Understanding Incubation and Entrepreneurship
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Module - 03
Innovation, Team Building and Problem Statement
Lecture - 03
Section - 01
Methodology for Innovation

Welcome to module 3 of our course Understanding Incubation and Entrepreneurship, where we are going to learn Innovation, Team building and Problem Statement. Today's lecture we will have 3 sessions. The 1st session is on methodology of innovation.

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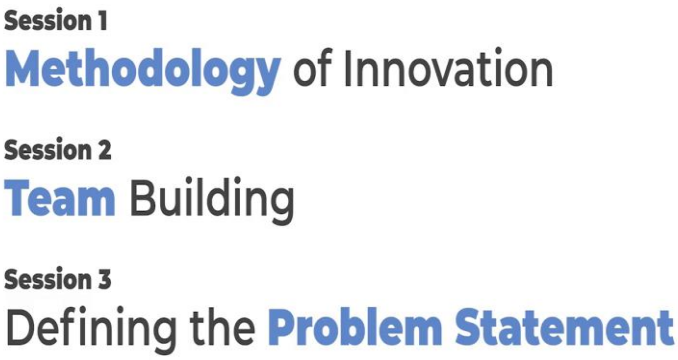

The 2nd session is on team building and the 3rd session we will discuss defining the problem statement.

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Shenoy Innovation Studio, IDC School of Design, IIT Bombay

In the 1st session on methodology for innovation I am going to take you through the live case studies from the Shenoy Innovation Studio at IDC School of Design IIT Bombay.

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Through these live case studies I am going to take you through the 7 concerns of innovation as well as the collaborative model of innovation which is extremely critical for any new start up or entrepreneurship.

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The innovation methodology helps us come up with solutions which can delight a large number of users and get potential customers. Hence, this is extremely critical for our businesses and start ups.

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The lecture also showcases how the innovation process requires empathy, meticulous effort, constant interaction with users and effective collaboration.

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For today's lecture let us discuss the startup story of Netflix. Netflix is the world's largest subscription based video service provider and it could not reach there very easily.

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The whole story started when Reed Hastings the founder of Netflix had rented an Apollo 13 cassette and forgot to return it. The video library charged a heavy fine of around 40 dollars and that left him embarrassed. While he was working out in the gym he realised that the payment model of the gym was very fair when compared to cassette rentals. This one idea of subscription triggered Netflix.

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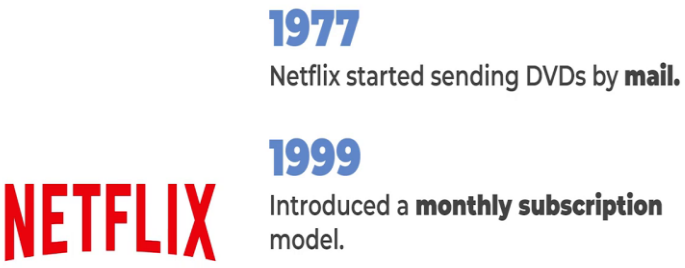

At that time in 1977, DVDs were just coming in and that was an added advantage to Netflix. And it started sending DVDs by mail and by 1999 they introduced a monthly subscription model.

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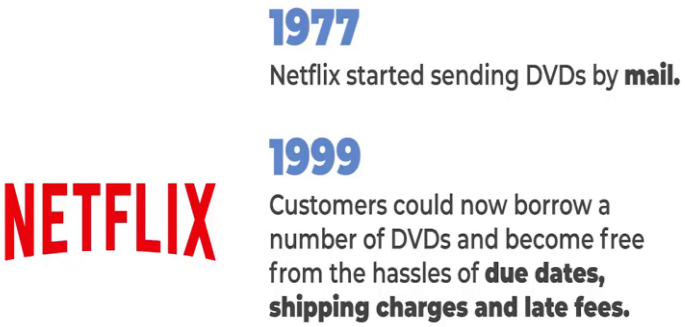

It was a big hit because customers could borrow a number of DVDs and become free from the hassles of due dates and shipping charges and late fees.

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Within ten years by 2007, Netflix introduced the subscription based online video streaming and there was no looking back after that. They started working on it immediately and put

in the best engineers. In fact, Netflix is known for getting the best manpower in their teams. Netflix became very very popular and they got huge subscriptions thanks to excellent internet speeds and technology.

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We can see how the ecosystem around you and the environment around you can also push you to innovation and excellent business prospects.

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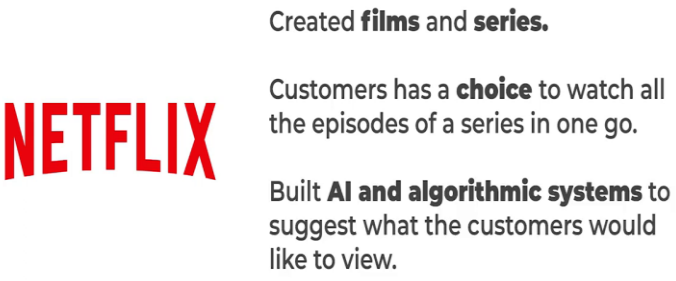

What is interesting is Netflix kept on innovating. They ventured into the film industry. They created films and serials and on top of it unlike the TV industry, the customer had

the choice to watch all the episodes of the show at one go. The founders of Netflix were known for their software proficiency and they built in artificial intelligence and algorithms to suggest what the customers would like to view and this actually made it a very very popular feature.

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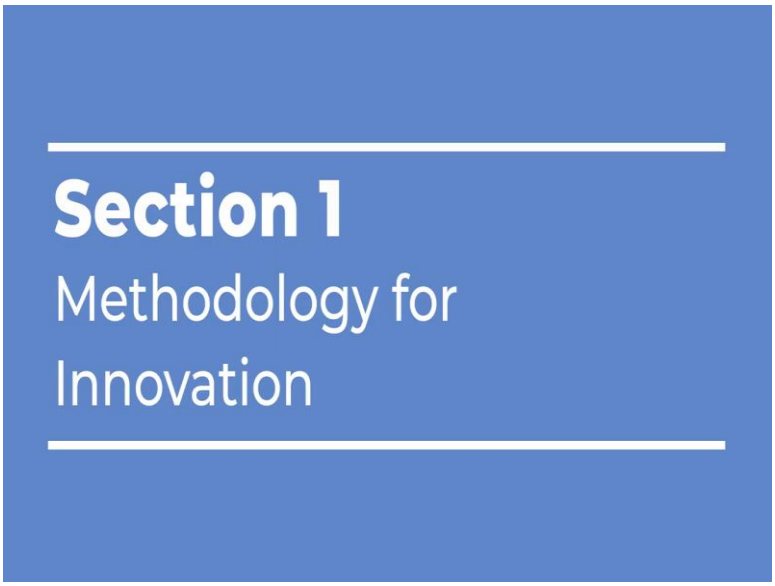

Let me now take you to my lecture of session 1, which is methodology for innovation. If innovation has to be sort of you know like implemented or you need to take it forward you either need you know you either need to go to industry which is already established.

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Petrol Pump designs by Prof. B. K. Chakravarthy

So, they can take your innovation forward which is one example I show you of my petrol pump design.

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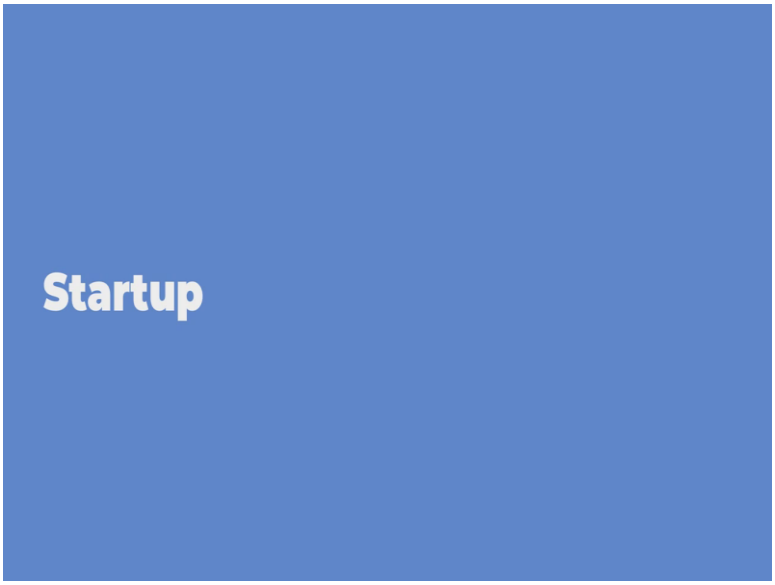

And of course, the second like the best option of course, is doing a startup. And when you do a startup, it is not the same user you are considering when you are designing a product. That was the biggest learning for me with those you know two weeks of classes with my you know colleagues in IIT Hyderabad.

And so, before I start my innovation by design let me you know talk about that one paradigm shift which we designers have to understand when we look at enterprises and when we look at innovation very closely because design and innovation are not the same right.

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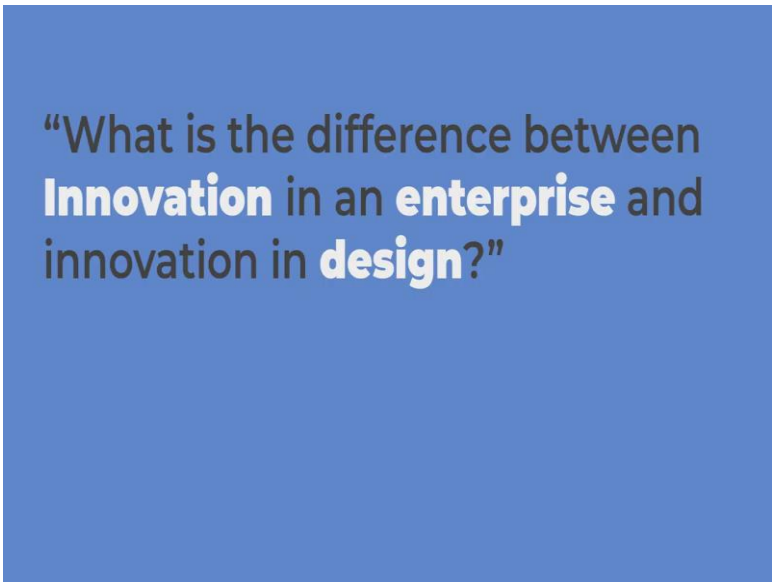

You know they are very different. So, what is the difference between design innovation, what is it how do each of them address each other is the biggest challenge and that is the reason for my logo innovation by design.

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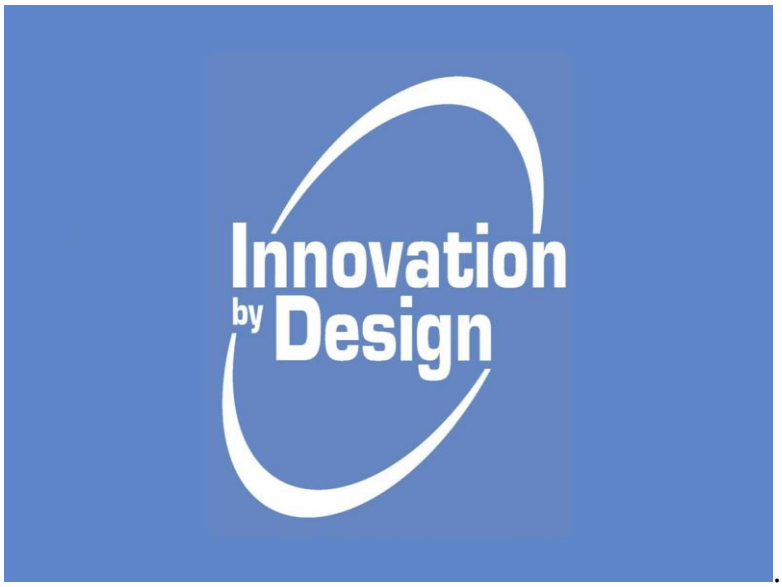

Where design addresses innovation and the innovation process is designed.

