Design, Technology and Innovation
Prof. Chetan Solanki and Prof Jayendran V
IDC School of Design
Indian Institute Technology Delhi

Lecture-6
Challenges of Reaching a Million Users Part 2

And I am going to show you, so it's a solar lamp. What is the big deal about the solar lamp? It is not a very complicated device.

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The very, the basic components that are included are actually the Solar panel, I am sure all of you know. A basic, I would say, power plant for the students.

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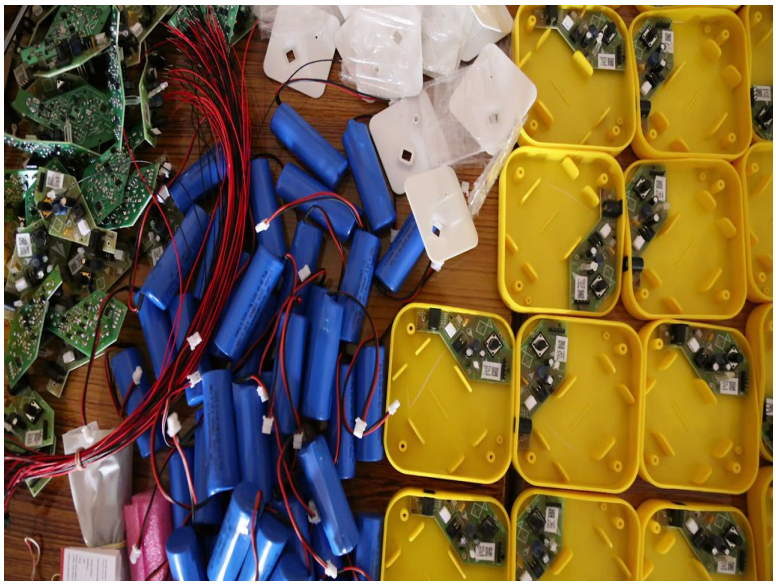

Then, what do you need is the basic components like a, the battery, is designed in a manner that it can give sufficient life. The circuit, the important part of the device, you need plastic body to hold it, and then all basic switches, wires, LEDs.

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Once you have it, you can actually get the lamp assembly like this, and this beautiful and very powerful device. So it's a very simple small solar lamp. And this is designed in a manner that it can work in multiple modes. So in a low operation mode, you press it once it switches on and this battery is good enough, because the whole thing is very efficient.

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The whole thing is it actually works for 12 to 15 hours on a, this intensity mode.

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And if you press it once more it will be even brighter.

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In this mode, it can work 5 to 6 hours.

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So if you see here, if I put it on the table this gives sufficient light and as bright as whatever you are getting from so that this basically solves the problem.

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What we really found out is that this lamp is designed for study purpose. But it is not only used for study purpose, but it is used for anything and everything.

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So mother will use in the kitchen, somebody will go to the field.

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You know, delivering the babies in the, I mean when there was no power available in the night, taking bodies to the funeral, everything. So from birth to death everything. Many times we found that people would actually put it like this and their hands will become free and when the hands are free, you can actually do the irrigation, you can milk the cows, you can walk in, you can actually tie it up here, mothers can actually use it and hang it anywhere they want.

And they can just rotate this head wherever you want the light. Rights? So if you want it upside down, this way, that way. So this will become a very very useful device. And that is how it can become very powerful.

