Electronics Equipment Integration and Prototype Building
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Lecture – 38
Round up

Hello I should have started with this earlier presentation which I had made very very old. It is the issue being saying why do we need to learn anything about this mechanical engineering.

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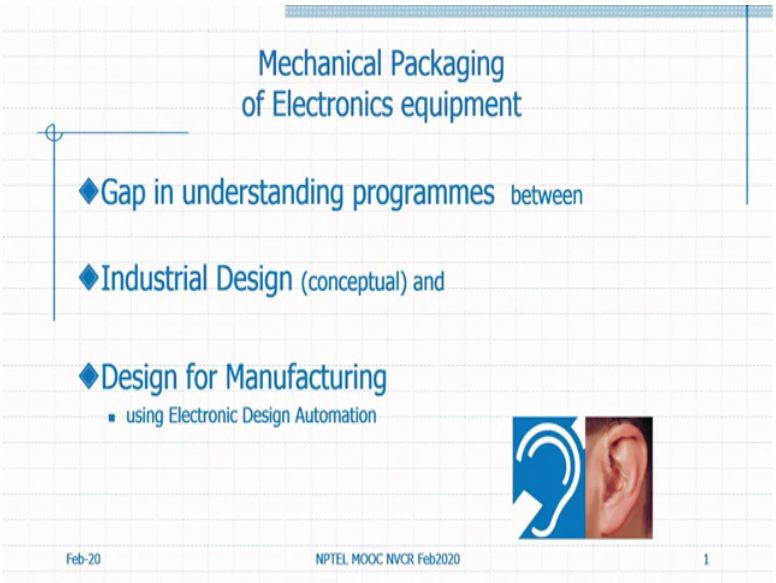

So, please follow this thing and so on. One of the first thing you will notice is that there is a significant and real difference between industrial design that is all where this you know you get all your beautiful things which are available. And so, called designer products; anything you come about right from clothes to standard items and all those you know interesting very very extremely interesting products come from industrial design.

And then secondly, designing for manufacturing and design for manufacturing in mechanical it has become two types which will seen the subsequent slides.

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Any design in fact, is a beehive of activity peculiarly we see that you know there are small cells and we have these ultimate thing know saying each cell is separate. The reality is all of then the purpose is same purpose is saying we have all work towards a product like this.

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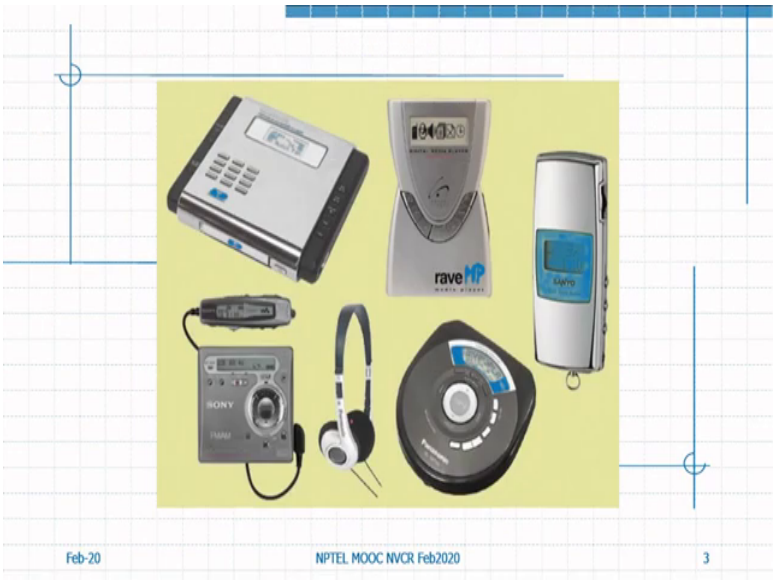

If you see a complicated product like this, only core electronics forms the very important thing. I am not saying anybody can make it, core electronics makes the important thing what does make the difference between you know a product that can be marketed and you can make profit out of it is the design of or presentation of the whole thing.

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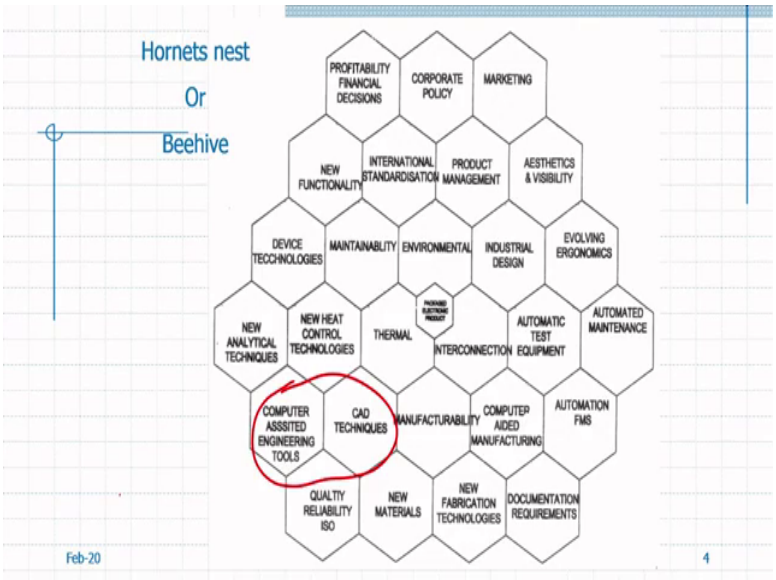

So, here we come into the important more and more important saying is this Hornets nest or is it a beehive of activity very very important thing we talk about saying there are so many things like that. They actually the small design comes here probably they starting point of any of these things says profitability and financial decisions, then the marketing and product management.

So, these things follow, then we come to product management and eventually come into the small core issue about it. It depends on for convenience I have just shown them about equal. If you are a marketing person, you will you know things it important. And then all the time this new device technologies are coming about that is how you are able to afford various other things.

And most important is what our lecture is going to be is about CAD technology and computer assisted engineering tools. In the case of manufacturing for the printed circuit boards and all that we have the EDA tools EDA tools help in laying out the equipment making a 100 percent analysis. And in the end you get things which will work every time under the given circumstances.

Similar let us for the mechanical items. Even in the case of mechanical items if you see here everything else which is not electronic is probably covered under computer aided manufacturing, materials and so many of these things.

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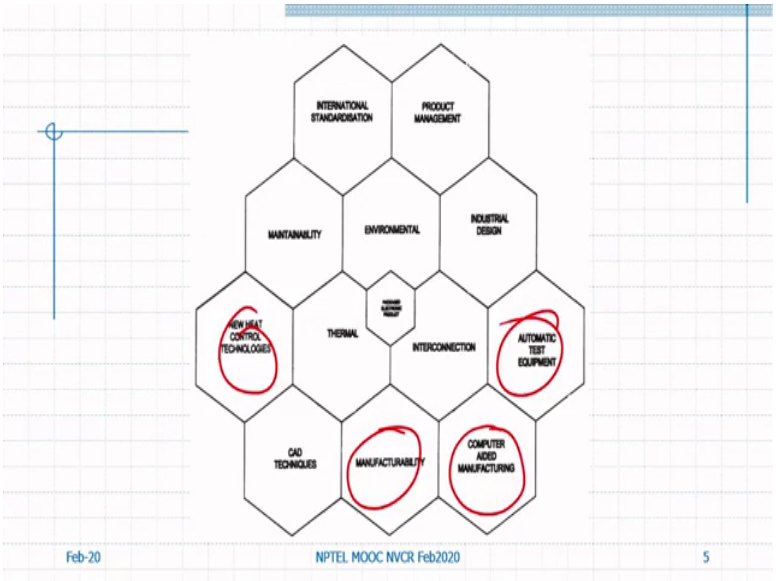

So, at least you can stop this I will go a little closer which does make a direct impact on us once you start the product design is that all the time we have new CAD techniques. If CAD is could be analytical or the CAD could be laying out CAD could be mechanical and so on. And

now we have this cam also associated with it cam is you have to directly whatever the designer wanted, he makes a file and with minimum amount of confusion and having to get back to the source should be able to produce the equipment.

So, the whole lecture so far what I have covered was about saying how to make certain files, certain things which are related to basic very core electronic design which involves little bit of laying out of the equipment. And towards the end how to actually go to the workshop find things how to do yourself and in the end the files that you have created will can be used by this CAD people and it can be used for fantastic analysis and finally, you know automatic test equipment.

So, these days in fact, components are no longer you do not bend early it and put it into a PCB with the holes surface mount has come and surface mount also these days, one does not talk about how many components to mount and all that. What is talked about is it is a component shooter, how many shots per minute, per second and so on. So, if you have a chance you can go to look for any of the YouTube tubes and what is a component shooter which is used for making PCBs, but that is lot more related to the other things.

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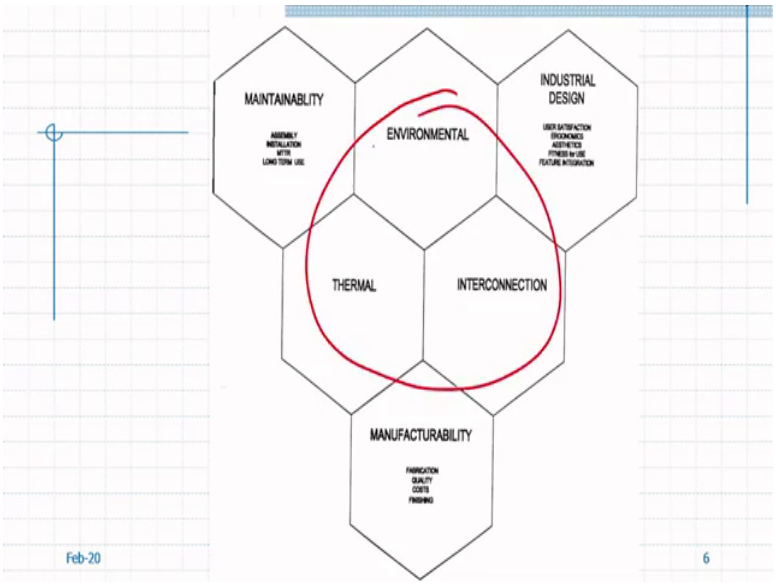

Now, we have come back to our very close now we are sort of converging back to our main thing important things, we need to concentrate whether you like it or not and whether they are familiar with it or not is manufacturability. What is the fabrication what is the quality cost and finishing what makes things good and maintainability, how do you assemble how do you install and our interest is these are not you know single use thing.