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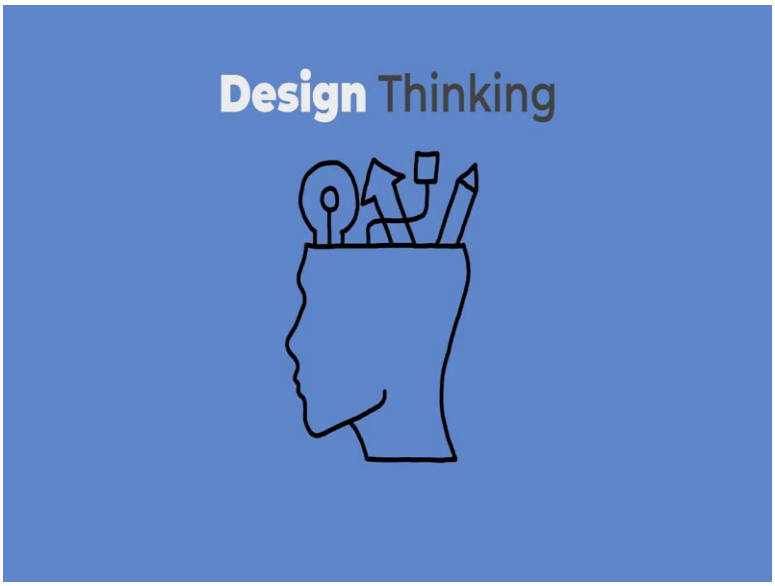

So, and then of course, now the management you know schools have taken up the design thinking process which is the management process for managing innovation and all of us are so well versed with it. And then we keep saying that we are the experts of design thinking, [FL] managers [FL].

You know a number of times we ask this question, but of course, you know that is the best part of design which design thinking or design approach is you know can be applied in all contexts in all situations.

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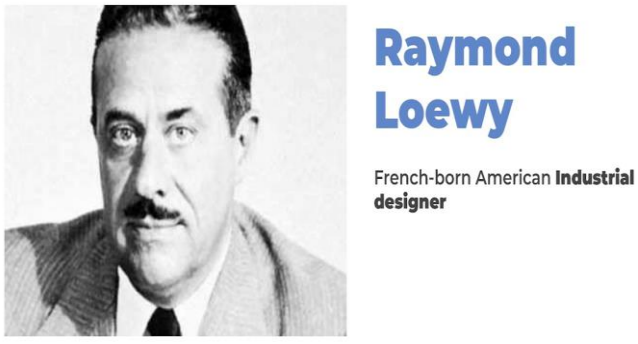

You know there was this famous you know American designer Raymond Loewy who started the first trains, who made the first copy machine, who made the first washing machine.

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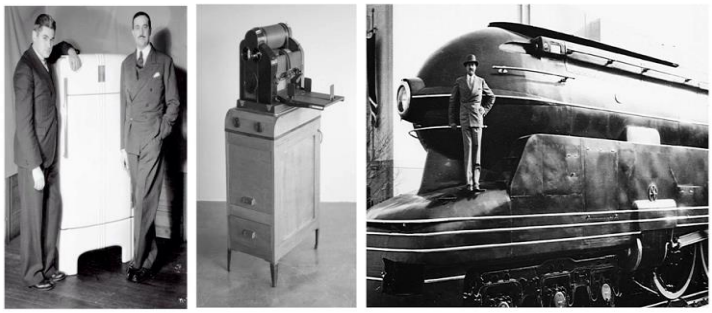

You must be looking up Raymond Loewy. He would actually use design to even solve personal problems and societal problems and also you know people you know who are not able to gel-together you know for managers. So, design can really you know do all that and all that is happening because you are very perseverance because you ask the right questions because you are ready to listen and these are valuable traits.

Students when your colleagues and my when my colleagues in MIT and the faculty keep on sending you outside survey [FL] that is the way we start you know learning what all is happening. So in fact, my I am very very lucky that I you know did mechanical engineering. So, when I do mechanical engineering and become a designer, I am a different animal. When I do sciences and become a designer, I am a different designer.

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And that brings us to a very very important aspect of collaboration in design. And all that I have you know told you in my online lectures and we will of course, you know like you know revisit some of it you know while we go ahead.

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And my grounding of course, in you know IIT Delhi after my Larsen and Toubro stint was again very very fabulous. I realised how research and technology could address design in a very big way.

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And how need to we need to again work very collaboratively with our professors over there. So, I became a specialist in collaborative design because I saw that without collaboration innovation cannot go forward. So, my you know my area of specialisation is collaboration and that too in the new product areas; new product design we call a new product and within the new product see research is very narrow, the concept generation.

Remember the idea generation what we do. [FL] quickly sketch [FL] sketch [FL] final concept [FL], not right. And of course, now you can see that my L&T experience counted heavily when I did my IIT Delhi stint and in the IIT Delhi I have to study again which was fabulous I was studying with my management colleagues there management school part time study that really helped me.

And then for example, in my PhD and then moved to IDC IIT Bombay as a professor where you know we started you know multiple programmes.

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And of course, now I head the Designs Innovation Centre at IIT Bombay, you know we tried to learn still we try to learn and this never ending story. Okay.

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So, now, today I am going to take you through my 7 concerns and these 7 concerns form the backbone of the innovation process and I am going to show you these small small you know videos of these concerns.

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So, from the you know first concern which is the cause, you know in design and innovation. In both cases we are very very focused on you know the type of commitment we have to solve the problem, right. In fact, that you know the concern to solve a problem you know is extremely critical even for the innovation journey and we call it the cause.

And that one sentence we write for the cause has to be one sentence students. A lot of my students would write a huge of course, objective [FL] cause [FL].

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If I am designing a letterbox for India Post, my only cause was to design a maintenance free letter box, [FL] free [FL] and all other things will come in automatically right.

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So, the cause becomes very important and of course, here look at this wonderful project we had where we designed a vein tracer.

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I am very proud to say that this vein tracer has reached the presidents you know hospital in Rashtrapati Bhavan.

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Because this got the you know good award during the you know like festival of innovation conducted by Professor Anil Gupta of IIM Ahmedabad.

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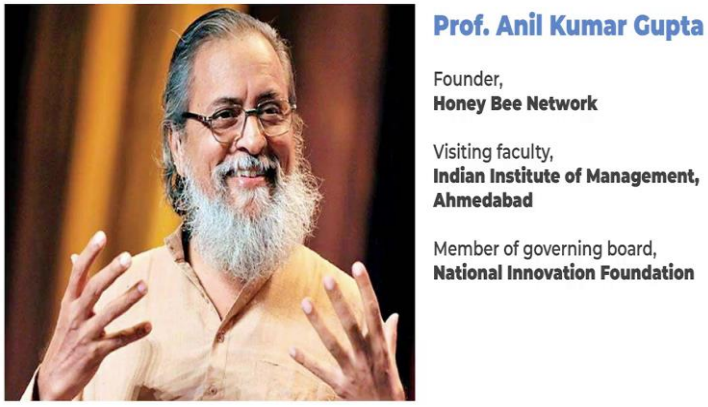

And the [FL] liked it so much that you know he asked us to supply one pile production to him. So, it is a very simple device where you could see the you know vein.

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And this whole thing started from that first lesson on design thinking, which is empathy, which is by visiting the location. So, what we did? In one course we said we will just go and visit blood banks. We did not we did not plan what product to work on. When we visited blood banks and the students kept on you know like talking to doctors talking to people who came to give blood and each student took one-one problem from the blood bank.

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To everlasting credit of Trivikram who took this project he said sir, it is so painful that they have to break to three times, why cannot we have a simple device and of course, that is the way these devices come up. See I told you about technology transfer no, this is not a technology transfer to a company which is now going to manufacture this product and you know put in the market. So, they the resolve to solve the problem is the key.

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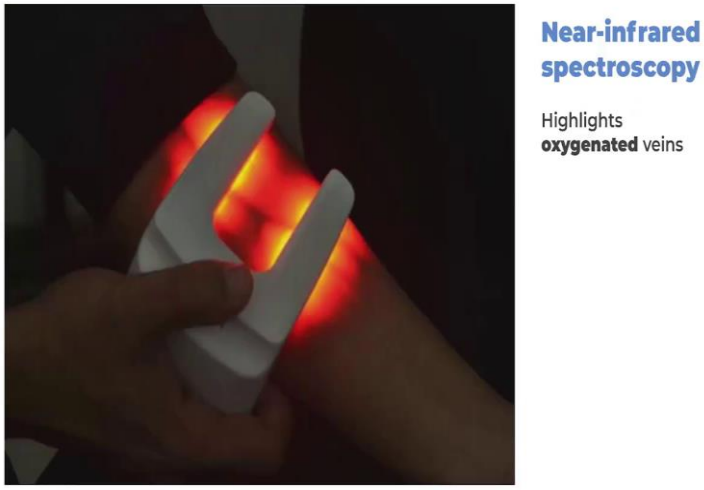

We designed and developed a vein detector using NIR spectroscopy which highlights oxygenated veins.

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This is especially useful for small children, obese patients as well as dark skinned people.

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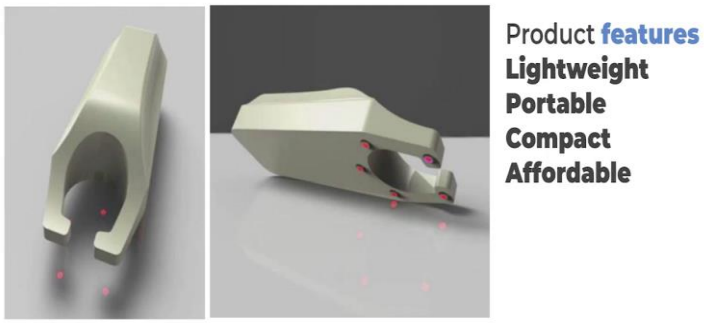

We designed a lightweight, portable and a compact unit which is also affordable and easy to use.

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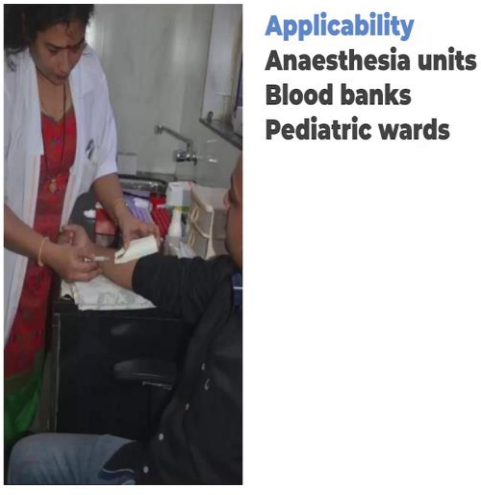

This is especially needed as there is wide application in all medical services ranging from anaesthesia units, blood banks and a paediatric wards.

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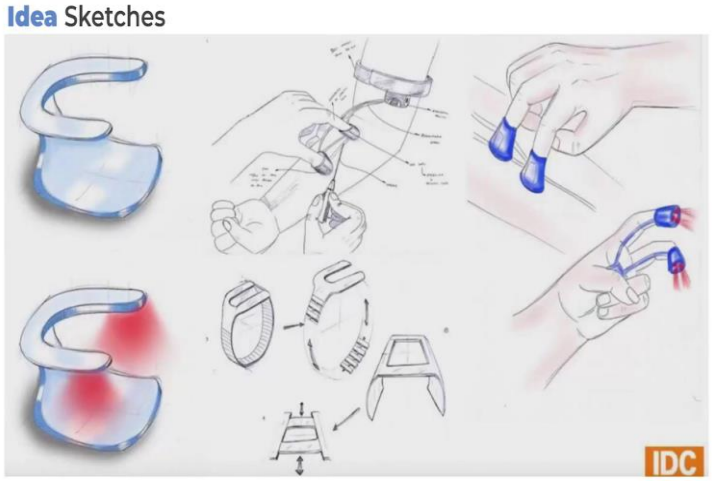

The design process was evolutionary in nature. We tried out different configurations for our infrared light source so that we could get the most optimum results.

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We also checked up various forms by doing 3D printed models so that the caregiver can have very good grip on the product for single use operations.

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Rapid Prototyping

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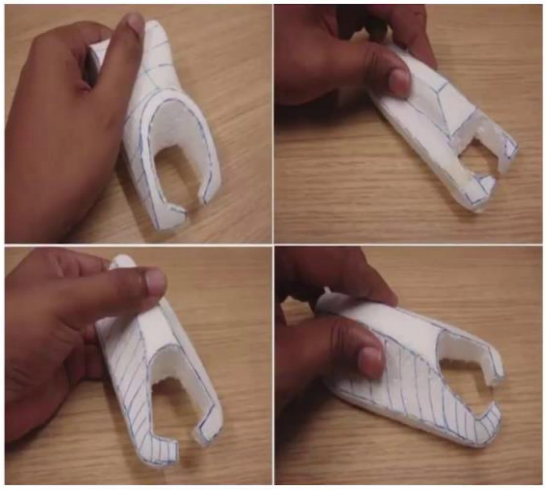

Ergonomic
Study

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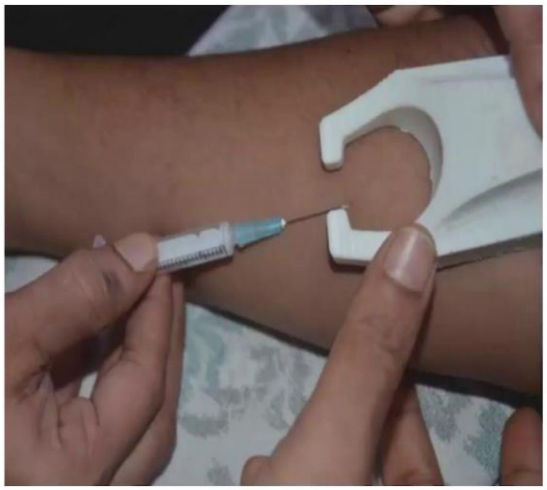

Our initial trials have resulted in very positive feedback from our anaesthesia doctors as well as paediatric wards.

