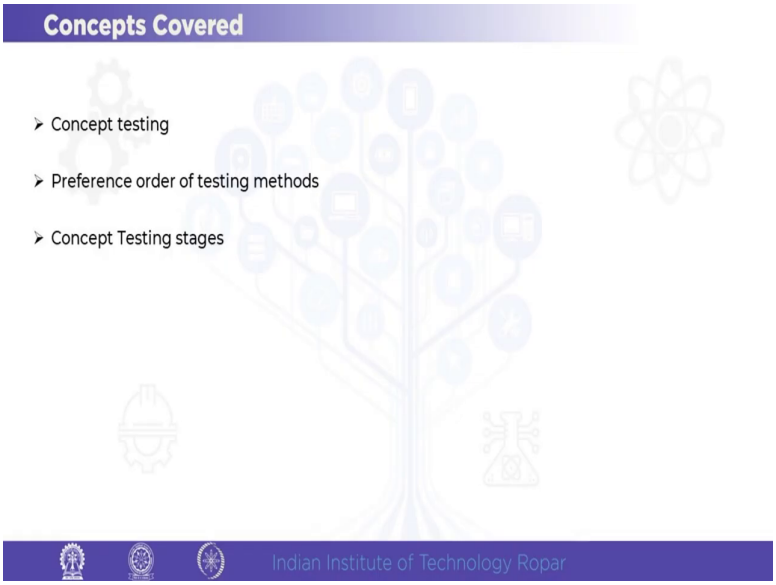
Product Engineering and Design Thinking
Prof. Prabir Sarkar
Department of Mechanical Engineering
Indian Institute of Technology, Ropar

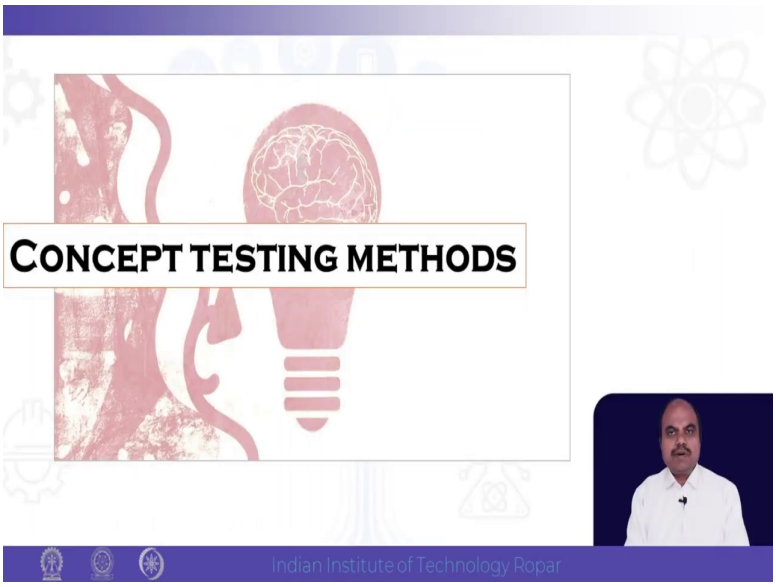
Module - 04
Concept Generation and Testing
Lecture - 19
Concept Testing Methods

Hello everyone and hello students, today we will be discussing about Concept Testing Methods.

(Refer Slide Time: 00:38)

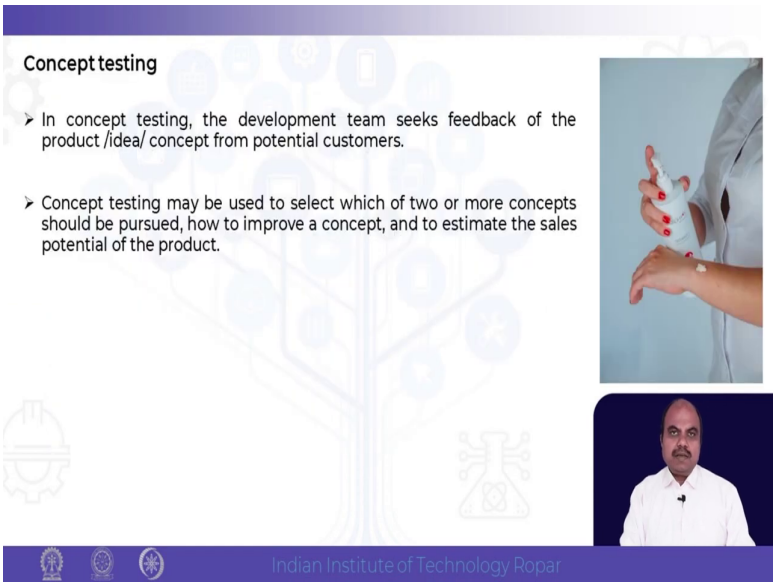


(Refer Slide Time: 00:38)



