Product Engineering and Design Thinking
Prof. Pranab Kumar Dan
Rajendra Mishra School of Engineering Entrepreneurship
Indian Institute of Technology, Kharagpur

Module - 01
Introduction and Prelims
Lecture - 03
Introduction to design thinking

Dear students, I welcome you to this session of the course on Product Engineering and Design Thinking. Today, I will talk about design thinking its introduction. Before I delve into this, I would like to tell you that design thinking is a very popular term and been very widely used in industry today and it is a buzzword practically. Now, the thing is that why it is important, why should people learn it?

That is a very important question that also I will try to address in this. Most importantly, how it would help in the career of a student that also is important to understand. We will talk about this.

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Now, I move on to this concept covered in this, what is design thinking and then we will cover what is the status in industry now. Basically, the students will be having two pathways generally other than those who are pursuing academics. In fact, in also in academics also there is a big area of research in design thinking, but primarily our focus is industry and that is invaluable there.

And interestingly that some students are taking up the career in startups or entrepreneurship. They are also and there it will come in as a big help. So, with this I would like to tell you that there is a huge scope and opportunity now. So, making a career in that area would be very useful.

We will talk about design thinking principles, then we would actually try and see how the innovation is gaining importance as a you required for an entrepreneur as well as an

intrapreneur those who will be working in a corporate organization, but doing innovation kind of things. And then we will talk about design thinking as the basis for innovation and then briefly I will discuss it steps.

Now, when I am saying steps, it is only one model that I am discussing because that is a very popular and most popular one because there are multiple models. So, at least for to have the working knowledge here now I would present one model and then we will talk about other models later.

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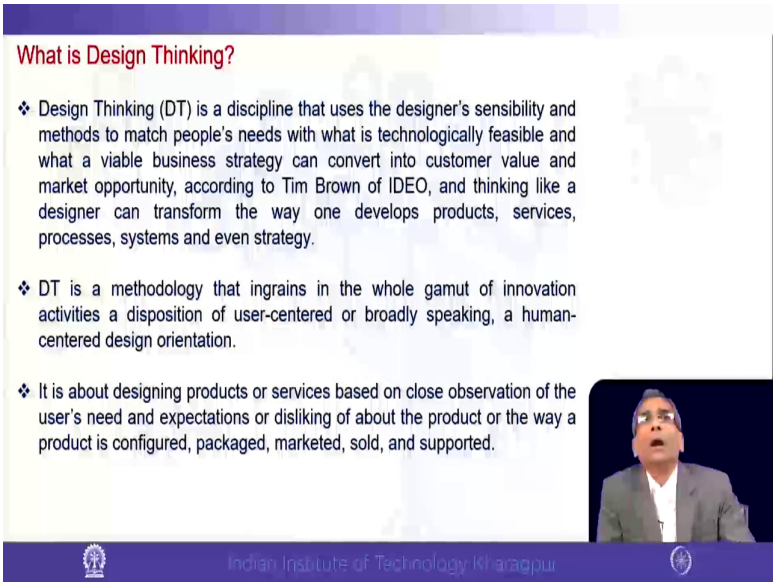

So, what is design thinking? Just as and I have prepared the slides in a way. So, that once the lecture is over later on when you read the slides you would get the essence of what was discussed here. So, it is a discipline that uses designer's sensibility and methods to match people's needs with what is technologically feasible and what is viable business strategy.

This actually was mentioned by Tim Brown of IDEO the basic foundation was from Stanford D School the Stanford University. But subsequently Tim Brown started his IDEO and popular is this term I would say and. So, and thinking like a designer and transform the way it one develops products services, processes systems etcetera even strategy etcetera. So, this has been discussed in his remarks.

DT is a methodology that ingrains in the whole gamut of innovation activities a disposition which is user-centric. Now, here two things I have just mentioned very briefly in the first one I have talked about the feasibility, viability and desirability. We will we will just keep this words in mind we will very soon be reaching into those slides.

And where we will elaborate on that is a very important point raised in the point number 1 and in point number 2 that it says that it is basically user centric primarily or largely broadly people call it human centric also that way. So, it is about designing products or services based on close observations of the users need.

Basically, as it is coming from the point number 2 that since it is user centric we need to be very very careful and thorough that we understand their need even the hidden need which perhaps they have not mentioned explicitly, but to understand their desire and the source of delightment.

So, to say need to observe like someone is working, but his facial or her facial expression says that it is not comfortable although that explicitly one might not have stated in any document, but that is the observation the designer has to make and design the product accordingly and there would be the desirability aspect which would be addressed hugely.

