Product Engineering and Design Thinking
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Module - 02
High-Level Design and Fuzzy Front End of Innovation
Lecture - 09
Product Design Specification

Ok, today we will be talking about Product Design Specification. It is also known as PDS document.

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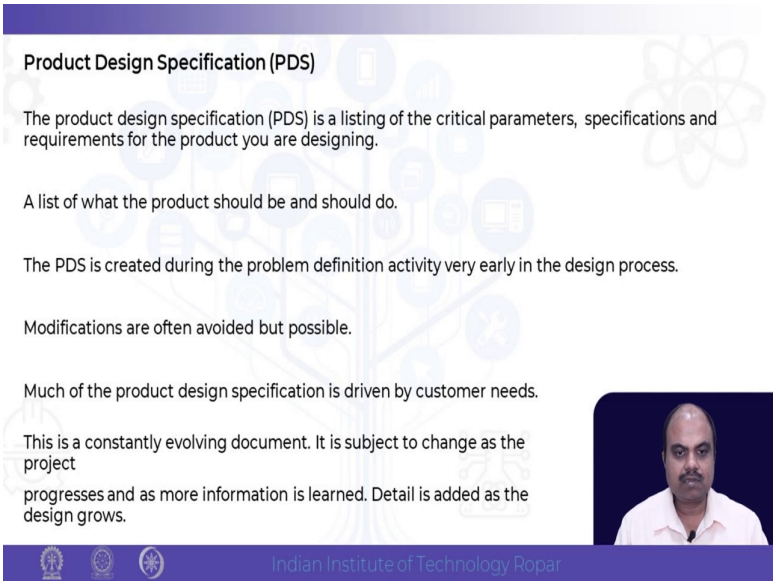

So, the product design specification is basically a document which is very important. After need identification, at the end of the need identification, we are going to have this document. So, this document is having a listing of critical parameters, specifications and requirement for

the product which one you are designing. A list of what the product should do and should be those are listed in this document.

So, the PDS document is created during the problem definition and actively very early in the design stage and modifications sometime is avoidable, but it is definitely possible and good to do have modification because it is a dynamic document often depending upon the kind of product which we are designing and the aim of the product is there.

So, this document is mostly driven by customer need. So, we have discussed about hill structure activity to the wave structure. So, from the hill structured we are going to go to the wave structured. Here is the structure more technical information will be available to us in this document – what exactly the product should do; what is the technical specification of the products.

So, based on this the designers are going to work on a design which is going to satisfy this product design documentation, product design specification and that is going to ultimately satisfy the need of the need and wishes of the user. It is the evolving document and it is changing also. So, the details of this is we are going to discuss soon.

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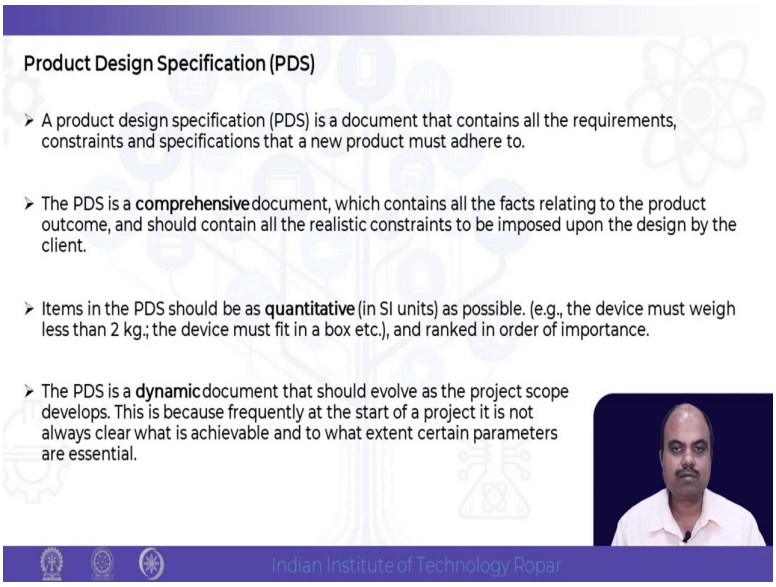

So, if you have a product design specification, these document will have requirements, constraints, specification of a new product. And, this is a basically a comprehensive document which is consist of in you know product outcome and one should conduct realistic constraints which is imposed by the design by the upon the design by the client realistic constraint we have to see.

It is also should be quantitative means some measurement is involved in this for each of the each of this criteria that is we can use SI unit and take for example, the weight of the product should be less than 2 kg. That is better rather instead of telling product should be light weight. So, what do you mean by light weight product? Ok.