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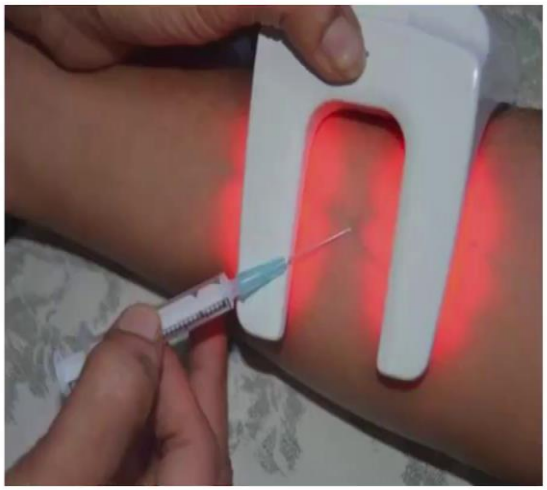

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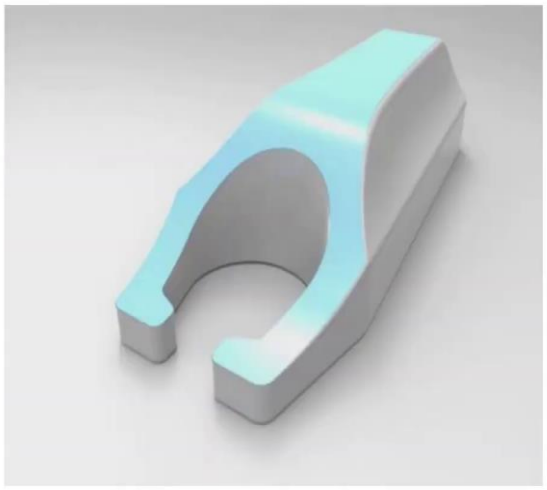

Our aim at the Shenoy Innovation Studio IIT Bombay is to humanise technology. Through this product we want to reach every hospital possible across India and the world.

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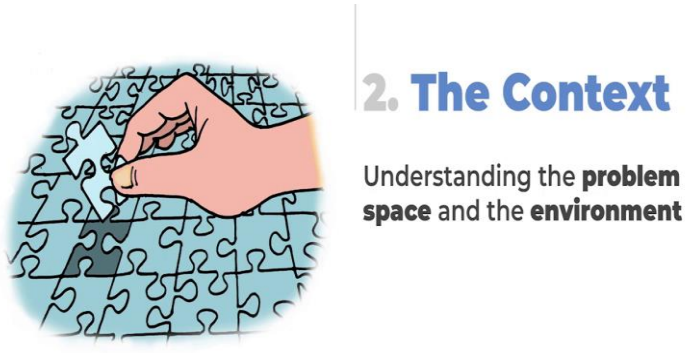

The context, understanding the problem, space and the environment, very very critical students. In fact, we may do a number of lectures on the context, but then when we finally go to the context we are making it very very wide. We do not understand the problem space much.

For example, yesterday one of my students Anagha called up. She said sir I am stuck. I am working on this you know device to help dementia elders you know with some device and

she start making an app. I said did you check up the context, who are these elderly people, what is their age group?

If it is the age group from 70 to 80 I know they are not comfortable with android phones. So, what are you making? Then the new you know aid for you know remembering whether to take it whether you take a medicine or not is a small you know shaft with some rotating wheels. So, you rotate the wheel as you know take a tablet and you remember I have taken the tablet.

So, that is the core of our understanding where we need to narrow down the problem, narrow down the context and the context is that the elderlies in that age group are not they living in the cities and they do not have you know and of course, if they have you know they are living together or they living in an old age home all those factors will be very valuable in your understanding of the context.

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So, here for example, this is an eye opener for me students.

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When we invited the CRPF Jawans, 8 of them came to my lab and we were designing these bottle.

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And I must tell you I must confess that I and my student Devanshi who is a; who was a NID you know graduate came to M. Des with us. You know people, we were in the project and in fact, I myself you know didn't push her enough to go and meet the Jawans for whom we were designing the bottle and then there was this jury. We have pre juries and multiple presentations, four presentations for every project.

And to the everlasting credit of my colleagues you know like in the department they said nothing doing, if you are not spoken to the user we are not buying anything from you, we are not none of your presentation is valid. See a senior professor guiding a student and not insisting on meeting the user just because [FL] project [FL], why are you working on a project. So, those are the important things you know which are very very critical for our direction.

So, the Jawans came and students I must tell you what we thought our concept would be and what the final product was this all credit to those users right. So, a lot of my colleagues who are working on participatory design where users become part of your design process, but of course, we all know that is a very very important journey right.

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So, here we have you know how they you know take bottle and quickly show you this one video.

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The type of insights we gain from our user study becomes the core for our sort of comprehension which is drawing insights. A number of times we do user study, we understand the context, but we never take insights, we never take back these insights as very important cues for our design process. So, here we are talking about the cues for the design process.

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And here we have this very interesting case study of our window mounted solar oven. Looks very simple students.

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Window Mounted Solar Oven

Collaborative design

Energy Science,
Thermal Aspects

Material science,
Coatings

Polymer Science,
Polymers and Plastics

But this window mounted solar oven for example uses collaborative design again from three different sort of disciplines. We have professors from Energy Science, who tell us the thermal aspects of the product. We have professors from Material Science who helped us with the coatings and of course, we have professors from Polymer who helped us with the polymers and the plastics for it to really work as a greenhouse effect.

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Window Mounted Solar Oven

Double walled Polycarbonate shell with **Coated Aluminium plates** inside which creates a **greenhouse effect** inside the oven.

So, here for example, this oven just has a double walled polycarbonate shell, very simple, and has coated aluminium plates inside which collect all the remember our cars get very warm collects all the heat from the sun.

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And does not let any of the heat escape and then cooks your rice you know within one and a half hours, 2 hours if the temperature outside is 40 degrees.

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The Design Innovation Centre at IIT Bombay supports the best design minds in the country to conceptualise, prototype, test and ultimately produce innovative products which will enrich our lives.

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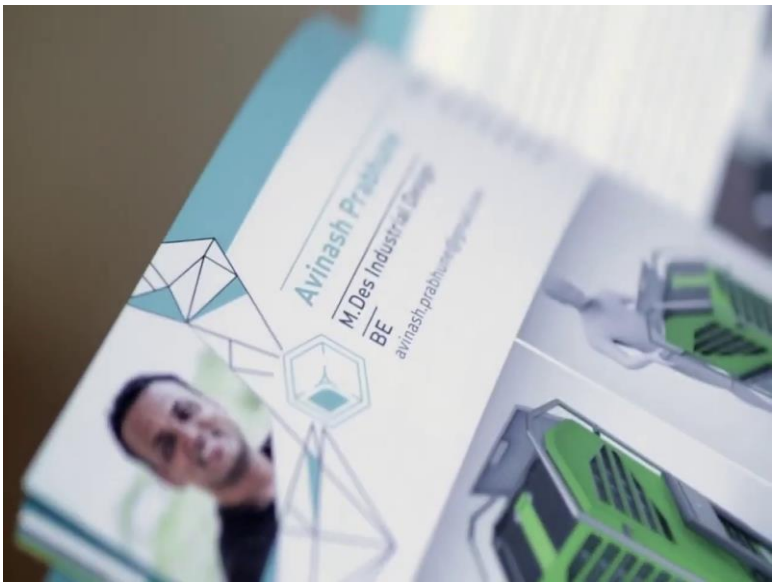

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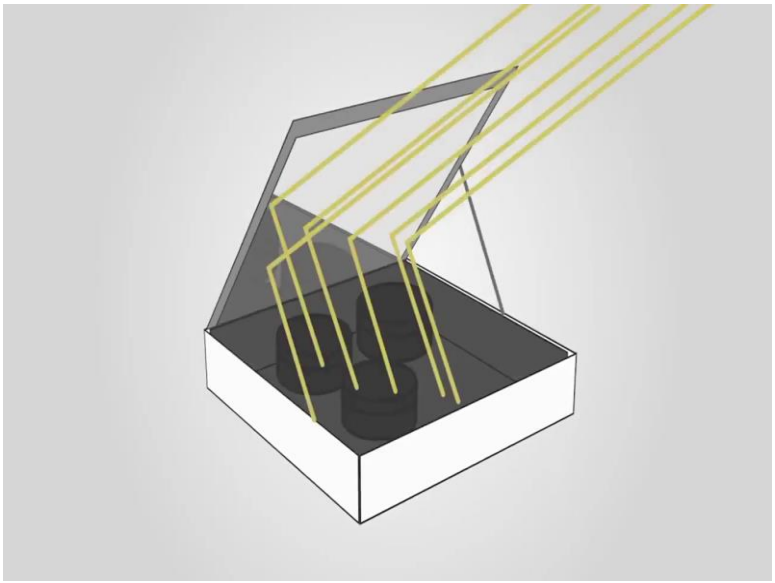

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Our student Avinash found out that the conventional box type solar cooker is very inconvenient to use.

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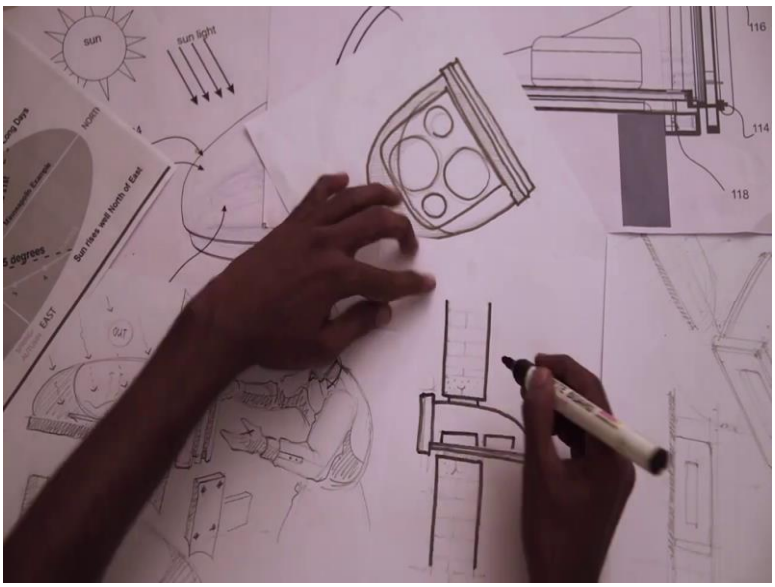

He came up with this new design of window mounted oven where one can operate the oven from indoors.

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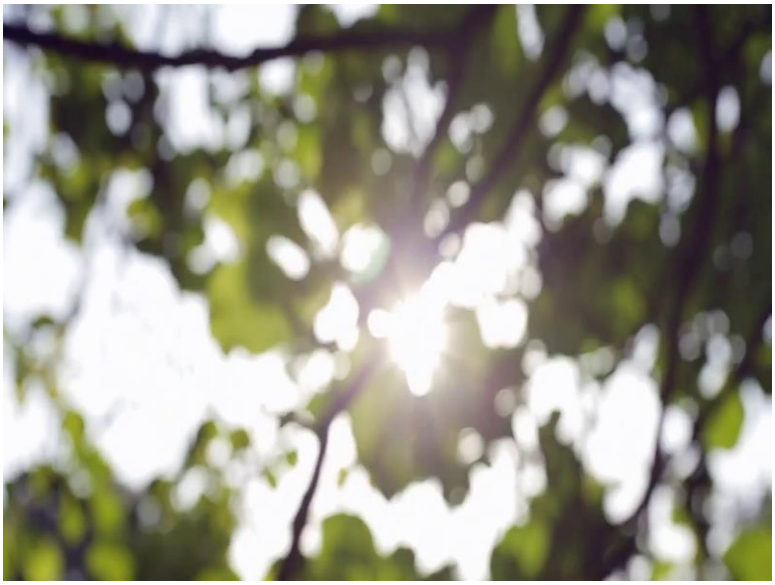

We receive ample sunlight in our country.