So, we are coming back to saying long term, how do you like to use it and you as a designer I am sure you are very very curious is to how somehow the things have been lasting very long. And are now our biggest manufacturing what do you call setup in the world is able to make things dirt cheap versus things even your costly mobiles are all made in China same thing as the cheapest clone mobiles also.

So, we have all this assembly and all of us whether you like it or not we are here. Industrial design is what that makes actually you know integrates all these things together. So, I am not belittling or anything I am just showing you that this the thing called as feature integration, integration of all the features and a trade off the designer has to take the trade off. At an extreme level I do not like this torn clothes which people are wearing, but that is my personal thing, but; obviously, people pay good money to buy them.

And we also have designer things and probably an occasional failure, but that is part of showbiz. Most important is we have this user satisfaction; user satisfaction involves the ergonomics, aesthetics and how well it is used how well it can be used. Now this is where we slowly come into what we can contribute is these things.

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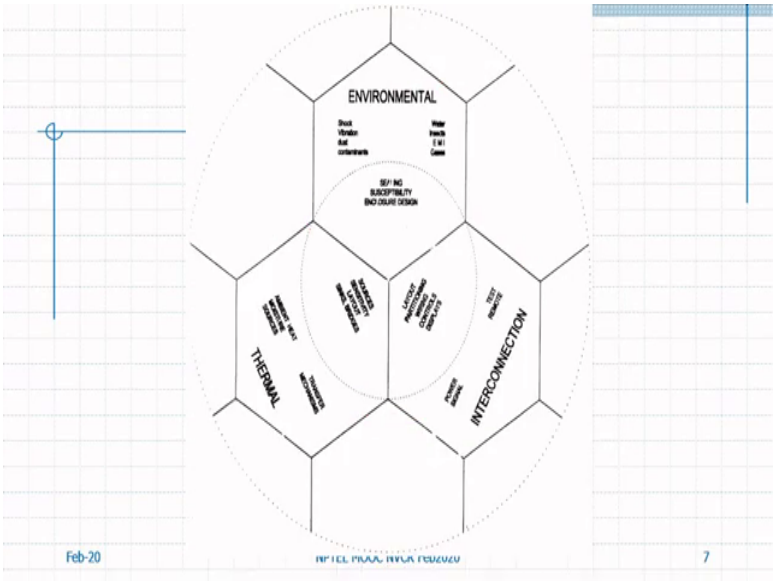

Next picture shows you we have the environmental effects, then we have the interconnection effects, next we have the thermal effects. The moment you talk about any small prototype or anything, you end up with these things you have seen that know something I have to do such that something has to be closed still it has to be transferred across, but that should cannot come inside. Same thing about it inside everything should be closed, but should you drop something into your bath tub or water splash on it, nothing should happen.

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So, we slowly come across fantastic equipment like this you have seen this. It is a beautiful some device I cannot say what it is an equipment. My interest was saying the way it has been package nothing will happen to it water, it deadly waterproof.

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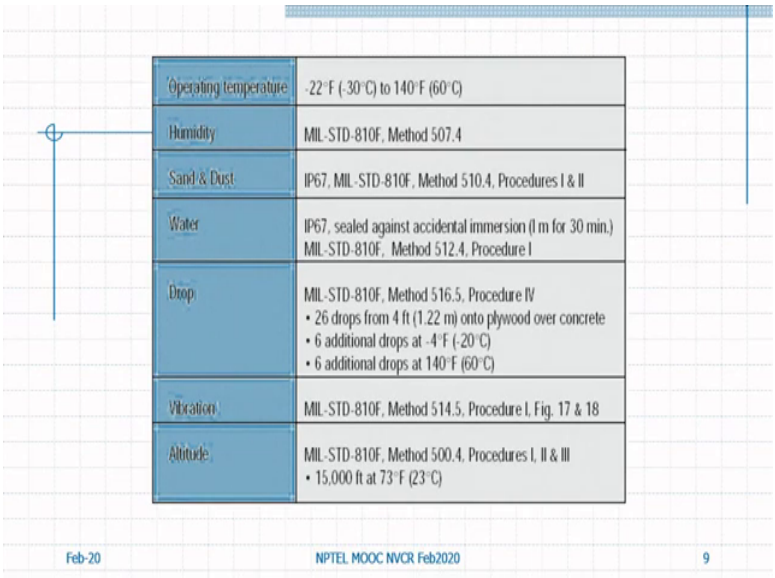

And long ago we only used to have environmental standards for military applications. So, you have operating temperature from 0 to generally in our places 60, but minus 30 and all is normal. So, then we have humidity then we have sand and dust IP67, then you have water then you have drop test vibration and altitude test.

These once upon a time we are only used for professional equipment, but near these days even a small mobile or in my case I hearing aid or your watch or your fitness tracker all these things are expected to work at all these places.

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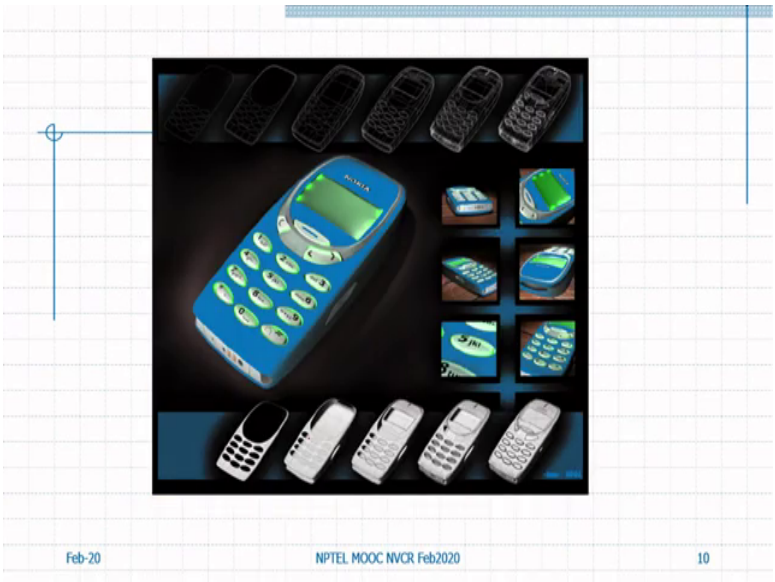

So, this if some of you may remember this old Nokia, one of the earlier phones. Now it comes we come to the very peculiar thing saying is it real or is it a just rendering on a computer screen. It is probably just a rendering, but I manage to pick it up you see here clearly you have various stages of it finally, you have the enclosure.

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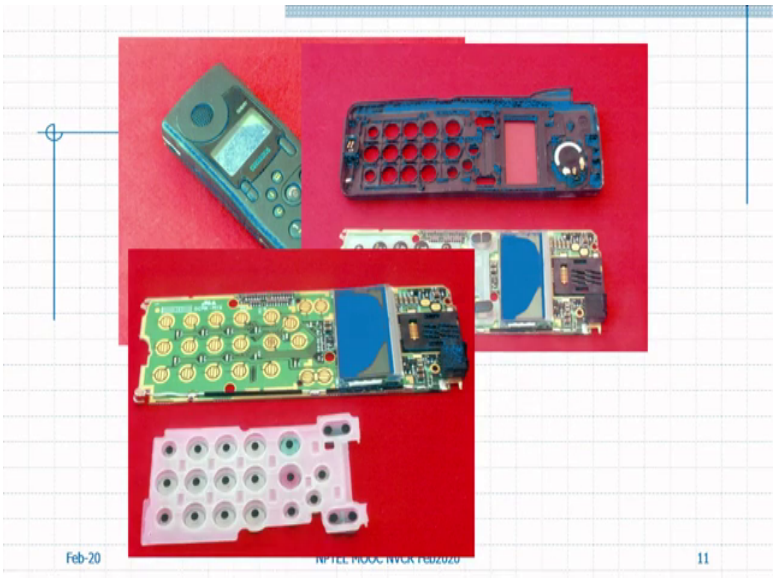

Now, to make somebody understand this you need to probably make a very simple prototype. This is one of the earlier you know devices cut open rather broken open. So, you see here you have various things.

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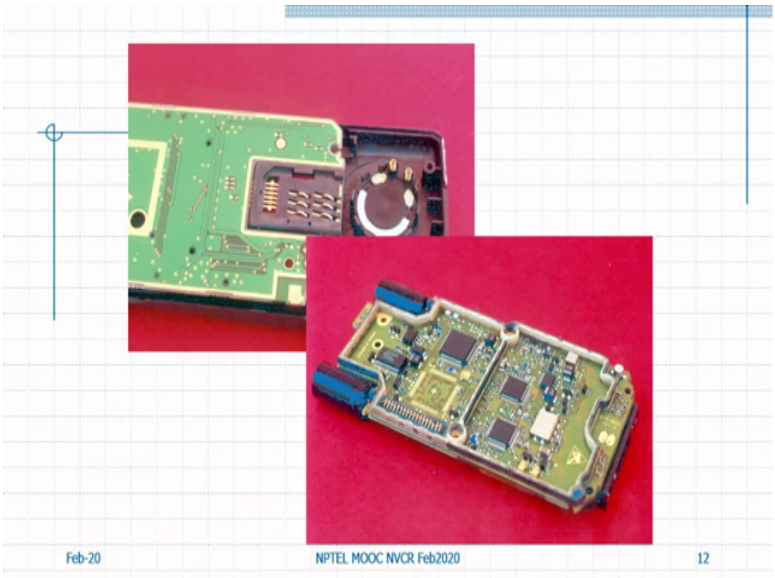

So, yourself you can pause it and see various things here and it is a wonder that things work the way how complicated it.

