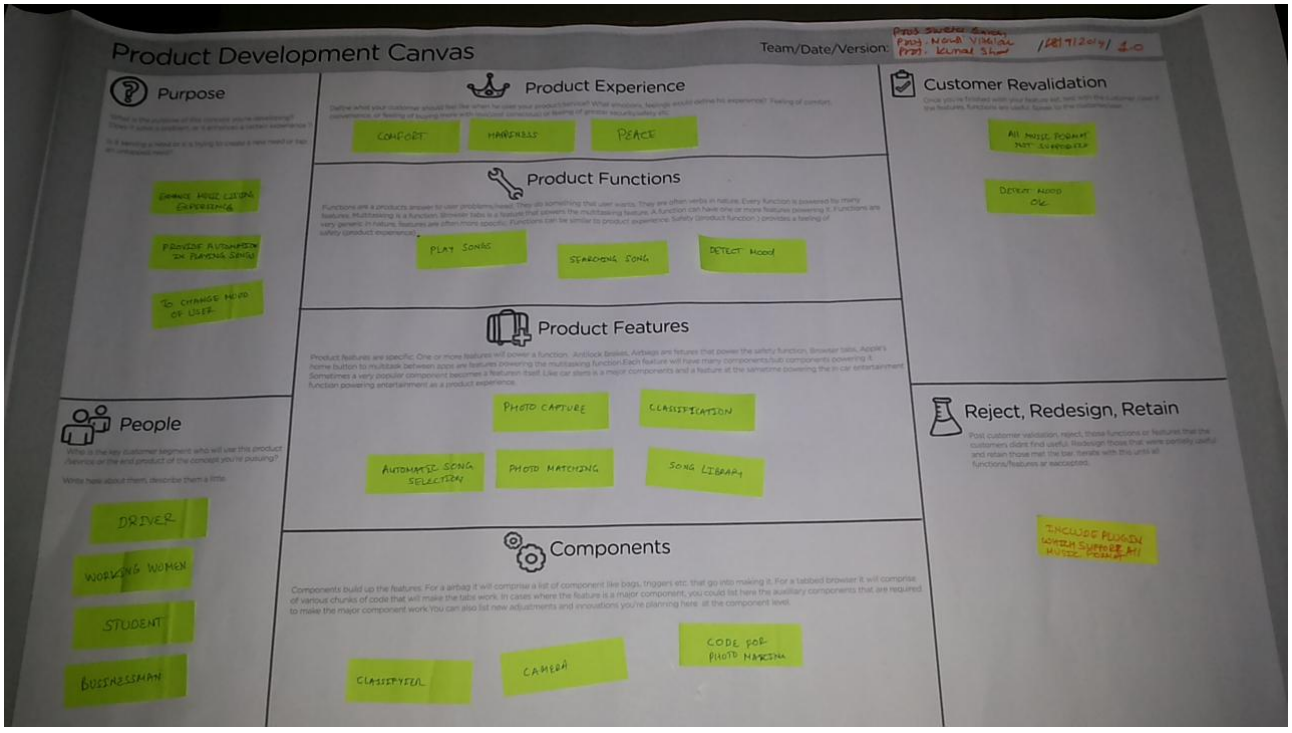
DAY 2: Hands on exercise on Ideation Canvas.

On second day we started with Ideation Canvas where first we started with people, where we simply thought about the people for whom we want to solve the problem. For our Product we listed the people like businessman, Working women, Student, kids, Drivers etc. Then list out whatever activity every segment of people do. Then thought for context/location/situation and finally for possible solutions .We conclude that people's emotions when using an interactive system do not only influence the current interaction process itself (e.g. short-time usage when being bored), but also the likelihood of reusing the system in the future as well as the effectiveness of the application's intention. So our problem definition which we wanted to develop is Emotion based Music player.



DAY 3: Hands on exercise on Product Development Canvas.

On third day of FDP we started with product development Canvas. Where we have mentioned purpose of our product, functions, features, revalidation, product experience. Purpose of our product was to change people's mood according to their present mood. For example pre-music mood of user is sad now music player identify mood and play a song based on Love songs with a happy ending or Disco/dance so post music mood of user will be hopeful or happy. We also visited other teams as a customer for User revalidation.



DAY 4: Hands on exercise on Venture Canvas

On the fourth day we started with Design thinking Venture Canvas, where we summarized our Product like people of Emotion based music Player can be businessman, Students, driver etc. Mutiple problems we listed are Mannual Track change, different file formats are not supported, need to start music player etc. We had chosen one key problem that was Manual Track change .Multiple solutions we listed were Mood based automatic music player, gesture based automatic track change etc. So we had chosen key solution that is Emotion based Music player.

DAY 5: Feedback on FDP

First we completed our Venture canvas then we had given feedback of experiences during this workshop.

Feedback:

It was very good and interactive session. It will improve creativity in our student, so once they started with design engineering it going to be very helpful for our society also.