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And the solar oven takes as a step closer towards a sustainable lifestyle.

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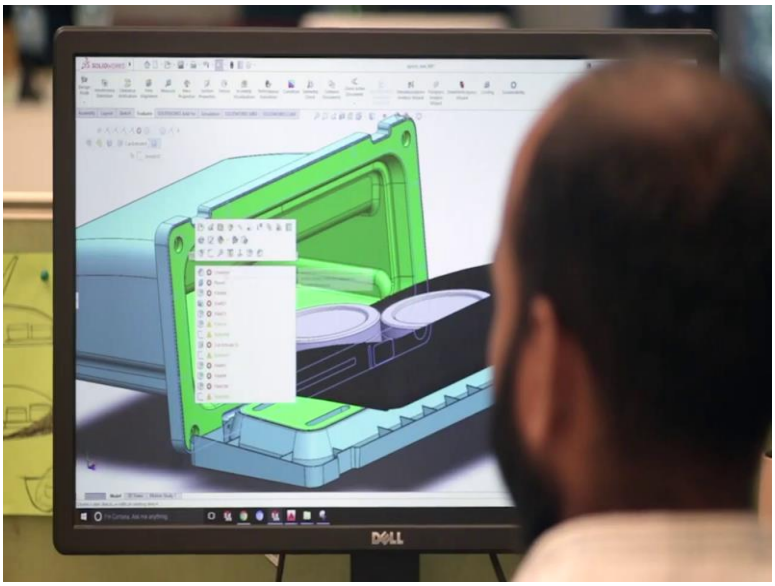

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This versatile solar cooker with zero maintenance can easily recover its cost in a span of 3 to 4 years.

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The multiple advantages of our solar oven are that it cooks for free, it cooks nutritious food and the food is tastier.

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As an athlete, I almost have to perform at my peak.

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The key is to be dedicated to the idea of fitness that also means I need to watch what I feed my body.

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LPG [FL] subsidy [FL], solar oven [FL] gas [FL].

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The solar cooker uses renewable energy of the sun and therefore, conserves fossil fuels.

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We have cooked rice we have cooked millets; various kinds of curries, vegetables, khichdi and things like that.

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Because of the low temperature, the nutrients in a food are more stable compared to other methods of cooking.

The cooking is done in the juices of the food itself and all this contributes to better retention of fragrance and a tastier product at the end.

Fabulous.

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The solar oven has gone through many stages of evolution from a design idea to pilot production.

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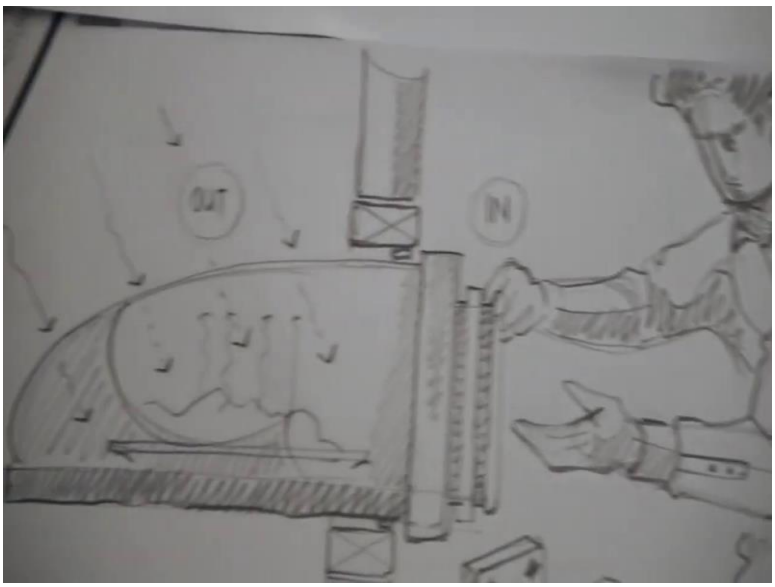

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We did multiple tests to improve the efficiency of the solar oven. Thanks to the collaborative efforts of our design innovation centre team and the professors at IIT Bombay. We are at the verge of delivering this amazing product from our drawing boards to your homes.

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So, students here it is the insight which the student got when he went to homes was that people want the convenience of cooking from indoors. So, that insight brought us to the product see. So, that comprehension becomes very important, one insight which is very critical.

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And now when I went to business guys in Surat they said sir [FL] oven [FL] rice cooker [FL]. I can sell thousand at you know in one go in Surat, itself I put them all on the windows. Look at the business acumen coming in there of narrowing down this you know further you know product because you have to focus you know on the you know same.

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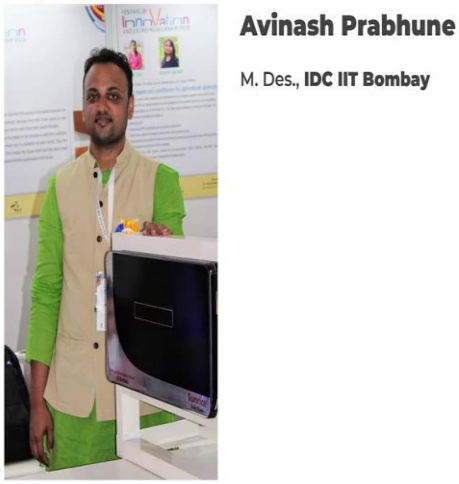

And again you know like to the everlasting you know credit of Avinash Prabhune student. Avinash has now joined back with us.

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So, this product we already taken it up as startup and we are on the pre incubator you know at IIT Bombay called the IDEAS Program and hopefully you know you will see these products you know out there you know in the homes of people.

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4. The Check

Creating a list of **key checks**
- product brief

So, from there for example, we need to go to our 4 see the check, of course, creating the key checks you know. Without a check we can never go forward. I have seen a number of times you know most of you will including me we do a good survey we get insights or [FL] checklist [FL] product [FL] because we are so we are designers right. We are

passionate about things, [FL]. Idea should work for the inside. Idea should be with your check.

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[FL]. And you know that is again a big story I will show you one after the other. So, of course, creating the checklist is very very important and students I must tell you this is my most toughest and most favourite project which is the palki for Vaishno Devi.

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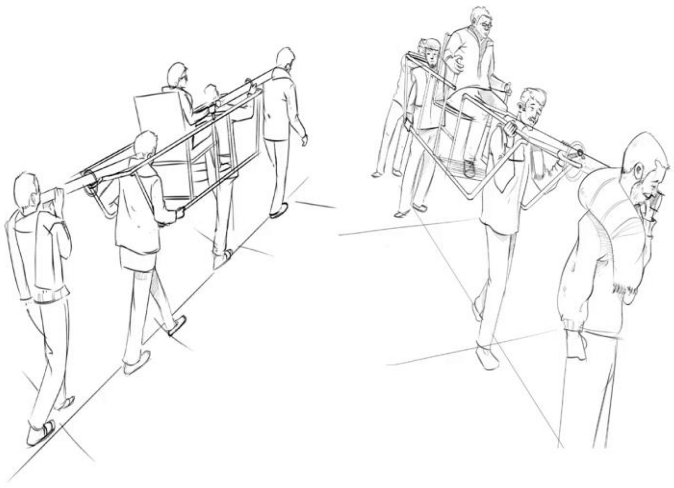

[FL]. If you have the money you go.

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But then I said if they are putting rules they should also provide the tools right, rule [FL] tool [FL] product [FL] very tough journey [FL] multiple trips to Vaishno Devi [FL] anyway. So, that is the beauty about you know about the this product that this key motto again collaborative effort. Let me quickly run the video for you over here students.

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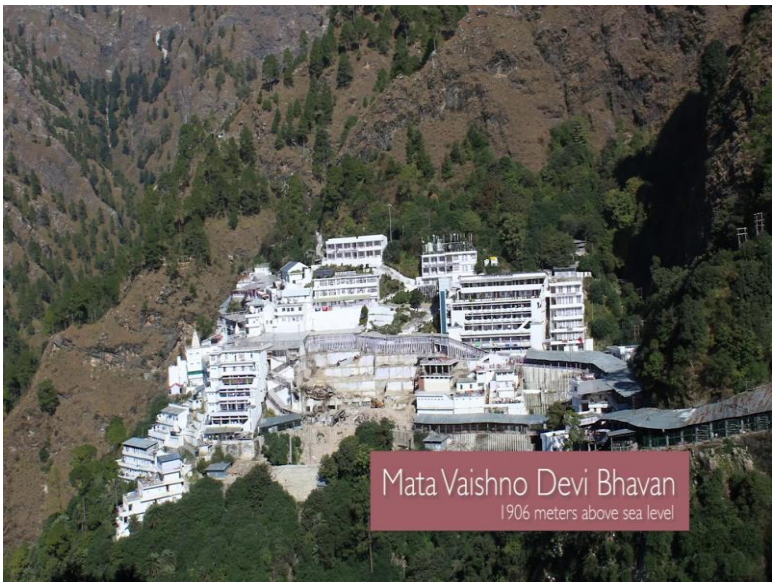

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Shri Mata Vaishno Devi shrine [FL].

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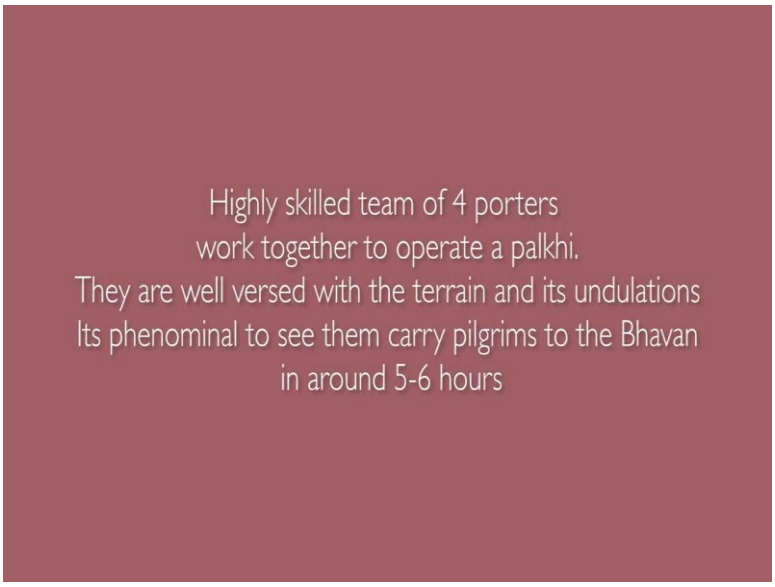

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[FL] [FL].(Refer Slide Time: 24:59)

This is about the deep concern of Dr. Chidambaram who is Principal Scientific Adviser to Government of India. In reducing the drudgery of the porters carrying pilgrims to the Katra shrine and that is how the redesigning of the Palki project initiated. This very good project was taken up as a integrative effort by IIT Mumbai's IDC Division and also NITIE for ergonomics studies and beautifully these people worked for that.

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Our role in this project was to do a very good user study.

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Understand the needs of the porters very very closely.

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And come up with designs which will help them to reduce the drudgery.