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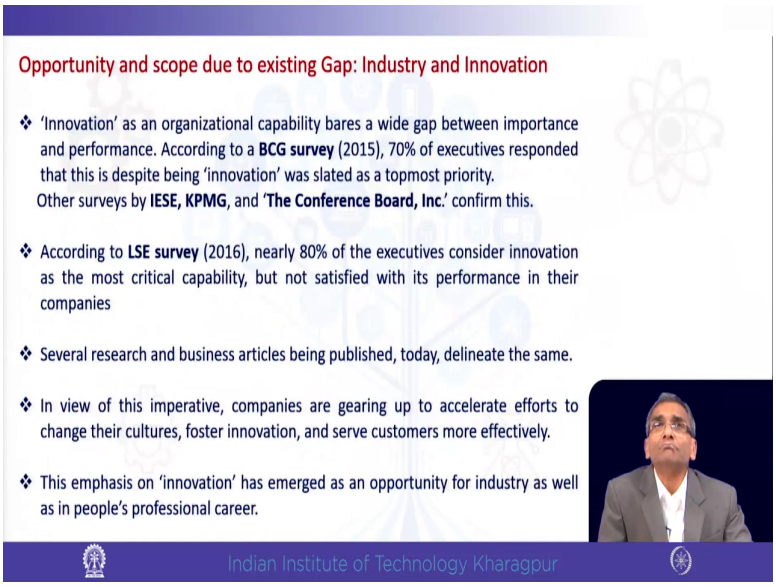

Now, as I said why should we be discussing this, how design thinking helps in the whole industry game. The issue is that currently it is being increasingly being realized that the 'innovation' the aspect in industry which the managers and top leaders of industry they believe and they feel they realize that it is the one or at least the one of the top 3 issues that is very very important for industries performance survival growth etcetera.

But interestingly and a bit shockingly is also reported that only a small fraction say 20 to 30 percent are more or less satisfied with this kind of activities being performed and practiced in those industry. Therefore, it tells us that there is a huge gap in this slide I will not discuss this slide in detail by giving the names of the companies because already those are there.

Just I would tell you that these are the data or information which has been gathered from the leading consultants business management consultants who are keeping track of all these in

industry and they have reported in recent times like say KPMG, IESE, The Conference Board, BCG survey and all and also the same similar thing is reported by London School of Economics in the recent time.

And if you go to the website or search any research articles or white papers or business magazine articles you would find every day almost there is an article on this on innovation, why innovation should be there and without that how the companies would have a setback those are being discussed.

Now, what is my contention why I am raising, this simply I am raising this because now the engineers who are coming out from the engineering colleges they need to understand and feel that since there is a big gap that is laying out an opportunity also. So, it is scope where one can make a career because it is quite evident that there is a gap.

So, naturally one has to look at the gap and prepare oneself for that. So, that you know induction becomes easier and good. So, that is what I have talked about the people's professional career would be enriched if this practice is understood beforehand.

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Now, here the moment I talks about the two areas of its application one is the corporate another is the startups or entrepreneurs enterprises new enterprises. Here basically I would like to tell you that it is gaining impetus and huge interest and the evidence of this is that there are magazines being published in the name called title called Intrapreneurship.

Now, this might appear to be a new term for you, intrapreneurship you have heard entrepreneurship maybe etcetera, but then intrapreneurship is a kind of entrepreneurial mindset of engineers or professionals people in the industry or corporate organizations. Like you have heard already in big organizations like Google and others they have a place for such people who would devote a part of their time for this innovation.

Now, what is the purpose of putting up this slide? If you carefully look at there are 3 bubbles here. So, I was; so, I was selling the importance. So, there is a there is an institute now called

Intrapreneurship Institute and they are publishing magazine. So, these magazines talk about the intrapreneurs those who are with this innovation on entrepreneur mindset often uses design thinking and are working in industry in corporate organizations.

Now, the purpose of my slide is to showing the 3 bubbles if you carefully look at that I said there are two categories people one is on the left most bubbly would find the intrapreneur on the right most bubbly will find entrepreneur. So, obviously, the start of the if someone is a founder or a owner of a company we will have more freedom and also will have to we will have to take more risks and on the other extreme intrapreneurs of course, take less risks, but they have the similar mindset.

The intersection of these two is they both are leaders in that area of innovation and they are into innovators. So, here our focus is on as they are innovators from here, we proceed that down that we have understood and established what is the purpose and need particularly of innovation oriented studies.