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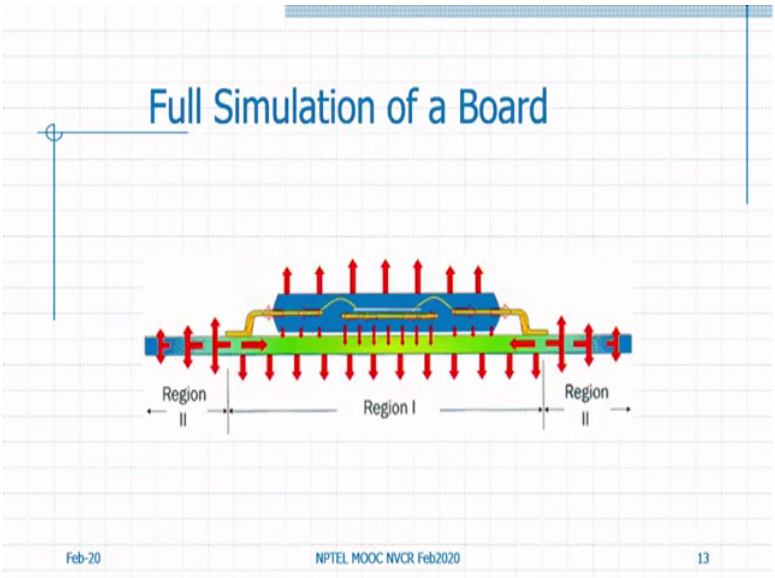

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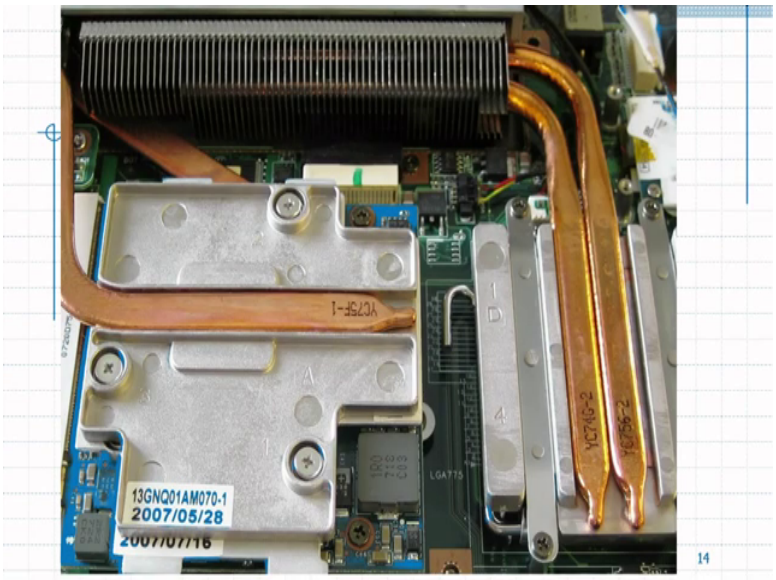

And then we have from the mechanical side, we have all these things. I was just trying to show you saying this is inside a computer, I do not know whether actually it is a game what do you call high pressure, high performance gaming device or an ordinary device, but what do we see here is can you see here we have very complicated things called heat pipes; all this is real.

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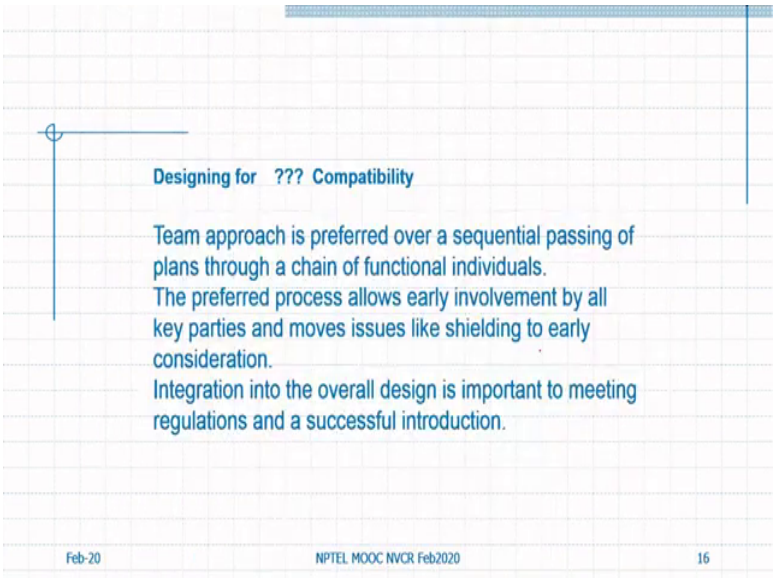

Now, comes to the important thing which I wanted to tell you which where you will be able to make a difference. The thing is a team approach is preferred over a sequential passing or over the wall preferred process allows early involvement by all key parties moves issued like shielding and so on. This is made for something else, but I thought it will help in understanding. So, your earliest prototype probably you know, you have to get across your friends in the other parts of the team.

So, my earliest lecture starting from the second or third lecture was about just to make how to make something very easily into your computerized still stick to that saying it is easy. Saying on where the resources have to be concentrated by the other people.

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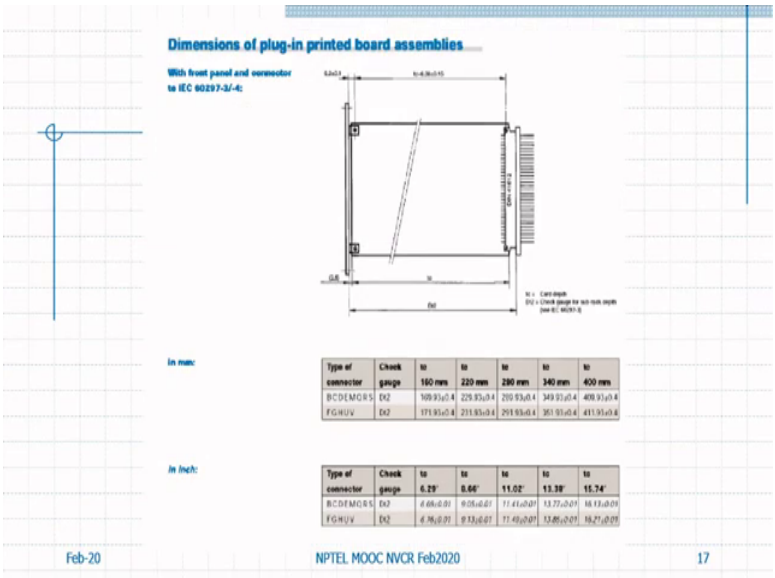

And we have several standardizations also this particular thing is called a single euro card.

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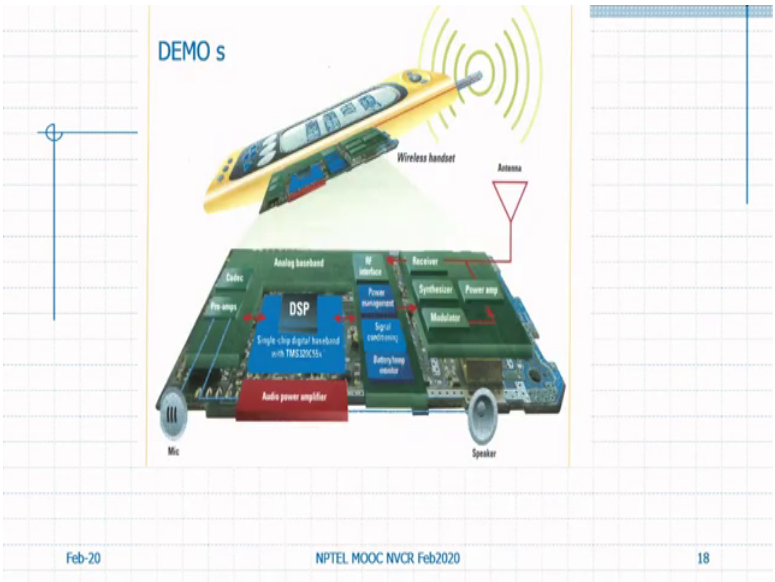

And it is a very old thing, will you believe this thing was made about may be 20 or 25 years back.

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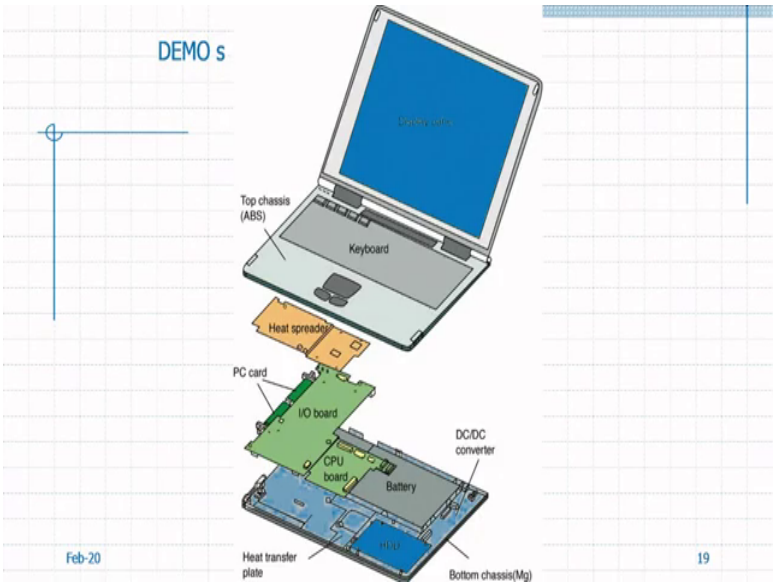

So, it is you need to make all these things finally, to make these things work.

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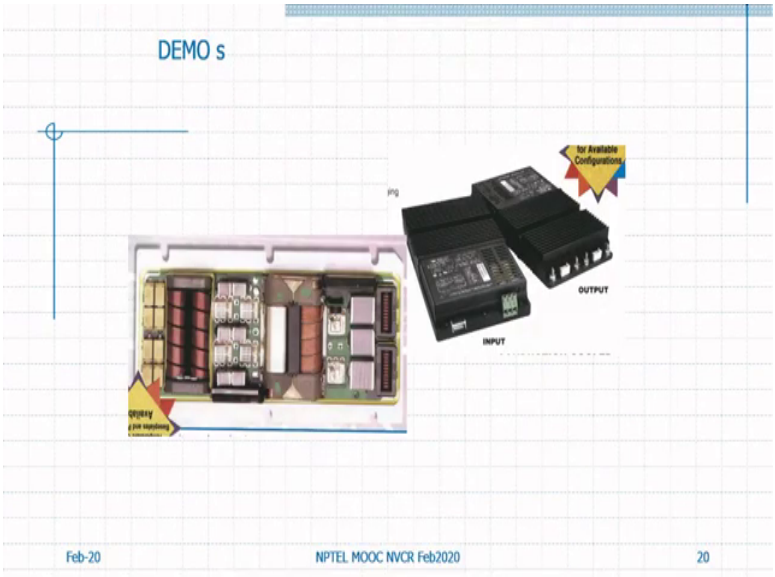

So, we have a really beautiful way.