Report on Design Engineering workshop

Example for computer engineering students

By: Prof. Kiran Acharya(Alpha College of Engineering & Technology)
Prof. Phenil Buch(Alpha College of Engineering & Technology)
Prof. Nitin Padariya(Shankarsinh Vaghela Bapu Institute of Technology)

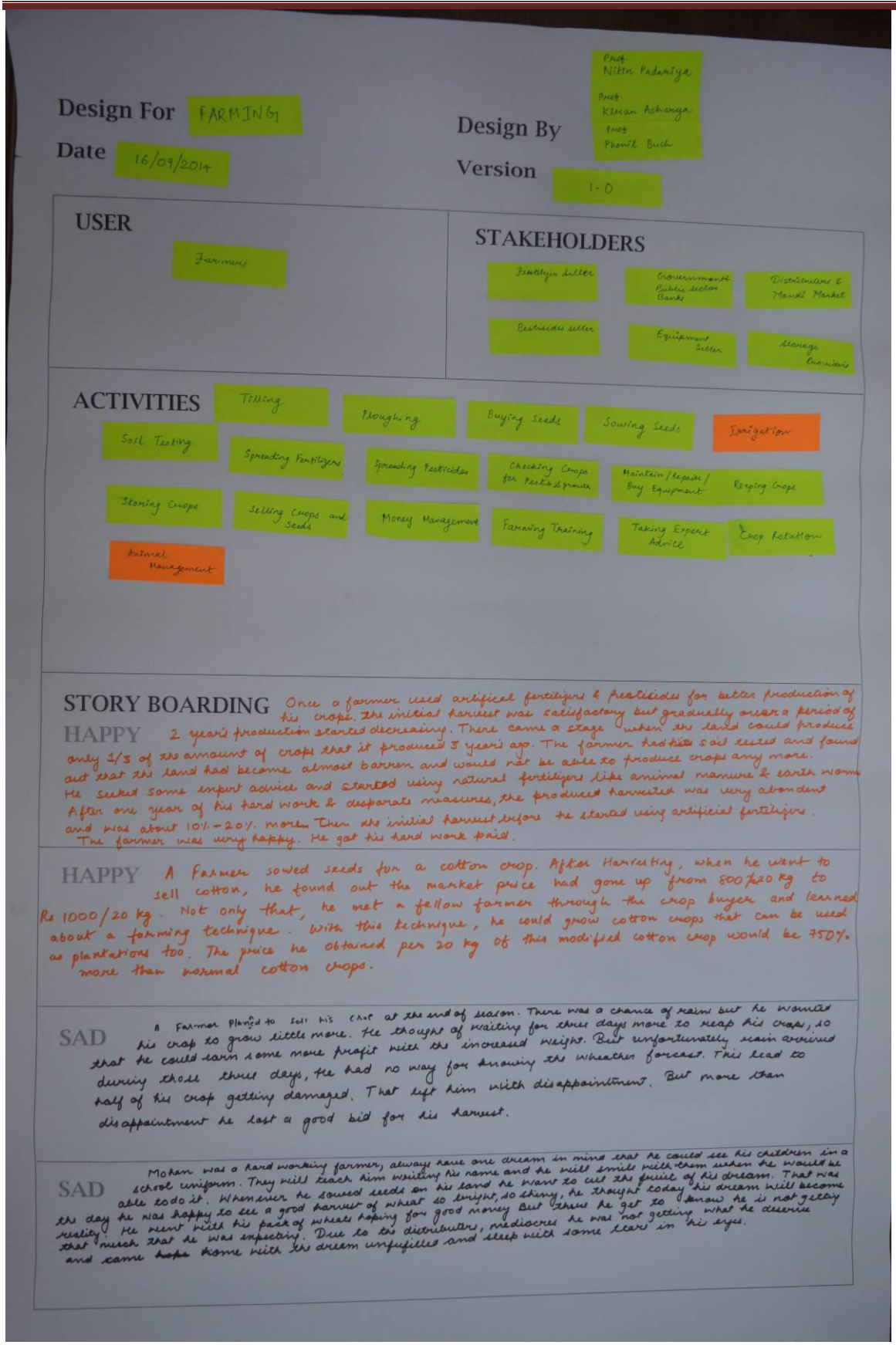
Canvas One (Empathize):

To define any user centric problem we need to know the user properly. That was what this canvas was all about. We thought of so many people but wanted to go for some people that mostly remain untouched by technology but are larger in number; we thought about farmers. They cover a large mass but are least touched with technology.

After that the next portion was stakeholders, who are the people that directly or indirectly make an impact on the life of the farmer, our user. After thinking we got so many names. The simple looking life of a farmer is surrounded with many stakeholders that make an impact on his life and profession. They were fertilizer distributors, pesticide sellers, Agriculture department, Private-Public sector banks and lastly storage providers.

'Activities' was the next portion, in which we had to include the activities that farmers carry out in their life. We tried to note down all the activities that he does in the process from growing the crop up to selling the crop. One after another the number of activities started growing. So much is to be done in growing the food that we easily cook at our places.