So, a light weight suitcase, if I say light suite my suitcase should be light weight and if I say my mobile should be light weight and if I say that a laptop will be light weight. So, but light weight meaning has different meaning or different notion to the different users, right.

So, obviously, we understand that mobile light weight mobile should be actually sorry light weight laptop should be actually heavier than the light weight mobile that we have understand, but there is no measure of it. So, here we are going to tell ok the laptop should be less than 2 kg of weight.

So, that is a specification which you are going to give and that is a measurable specification and that we can say that ultimately after redesigning we can measure it and find out whether it is satisfying the product design specification or one portion of the product designs once particular criteria of the product design specification or not. If not we have to change it modify the product all this.

In dynamic document, it evolves also and frequently start with the project and sometime we are not clear. So, slowly the parameters also sometime is going to come up in this world. Ok.

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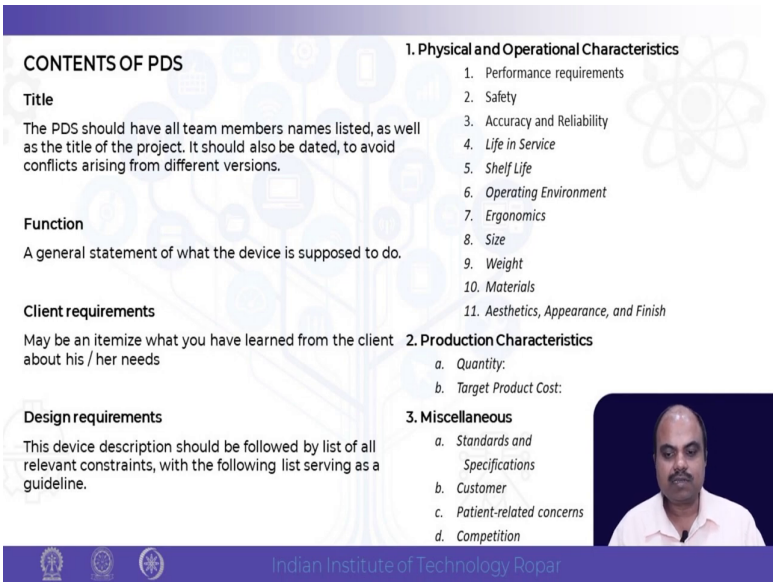

Now, so, what we have one example, but apart from that if any other product which you want to make design and that we wanted to have this product design specification. So, what are the things required for any of this. In general, what are the things which we require for a product design specification document?

So, we should have a title. So, if you tell the team members who are listed what is the title of the project and what are the conflict arising, what is the first chance all these information should be there in the product and design specification document. Then function – function is what exactly the product is supposed to do that function is also it could be having some functions, it could be having multiple function, it could be having a part of the function which is done by another product. Those things are possible.

Client requirement – what exactly the client design requirement is these are the constants we should be given. Physical and operation constants may be performance what could be the performance of the machine. What are the safety features required; then accuracy and reliability that is also another important thing. Then life in service how much how long we want the product to service in the continuously somebody is using.

The shelf life is if you are keeping the product for say for selling it is not going to sell immediately, right. So, sometime we need to keep in the inventory. So, if we want to keep the this inventory how long the product can be there and still it could be sold as a new product.

Then, operating environment: operating environment, these all very important because some products are indoor. So, operating environment of that is not that harsh, but some product need to be kept outside. So, the operating environment should be the product should be designed in such a way that it is suitable for it is suitable for using as a external this one environment. So, there are several examples of this one that we can also say.

Then agronomics – agronomics means how good the product is in terms of when it comes to the in contact with the people. So, there are of course, there are certain products which we need to touch. So, then agronomics is more important like mouse. So, it should fit in our hand.

Some products which we do not need to connect like you know some of the electronic products. So, there are some electronics circuits which are under inside a box. So, the there agronomics is not very important, right. So, depending upon the products which we have we are going to some important.

Size of product size means what (Refer Time: 07:20) size, the weight, then materials, aesthetics, appearance, finish – what kind of finish we are going to have. Then quality: so, product production characteristics means quality; then target production called is again I told this is very important that product have a certain values to be the customer, but customer is

going to pay some price. So, this price is very important that is going to govern multiple things also.

So, if you see car this price is so on for example. Even mouse also if you buy in the market, then very price is very different from each other. So, what makes this price difference? It is not just about manufacturing, there are so many other aspects of it also. Then standards are particularly very important there are some standard like you know if you have a mouse which is going to be USB. So, USB 2.0, USB 3.0 mouse.