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Now, we come to the saying your simple desktop or laptop solid modelling is available. So, various things like lofting and as I said know sweeping surfaces, I do not know whether it is from solid works solid, edge or any of the innumerable other model makers are there. The way photorealistic rendering is been made it looks extremely real.

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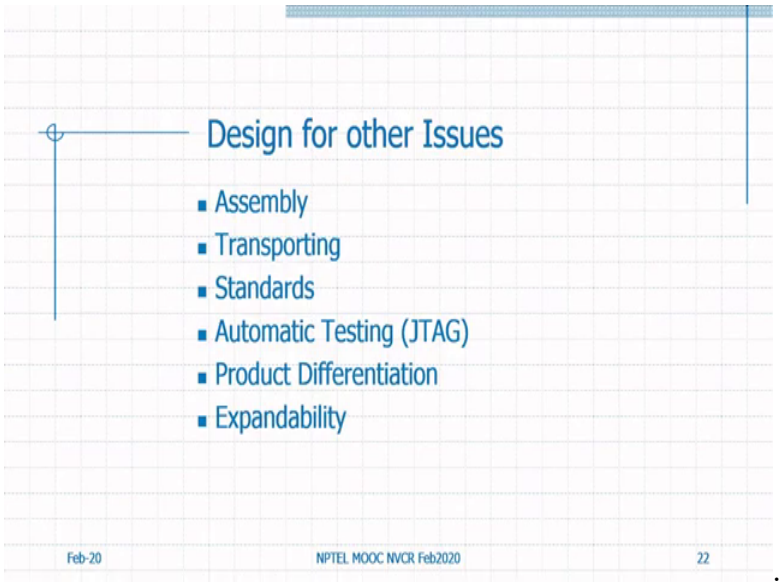

So, this is where somebody needs to include all these things here saying at in the beginning itself if you take a stand on these things typically, it is a product differentiation. So, if something can be made at a lower price probably sales will be much much better. So, we have here product differentiation for each market segment. So, that is where that marketing comes.

So, in case your team is interested is knowing, you can always show these things to somebody and you can do it yourself saying you see this small product is meant for this application. And old people also need phones, but then keys should be different should be tactile feedback and you probably do not need so many features, but inside core can be same; basic core processor can be same and you can continue to make products for different markets.

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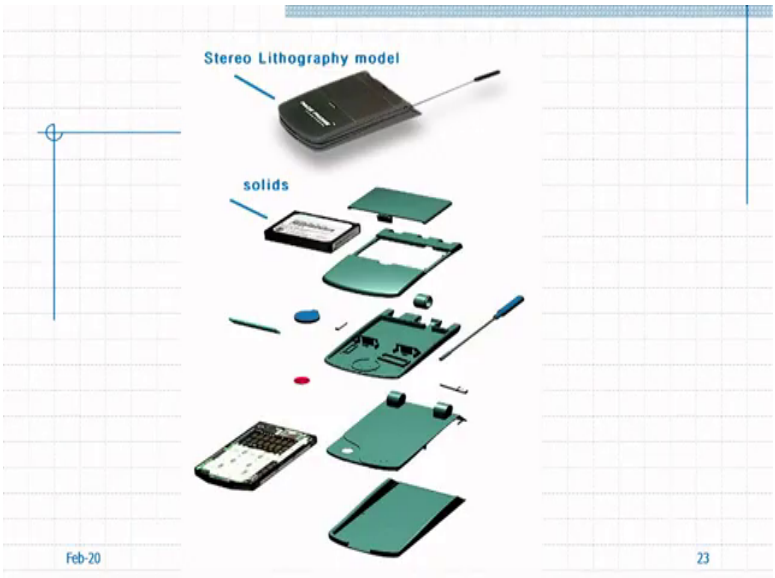

And you see here fantastic build up is shown here saying some are various types of solids. Now this whole thing can be done by 3D printing, but it just a culture of a concept.

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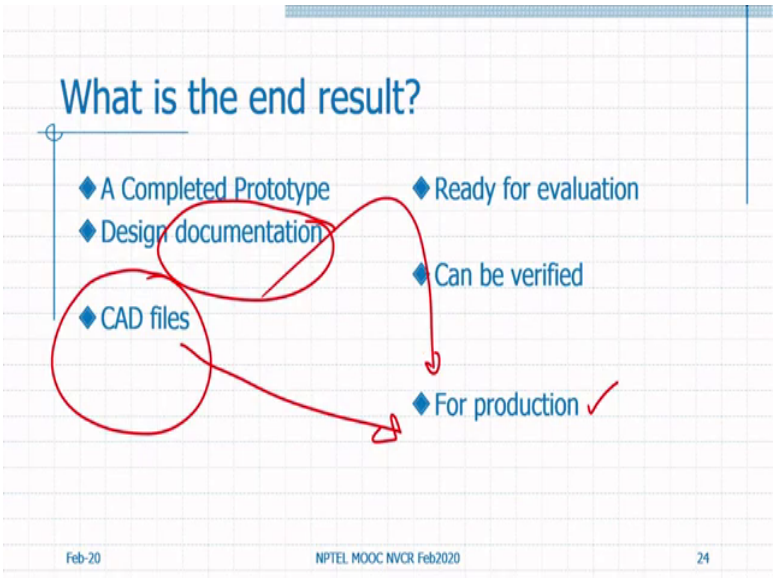

So, the end result is you have CAD files and tremendous amount of documentation which in the initial stage when we started it, it just started as a cardboard model made at home eventually it can be verified this CAD files can be verified after evaluation. So, I have started with you with a very very simple way of how to start these things.

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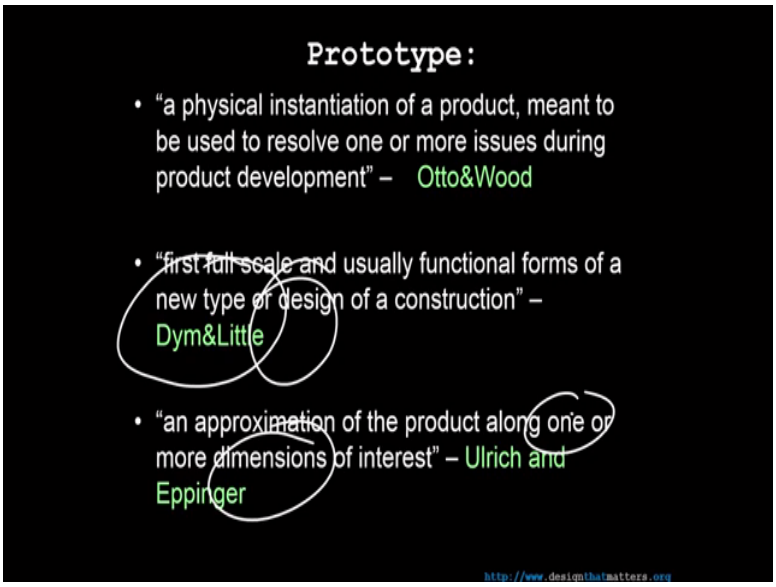

These are all as you could have seen it in the beginning saying at one instant what is the product meant to be used to resolve one or more issues during product development that is what a prototype is. You seen that in the main issue seems to be new newness everywhere know, new design and one or more dimensions.

This is what the engineering people will believe, the advantage for you is instead of going around for a very comprehensive very big prototype. It is much easier for you to come out with the very simple model and pass it along to all your team members. And probably one Friday meeting if your product looks interesting and people are all focused, you are ready saying now we will work on these lines.

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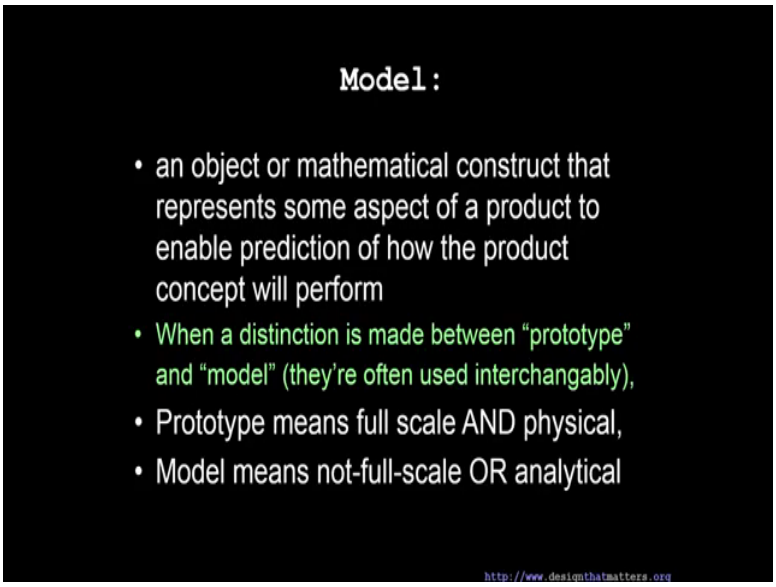

So, now the next slide we are going to show you about mathematical construction that is the word solid modelling we are talking about, not full scale or analytical just a model.

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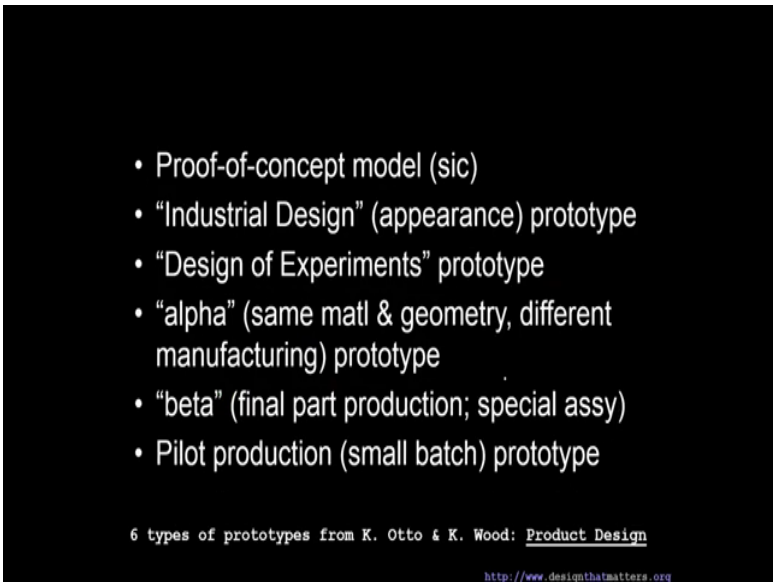

Prototype means a full scale and physical. So, we keep all these type of thing; design of experiments, beta, pilot production and so on. This you have see this know. So, right now at the time of going to this press I am sure you also have got the thing same, they are going to release or already released dark mode WhatsApp. So, and the small print is only for beta users and you cannot access the beta user if you are already not a beta user.