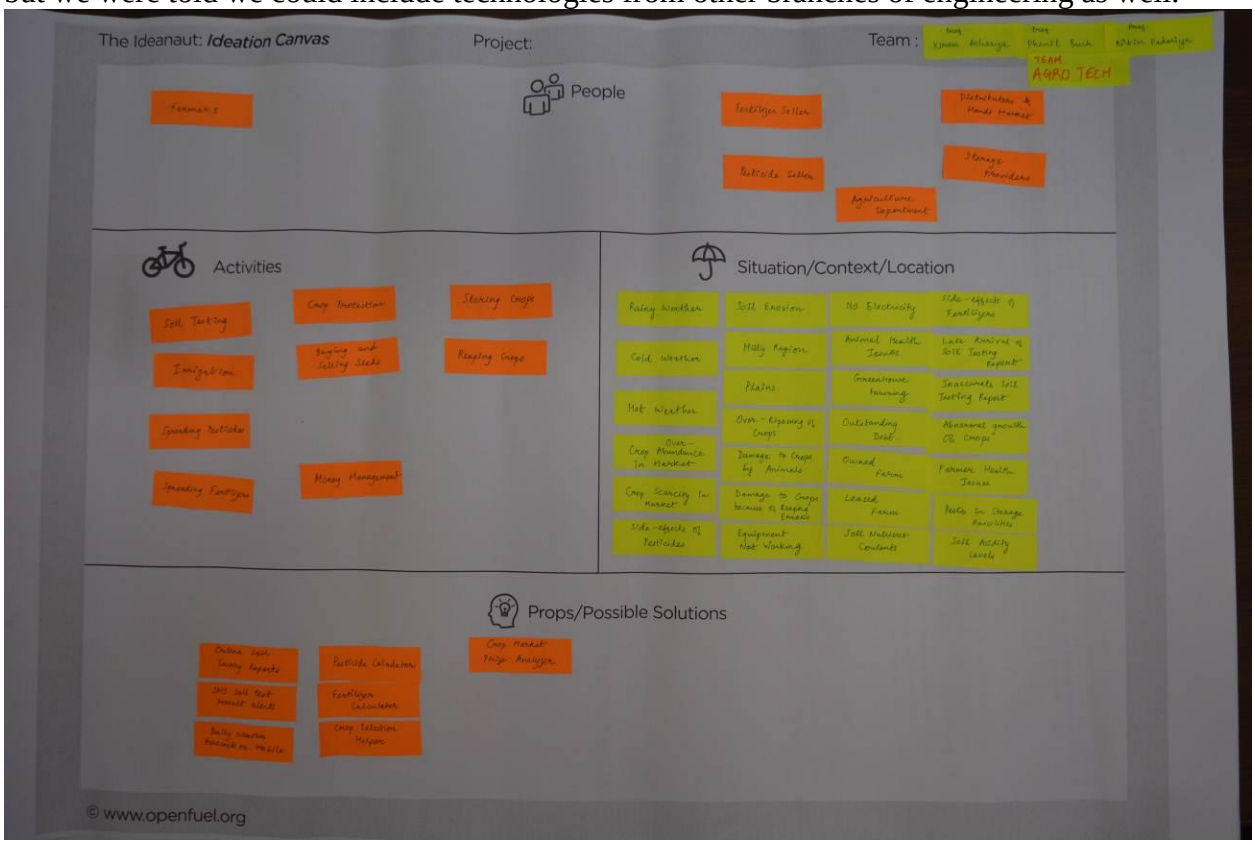
Last and the most interesting part was the 'Story Boards' which can be called the board of emotions. It helped us understand that when we build anything for anyone, the purpose and emotion behind that are equally important. So many stories were striking to our minds and we drafted the four which we thought were connected to the roots of being a farmer. This process somehow gave us a feeling of being in the shoes of a farmer, and with that the first canvas was complete.



Canvas Two (Ideation): After getting to know the user and his activities, the next step was to know his problems. But to do that we had to come up with possible contexts, situations and locations of the farmer's activities. Because only after discussing the various possibilities of how several activities need to be done, can we find out the activities that are difficult for the farmer to

perform.

Engineering is after all about helping people through technological solutions, making processes simpler and less cumbersome. We thought about how farmers had to take care of their farms in different weather conditions. How would he deal with activities like crop protection when a situation had risen where the farmer fell sick? How would he have to alter his crop reaping activity when he was growing a particular crop, in a particular season and a particular type of landscape?
We found out that farmers faced all kinds of problems from deciding the amount of fertilizers/pesticides to be used to deciding which crop to sow seeds of. We found out which factors played important roles in their farming activity as a whole. These factors included weather, farm landscape, crop market prices, soil acidity and nutrient levels, health of the farmer and his animals and the condition of the equipments he uses.
Then arrived the next portion of finding possible solutions. Here we had to list all the ways in which the problems of farmers could be solved. Our team belongs to the computer engineering department but we were told we could include technologies from other branches of engineering as well.