So, initially what we have seen that we are going to identify a multiple problems, multiple problems on the user.

(Refer Slide Time: 00:43)



And then take one of these problems as our main focus and then we are going to in problem understanding stage.

We have done analysis of the problem from various prospective, especially from users prospective there are various methods which can be used and we have used one of the methods and then when the problem understanding is done we have gone to the product specification document that is PDS.

So, initially the problem which the designer which the consumers will be telling sometime it is vague. So, in product specification document we have seen how this vague statement can be converted into very technical specific requirements. So, once we have these requirements

in place, we have used we can use various kind of techniques especially brainstorming, (Refer Time: 01:51) trees, gallery method to generate a lot of ideas.

So, we have generated a lot of ideas and then once the ideas are generated in concept selection and concept evaluation phase, we have evaluated the ideas using various methods and or any method which we wanted to use. In that case the main purpose is to evaluate the ideas with respect to the requirement and select the best idea which is most suitable for this kind of problem especially for the customers it is not easy.

But then we have done it. However, at this stage we might have one or two of the ideas that we know it is pretty good for from the customer point of view. However, you want to we want to actually see this testing, we want to actually see this product it is really being liked by the users or not.

So, for that what we need to do? We need to take feedback from the user. So, in concept testing phase development team that is the designers and the engineers and other managers they seek feedback of the product or the idea from the cost from the potential customer. In general, they will make a mock up, they will make virtual model maybe, they will make actual prototype, scale prototype, there are several ways to do it.

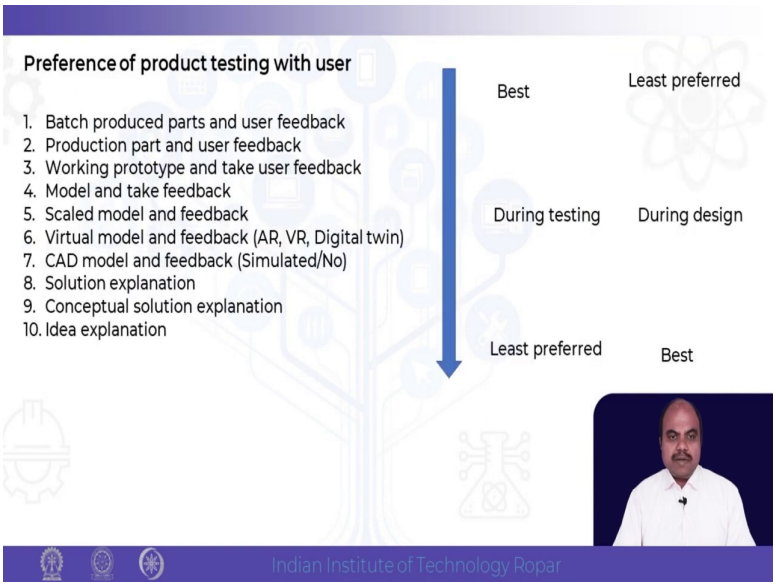
But the main idea is to take feedback from the user and see whether they like the product or not, what is the feedback? Sometimes they will be telling exactly what they need and if this is the right product for the need or the changes are required or not. So, these feedback will be will be taken by this people and modification will be done again.

So, design is as you see this is a cyclic procedure. The next cycle this design steps that is problem understanding solution generation, solution evolution will partially used again to make the product much better. So, this phase is been done by various companies, big companies they are doing it, they are making the product taking to the customer, taking the feedback and then try to improve it and then again, they are going to get feedback from the feedback of the user then they will try to modify it.