So, the everything you actually have to mass manufacture you are you have to make a prototype and then we have a simple proof of concept models and all the way to full-fledged scalable prototype model.

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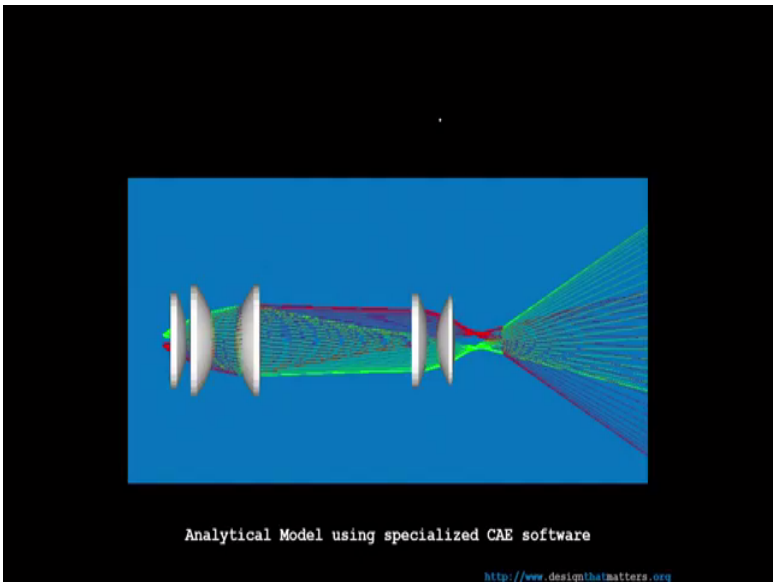

So, you see here I do not know what it is actually, but just I expect it is something to do with I do not know some optical thing maybe it is part of a spectrometer.

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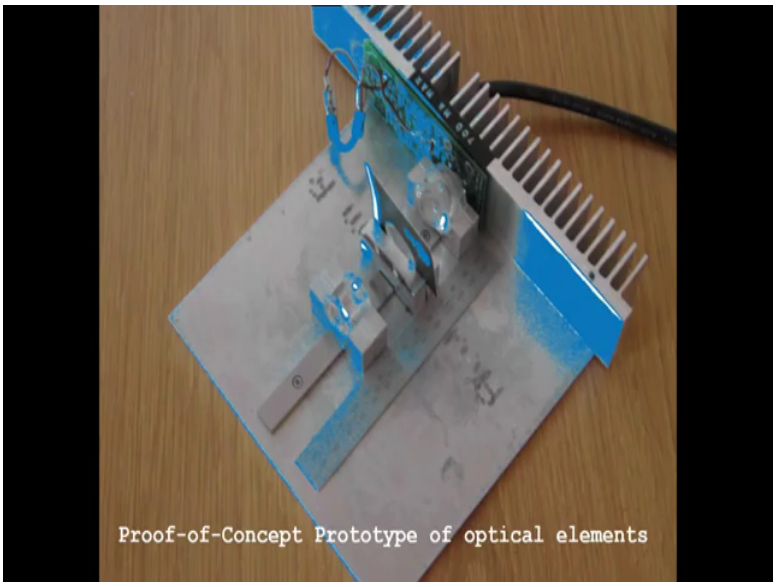

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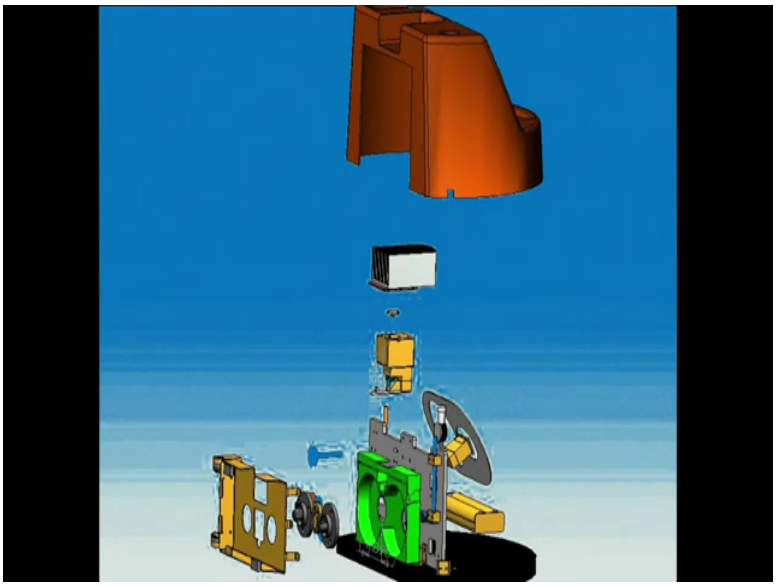

The next few picture shows what it is you seen it, this is taken from another thing.

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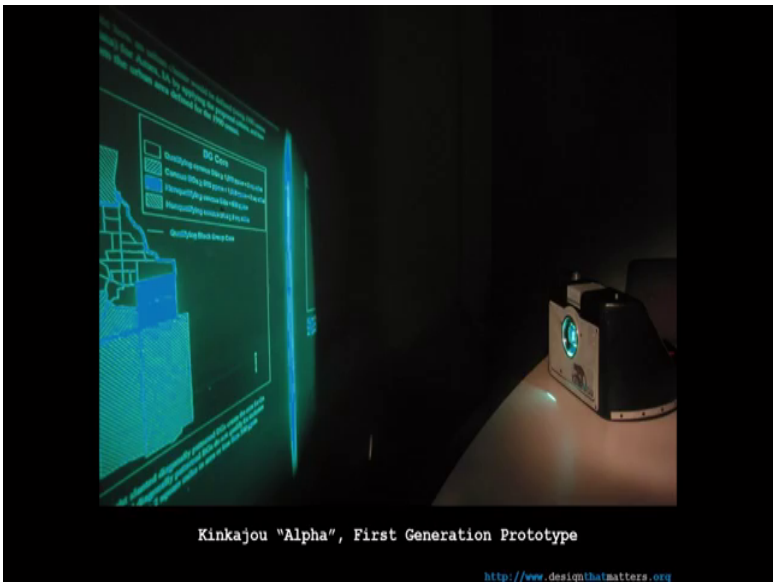

Do not worry about it showing the extreme left we have all these things and you see here now you know what it is, it is a projector while just taking full rgb and projecting on to the screen.

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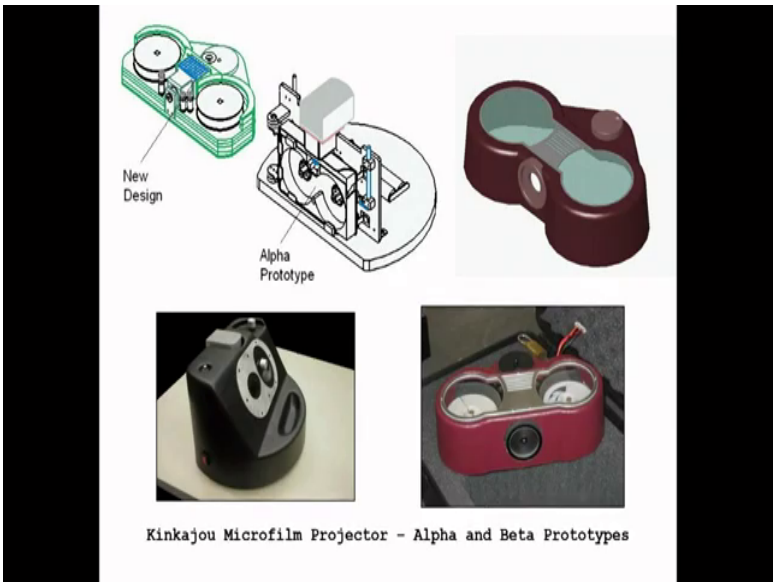

That time this were not known very well we have seen this we have a something here then we have a prototype.

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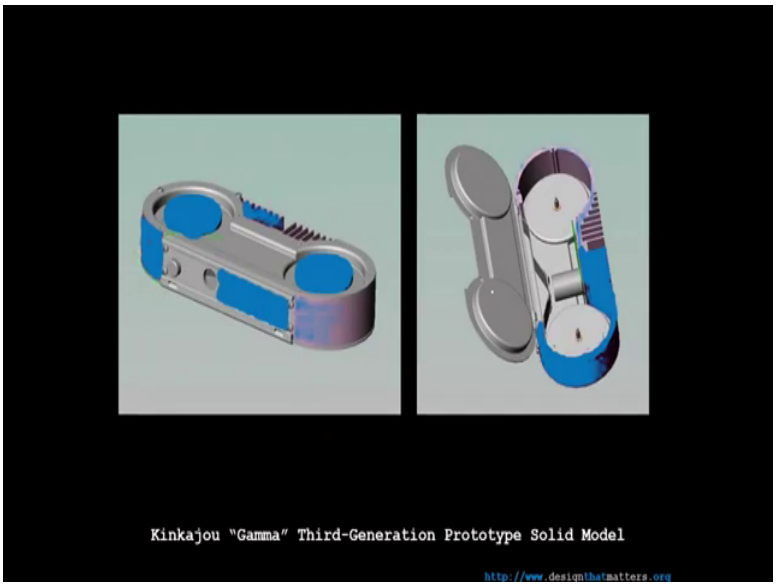

And finally we have beautiful working units to me it looks like a film projector.