Canvas Three (Product Development): Now arrived the core part of the design process. We had to design a product based on a key solution. A key solution according to our understanding was a solution which solved a key problem. Out of the many possible solutions for multiple problems that we listed down in the ‘Ideation’ phase, we recognized some problems that if solved would be very emotionally rewarding to the farmer and functionally rewarding to the agricultural department of India.
The first thing we had to do was clarify the purpose of our product. Our purpose was clear: help the agricultural department manage soil test report data and help the farmer choose a crop to plant while increasing productivity and monetary gain.
For this purpose, we defined some Functions that our product must do. These included, Soil Testing Report Data Management, Crop Selection and Fertilizer & Pesticide Management.
For each of the function that our product fulfilled, we had to include one or more features that supported that function. The features of Water Requirement Calculator, Crop Analyzer and Crop

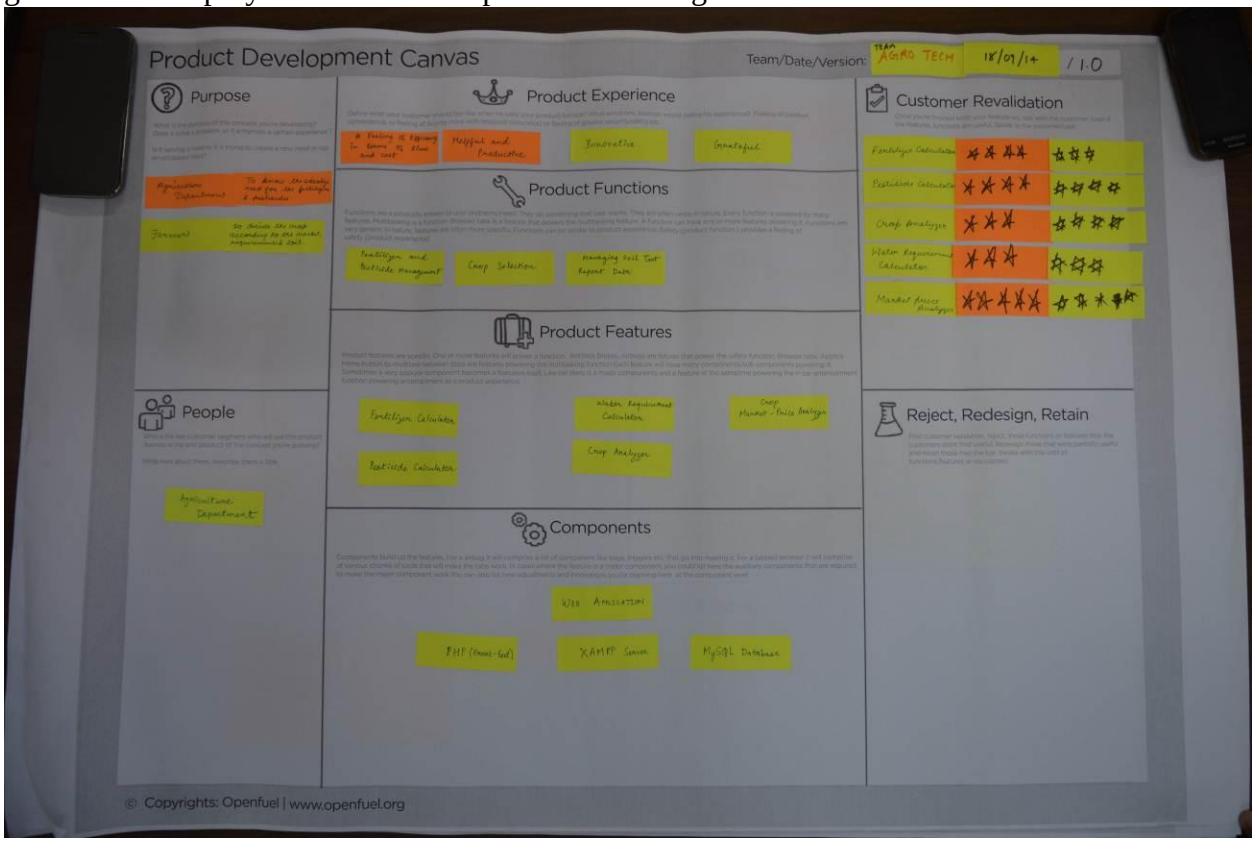
Market Price Analyzer would help in the selection of crops to plant. The features of Fertilizer Calculator and Pesticide Calculator would help manage the amount of fertilizers and pesticides that the agricultural department provided to some farmers. This would also help curbing of black market selling of fertilizers and pesticides and stop wastage of supplies.

Our Product was a Web Application, whose components we had to list in the next portion. We chose PHP as front-end, a XAMPP server and MySQL server.