If you buy a mouse which is having USB 2.0 and using 2 USB 2.0, 3.0 or it is USB driven mouse you do not have to worry about that is mouse is going to function or not function because USB 2.0 or USB 3.0 is something really standard across the world. So, these are the standard which we need to be adhered to when manufacturing a product.

So, these standard so, there are several standards. In laptop if you see there are so many standards are there. Recycling standard, then power standard, then energy star so many standards are standards are required. So, these standards are very important for any product.

Then customer: customer whom exactly for whom exactly this for whom we are designing this product. Are we designing for particular set of users, like you know the students. Even for students also what kind of students are we talking about engineering students or we are talking about medical students or talking about undergraduate students or PhD students. Requirement need not be always same, it could be different also.

Then competition; patient-related concerns some of the products are basically having patents are being filed when designing the products because they are innovative. So, when making a new product we should see the patent are not infringe. Of course there are many things we are regarding patents. So, patents in one country sometime is filed in another country sometime is not.

However, we need to see that in that particular country, where the product is supposed to be sold. The product should not have any infringement of the patent. We can have license

product means one can take the license from the company and they manufacturer the product, but this is important. And then competition also is very important that we see a product if so many competitions are there, then we do not need that product. Maybe something else we can do, we can buy the product.

But, when we are having an innovative product then we have to see the competition also that how many people how many companies are actually manufacturing this product and how our product is going to fit in that scenario and, what exactly the product is doing apart from what others products are not doing. So, this is something which is important to understand.

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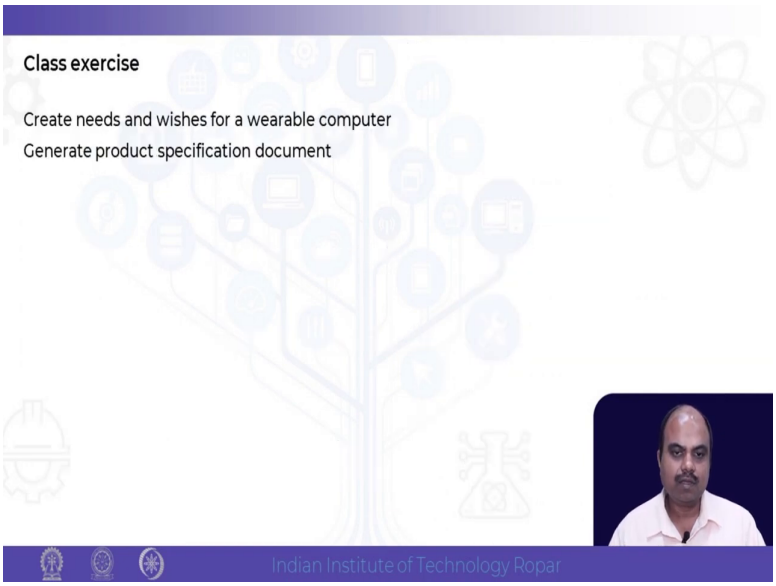

So, these are we there these are exercises like you know wherever computers what are the specifications there especially design specification how we can make it.

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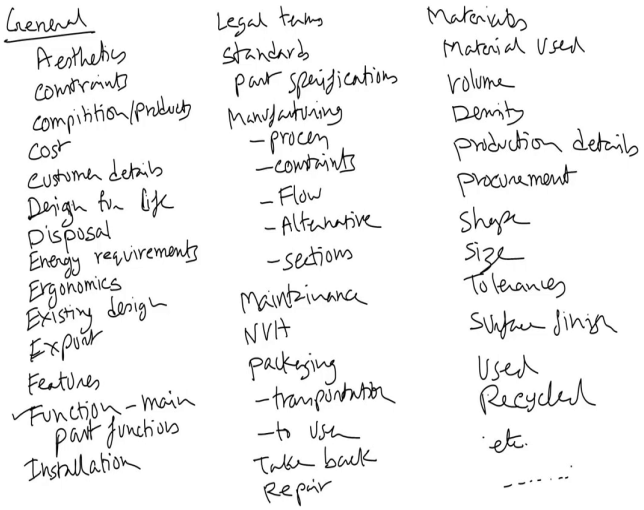

So, in PDS that is product design specification there are several things in product design specification that we can add in the product design specification. Some of the some of the content which we can add take for example, general in the general we can add the aesthetics. We can have any other constraints, if it is there. We can add competent competition and competitors products. We can add the cost also. Then customer details, then we can also say design life design for life.