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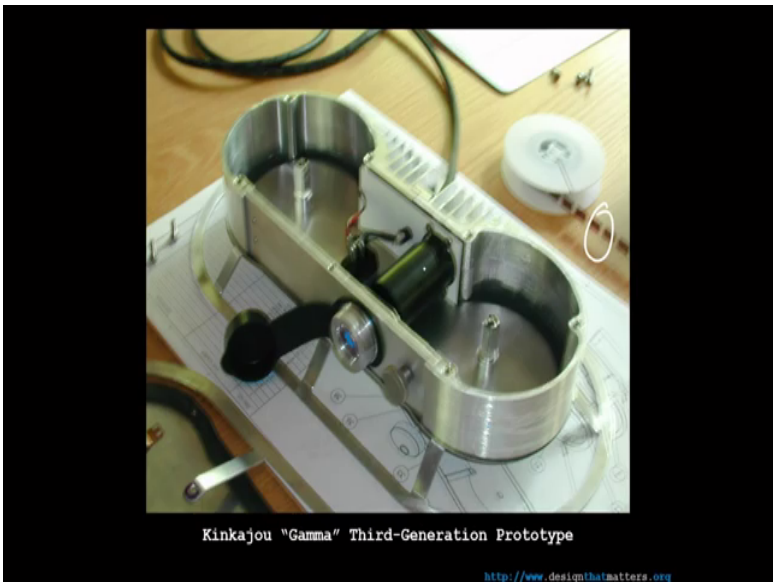

So, let me leave it there.

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Yes it is a film projector. You see here something moving there probably you load it and nicely the projector is working.

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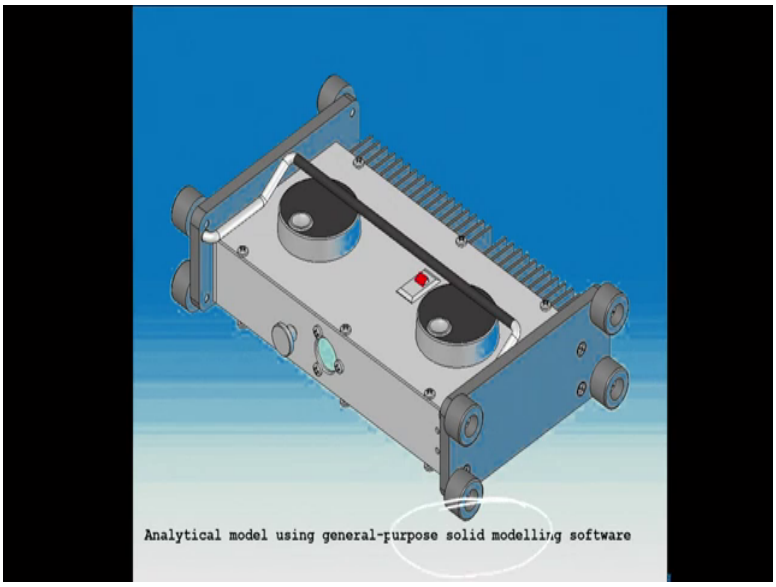

And you see here we have solid modelling and in this case of this solid modeling, this if you say is predominantly electromechanical. See this very predominantly electromechanical device. This is a electromechanical device probably has core electronics things may be 10 percent, 90 percent is the all the enclosure in our case, it is the other way.

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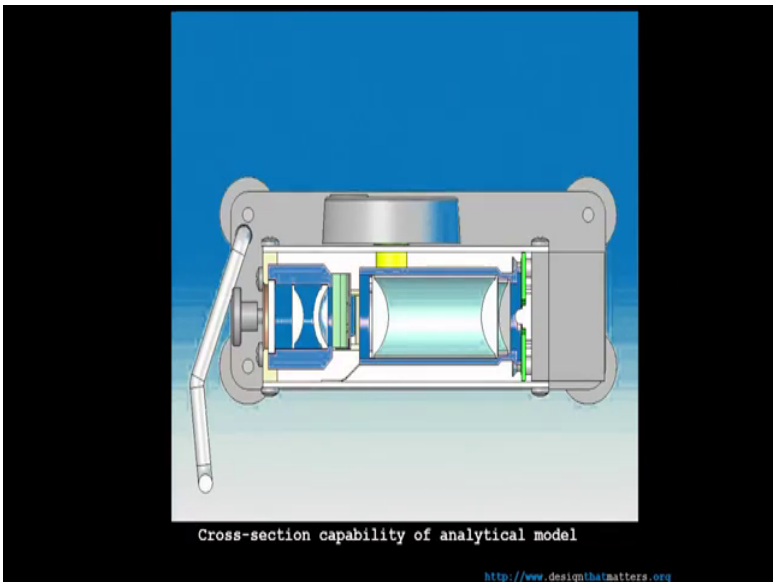

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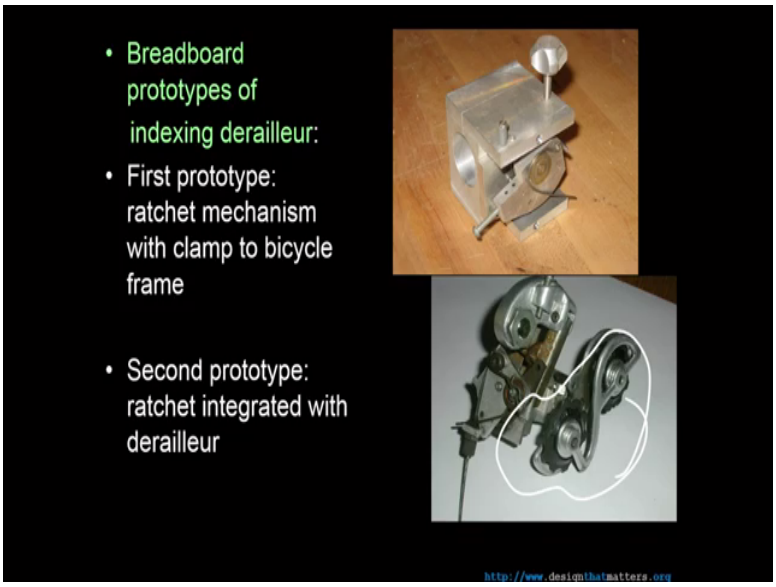

So, lot of these things are included which I will just; I will just skip through if we do not need to. I think all of you know about it know. I do not know how to pronounce it, but I will just call it a derailleur; derailleur means it something changes your gears.

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So, we have a derailleur and then final prototype eventually you know you have beautiful equipments like this recumbent tricycles.

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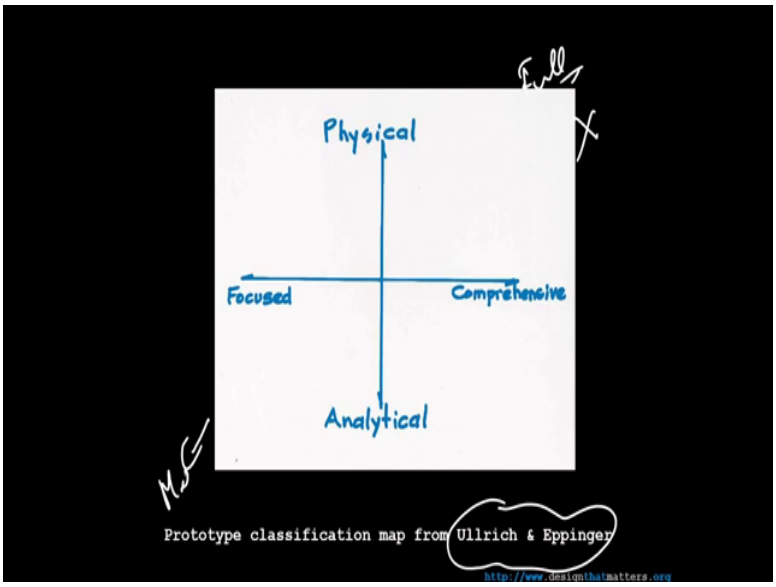

So, we have all these things its again is from the very interesting book which I have shown you Ullrich and Eppinger get a chance read the book and pay for it. So, that you know it will more valuable and people will try to steal, you do not steal.

The advantage being do you have a comprehensive meaning all aspects included in it or do you have to have a focus thing or do you have a full physical or just analytical. Focused analytical is probably one type of fem analysis like that. Physical comprehensive is a regular full flash prototype here. So, this is full, this is just math.

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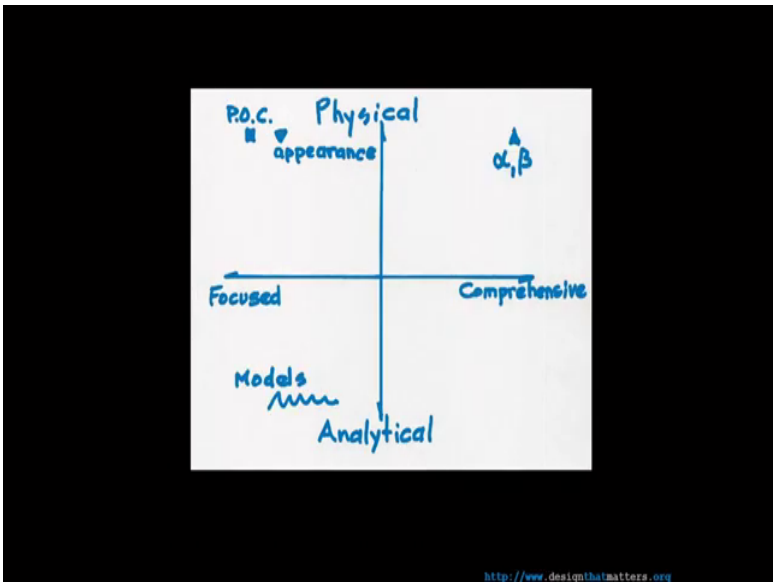

So, we have all these know alpha beta and then we have models and various things about it know how point of sale and so on.