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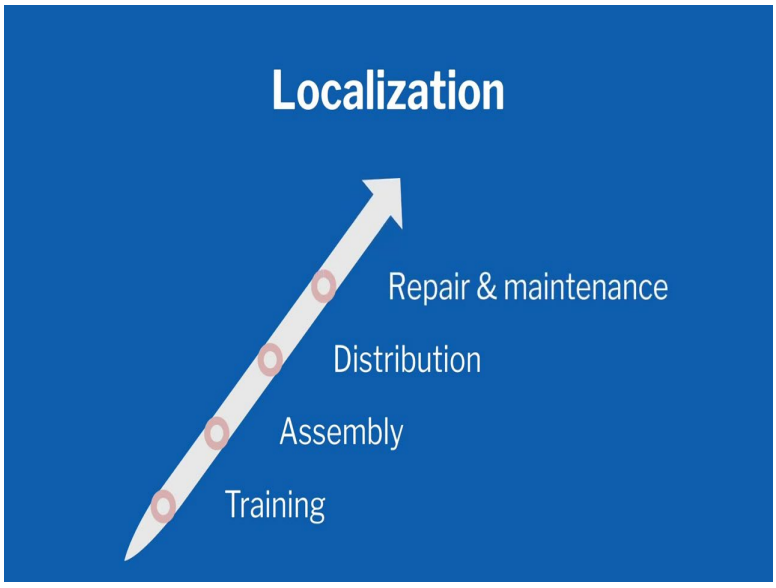

Now, the three components included: One is, localize the whole solution. What does it mean that, let the local community be involved in each and every operation. Once we do the localization, what are the benefits you can get? Number one, your cost of operations will go down because you do not have to have the units and manufacturing units. Your labour will be cheaper and the important thing is your services, repair services will be available right there.

You do not have to really rely on somebody else. How each and every component can be manufactured in India as much as possible.

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So except two components, the battery which nobody manufactures here and the LED. These two components come from outside, but everything else is manufactured here. What we have also done in various projects here is we have standardized the technology. Right now you Google and say, Solar Lamp, you will find 200 different kinds of solar lamp, and the problem with each of those different lamps is that they will have their own design, they will give their own circuit, they will have their own battery, everything.

And therefore the components are not interchangeable. As a result of that, no single device can be promoted and even if it is supplied to some area, you will not find the spare parts, but if we have standardized the whole thing, the entire technology is open source right now. So if you go to the,

our website you will find every design of the body, of the circuit open source. Some of the IDC students were actually involved in helping us to design the Solar lamp. The second problem was: How to make it affordable? Now, one of the ways to make it affordable is to appropriate the technology for the use. In this case, we thought it should be study purpose.

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And for study purpose you need 150 lux of light. In the light you required in about, you know, 145 CM diameter area.

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So any book will fit into that.

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Now, as soon as we do that you will realise that light wastage is not there. So this light is there where it is required. Right? So there is no unnecessary wastage. So earlier I showed you, it was a 5 Watts solar lamp. This LED is just 1 Watt. So, in less power you can do that. Our circuit is very efficient. So that itself has resulted in a cost reduction, but still it used to cost about 500 rupees and we figured out that 500 rupees is not affordable.

So then, we devised a kind of method in which we said 'Let the cost of the solar lamp be equally borne by students, society and the government'. It's the society's responsibility that every child should be educated. It is government responsibility that the child should be educated.

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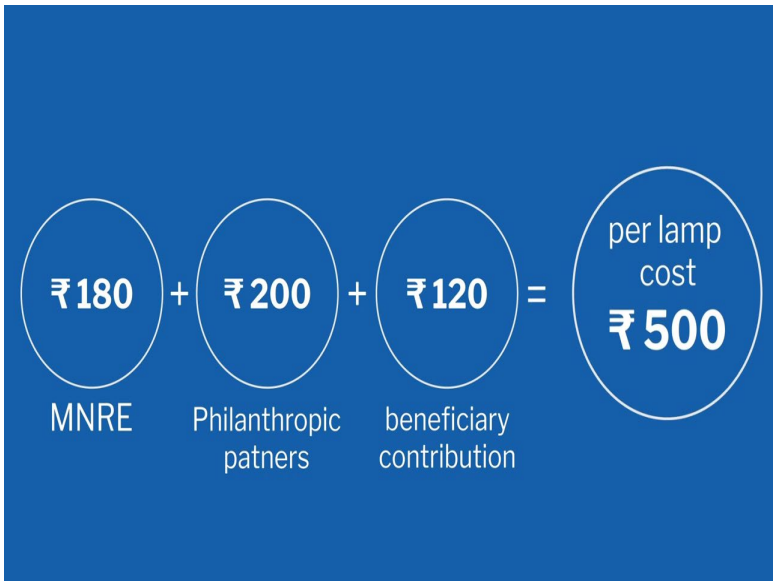