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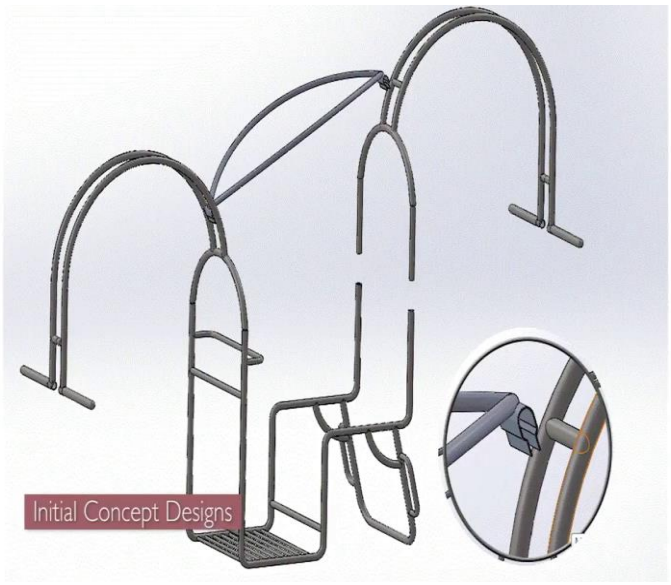

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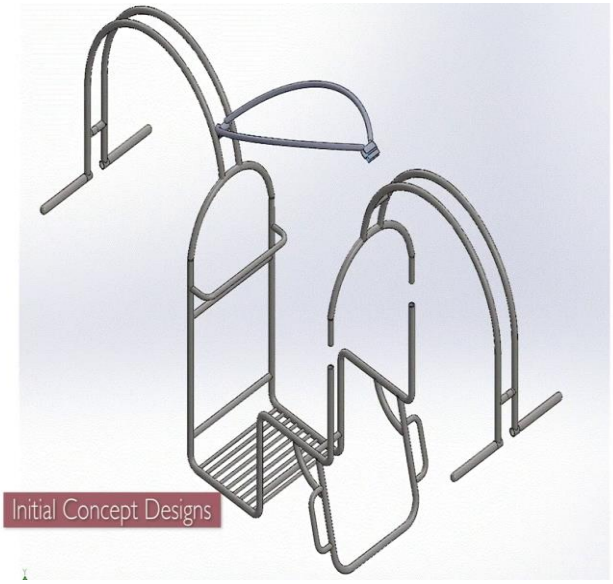

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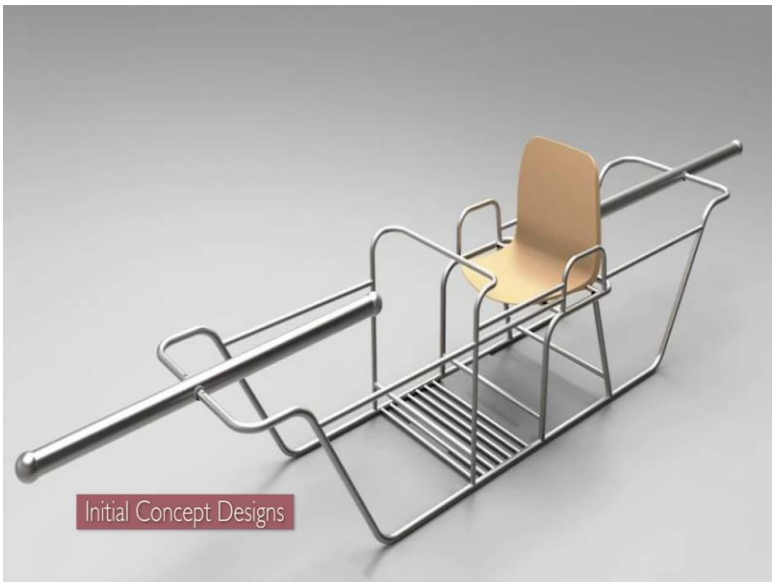

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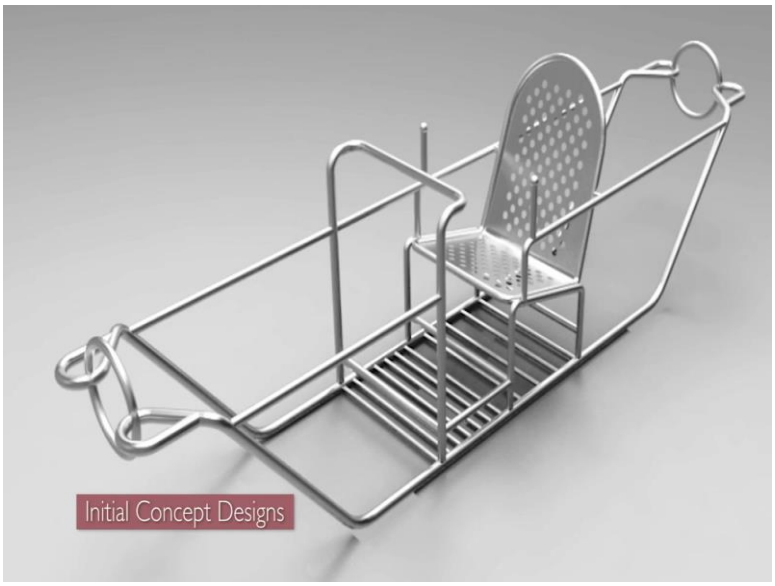

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So, NITIE is one place where we have a Centre of Excellence in Ergonomics and Human Factor Engineering. While IDC put up a design, we came up with ergonomics studies their bio mechanics system where the load is coming.

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We found the shoulder and back were two areas where the lower back these two areas where a load was very heavy and we looked at how we can reduce that load by doing proper design.

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I think some of the experts also said that so many minute details we as a team has looked at and try to find a solution which is good for the design.

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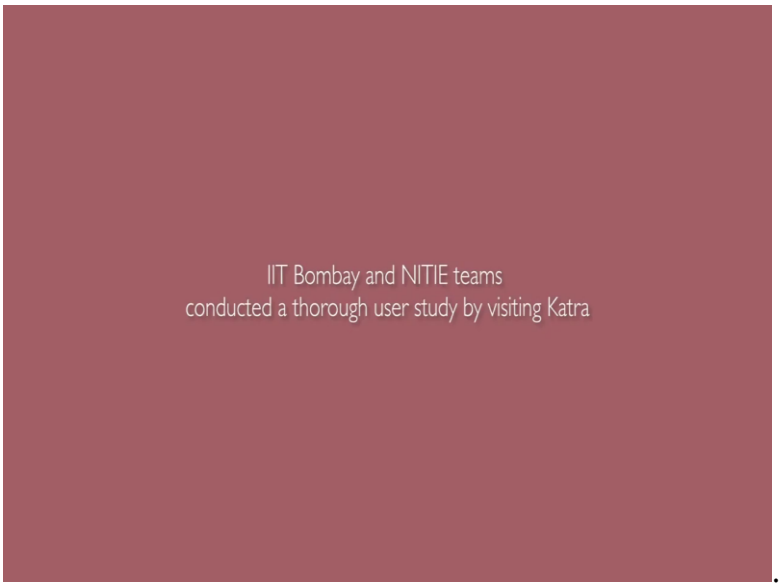

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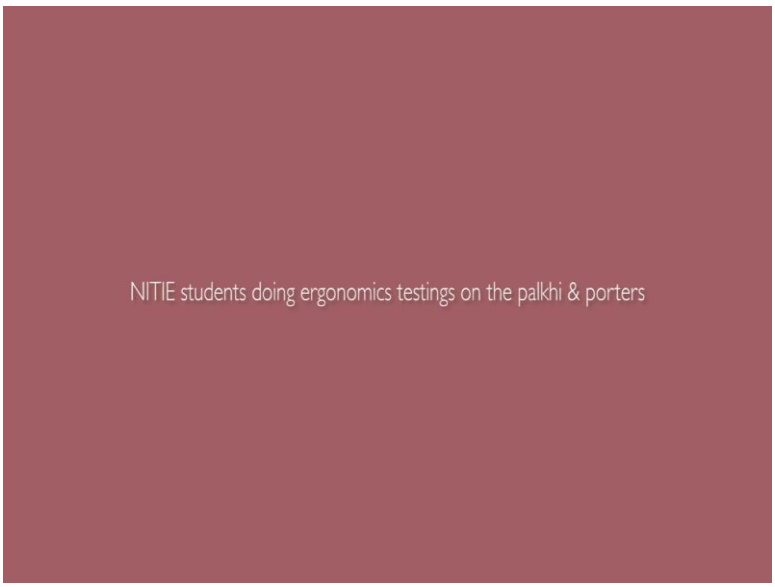

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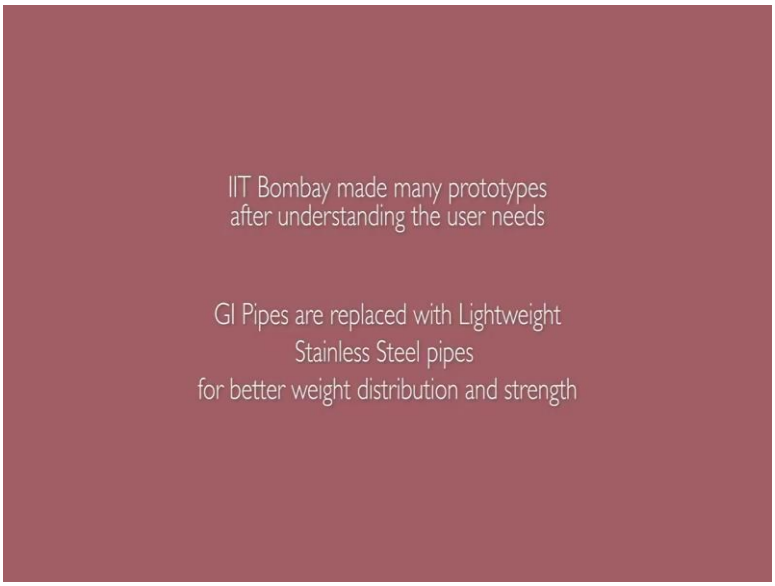

So, when we made our first prototype we had missed out a lot of important issues then we had to go with a second prototype and some more new issues started cropping up and finally, when we actually made our 7th prototype, the porters finally, said wow, this is done and now the palki is very good.

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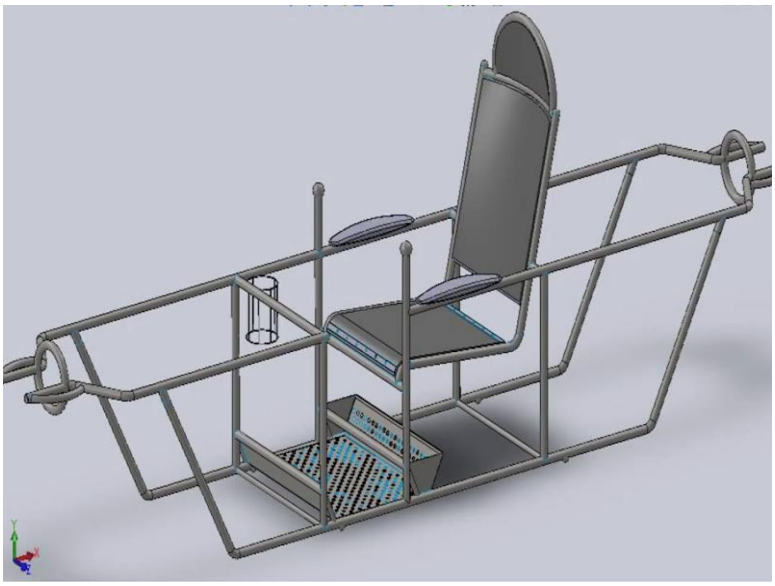

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The final design was lightweight and robust.

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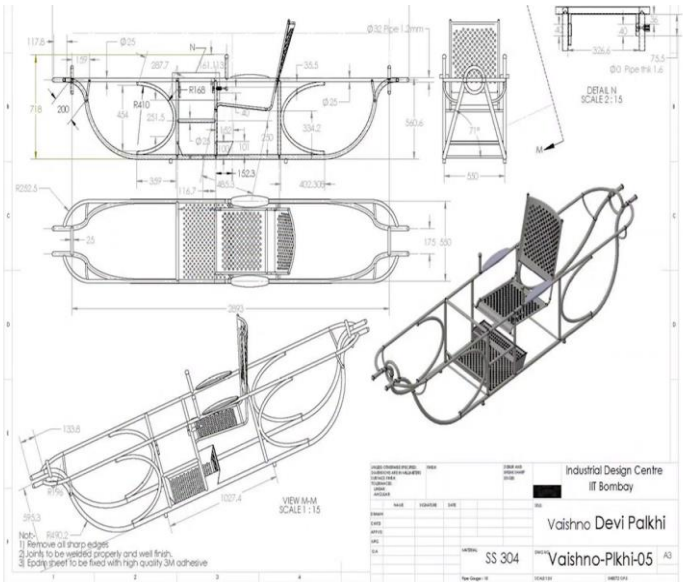

We could reduce the weight to 34 kilos from around 50 to 54 kilos and this made a large impact on the comfort of the porters.

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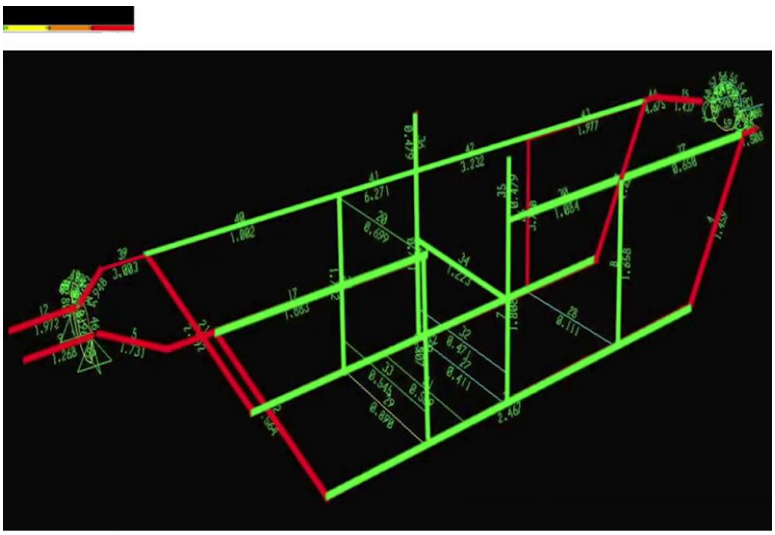

At the same time we were very focused on the structural analysis of the palki.

