Functional and Conceptual Design
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Department of Engineering Design
Lecture No. 24
Intuitive Methods

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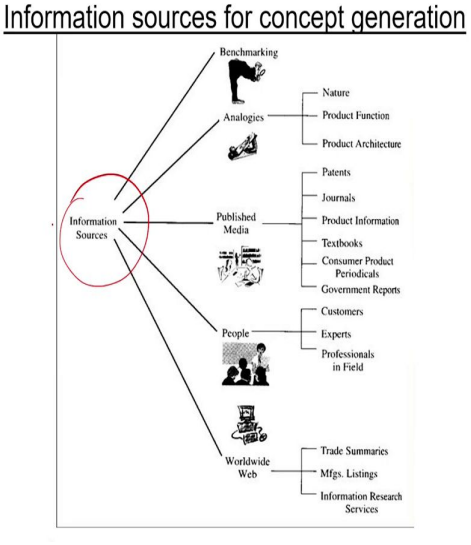

Good morning! Welcome back. So, we are discussing the concept generation and the concept development stage of product design. So, concept generation is a creative design stage, where we try to get creative ideas to solve a design problem. We identify the functions which need to be modified and then do idea generation sessions in order to develop ideas, to get ideas and then to develop these ideas into concepts. So, we saw the methods that are commonly employed for concept generation, basically the intuitive methods and logical methods.

So, we will start with the intuitive method today. We will see two or 3 intuitive methods of idea generation and then how these ideas can be converted to concepts. And as I told you in the last class, we need to be well prepared for going for an idea generation session. So, we need to collect as much information as possible and you can go for different information sources to collect information and then be prepared for the sessions for intuitive idea generation.

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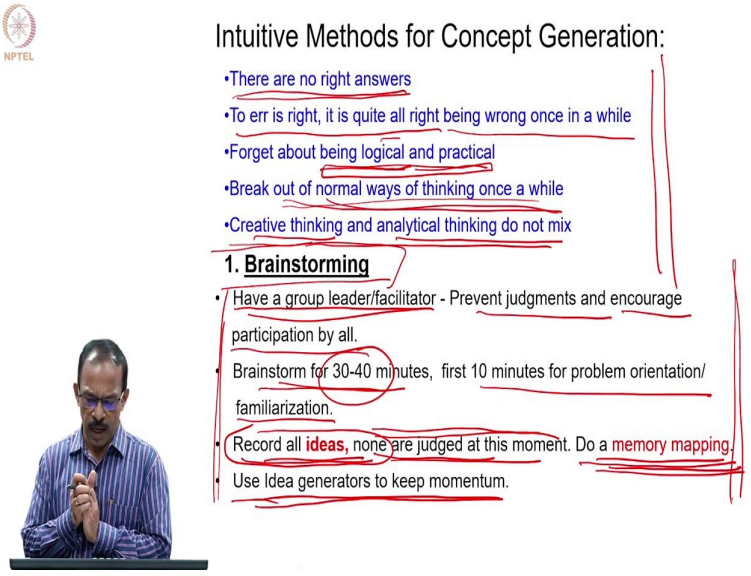

And the intuitive methods of concept generation, as I told you, one of them is, the most commonly used one is brainstorming. But whatever may be the method that you follow, there are a few things you need to keep in mind when you go for an intuitive idea generation session, because it is a creative stage where your creativity and intuition plays a major role. And that is why we need to understand that there are no right answers at this stage for you.

You do not know whether you are talking is the right thing or the wrong thing, and there are no right or wrong answers for your problem at this stage. So whatever solution comes to your mind, assume that it is the right solution, no need to worry about whether it is feasible or not. So, there is no right answer at this stage, maybe everything is right. Or everything may go wrong also. So do not worry about whether it is right or wrong at this stage.

And understand that to err is right, it is quite all right being wrong once in a while. So even if you make a wrong suggestion or a wrong idea, you put up a wrong idea, nothing to worry because you cannot always be right. And to err is always right and then it is quite all right being wrong once in a while or many times also nothing to worry, especially in this stage. And another important point is that forget about being logical and practical at this stage.

So you are not looking for a logical, practical, solution in the idea generation session, idea generation session is to get ideas. Whether it is logically correct, practically feasible, all those things we can analyze later, at this stage what we need is ideas. So, we need to have a large number of ideas, whether it is good or bad or logical or illogical, practical or not at all

feasible, all those things or worries are to be kept aside, we can analyze all those things at a later stage.

Because at this stage, do not try to be logical and practical in coming up with a solution. You can give any type of ideas, whether it is practical or logical that without worrying that you keep suggesting ideas and solutions for the problem. Break out of normal ways of thinking once in a while, that is what people say that you think out of the box or without the box also.

So, do not think in the normal way that everybody can think of, because when a problem is there, there is an obvious way to solve it. But you are not looking for that kind of an obvious way because people have tried that and it probably did not work. So, you are actually here to look for very novel ideas, very creative novel ideas. That is why you need to break out of the normal ways of thinking and then come up with very innovative ideas, creative ideas.