Government by the time had, you know, given this Right to Education, and based on that we also said that our project is a Right to Light project, that every child should have a guarantee of a minimum quality of life. So that was our project and it clicked very well. Government liked it very well because we did not ask all the money from the government. Society liked it because the government is part of it and they were giving so they do not have to give all the amount. The student also could afford it.

Third thing, what we did is to reduce the operational cost of the whole project. What are the operational cost required?

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That somebody has to assemble the lamp. Right?

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And once assembled, the lamp is assembled, it has to be sold because it is not given free. Somebody has to go and sell it.

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Once the selling is done, and if there is any problem with the lamp, somebody has to repair it.

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So, these are operations involved. If your scale is not large, all these operation costs will be very high. So, one thing that we realised in the very beginning that what we are going to do is we are not going to identify students by their class, category, this and that. We have decided that everybody would be a beneficiary. Everybody could actually buy the lamp in our project. And we decided the minimum geographical area that we need to cover is a block. Right?

I hope you are aware, there are the states and the districts, and under the district we have blocks. For the block level typically 50 to 100 villages. So we identify a block, every student in those 50 to 100 villages will be eligible to buy. Now, as a result, what happens suddenly you have a big scale. In every block will have 15 thousand students, 20 thousand students. If you go to some, UP and Bihari you will find 25, 30 thousand students.

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So as a result of that our operational cost of assembly, the cost of distribution and sale, and the cost of repair, maintenance has come down. And what we realise that this is not only applicable to the solar lamp program, but every other solar program that you want to do, would actually have the same issues.

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So once we standardized the technology, we started giving training to the group,

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and as I said solar technology is so simple that it does not require a very high technical knowledge and anybody actually can learn it.

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And we have developed a training program where not so very literate people also can actually understand, measure the circuit is working or not,

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measure the battery if it is charged or not,

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measure the panel if it is giving in enough power or not, enough voltage or not,

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how to do the soldering,

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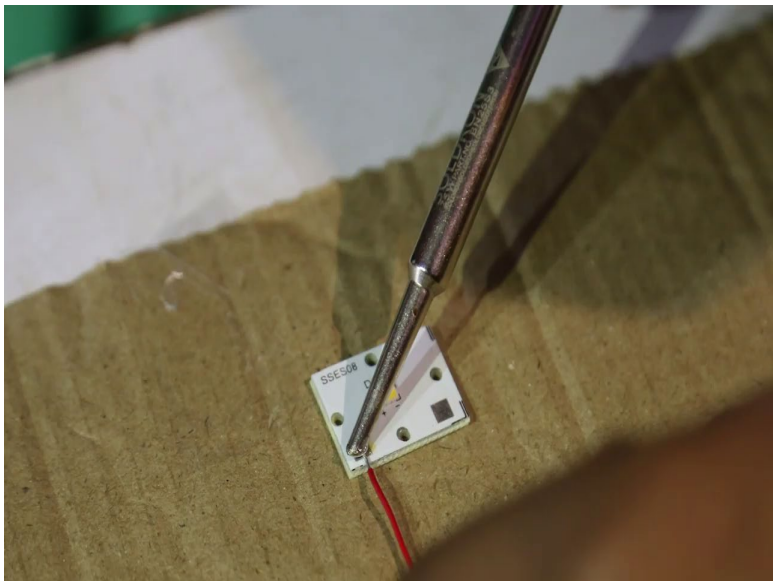

some basic screwing and all that they need to do it.

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All those things, operations can be done.

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And they can make this lamp. Now, when we were doing all this, one of the basic, the doubt in everybody's mind was, whether this lamp will be of the same quality as you buy the lamp in the market. Right? Because the people from the rural area are going to do it.