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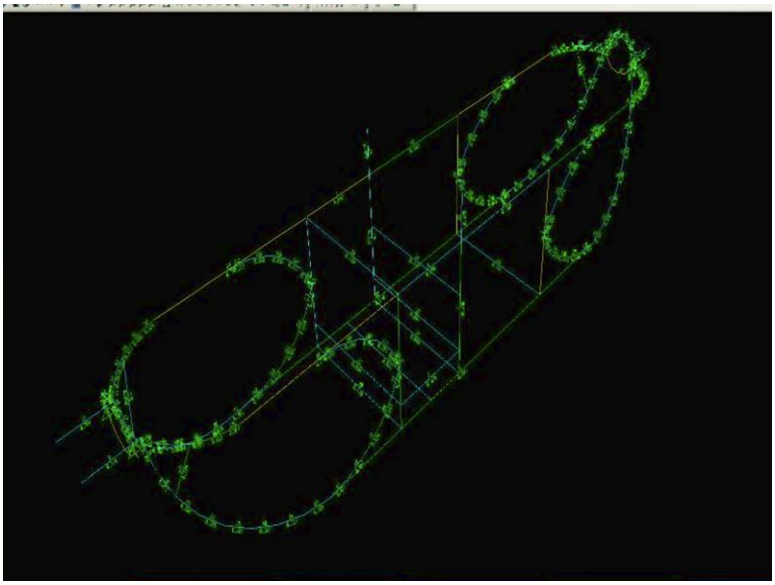

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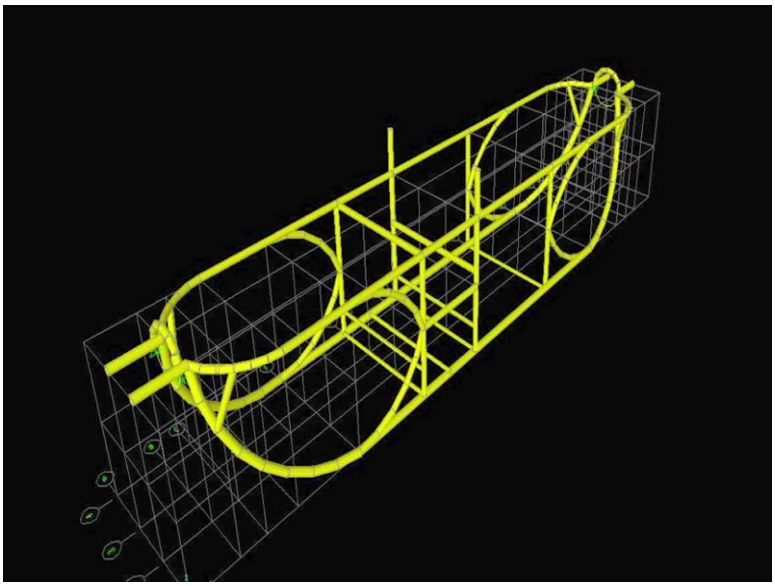

And we conducted the analysis that we managed to maintain very good structural stability and structural integrity in the design so that the palki can last long and it can be very safe.

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Today I am very happy as these integrative efforts are being concluded and final solution is emerged is lightweight, ergonomically designed, safety aspects are there..

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There all the designs are structurally validated also and it is also catering to the large age groups of the pilgrims which are actually will be benefited and along with the porters health and also. I am extremely happy these are all integrative efforts and the guidance from PRMC members and the experts we have got.

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[FL]. So, there are multiple risks and they would not let me move. You will see we worked on you know, but of course, in design, students you all know you have to go out of the box first right..

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Helicopter Idea for Vaishno Devi Palki

[FL] ideas [FL]. Helicopter idea, then you know open ideas and multiple things. We failed miserably with all these new designs.

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Plastic Chair option for Vaishno Devi Palki

We made prototypes of this took them to the field tried them all, because I did not want the porters to get locked inside right. They were used to it then we made options with plastic chairs. Plastic chairs would come off within 6 months, so, we had to become very then we made prototypes of all the CAD models. We tried all these, failed miserably.

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8th Prototype of the Vaishno Devi Palki project

And finally, the 8th prototype you know is what you know finally, worked.

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And that is the whole challenge in this journey. Every project, see the collaborative nature is becoming very very big here students. So, we need to collaborate with multiple thing. Look at the number of people in this room. All of them are there are three professors from NITIE there are three two professors from IIT Bombay.

Professor Desai was a structural expert and there were four experts from the Principal Scientific Adviser to the Prime Minister's office and you know and the porters are sitting in the back you know all the four quarters. So, when the exports come you know we may have our own perceptions we may also go wrong right.

Whenever we do a project will be a professor whoever there is a review committee which gives valuable advice. So, this review committee we will be calling the Programme Review and Monitoring committee is a collaborative committee which meets every one month and gives you feedback which is so valuable to take your project forward. So, that is a very important part in our journey.

And of course, they all tried the palki out there. So, there we go and then we are very happy now to mention that you know finally, Jindal sponsored hundred palkis. You know Jindal is as you know one of the largest you know companies which manufacture stainless steel [FL] Jindal architecture which has all this pipe bending and all.

So, we you know we now hundred palkis are plying in Vaishno Devi for last two years. We are very very happy. We are coming up with a book. We will share a book also with you on the palki design.

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Here for example, the check was very important. It was supposed to be a lightweight palki and we made in conscious decision that the weight should be reduced by 30 to 40, you know percent. So, that is the whole you know importance of a check. You need to mention the weight. [FL]. A brief a product brief or a check should have a value.

So, [FL] palki 34 kilo [FL] 22 kilo [FL] fail [FL] 24 [FL] try [FL] 22 [FL] for example. So, that value proposition is very very important for us to you know to match. [FL] check [FL] ergonomics study [FL] values [FL] lightweight [FL], the weight should be less than 20 grams if it is in the hand or the weight should be if it is a wearable if it is a wearable mobile or a wearable thing you are making for somebody the weight should not be more than 40 grams whatever exact weight.

[FL]? Insight, user study; [FL] brief [FL], if it is a wearable product for example. So, these are very very small you know very important you know like learnings for all of us whatever I shared you know with you.

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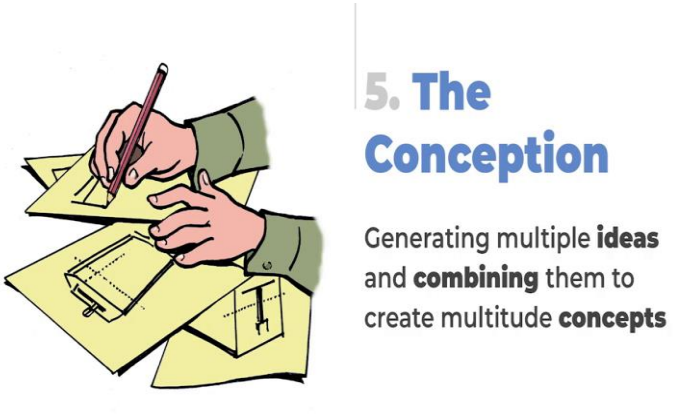

So, of course, my next project is my very favourite project called the helmet design and [FL] like you know in our country what type of options we have and what type of two wheeler use we have in the country.

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You know this is done by my very favourite student called Chari. He is currently working in Fun School in Goa, he is the head of design there. And he made this wonderful sketch for me. He spent nearly a week to make this sketch, but it is fabulous to you know make

us understand [FL] product [FL] product [FL] focus [FL] if the focus [FL] user [FL] wide [FL].

There is an office going person, there is a delivery person, there is a mom who is dropping the children to school and there is also you know like boys who are on the vehicle for fun and of course, there girls who want to cover their face because of the pollution and you have [FL] with the [FL] challenging environment [FL] students [FL] helmet [FL] helmet [FL] context [FL] student [FL] project [FL] students [FL] students [FL] helmet [FL] use [FL] assignment [FL].

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So, all the kids had to make an helmet, thermocol [FL] of course, [FL] idea [FL] helmet [FL] for example, [FL]. And of course, it was also you know we would also look at the safety and everything. So, those are the interesting things. So, we can really make one helmet for each you know each application [FL] mobile phone scooter [FL] idea [FL].

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And of course then you know this is my again favourite topic Mandar Kale [FL] student [FL] I think he is a he is a professor. He was in Pune, now he is a professor in Bangalore teaching design.

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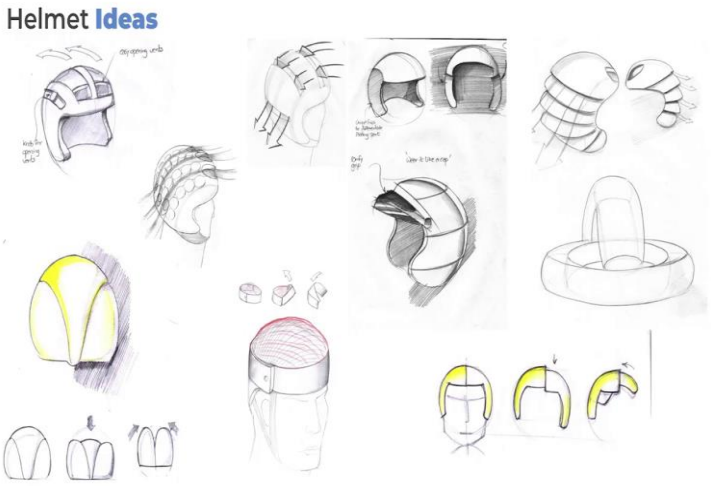

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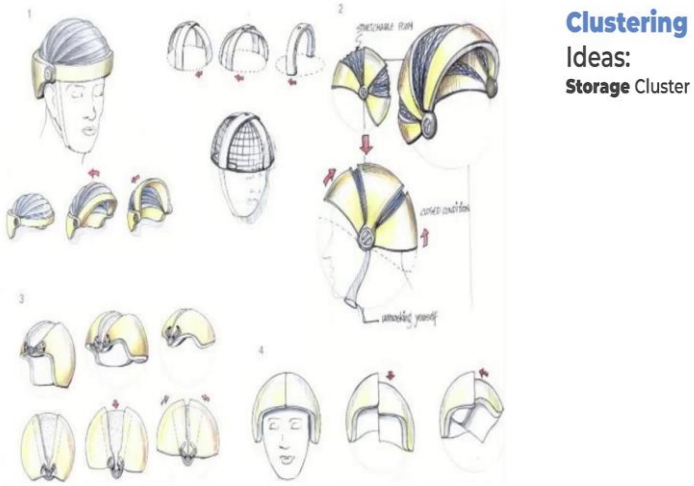

He worked on this wonderful ideas. Ideas [FL] important [FL] product [FL].

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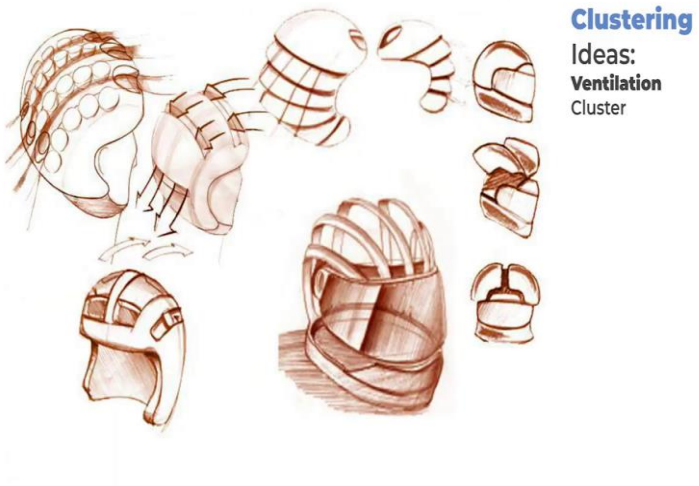

Then you have to cluster the ideas as part of what I showed you.

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And then mock up models then prototypes and of course, now this is under tooling. So, that we can make the first you know pilot production and you know take it to the market. It should be collapsing, but it should not look broken you know. So, that is a big thing learning we got from our user study. So, that is the helmet design.