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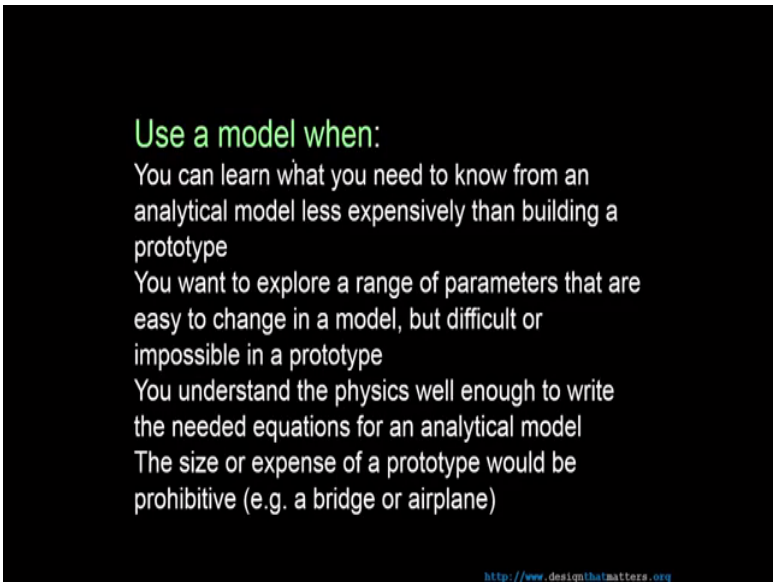

And all this know is various things are there which fortunately you know we do not know to in my initial course, you do not need it.

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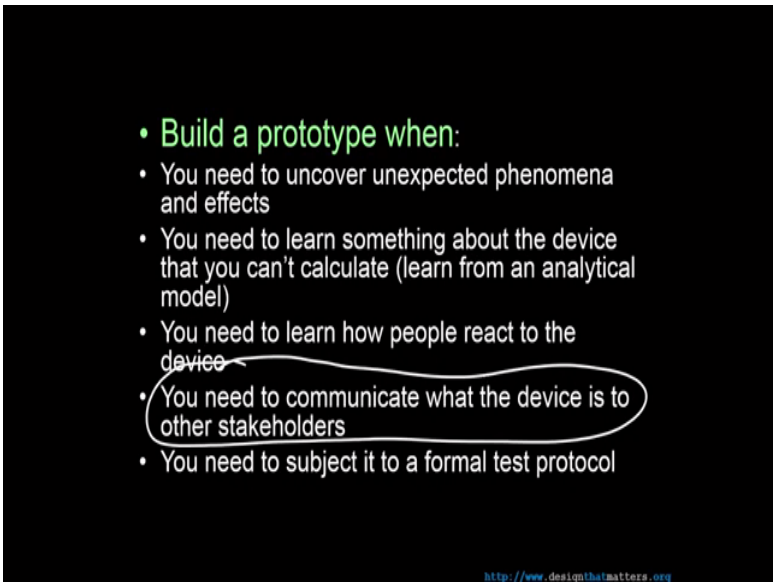

You need to build a prototype you need to uncover all these things something about, you cannot calculate learn from analytical how people react to the device and so on. Now, at this point this is where I kept telling you where are simple CAD modelling will help; I will just make a simple cardboard model.

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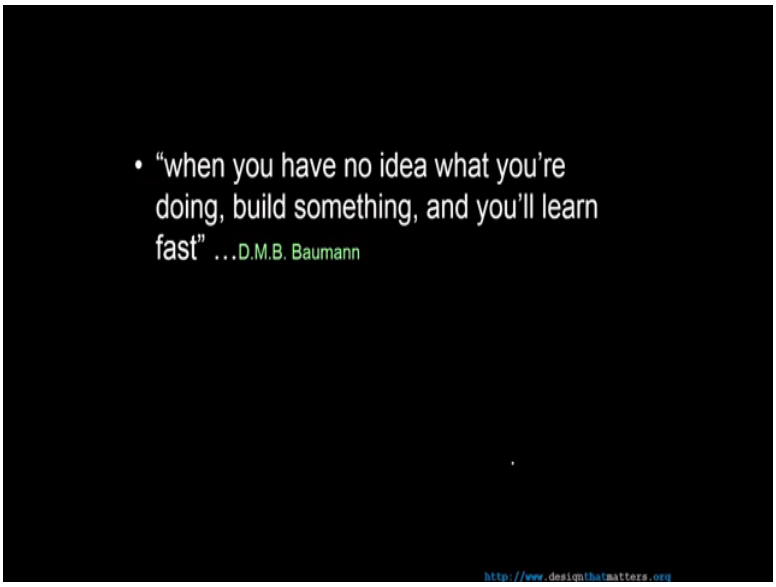

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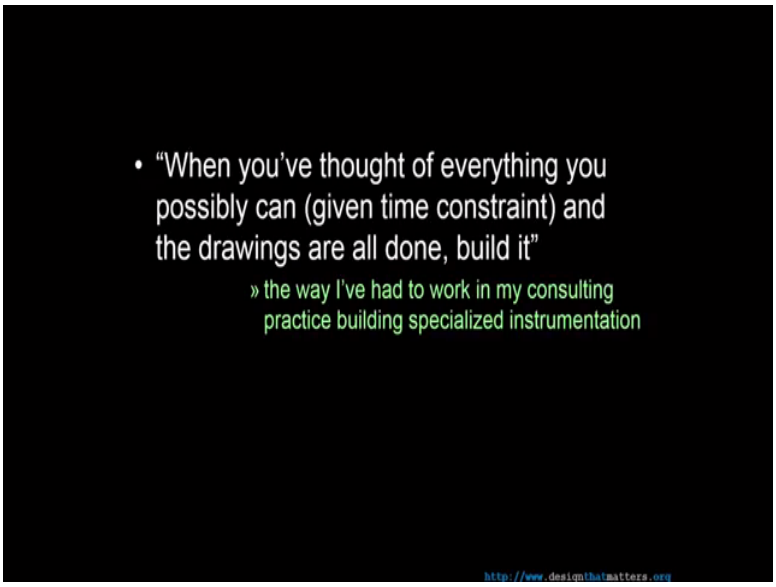

And all it needs is I am sure after a good nights lack of sleep, you can come out with multiple things. You will sleep you are likely to forget just awake and make two different models and I am sure you will be able to make things.

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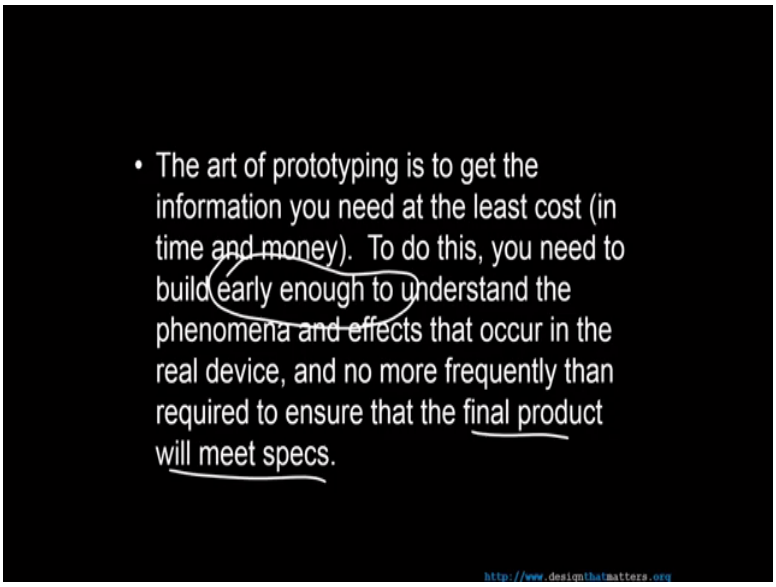

So, all the stuff know exactly you have seen it. The art of prototyping is get the information, you need at the least cost in time and money you need to build early enough to understand say everywhere every person and this particular things has design that matters early not just early in the day, but early in the design cycle. Early in the design cycle if you start these things, you will have very good chance of final product will meet this specs.

So, let us say I will just take in our case only two types of people one is the electronics people who do the various types of layout and coding and all that another type is the mechanical or the production people and the design people. In this particular case, I will use design for the mechanical design and integration people. So, both of them if they make their own variations and bring it to the table and I am sure all it needs is one Friday meeting by Monday your full action.

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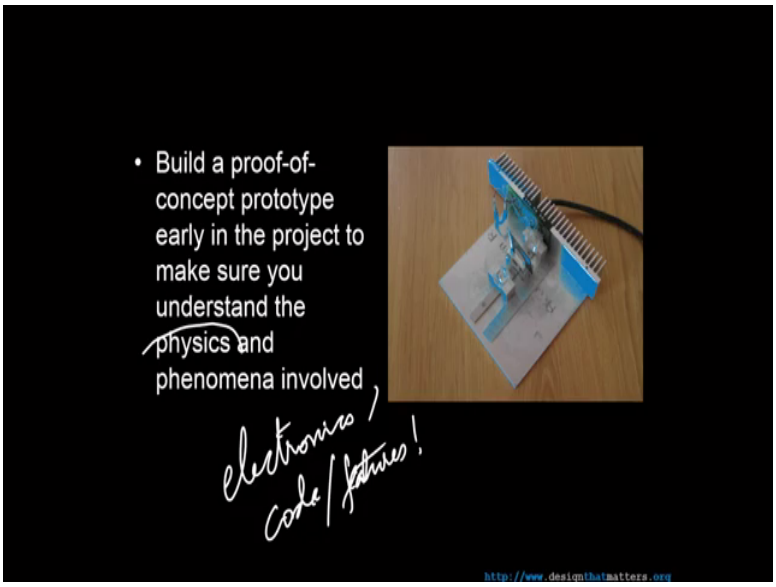

So, we have concept prototype and so on know understand the physics and phenomenal involved, same thing. This is in our case will be electronics. So, if somebody can talk about it; most of the time if you see our mobile phone started with that old good old Nokia and good old Nokia did not even have a headphone socket I understand, but the one that sold in India had a LED lamp and that made sure that nobody had to carry a separate torch and you could speak on the phone.

So, on so on slowly FM radio started and the movement the FM radio started we ended up with the wire and antenna in the headphones and you will not disturb anybody if you want to listen to your own music.