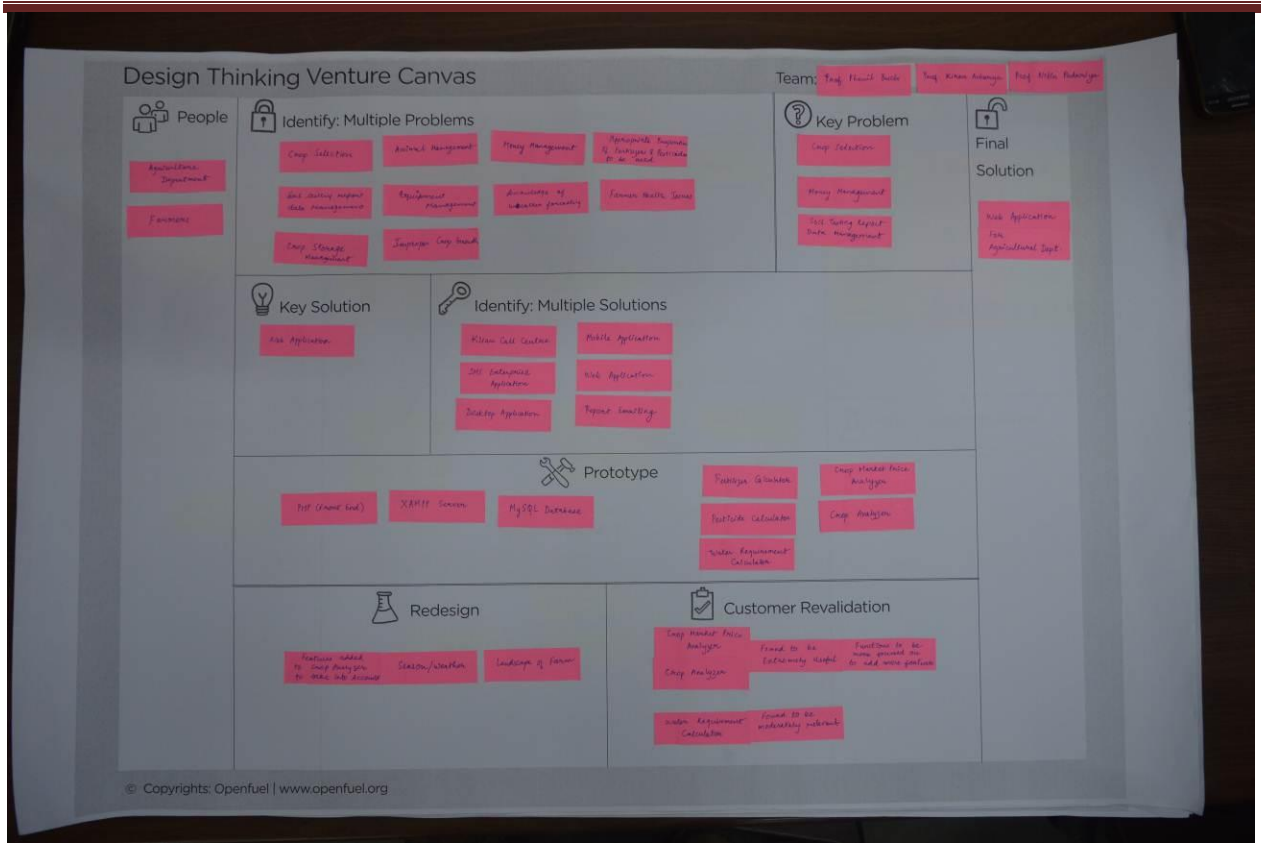
In the next section we had to revalidate our product with the help of customers, who were, for the moment, other teams that were working like us on different designs. Most of our features were validated as extremely useful by other teams.

We had to redesign some features in the next section. These features were both the ones that were extremely useful and the ones that were moderately relevant. We optimized the features that were useful and made them even better. For example, our crop selection function depended on data from the soil testing report only, which might not include the landscape type of the farm or what season is currently going on. So we integrated these factors to display the possible crops that the farmer could plant based on all of this data including the soil testing report data.

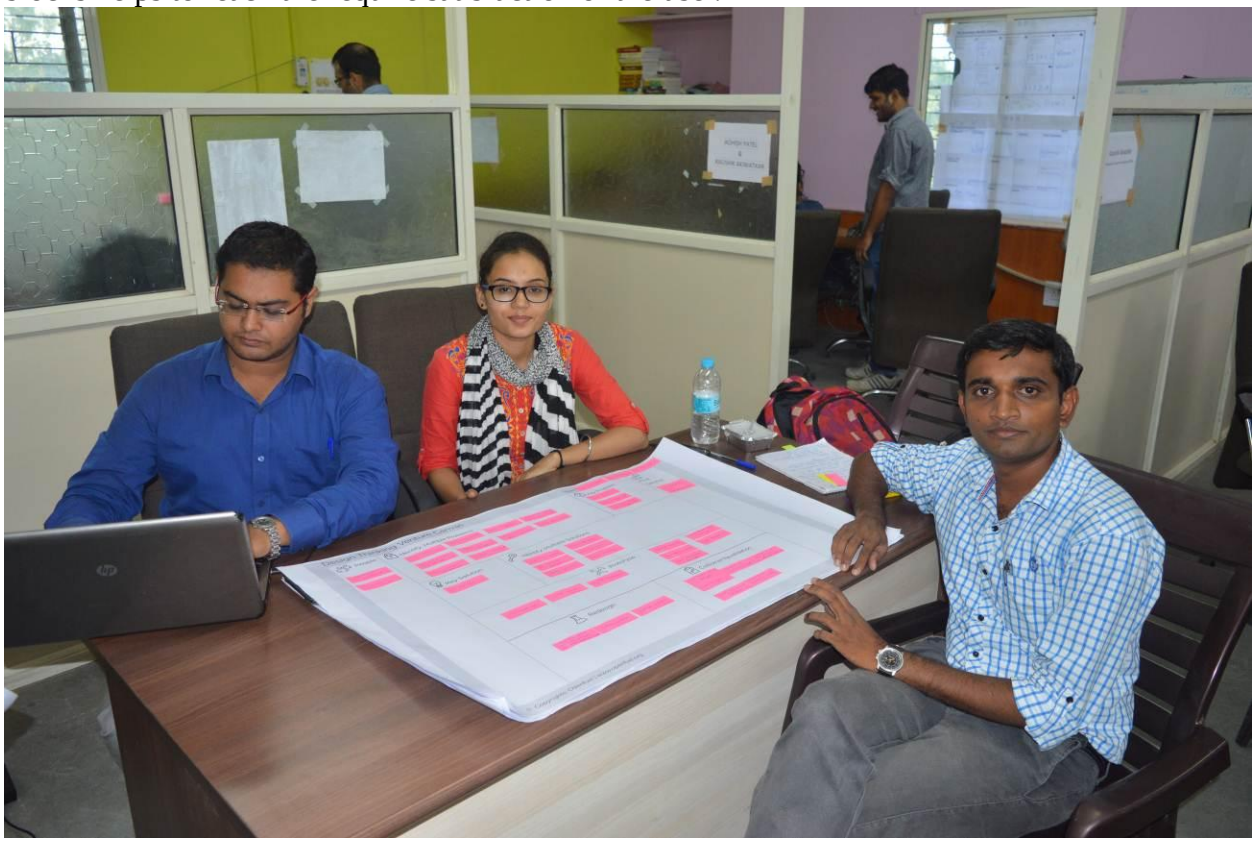
There was a section on this canvas where we had to write down about customer experience. Here we had to write what the user would feel when using our product. We wrote about how the work of government employees would be simplified and how grateful and innovative the farmer would feel.