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Therefore we have established, all kinds of quality checks after the assembly,

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so that eventually the lamp that goes in the hands of people is of a good quality.

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So, after the lamp is assembled. The next was get it distributed,

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to the students in rural areas. Distributed means, at some cost it has to be sold. Right?

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It is not given free. This was only the beginning of what we started doing. So now I will show another video that, what is our overall plan in our SoUL, S-O-U-L: Solar Urja Lamp project has become SoULS: Solar Urja through Localisation for Sustainability. So as we started doing this solar lamp project we actually went to the bigger and bigger kind of solutions.

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Ministry of New and Renewable Energy
Government of India

Just have a look at this video.

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By now we have reached to more than 6 million students. Now, how it all happened? I have only told the conceptual level but how it will all happened will be told to you by Prof. *Jayendran*.

I am *Jayendran*. I am a faculty in Industrial Engineering in Operation Research, IIT Bombay, IEOR. Apart from working with many big industries this was a very interesting challenge where some of these concepts of consultants is also applicable in rural areas.

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Now coming to this aspect of the technology intervention which *Chetan* talked about, pretty much what we want to do is improve the energy access by providing an appropriate type of intervention in this particular case, which happens to be a solar study lamp.

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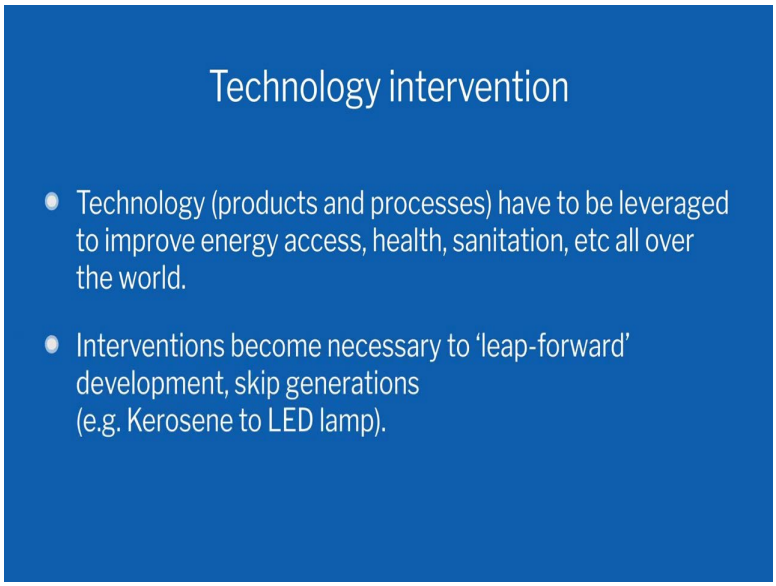

But whatever intervention that we want to do, like you know, we can have really lofty goals but that has to be appropriately translated to operational processes and procedures and down the line, so that the entire goal and vision can actually be a success. That is pretty much similar to what is the goal of a supply chain of a very large company can be. Whether they are in the business of ensuring the right product, reaches the right customer at the right time at the right price is pretty much that what we want to do.

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But the added challenge here is the people we want to benefit are the people (who) are not able to afford the product at the current price point. So that makes it a little more challenging and they are at various locations.

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So, some of the research we are regularly working on is related to supply chain has a nice sync with the Solar Urja Localised and Sustainability initiatives that we had started. So we started working on that and I wanted to see how various aspect supply chains becomes relevant here.

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The objective of the SoULS is pretty much what you want to do is provide high quality, affordable, clean light that is a solar lamp to millions of school students in rural India at the fastest possible way.

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It is to provide 1 solar lamp to each student. It is not that 1 million goes to one person. We need to ensure that everybody gets it, equitable access. It should generate a sustainable employment, generate local capabilities. It should be able to seed the rural market for accessibility and availability of solar products in the future. And we gave ourselves the goal of the fastest possible way which is approximately say, 12 months, before which all the millions of students must be able to get access to the solar product.