So, this is going to go on. Until and unless the company satisfied yes most of the customers are happy with this product and then we can plan to launch this launch this product as soon as possible. However, this phase is really important because this is a phase where the customers can give real feedback to the designers and designers can take feedback and modify their design.

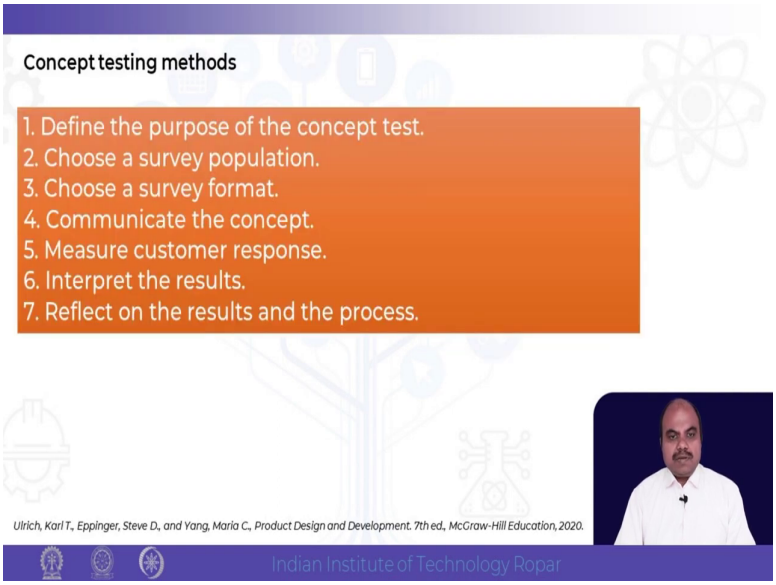
They also need to also understand how they are doing it, how they are doing right and this feedback is important because before this sorry after this we are going to go for mass production. So, this feedback is crucial to tell the people to tell the designers that what the product is how much the product is being liked by the users. So, there are several techniques to do this one.

(Refer Slide Time: 05:49)



What are the best ways? One is this batch produced parts, then production parts, working prototypes. So, these are the some of the products some of the ways are there that we will learn in details. The best is basically the batch produced part and the least preferred is the idea. So, now what are the steps for concept testing methods?

(Refer Slide Time: 06:18)

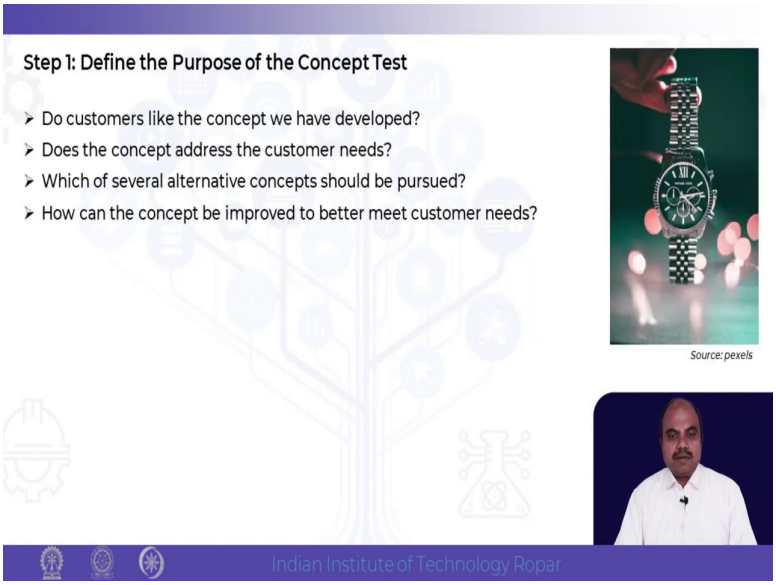


The first step is to define the purpose of the concept test. Once we define the purpose, we are going to choose a survey population. Once we take the survey population, we are going to make a survey and survey format we are going to find out we are going to decide on that. Then communicate the concept we are going to communicate this concept to the potential users or the testing people who are testing it.

Then we are going to measure the customer response. Then we are going to interpret the results. So, let us see an after interpretation of course, the reflection that is reflection of the

results and how you can improve it. So, let us see these details in each of these in more detail. The first thing is define.