Canvas Four (Design Thinking Venture Canvas): This canvas was a summarization canvas for all the other canvases we used during the designing process. People are the part of fist canvas that is empathizes. We reached to the final entities of this block through the whole process; those were agriculture department and farmer. Identifying the problem and solution signifies our second canvas, which is ideation canvas. Next was Prototype, Redesign and customer revalidation signifies the product building canvas and the last block was final solution on which we arrived. That is web application for agriculture department.



Journey of the Workshop: There is huge change in thinking of a problem. Designing really helps to find a way to concentrate on the actual requirement of the user. Revalidation and redesign blocks helps to reach the require satisfaction of the user.

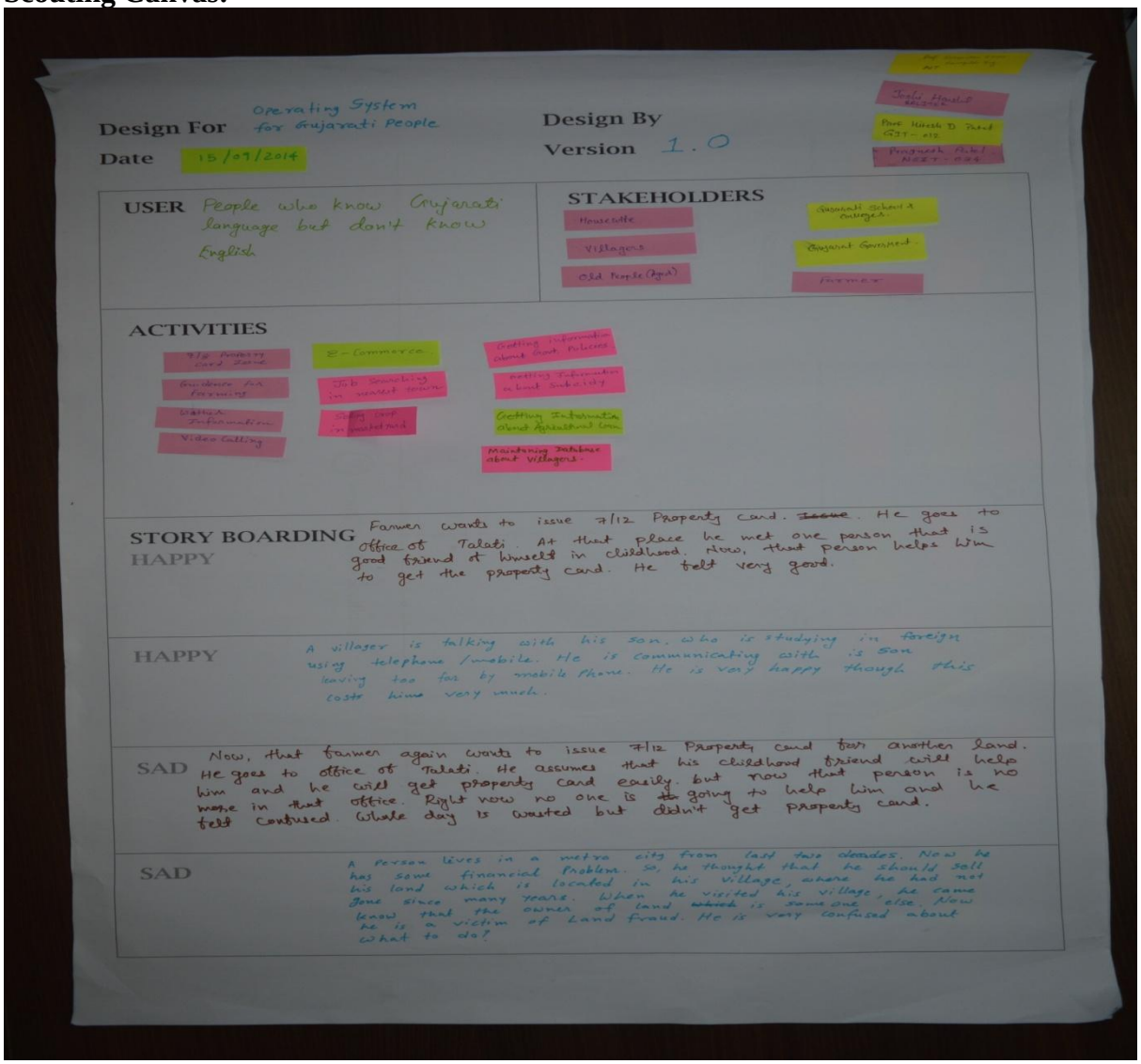


Team details:

1) Prof. Satyadev Vyas (AIT) Email: hod_ceait@gmail.com contact: 9825360643
2) Pragnesh Patel(NSIT) Email:pragnesh.patel@nsitgurukul.com contact: 7383501284
3) Hitesh Patel(GIT) Email: Hitesh.patel2@git.org.in contact: 760003058
4) Harshil Joshi(SAL) Email: harshil@yahoo.com contact: 8128989597

We had no idea what was required in Design Engineering. Initially it was explained to us by GTU Innovation Team by giving examples of similar courses elsewhere specifically Stanford University and IIT Delhi.