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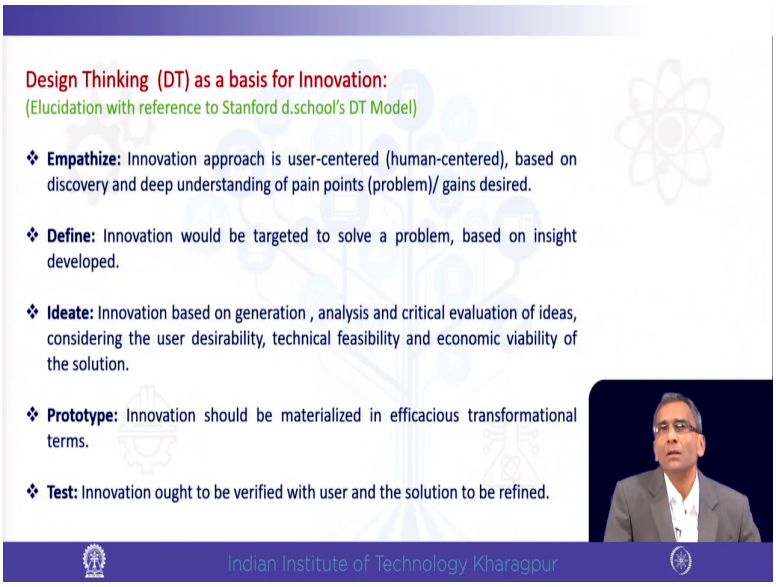

We will move on to connect these two which tells us that how design thinking can be considered as a basis for innovation. Now, as I said in the beginning that design thinking are having several models by experts, but one which is most popular is in the Stanford model and according to Stanford model there are these five steps, I will very soon say that these steps are not linear in the next slide and then let us understand the steps they are empathized define ideate prototype and test.

Now, how innovation is connected to these tenets of design thinking? Empathize which is the empathize basically to whom it is not sympathize it is empathize with the user or customer who to understand their pain points or the problems they are facing and how to solve it. That understanding or developing insight are very important in the product engineering.

So, empathize is the innovation approach which is user-centric as I said also called human centric or centered based on discovery, discovery about the customer here and deep understanding of pain points and gains desired. So, how a customer will solve their problem or how one will benefit, how it will improve the performance or the productivity in that organization etcetera or the gains.

So, empathize define the most important step I consider is define because it is believed that if a problem is well defined it is half solved. So, one has to be very careful about the aspect called define that is innovation would be targeted to solve a problem based on the insight developed from the observations that was made in the empathy phase.

As the problem is defined now then we have to ideate, ideate means to find out how it can be solved. So, innovation based on generation analysis and critical evaluation of ideas. Now, when we are generating many ideas to solve a problem there will be plenty of ideas generated should be.

So, that we can pick up or pick out one or two good ones from those large number of ideas and use them to for our benefit to create the solution. Now, the ideas are to be tested against those three important precepts that I said is the desirability the that user desirability user should desire their product technical feasibility will talk those in details later and economic viability of the solution.

Once the ideation is complete then is a prototyping; that means, one has to build to see whether it works. Now, here I would put a word of caution that now in the modern times the prototyping not necessarily is physical every time at least to start with, there are digital prototypes, there are softwares even the common softwares like solid works etcetera.

Can be or any care software for that matter many care software and CAE computer aided engineering or simulation software can be used for this purpose both in the mechanical domain, electrical electronic domain because there are CAD mechanical electrical CAD electrical cad and all that so those can be deployed to do this.

Then finally, is the test that is ought to be verified to the user; that means, whatever is the outcome unless it is verified with the user, whether they like it, whether they it serves a purpose, whether they have any suggestion to improve till then the work is not complete and once the such test is conducted then the thing is ready for taking it forward.