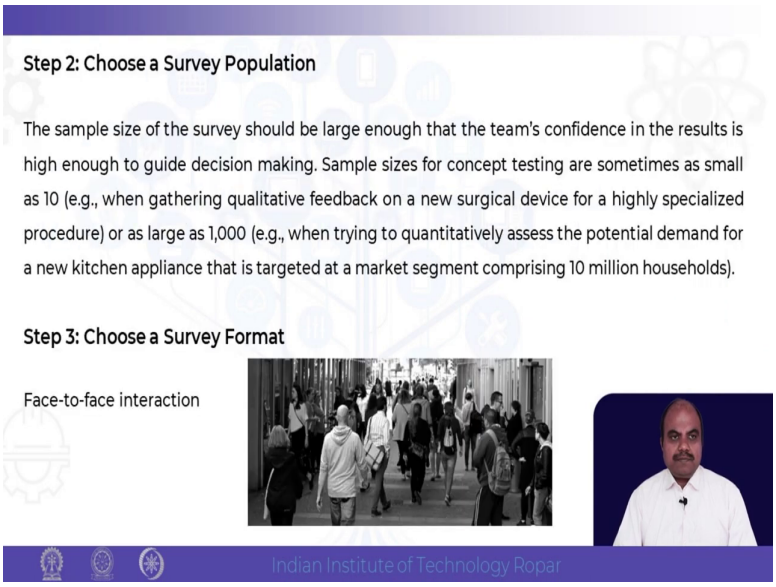
(Refer Slide Time: 07:17)



Define is do the customer like the product concept what we have made it and does the concept addresses the customer need.

These are some of the questions which we can ask we can ask what are the several alternative concept should have been perceived how can the concept is improved to better meet customer needs. So, once we once we focus on our purpose of the test we will know that within even everything is going to be to answer this question which we are taking for the as a purpose of the test.

(Refer Slide Time: 08:01)



Next is once we define the purpose we need to find out or like fix on the number of people whom we are going to use as people we are going to test this concept. So, now sample size it is important, but finding out sample size the right kind of sample size is not that easy because there are various different kinds of products.

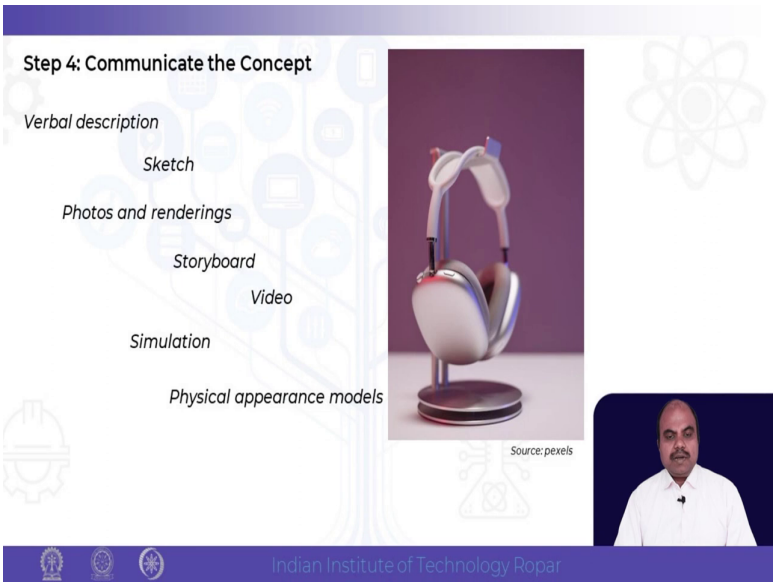
There are some products which are very specialized. So, there a small sample size should be enough whereas, whereas, there are certain products which is used by lakhs and lakhs of which is supposed to be used by lakhs and lakhs of people. So, there the survey size need to be much higher. So, it start from 10 people to 1000 people even more than that. So, there are people who are doing research on this area and they have set lot of different kinds of number for different kinds of survey.

Once we have a population survey like population ready like how many people are going to survey how to get those people is another task tough task for various researcher going to them and pursuing them that this is what we are doing some research we are going to understand the user need and you are one of the potential user and we are going to ask you some questions.