Scouting Canvas:



First task was to complete a scouting canvas. As the time was limited and we could not move out and scout for the problems we discussed within our team. There were problems galore. But we short listed two. One was students data to be kept by faculties and other was use of computers by non-English speaking Indian. After discussion within team members, it was decided to go for the use of computers by non-English speaking Gujarati folk. Gujarat Govt. is fully committed to e-everything, hence use of computers is becoming essential. We started filling in the canvas. Detailed description of the canvas is as below:

User: People who know Guajarati language but do not know English and hence have problems using computers.

Activities:

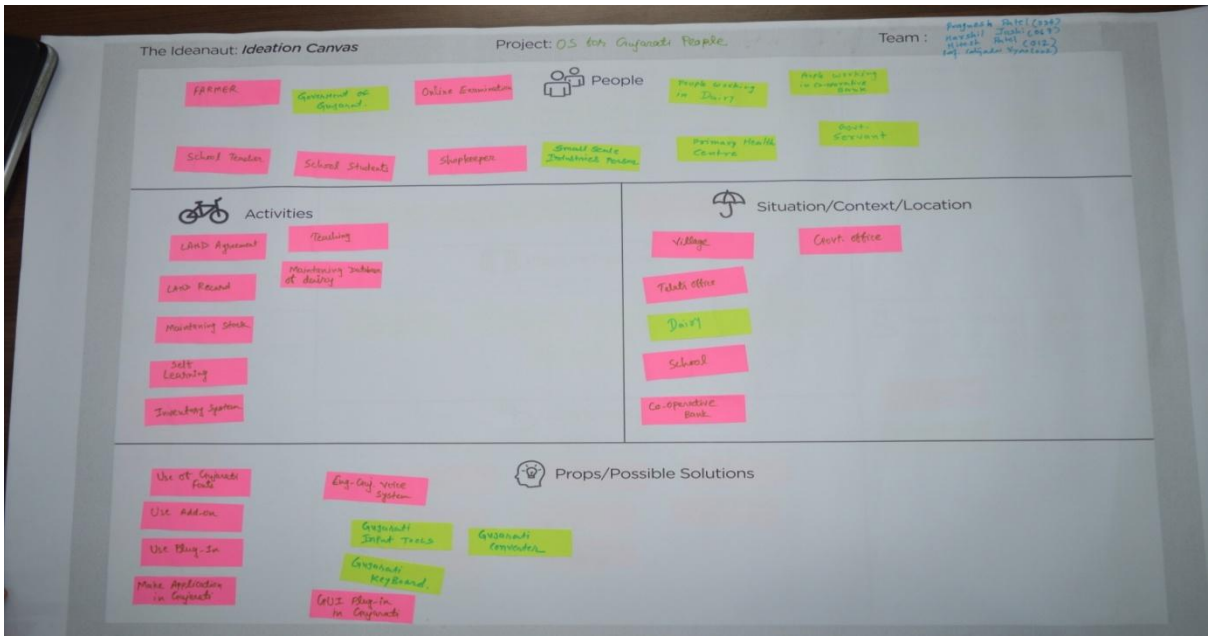
- 7/12 property card issue
- Weather information gathering mainly by farmer
- E-commerce
- Getting information about government policies and services
- Selling crop in market yard
- Maintaining data about villagers
- Communicating with people living too far with technologies

Stakeholders:

- Housewife
- Villagers
- Old people
- Gujarati school
- Government of Gujarat
- Farmer

We provided two sad and two happy emotional stories highlighting the difficulties being faced.