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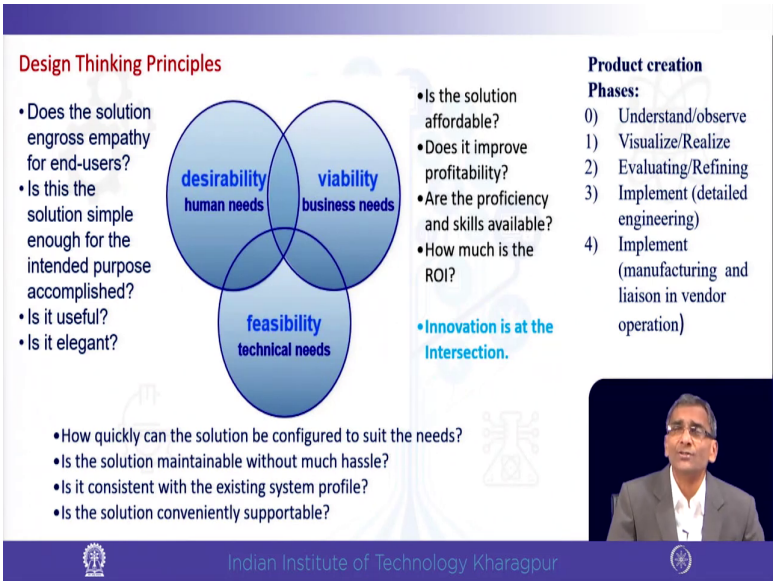

Here as I said it is just the elaboration of that the three things that desirability, feasibility and viability some details of those are there, desirability basically talks about does the solution engross empathy for end users? Say that empathy thing is the solution is simple and not very complex to operate, it is user friendly, is it elegant? Is it attractive? Like someone has created building with good structures say for example, but it is surface finish or say color is not good.

Similarly, if a car is built, but its style and this coloring and painting or the arrangement of the look is not good then it is not very appealing. So, desirability then feasibility that, how

quickly can the solution be configured to suit the means? The solution maintainable without much hassle, I am giving the introduction today we will discuss this in detail subsequently. Is it consistent with the existing system profile?

Is the whatever is being done is it supportable? That means, whether if that product is set out to the market can we maintain that there. Similarly, viability also is the question of whether it is affordable? Whether it can make profit? Whether there is a margin enough? And how much is the ROI? ROI means return on investment the owner who is investing money would like to get that back.

So, how that will happen because after all it is industry and whatever they do finally, it turns out to be a business venture and so or business activity so, naturally that question is to be asked. And here on the ROI side you see the product creation phases. So, understand and observe which goes with this it is presented to see how it saying in sync with the design thinking and that approach the visualize or realize the evaluating or refining and implement it building the prototype and manufacture. So, these are the activities which are in sync that is to show.

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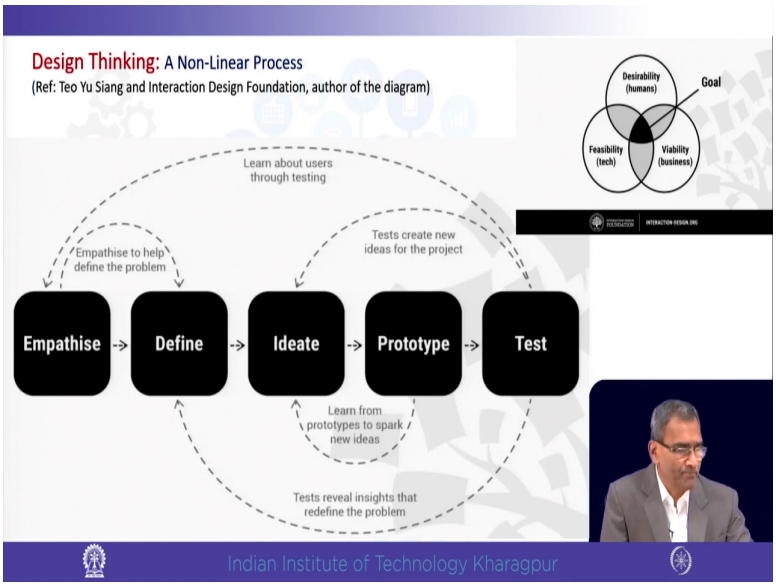

It is just to tell you here that intersection as you can see is the goal where innovation is to occur and this is the slide available in the interaction design foundation where there their website and you can see this that the thing that I wanted to tell you is as I already said that these steps are not linear because though these are the steps, but it may be iterations and back and forth at some point in time at the stage of test one might know the ideation was not right or the understanding and developing insight was not correct.

So, those corrections are to be made and again that is to be rebuilt or rectified. So, this is a non-linear process that is what I just wanted to impress upon you though and as I again I am saying that these are the aspects we will discuss in detail, but today being the introductory discussion I am duty bound to give you overview of the whole thing.

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So, here I in brief would tell you that the steps are the empathize that is holding back one's opinion how it is done that empathize means if we go ahead with our beliefs or honest beliefs even or the culture or the knowledge that this will work or that will not work or people would like it or people would not like it. So, those notions actually comes against a good product creation.