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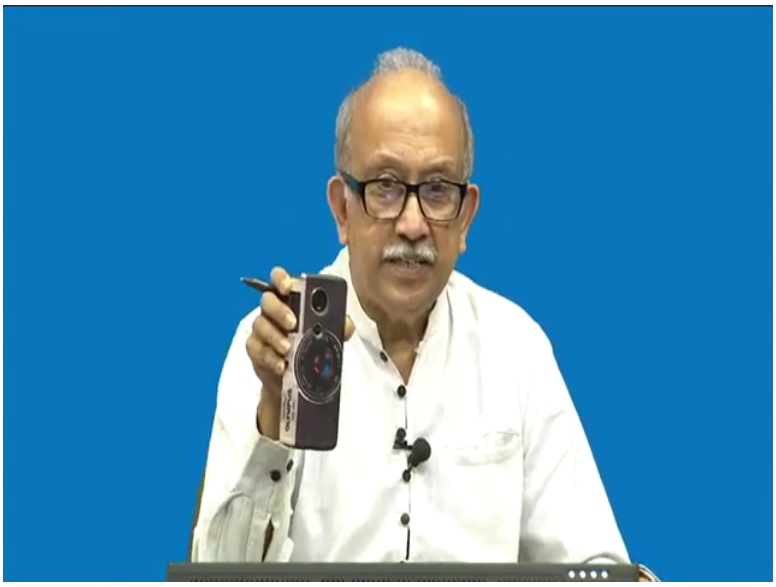

And now headphone like this is probably ancient. I have just used a gauge sticker to make it look like a camera. The reality is unless something has at least one white camera to drop the background and one focused 28 mega pixel camera.

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And then probably a range of sensors here and same thing in different saying a smart phone will be considered dump if it does not have a camera. The fallout is that the small cameras people have stopped carrying it along; everybody has one that is the separate problem and you have a beautiful a featured this thing.

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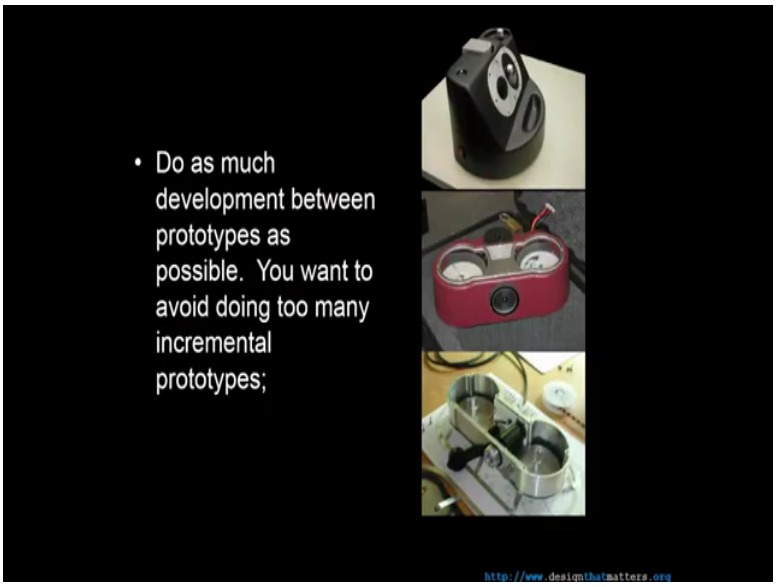

So, looking back at this, you see here know beautiful amount of combinations of things have been given.

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That is what I kept showing even my earlier thing catalogs information is generally authentic and these days it is becoming expensive to have catalogs. But so, most websites which give you the equipment or all the subsystems, give all of these things to you without any problem, you can get all the equipment you want, get all the subsystems, you want get details of each of them including a connector and including everything.

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And finally, this is from the mechanical point of view.

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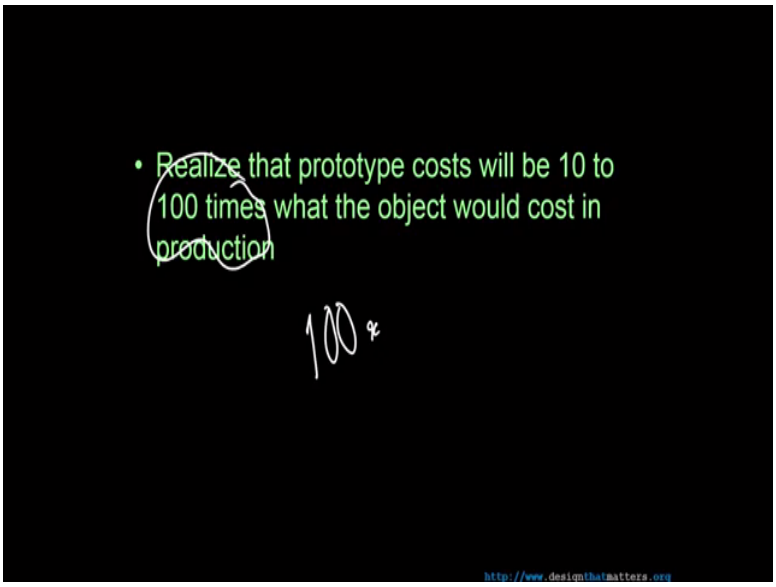

So, ignore it this is thing a full-fledged prototype, it is going to probably cost you a 100 times 100 is still a lot of money. So, that if you need to sell this for let us say I thing when we bought it to around 15000 rupees so, it will probably cost you to make a device like this you know, it would have costed them lot of money to make full. That is you have a case then you have all the necessary what do you call printed wiring board, then you have a display everything you know.

The first few model should have cost them may be 10 lakhs each. Then finally, they have been able to right now this is available for sale in India for about 5 or 6000 rupees. These are old Motorola I do not know e e 5 or e 5 plus or something.

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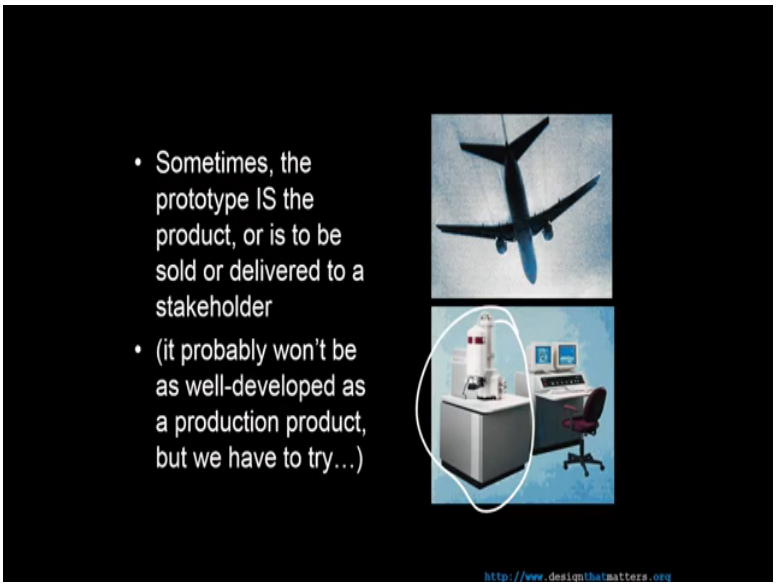

So, if you look at very huge things like that here are in the case of a ship a cruise ship that is the final thing. And you see all this you know from the place where have come these are all very beautiful devices which are used for materials research. So, these are different and then there you will seen that know.

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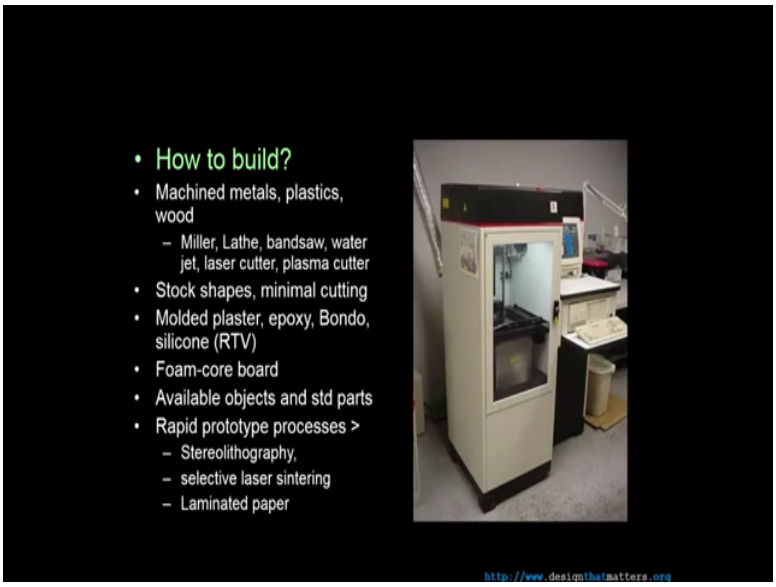

So, we have all this which have been given here. So, you can go through it since a little old I have shown you by somebody else is saying.

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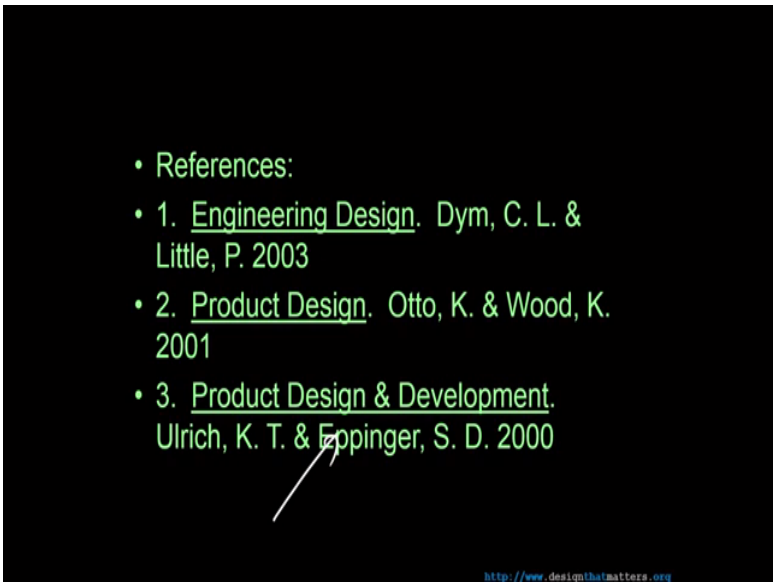

So, we have all these thing saying now stereolithography is there. So, you can just stop it here see if you can, I had access to this. So, I was able to use it ah, my suggestion is you can go through this. Right now I will stop the lecture the focus in this has been saying why a prototype is required, you have got my point know.

When whole focus in this saying why do we need a prototype at all, why cannot we just go about building the whole things. I will continue this lecture afterwards after a small break to say our own experiences with these things ok.

So, thank you I will continue a little later.