So, we will be happy to give unbiased responses to this. Once we get this by people who are ready for this then we can have a survey format. There are different kinds of survey, face to face survey, online survey, questionnaire can be given as an online or offline it could be interactive, it could be non-interactive, survey can be done individually survey can be done in group also.

So, there are various ways to do survey and there are some statistical reasoning and rules for this also we will not go much on this one, but the main thing is important that we are going to get this survey done.

(Refer Slide Time: 10:29)



So, once we get the survey this, we want to communicate the concept. When you want to express this concept to someone, we can use verbal description, we can use sketching. So, verbal description we describe this is the problem. So, take for example, I have created a or we have created a headphone which is can be used in your with a mobile or with laptop and over the head.

Now, there are so, many possibilities of this. So, verbal description is not always a good idea. So, a second possibility is a sketch. Once you sketch it and then you show it to the users. But sketching is often 2D. So, sometime is not possible to understand everything.

So, then you go for photographs and renderings, renderings are 3D renderings. It could be hand rendering it could be computer generator rendering. Photos of the images, it could be of

the product. Storyboard you can write that one user is using a headphone, a photo of the user and headphone is going to be there and then you are going to show it to the user.

That is another possibility that you we express in such a way the user get maximum amount of information, how they are going to use this product, how they are going to feel about this product. And the best thing is about all always it is having something physical product done and show it to them.

But sometime is not possible because physical product if it is small, it is easy to do, but it will have large product like a car. We cannot make a complete car and then show it to the users. So, a model can be required or maybe photo can be required. So, smaller product also if it is very expensive sometime, we cannot make it. So, verbal description is good to have for some kind of solution, evaluation, sketch is better, photos and rendering is 3D modeling and it is a CAD model.

You can make do the simulation and then you can make very very realistic views of rendering and then we can show it to the users. Storyboarding where you can see show the user as a user using the product and that image of that you can make it is like a story how you are going to use the product and that you are going to show it to the user.

Video is where you can make a video of a particular user using the product or a simulation animation and then you show it to the user this is what you are going to use this are you do you like it? Do you think any changes are required in the design because you are going to use this product from like the way I am showing you in the video.

Next is simulation. Simulation is that is defined with simulation animation is where you animate something. Simulation is actually simulate with respect to the laws of nature. So, in animation one product one component can go inside another component, but in simulation it cannot.

So, it is a technical actually technical analysis and the simulation is also something like animation. However, with all the rules which are followed. So, you can make simulation also

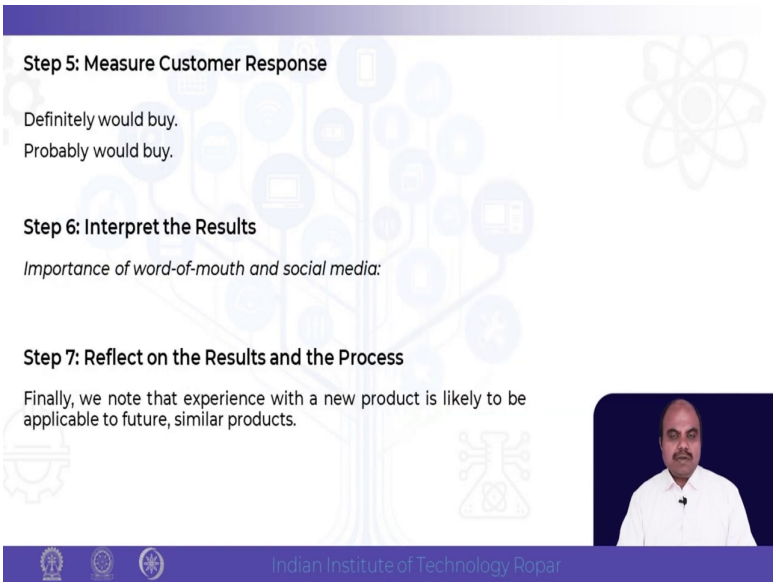
you can show it to the user ok this is the way this product is going to function. Do you like it or not? Do you think it is change is required? Do you think any anything which you need to change which is going which you are when you are going to use it you suggest any changes?

Then physical appearance models physical appearance model means you can physically make a product you can use 3D printing or any other printing method or any other manufacturing method and make the product you can make it dummy or actually is working prototype.