So, it has to one has to be of open mind and to go to the field which in Steve Blanks word is a go out of a building; that means, go out and to the field find out what is actually happening there find out what is the problem what is the pains. So, from that so, this to be done and to set aside one's own point of view and try and be curious and learn actually what is needed.

It is not easy because we are programmed to from a childhood to know that what is right or what is wrong kind of a thing, but then, but that is notion in product development may not

always work so well because the particular culture of a particular region or group or community or segment may need a relook or recapitulation.

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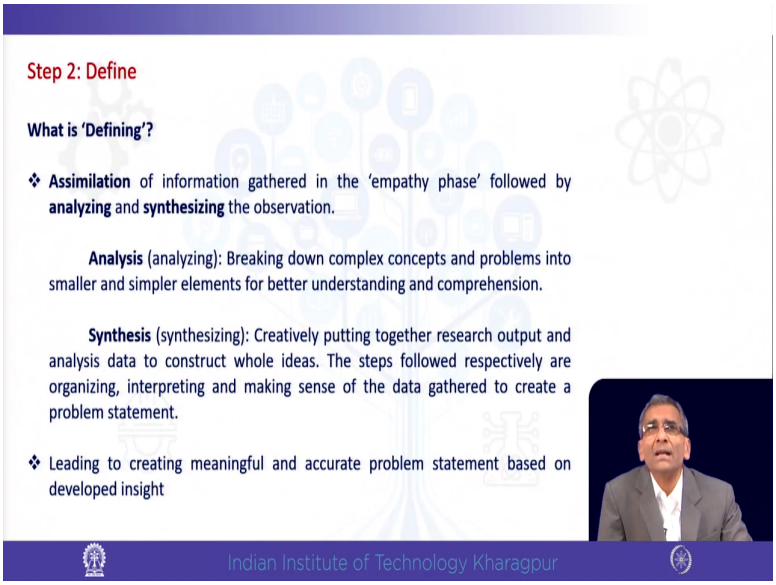

Defined as I said is the very important part and it is assimilation of the information gathered from the previous part that is called empathy and it has got main two things one is analyze the problem and then whatever we have got from different components of analysis then we sum up them combine them, collate them which we call synthesizing or syntheze synthesis.

So, these are the two processes one is the breaking down of the complex concept into problems. So, that is understanding is good and then synthesis is bringing all the parts put together so, that is you know it makes sense the whole thing. Leading to create a meaningful and accurate problem statement based on developed insight is a big take away from the defining phase that insight is the most important part.

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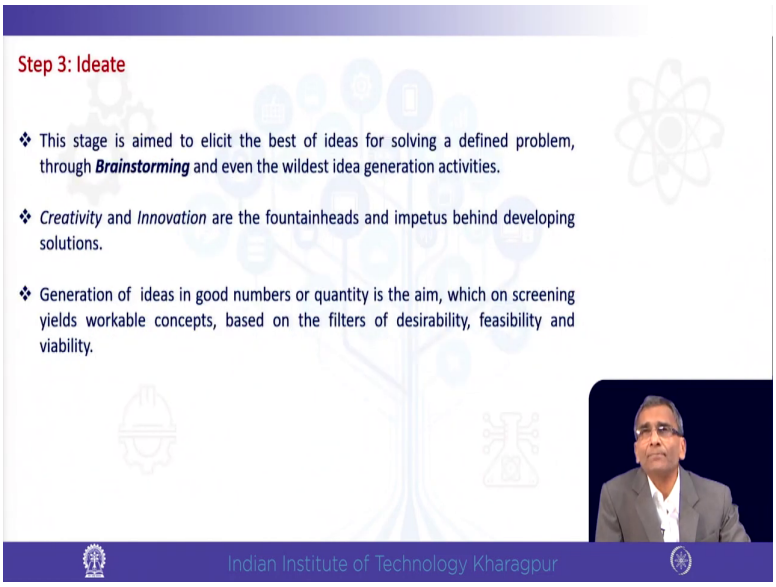

Ideate possibly we will be talking about some other methods later, but here I would like to tell you perhaps you all have practice or you have not practiced it knowingly you know that is in a group meeting you do brainstorming. So, brainstorming is a very important and powerful tool here that is deployed for creating ideas generating ideas, because here it is believed that more ideas here we are talking about quantity, the more ideas we are not actually checking the quality at this stage when we are doing brainstorming.