Then how this would be disposed disposal; then energy requirements; we can also add ergonomics and if there is some existing design; we can also say like this some import export; then features; then we can say like function. So, this is of course, very important. So, main function and these are like part functions; then we can have installation how to install; we can

also add legal terms; we can also say kind of standards; then we can also add what are the specifications other specification of parts.

We can also add like manufacturing – process, constraints, then flow, then alternative, there are sections to be used and several others we can add. Then we can also say how maintenance need to be done; then we can say that what is the NVH conditions; then how the packaging will be done and this packaging in transportation and to user and you can also take back the packaging and then you can also say that take back, then repair. So, all these things you can have. So, these all are general.

Then it could be unturned materials also; you can say material used; you can say the volume, density, production, procurement and then shape, size, tolerances, surface finish. Then we can also say for like how it will be used; then how it will be recycled and these are not these are so many things which can add etcetera We can go on adding various things.

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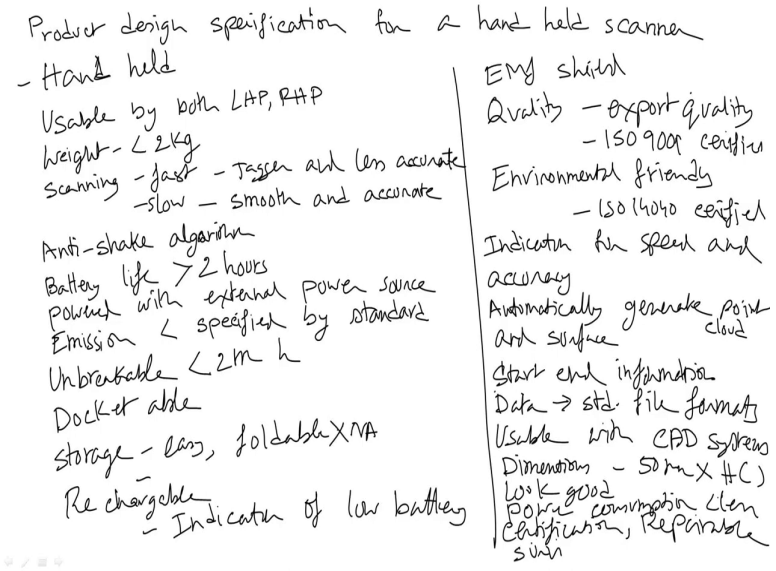

Now, let us take an example of usage of this product design specification for example. So, take for example, a handheld scanner. Many of you have you seen a handheld scanner. So, for handheld scanner, you can see the product specification leaders make the product design specification for a handheld.

Handheld scanner is often used especially manufacturing industry for reverse engineering and, also to understand how the product is being made and various other applications. So, there is a daily product, small product or be larger product and then scanner will be taken around the product. And this product will be scanned and then this product, after scanning the data of this product would be fetched in a computer.

It could be point cloud or it could be surface and then from there, you can make the CAD model modified. Handheld scanner is also used to basically find out the dimensions

sometime. It could be also used to find out some error in machining and then several other application. It could be also used to scan it and put it in the computer as a product. There are various applications.

So, one possibility is that we can go by the like you know definitions like sections. One is general, then materials, then product life or we can just brainstorming in the group and then try to find out what are the specifications of a product in terms of product design, design specification and then later on we regroup them in such a way that it actually follow a the format of the product design specification.

So, let us now write it down all of them as much as possible and then later on we will try to regroup. So, one is this hand held; then thing which is coming out of mind is usable by both left hand person and right handed person. Weight could be something less than 2 kgs; then scanning speed, scanning fast, jagged and less; scanning slow should be smooth and accurate.

And, then there should be some anti-check algorithm. The battery life, it should be more than 2 hours. It should also have power with external power, with external power like you know power powered with external power source. Then thinking emission, emission is another thing like emission. Whatever emission is creating, it should be less than what is specified by standard.

Then it should be unbreakable also. Unbreakable means not that it is not I mean unbreakable means if something is falling less than 2 meters height, it should not break. But of course, beyond that it may break, right. Then docket able. So, it should be able to keep it because we are scanning by hand, suddenly I want to keep it. I should be able to keep it.

Then storage should be easy, foldable if required otherwise, it may not be applicable also and it should be you know one can take from one place to another place, transportable all these. Then rechargeable. Rechargeable and if it is rechargeable, then one should be also having that indicator of low battery. Apart from that, one can also have EMF shield may be required. Then quality should be good, quality, export, export quality.