The Ideation Canvas:



Second task was to create **"The Ideation Canvas".** We described activities of people and situations or locations where they are facing problems. This canvas is very helpful to reach near our goal. This canvas helped us to know what are the areas which need focus.

People:

- Farmer
- Government of Gujarat
- Staff of Dairy
- Co-operative bank
- Primary Health Centre
- Student
- Teacher
- Small Scale Industries

Activities:

- Land agreement
- Land record
- Maintaining stock
- Self learning
- Inventory System
- Teaching
- Maintaining Data of Dairy

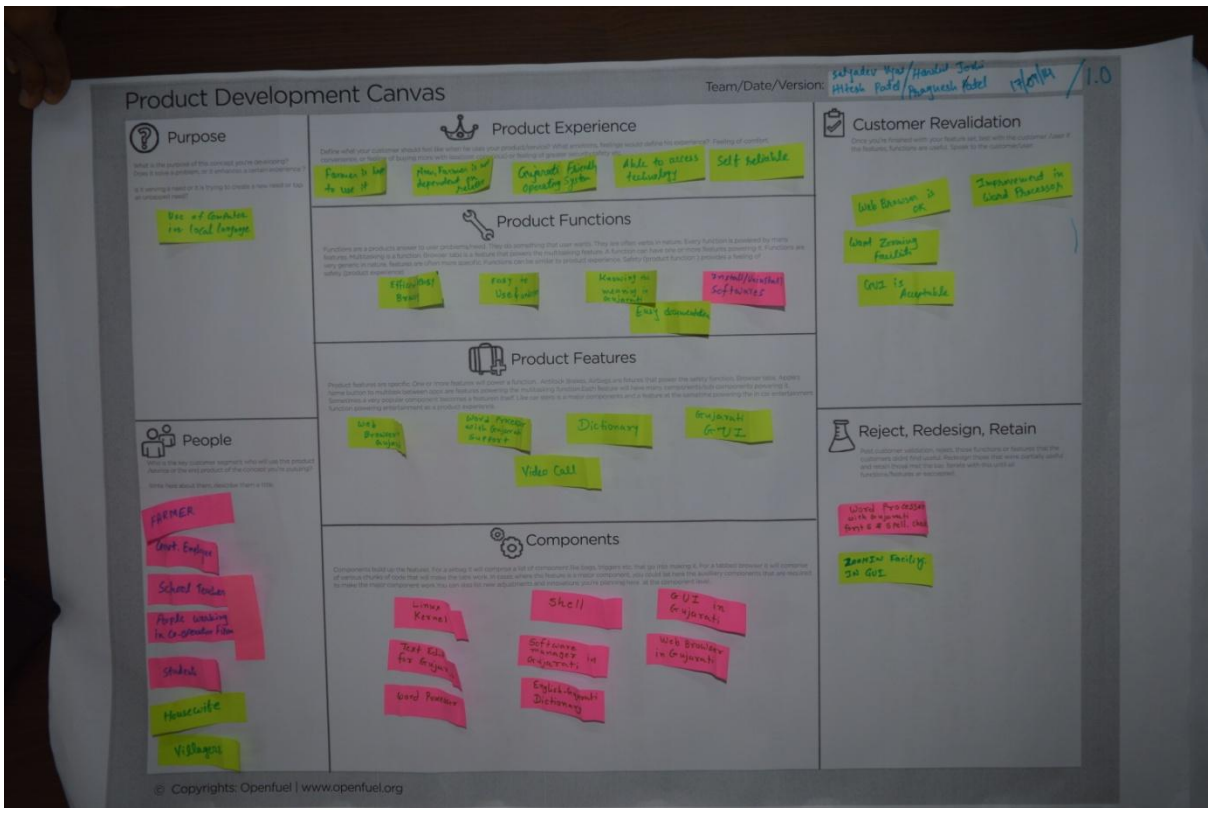
Situation/Context/Location:

- Village
- Talati office
- Dairy
- School
- Co-operative Bank
- Government Offices

Possible Solutions:

- Use of Gujarati Fonts
- Use of Guajarati plug-ins to existing software
- Make applications supporting Guajarati
- Expert Helper

Product Development Canvas:



Third task was to create **"Product Development Canvas".** This canvas is about the solution to be

developed. What is the purpose? Who is the user? What are the features? What are the functions? What are the components? These all things are to be pointed out in this canvas. With the canvas so far filled, we reached the conclusion that a Gujarati Operating System would serve the cause best. It can be adopted to work in any other Indian Language very easily.

Purpose:

- Use of computer in local language (Here Gujarati).

Product Functions:

- Efficient and easy browsing
- Easy to use and understand
- Knowing meaning in Gujarati
- Install/Uninstall software
- Easy Documentation

Product Features:

- Web Browser in Gujarati
- Word Processor with Guajarati support
- GUI in Gujarati
- Video Call
- Dictionary

Design Thinking Venture Canvas

This is the last canvas we had done. It is about how you come to problem solution. Naturally, we do not have the product as yet. It would take a while to develop a product. But assuming it was developed, what would be reaction of users. We asked around and wrote it down.
It was very useful exercise. We are sure without this, most faculties would have struggled to implement Design Engineering course. Let us hope faculties implement this course with the spirit with which it is designed.