The problem the there may be different ways to look at a thing or solve a problem. So, at this stage one should not be worried as to whether that would work or one should not be or should not criticize as to whether its significance is high or it is at all useful first at this phase the objective is to collect as many ideas.

Like when people say that ok there will be a telephone or there will be a computer or say for example, there would be optical fibers or transits that is those at those where say at those times or people or when people thought that they will be going to the space to the moon.

So, all these are the example of wide thinking, but at this stage therefore, the idea is to get as many as because there would be opportunity to screen them in the concept development stage where we would be screening against those filters the three filters as I mentioned their desirability, feasibility and viability. So, against those filters they would be tested to get the idea for further stage that is called prototyping.

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So, prototype is an early in inexpensive scaled out version of a product that can be used to obtain the test results. So, it is not the complete product, but you have many times heard the some websites are being launched as beta. So, the beta version is tested by people and if the

fide is good then finally, the website is launched or similarly the first prototype is prepared for two things one is that one has to see whether that functionality is happening with a particular aspect.

And then once people are satisfied then would move for developing the product which is a full scale one with more expensive and with the actual manufacturing processes etcetera. Suppose some gear whether the gear profile is working or not one can see that by producing it in 3D printing machine, but that would made suppose of plastic, but then when in real use they have to with set the talk then one has to make it of steel, but then whether the functionality of gear is questioned then that is good enough.

So, there are two kinds of prototype one is called low-fidelity prototyping another is high-fidelity prototyping. The low one which is the very early stage kind of a thing which is just not very complete version rather often uses a few features to check test ok whether those will work.

And then where higher level or which is more closer to the product resembles the product is high fidelity prototyping the version more closer to the final outcome on the final product. So, these are the two types of prototyping as it is an overview session, I would be discussing those in detail later.

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Then the final part of it is test, already about which I have said a couple of words and testing and design thinking refers to the refers to and purpose for obtaining feedback from the customer user as I said earlier also. This is about functionality, this is about feature, this is about maybe aesthetics maybe about the ergonomic aspects whatever.

So, the why testing connect collecting feedback is crucial in design thinking and product innovation because without proper understanding of the user's needs one cannot develop a very successful product. So, a set of iterations would be necessary and those feedbacks from the customer would give the right direction for such you know they feedback and using those feedbacks into the iterations for product development.

If the user encounter any problem with the present solution version then the product engineering team must rethink and design some already versions this is exactly what I

mentioned in the earlier point. And therefore, if that is done then we may believe that a good design thinking process is adhered to and we can expect that a good product will turn out from this practice and parallel. So, I hope it has helped you and there will be assignment on this.

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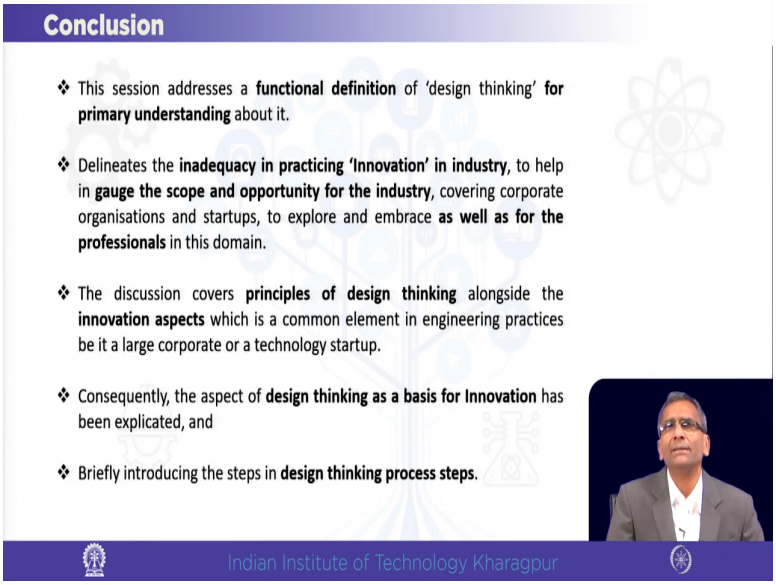

And the conclusion is that session addresses a functional definition of 'design thinking' for primary understanding about it. It delineates the inadequacy of practicing 'innovation' in industry, to help engage the scope I have already said that to understand the gap and work around it. The discussion covers principles of design thinking.

They also the design thinking is the basis for innovation and finally, it we talked about the design thinking steps and I hope this from this you have gathered the necessary information and learning and there will be assignments on this.

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Here are some of the references which would be helpful for you.

And I thank you very much for your patient hearing.