It is not just a lab prototype, right? We need to produce millions. So we need to develop the vendors. We need to provide them the capability to actually manufacture it, supply chain network has to be designed, assembly distribution centers has to be setup. It is one thing to say that we can empower local people to assemble and distribute. It is quite a different thing to actually empower thousands of people to start making the lamp but the quality level we want. Right?

Then production, sales, planning, scheduling, after sale service, all these things are, will have to come into play in the SoULS project. All these attributes, in a time bound manner which makes it much more interesting and exciting, unlike Apple, which can come up with new versions every few months, what we want to do is ensure this, it reaches as many people as possible.

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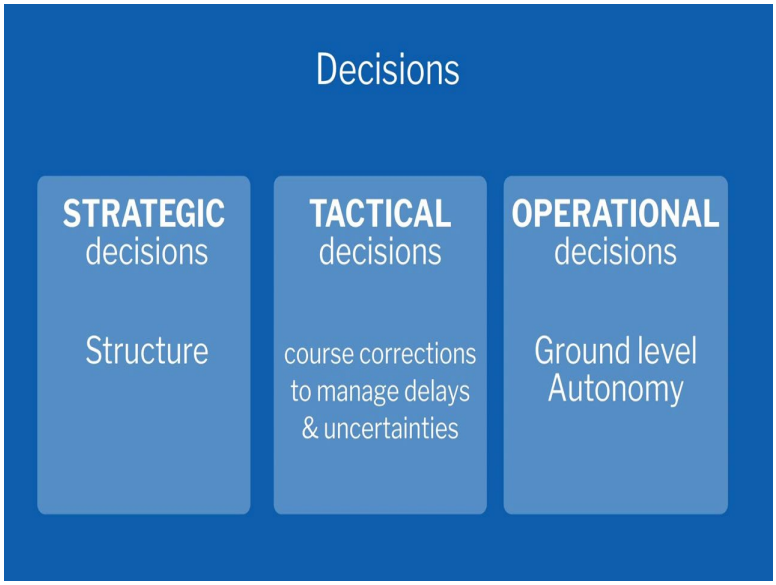

So, broadly speaking we had decisions like strategic decisions, which pretty much talked about what kind of supply structures, what kind of financial models we want to work on, which is then translated into tactical decisions which most of the time involved more short decisions that was given the current constraint to manage the delays and uncertainties. All this has to help in making operational activities at the ground level so that the actual student gets a high quality lamp at the price that we actually want.

Strategic decisions are always important because that pretty much locks in what kind of intervention, what kind of scope your entire activities can have.

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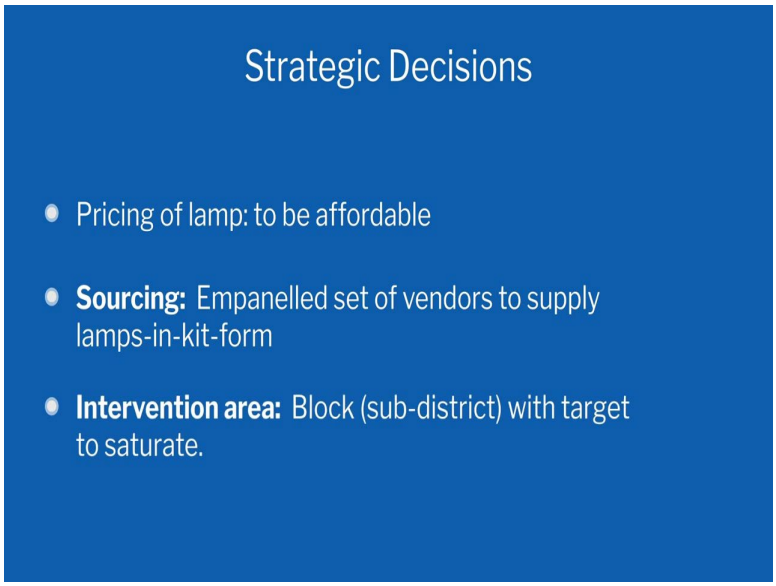

First of course, the pricing of the lamp should be affordable which *Chetan* explained how we went ahead, going, making it affordable. Sourcing, so we had to iterate and empanel a set of vendors. So this lamp has been designed by IIT Bombay and has been released as an open source, as an open source hardware which means anybody connected download the design files and manufacture this lamp. This can significantly reduce the cost of the product and cannot enable many small players, to at least start making this product. We also involved in large scale tendering which actually reduced the cost significantly, which can allow us to reach to more students.