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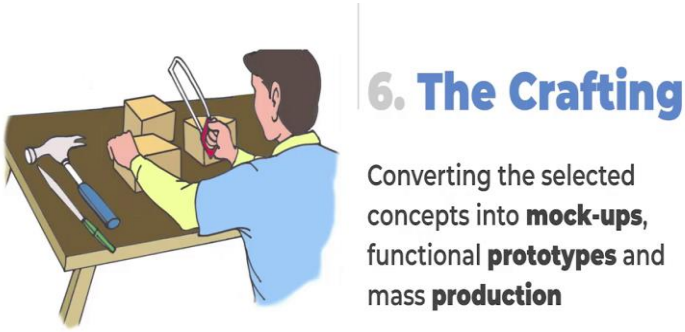

And of course, the crafting; all of us have to have fabulous lab students without crafting. In fact, to the everlasting credit there is Gayatri Menon who is my PG student, now is a professor at NID. She had a student I forget her name. [FL] last year [FL] motorised wheel

chair [FL] students. So, impressive. This motorised wheelchair she collaborated with the company, startup [FL] balcony [FL] setup [FL] carpentry [FL] plastic [FL] acrylic [FL] working rig [FL] for that you know motorised wheelchair for elderly which will stand up.

[FL] stand up [FL] student [FL] recently [FL] solar cooker [FL], IIT Bombay [FL] he went to the vendors, got it done, laser cut [FL] solar cooker dish type solar cooker he made in his internship project the first year in the first year.

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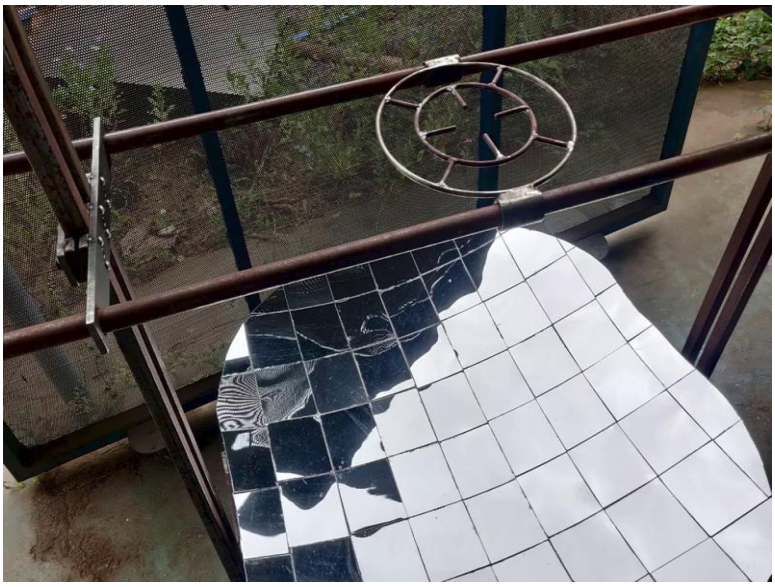

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So, it is just in our minds and designers if they do not make mock ups if they do not do crafting [FL] creativity one-tenth [FL]. Ideas of course, are very good creative, but after creativity when you do not do crafting where you make mock up models where you make a working prototype where you make working rigs all those are very very valuable you know for our thing.

So, again you know again a very very favourite project of mine when you said crafting [FL] students this product was crafted by you know all you know like our vendors who are everywhere in the country..

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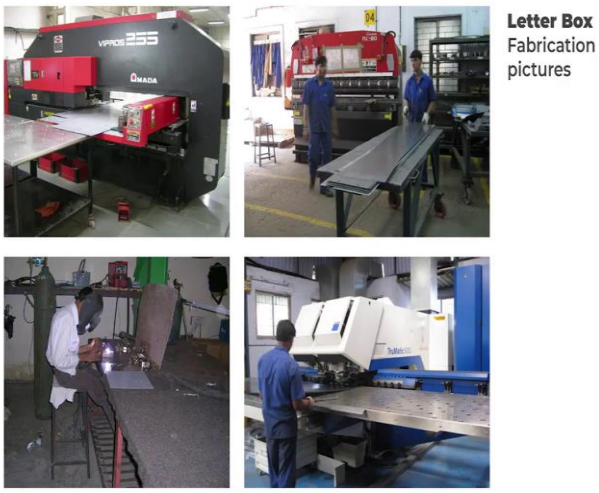

[FL] sheet metal [FL] fabrication [FL] first prototype [FL]. And of course, after that we took it again as innovation project and then you know like [FL] story [FL]..

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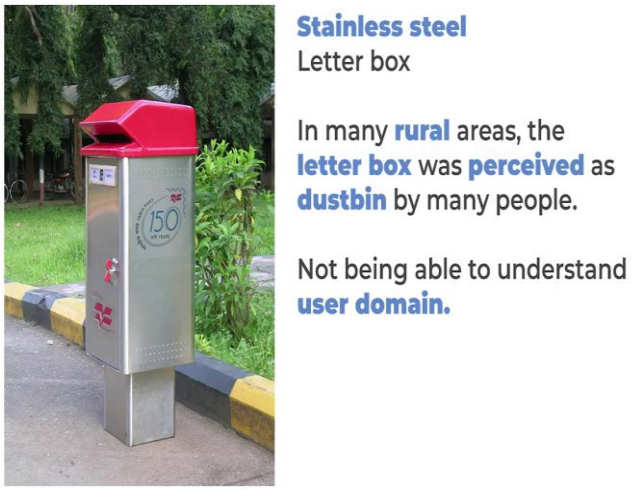

Stainless steel [FL] box [FL] and secretary [FL] students [FL] faculty [FL] we can be big professors but we can make a mistake [FL] Chakravarthy [FL] stainless steel [FL] box [FL]

dustbin [FL] survey [FL] city [FL] rural areas [FL] post boxes [FL] use [FL] dustbin [FL] form [FL] form [FL] perceptional form, [FL] PhD students [FL] Sushmitha Sharma who worked on perception on form [FL] user domain [FL] product [FL] city [FL] survey [FL] city [FL] papers [FL] ego [FL]..

No, take feedback from the user. Take feedback from the large sector of users if it is a public domain product. Public domain [FL] postbox [FL] animation colleague [FL] Chakku [FL] animation [FL] professor, Professor Shilpa Ranadey she is the head of animation. [FL]. They all knew that [FL] post box [FL] petrol pump [FL] experience [FL] semantically new product, make the product look jazzy, make the product look new so that people will recognise it as a new product [FL] product [FL] that also is important.

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So, we did finally, know like [FL] we designed this new box with all the same values, but with a round top with the red colour. [FL] stainless steel [FL], but it is a low nickel stainless steel [FL] product [FL] powder coating [FL].

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Hon'ble PM Narendra Modi seeing the **Letter Box** at Convocation in IITB

And of course, the prime minister also came to see it during our convocation and he had some very interesting questions to ask. [FL] letters use [FL] sir [FL] letter [FL] India post [FL]. So, that is a big learning for our students. You have to know that there are people who use letters because [FL] mobile phone use [FL] use [FL] right [FL]. We need to know.

Every year it is dwindling of course, the personalities are dwindling. The business post is increasing, it is another story. And of course, he also had very good insights [FL] modern [FL] IoT enable [FL] letter [FL] letter [FL] and of course, there is multiple functions of this letter box [FL] India post [FL] India post [FL] symbology [FL]. So, that is a very very important lesson for us and of course, you know this was the interesting thing.

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And of course, the last one students is the connection. We say in innovation you need to connect back with the user. [FL] connect [FL] fail [FL] connect [FL] similarly in the letterbox, but in this I was very lucky when I joined Larsen and Toubro after my MDes at IIT Bombay.

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Where we created the petrol pumps which became you know maybe you are too young when this came up and you know this was launched in of course, 1990 and then became a runaway success it was supporting all over the country.

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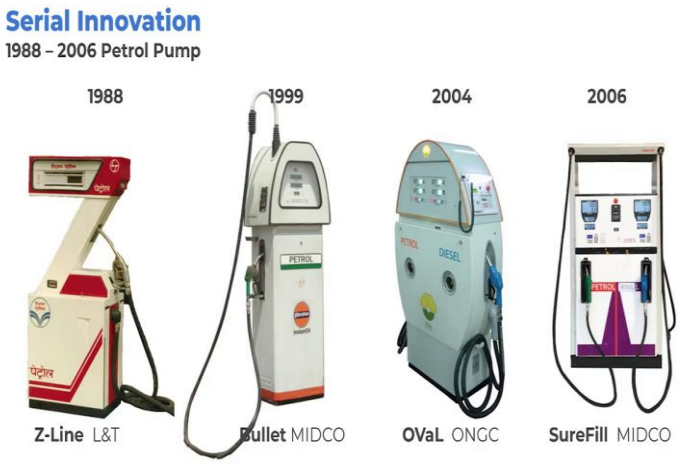

And then of course, I went on to work on serial innovation. Every 10 years, we designed a new product and that is coming up in your you know in your journey.

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So, quickly browse through the pitfalls of the innovation process students, it was very very valuable. I think I discussed this with you..

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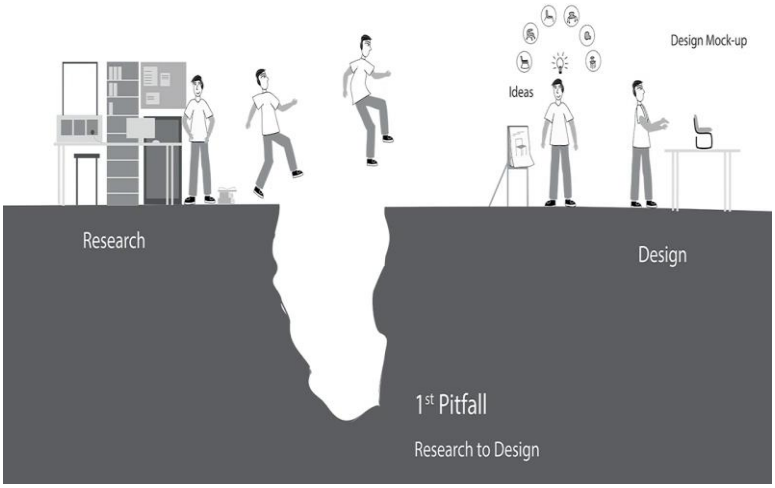

[FL] research [FL]. Research see [FL] design [FL] that is the 1st pitfall [FL] cross [FL] design [FL]. We give it another design mock up the product is gone. Thousands of mock ups are available all over the country in all the design schools [FL] model [FL] sketch [FL]. When you cross from there which is a 2nd pitfall [FL] jump [FL] research [FL] jump [FL] skill [FL] practise [FL] research [FL] design [FL] taken. So, that is a that is a skill which is more important.

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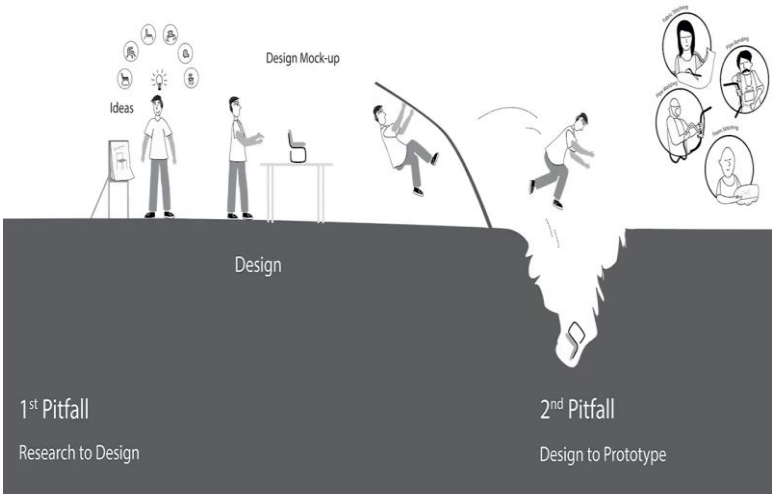

[FL] pole vault [FL] 2nd pitfall. So, from a mock up take it to a prototype [FL]. So, that is a pole vault right. In pole vault you are using tools, but you are practising and you are taking forward and of course, then you make a working prototype test with users [FL] prototype [FL] most of the start-ups fail over here [FL]. Prototype [FL]. So, then you need to make a prototype and from here.