So, the headphone you can make one or few of the products put it in your put the user in your head and they can use the product and see how it is working and when it is working then they feel that ok the product is working and so, then they can evaluate with much better.

So, this is the best option the best option is to actually evaluate with respect to the product which they are having in in their hand and these can be scaled model like a small car or a one is to one model like headphone and then evolutionally much more better because they can feel the texture, feel the color, feel the weight, feel the performance. So, this communication is important and this is the way various ways which you can communicate.

(Refer Slide Time: 15:49)



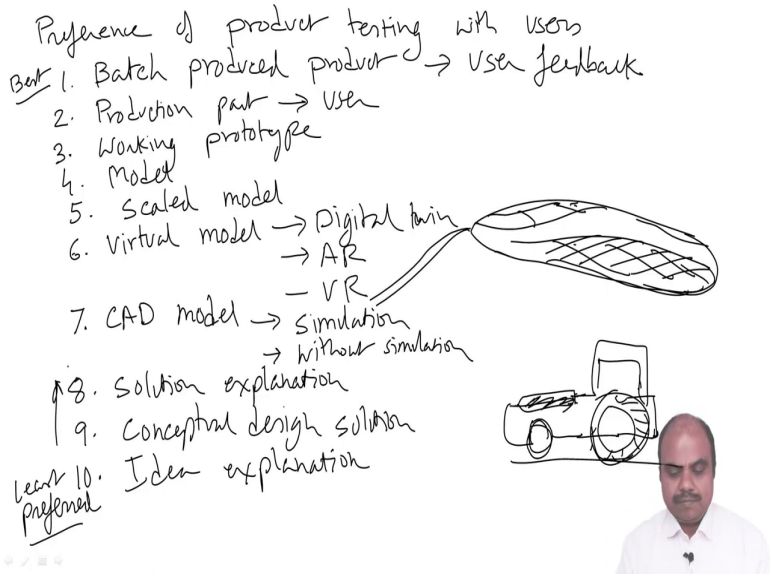
Then major customer response. Once you communicate the customers most many of the customers will give direct response yes they want to buy the product or they may be provided by the product somebody will know I do not want to interested in this product somebody will tell yeah, I buy, but this modification could have been better somebody will tell you yeah I buy the product, but not in this price.

So, there are so, many things if some people will do not tell anything, but they will express like this some kind like I mean yes, they will have. So, you can see their face also and see that what kind of assessment they are doing with respect to the product and then you interpret the results and they show it to the media and then tell it tell this is what we are going to do. And you will you are going to launch a little later of this product and then again you will have a more under more understanding what exactly the user is supposed to feel.

Then we have to reflect the reflect it then finally, we notice that experience with the new product is how the experience how the user is feeling. You can see their faces you can see their see the way they are expressing what kind of a what kind of comments they are putting in the assessment file.

And you can see that in the future also this product will be liked or not are there similar products or not and then you will reflect back and see whether this is the best product and then modify it try to modify the product as and see whether it can be modified to make the product much better.

(Refer Slide Time: 17:38)



Now, we are going to learn about preference of product testing with user preference of product testing with users. So, of course, the production prototype directly if you can show it

to the user that is the best. So, the first one is batch produced product and this product we can take to the user for user feedback.

So, take for example, we are using one mouse somebody design a mouse like this and then we are trying to the user and then they will understand this mouse and they will feel it and use it. In case this is not possible what is the next step next is we can have a production part and this we can show it to the user for feedback.

Now, if that is also not possible at this stage when we are getting the users feedback that time what we can do we can actually take a working prototype. And then working prototype is a single prototype, but is working completely with all the features with and then we are going to go and take the user and tell how they are feeling about the product does it really meet the need of them or do they want any changes to be done on the product any feature they do not like any feature they like and all this feedback that can be taken.

So, sometime it is not possible even then the next less preferred little bit less preferred compared to others are ease this model. Model is it is just take for example, the mouse here the previous one is production part is actually using the mouse, it will use the mouse it will work in the computer show it click it, it will work.

But a model of the mouse will not going to work it is just that it is a you can feel it, but it is not a functional model is functional metal then we can take we can tell this is a working prototype, but is non-functional model. And then we can show it to user and get some feedback. In case that is not possible also we can have a scaled model.