So one of the things that we targeted was 'let us just focus on one block', so that way we cab actually go deep in one location rather than spreading thin at every location. But we want to repeat it in multiple such blocks across the country. So the selection of it is also quite an interesting challenge like, I'll just give you an example, State of Bihar, all except two blocks were all eligible blocks. Eligibility criteria was kept as the percentage of households that depended on kerosene as per 2011 census and percentage of marginalised households within that block.

Based on that when we shortlisted eligible blocks, all except two blocks in Bihar was eligible. And the number of students enrolled there itself is about, I think, 10 or 12 million students already there, just in one State.

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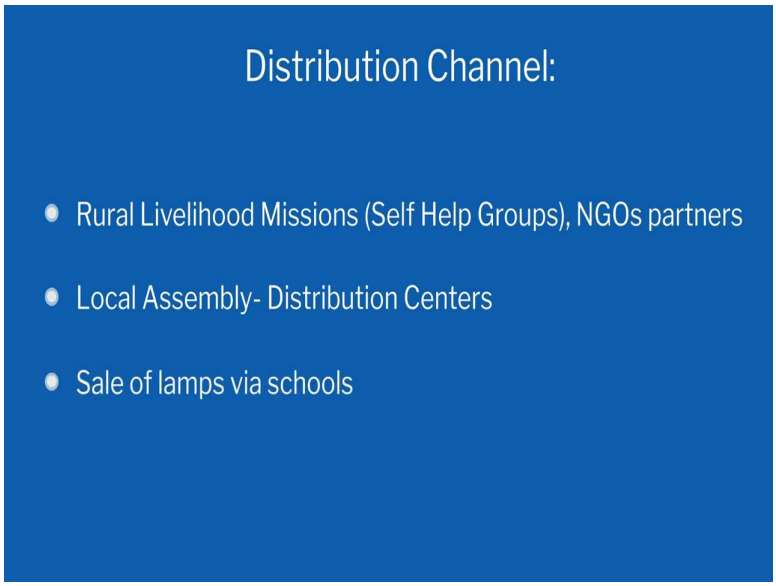

So we used these multiple criterias, then the distribution channels, they partnered with State Rural Livelihood missions and their self help groups where in and various NGOs were partnered to reach the ground level. The purpose of these missions is to create local self help groups which are independent autonomous units which are formed by community or bringing together women from every household and forming a community organisation who are then empowered to take decisions, do some microfinance and use it for their own training and skill development, so we partnered with them.

And through them we set up local assembly and distribution centres, which is manned completely by the local women who run these assembly and distribution centres on their own. Now, how do you sell the lamp to the students? Since the already targeted population is students or the children, expectations are that they are enrolled, so the sale of lamp was conducted for all the schools in the State, whether it is government school, or private school, does not matter.

So that actually is your point of dissemination. So we can ensure that actually the target audience indeed get the lamp.

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These things are actually are really big especially in India because there is, it is prone to leakages and corruption. Imagine a product which is available in 100 rupees, but competition in the market 500 rupees. It is almost natural for people to buy for 100 and sell it for 200 rupees somewhere because the desire for economic improvement is much higher than the actual need for the lamp. So how do you prevent the leakage, by empowering these local organizations and advertising well and saying look everybody in this area is definitely going to get a chance to buy.

So, thereby we can reduce the chances that people will actually, so even if somebody wants to sell it, others may not buy it because they know that they will get their turn within a short period of time. They do not have to wait for years and years for that.