It should have standard ISO 9000 certified. Here now it is 9001 certified, right. Then the product should be also environmental friendly; so, ISO 14040 certified. Then it should have also indicator for speed and accuracy. So, whoever is used this scanner before, one have sometimes may have felt that if you move the scanner very fast, it does not do a scan and sometimes we will not know also it is the that the scanning speed is too high for the user. So, there should be some indication of this.

Then it should have automatically generate point and surface point cloud and surface. And this should have indication starting end indication, start end information. Then it should have the data should be given in standard file format. It should be usable with major CAD system, dimensions, it should be something like 50 mm base into height, we can decide.

Aesthetics should look good. Power consumption should be low. Then the certification should be there. Then it should have, it will repairable. It should be serviceable. Let me write in a different place. It should be serviceable.

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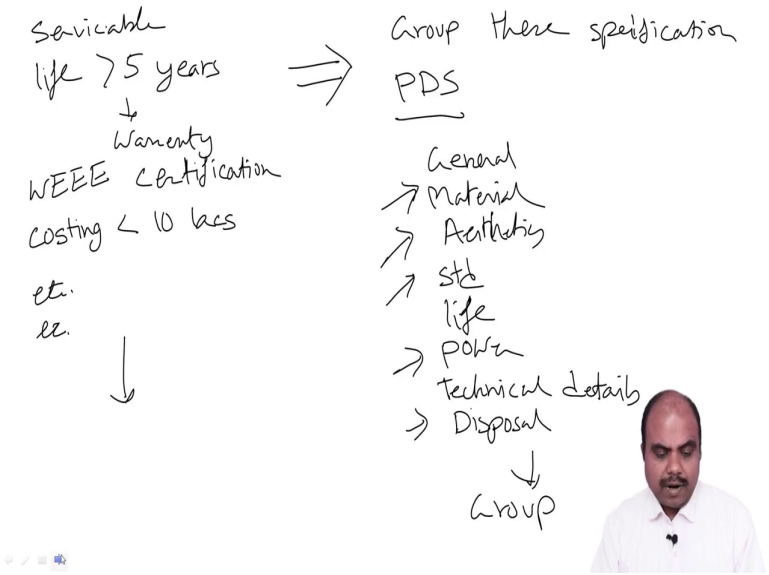

It should have life greater than 5 years. So, this can be the warranty. It should have WEEE certification. It should be costing less than something like lakhs 10 lakhs. So, several others we can have and we can go on adding. So, once we have this list, what we can do, we can group them now.

So, these are basically requirements. So, PDS, it will be and then we are going to group some general material. Then we can group them according to aesthetics, standard, then we can have this life. We can have some power; material we have done. Then technical and the new software usage and the disposal and like this, etcetera etcetera we can go on adding.

So, all these things we are going to add and we are going to group them. So, next we will see the grouping how it is done. And then we can say that this is, we have done this PDS

documentation of this scanner. So, handheld scanner can be, like you know many types you can see this handheld scanner.

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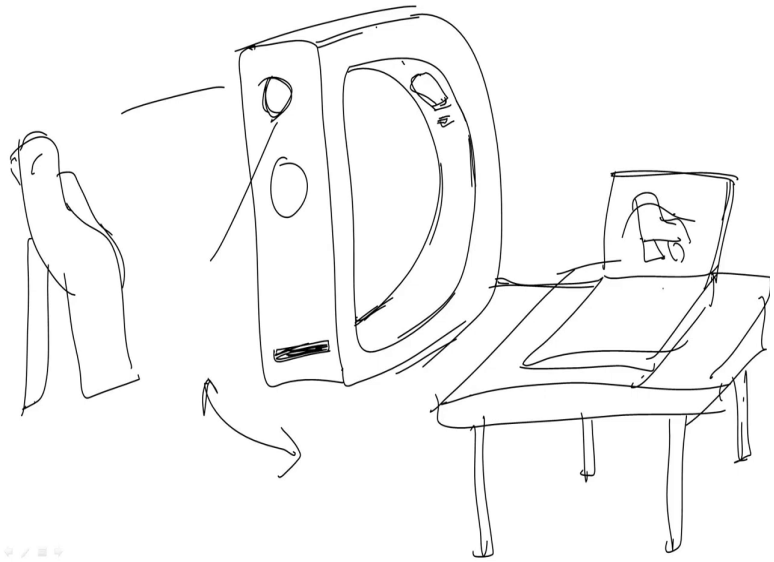

Ultimately the solution which one can see one can give, maybe something like this. So, after the scanning will be done. So, these handheld scanner will be scanning the product which is there and then this will be connected with the computer. Ok. Hope you understood.

Thank you for your time.