So, scaled model are basically models which are small or in size with respect to the actual model and where scale models are used take for example, we have made it we have designing a tractor. So, making complete one is to one tractor will take lot of time is expensive even to make a model.

So, there we wanted to we have a scale model right. So, smaller model we will use and the scale model we are going to show it to the user that this is the tractor which we are going to

use do you like the tractor or not of course, it will be; it will have all the features shown. So, if sometime that is also not possible then we will go for virtual model.

So, in virtual model there are three possibilities one is digital twin. Digital twin is a model which is having all the features and the functionalities in the computer and this is having all the features with respect to the functionality physically which is there. So, it is a mapping of physical model into the computer and all the laws of physics everything is being taken care when making the model.

So, this is this we can show it to the user. Other option is AR argument reality argument reality is where we will have maybe a little bit part of the model physically and part of the model in computer and when they are using VR set the users can actually interact with the product and they can have some kind of virtual filling of the product.

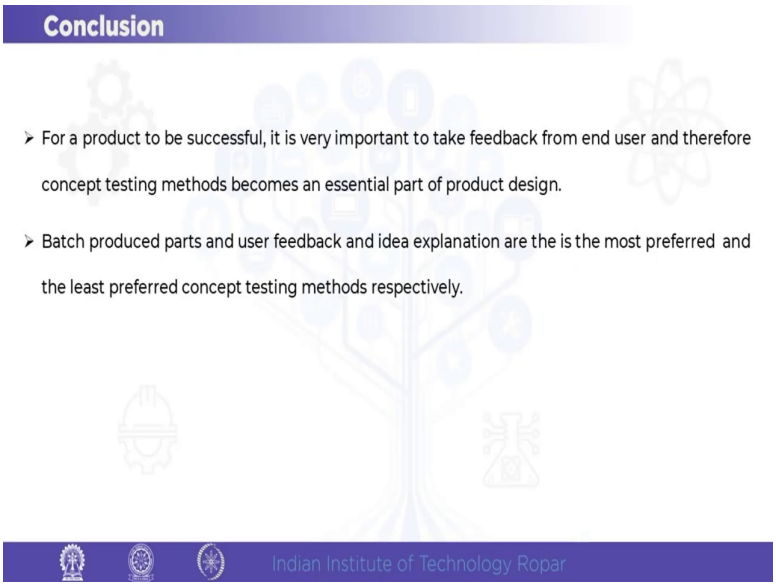
The next one is VR. VR is only completely virtual. So, they can see it in virtual duty environment see in the environment how the product is functioning and how the product is will be there what are things it can be done with the product, but this is a virtual model. So, if that is not possible then we can have a CAD model CAD model.

In CAD model there can be two kinds of CAD model one is CAD model means, we can make a computer model which means that you can previously people used to use autocad, but autocad is generally for 2D it can be make 3D also, but nowadays making 3D is important. So, we have solid works CATIA, NX there are several of the software, solid edge, thing 3D and NX also then newer version then there are also software which are like for industrial design, a price then Rhino.

So, so, many software are there you can make CAD model in this CAD model you can do either simulation can use actually simulation or without. Now, if that is also not possible then next is it is just that solution explanation you explain the user that this is the way it is want to solve a problem.

So, depending upon the product. So, this is I mean you explain the problem solution and then see the feedback this is not a good way of getting feedback, but this sometime you if you require feedback early and then that is what you should do. If that is also not possible sometime now, we tend to take feedback in the conceptual design stage, then the conceptual design conceptual solution conceptual design solution feedback.

Conceptual design solution you can use and that can be feedback and if nothing of this works out then what you going to do? In that case we going to have just idea explain the idea. So, if you see that if this is the case ideally for concept testing. The best thing is to finish to actually finish the product and go for the testing. So, this is the from conceptual from concept testing. This is the best and this is the least preferred, but when you do not take evaluation in the design phase itself in the conceptual space.

So, finally, if you want to have that product tested the best thing is the first one the least preferred is the tenth one, but when you are in the design stage is the other way round. Te idea explanation concept this you can if you if you go on testing then the then you do not have to go to the final stage and test it. So, before that you need to test it and then modify it. So, this is the way we are going to do the testing.

(Refer Slide Time: 28:33)