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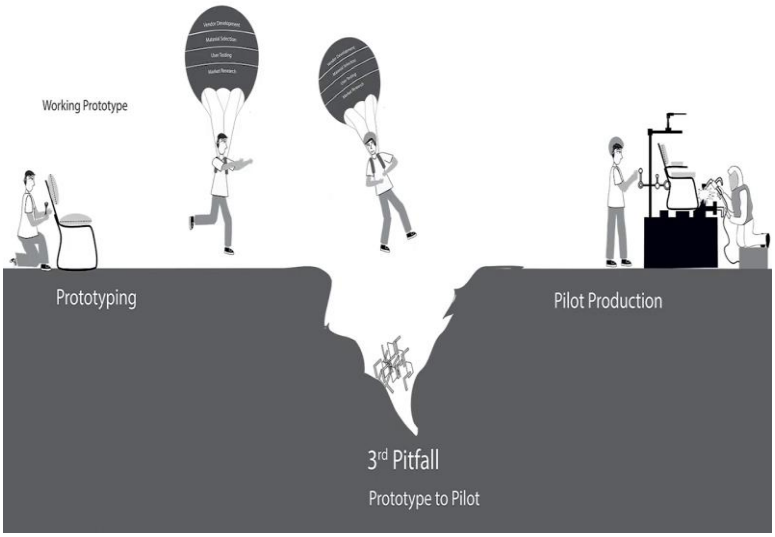

For example, the bow gets you need a hot air balloon to you know cross this you know next pitfall of pilot production where [FL] letterbox [FL] pilot production [FL]. And of course, when you make the pilot production you know you of course use a lot of manufacturing technologies and things like that.

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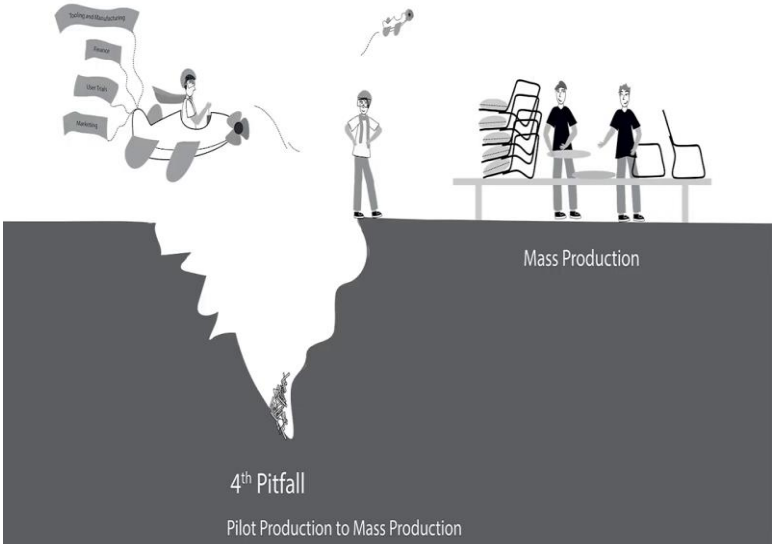

And then of course, the final one is an aeroplane which is much more difficult where you need much more resources, much more money, much more collaboration to take the product from pilot production to innovation where you know your whole journey is complete.

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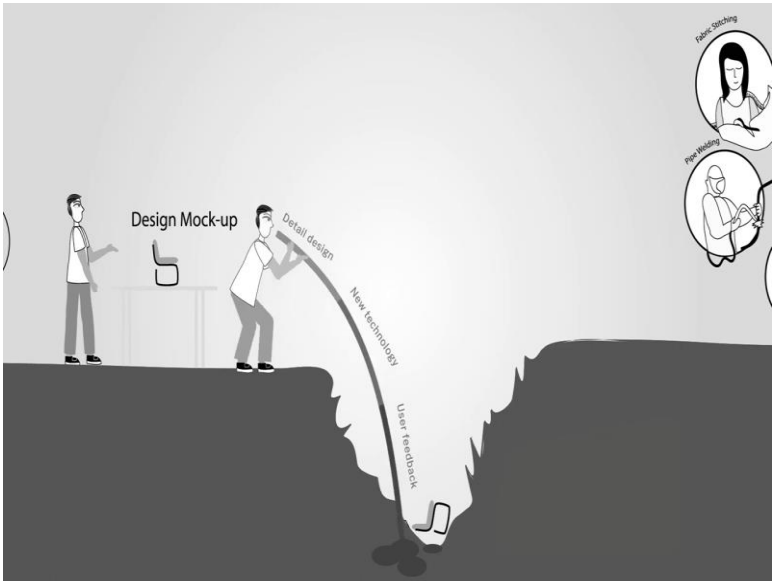

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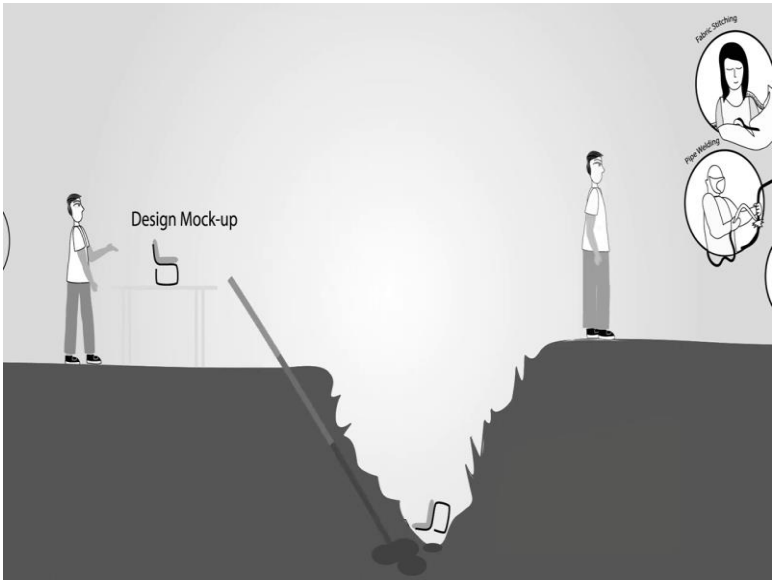

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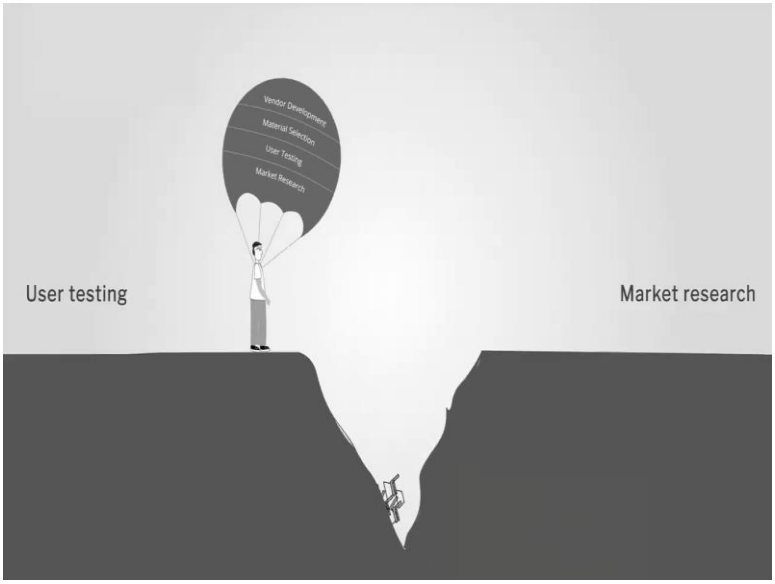

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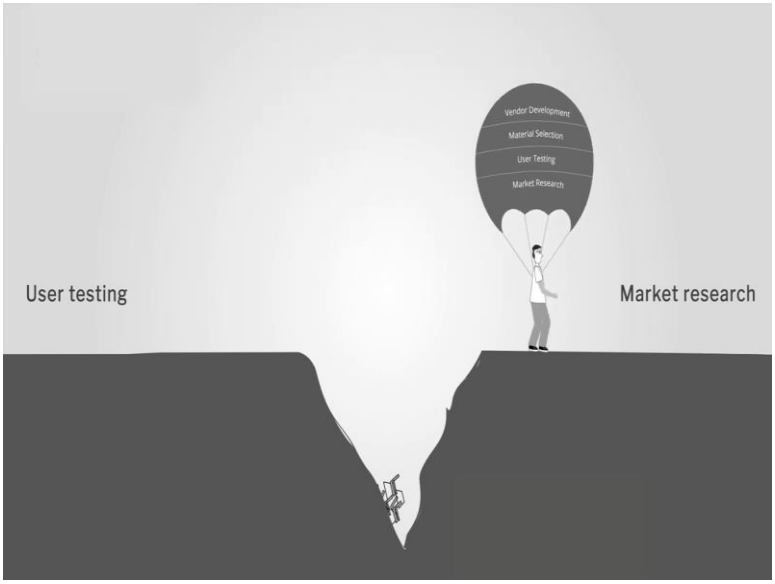

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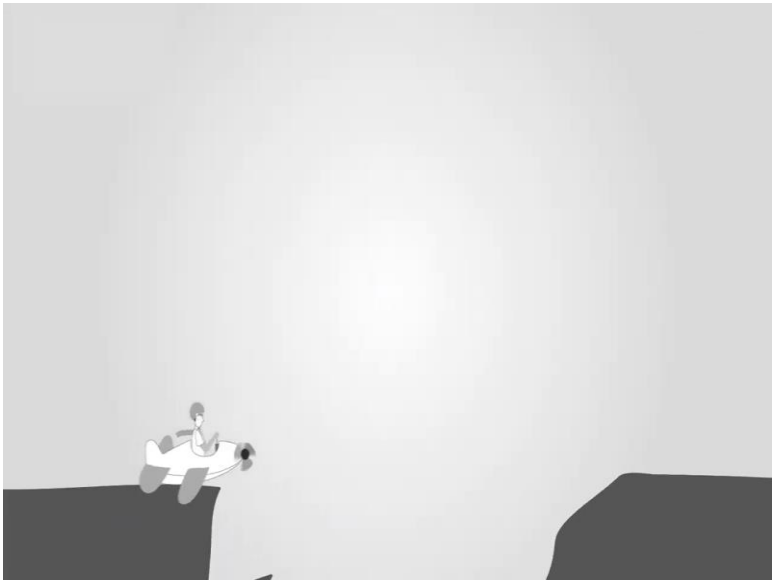

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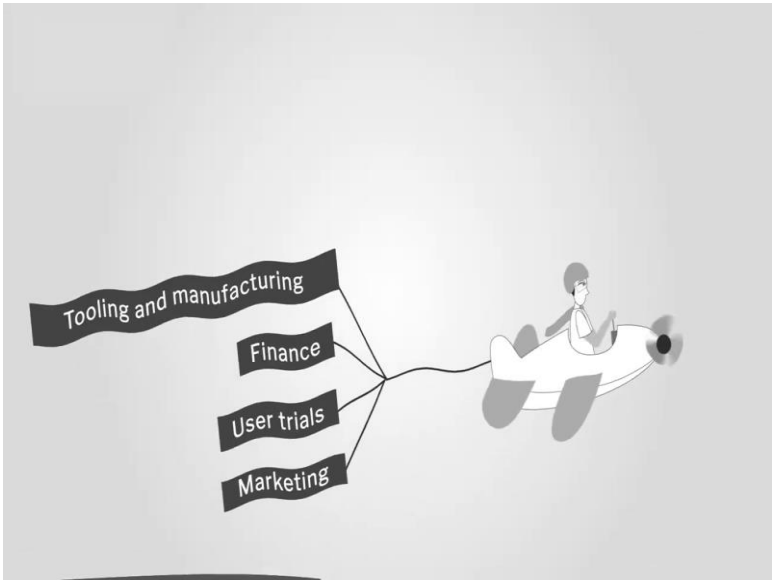

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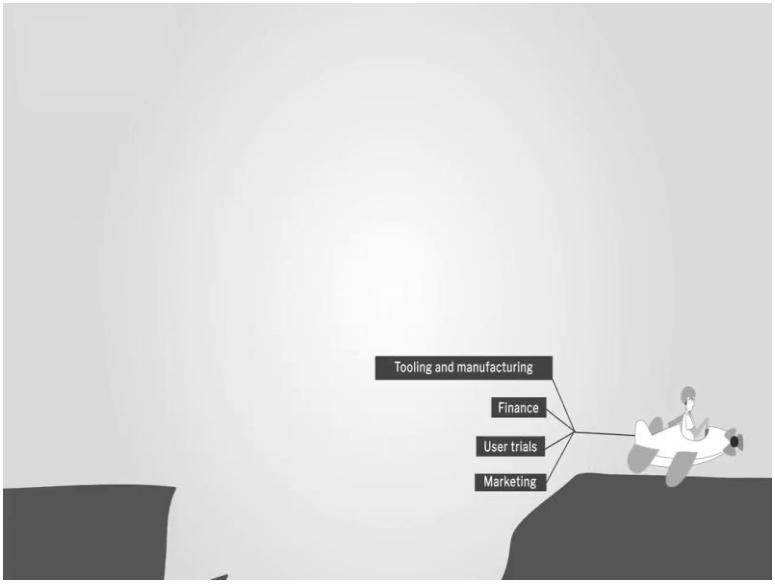

So, this is the whole you know story students.

Thank you so much for your time.