And creative thinking and analytical thinking do not mix. So, when you are trying to be creative, you cannot be very analytical. Because when you are analytical, you try to look at the details and whether it is feasible, whether it will actually work, all those things you will try to think but when you are creative, you have to be giving creative ideas, not an analytical solution for this. So, do not mix up the creative thinking and analytical thinking.

You are only creative at this stage. Try to get ideas, as many ideas as possible. So the objective is to get as many ideas as possible. And you know for a few hundred ideas, maybe only 10 will be really work or really worth proceeding further, but that does not mean that you can get, you need only to get 10 ideas. You need to have 100 ideas, so that you can see out of these 100, which one is the most promising one. When you have only 10 then you are actually left with only these 10 and you have no more options.

That is why you need to get a large number of ideas and a large number of ideas will come only through a creative thinking process. And you go for analytical or being logical and practical at this stage, that will restrict your thinking process; that will restrict your creative mind in going for solutions. So do not be analytical or logical. And do not try to be too practical at this stage, be more and more creative. So, that is the way how the intuitive methods will work.

Sometimes an idea proposed by someone which may appear to be very illogical, very impractical, but then probably you look at it in a different angle and then try to modify it a little bit, that may actually become practical at a later stage. That is why we should not stop any idea which may appear to be very illogical at this stage because you want to get all those ideas which are illogical, impractical and analytically not correct, all those ideas we want, so that we can actually take or modify those ideas to get a very practical solution.

So, keep this in mind any concept generation, intuitive concept generation methods should not look for logical, practical or analytical solutions at this stage. Get ideas to solve the problem and get as many ideas as possible. So, with this background, let us talk about the first method of concept generation which we call brainstorming.

So, brainstorming is a very commonly used method, as I mentioned in the last class also. It is very commonly used for many problems solving issues, not only in product design whenever you get this problem to be solved. Few people will sit together and then start brainstorming to find a solution, which is basically the brainstorming for a common man. Now, in the product design also, we can apply the same kind of modalities to get the ideas, but let us see how we actually do this in a practical scenario.

So, what we need to have is a team of people, we need to have 6 or 7 people. So, 6 is considered to be a good number to have a group discussion or a brainstorming session. It does not matter where there are 5 or 7, but too many people also will be difficult, too few people also will be difficult, because if the number of people is very less, you will not get enough ideas.

When too many people are there, you will actually get lost in the discussions and probably you do not get a very effective brainstorming. So, good to have a group leader or a facilitator. So, when you are having a group, better to have one group leader because we need this group leader to control the discussion, it should not go away from the focus of what you are trying to discuss.

Or whenever there is a silence or whenever people are not able to come up with new ideas, the group leader should be able to facilitate the discussion and then give some tips to engage people in coming up with new solutions. That is one to prevent judgment and one to

encourage the participation by all. So judgment also I will tell you that because sometimes people try to be say that, it is not logical or practical. So, the leader has to stop that kind of judgment also.

And then you need the first 10 minutes for problem orientation and familiarization. So, the team leader can actually explain the problem and what actually you are trying to solve and the context in which it is being tried and a little bit on the scope of the solution and things like that, so that everyone understands what the core focus is. And if there are any questions from the participants, that also can be clarified during the first 10 minutes.

Then go for 30 to 40 minutes of very intense brainstorming, that actually that is the period when actually you start getting more and more ideas to solve that particular problem. So, brainstorm for 30 to 40 minutes and at the end of this, record all ideas, So, here what we are getting is only ideas, that are not concepts at this stage, they are basically the ideas to solve the problem. Very abstract and not at all detailed, and many of them may not be practical or may not many of them may be illogical at this stage, but whatever it is, record all ideas.

And none not are judged at this moment. Do not judge any idea at this moment. So do not say that, this will not work because of so-and-so reason. And this will not work because the technology is not there, or whatever the reason you are trying to find out. But do not judge any idea at this moment. Because you have another stage where you will be doing this exercise of judging and then removing things which are not possible. So, do not judge any ideas at this moment and do a memory mapping.

Memory mapping is basically categorizing these ideas into different groups based on the domain or based on the application or based on the technology, you try to group them, and then prepare a sketch in which you can actually see all those ideas in a nice way, a graphical way. And that will help you to combine some of the ideas or some of the domains to get a better idea. So, you need to have a memory mapping at the end of this session.

And as you progress with the brainstorming session, sometimes there will be silence because nobody is able to come up with new ideas, then we need to have something called idea generators to keep momentum. So, idea generators are some kind of questions or some tips given by the team leader and asking some questions or what about this method, or how about,

how is this being done in a particular industry. So, this kind of question if the leader, Team Leader asks that will actually trigger the discussion again. So that is basically the idea generators.

So how, why, what and things like that the team leader asks questions, then there will be some momentum again for ideas. So this way, we need to proceed with the brainstorming session for 30 to 40 minutes. And brainstorming sessions are not a one time affair, so you may have to do it many times. First time you will do this and then you may get some ideas and you feel that probably that is not sufficient, you need to have more ideas, and then you will again go for a brainstorming session.

So, that again depends on the problem and then the situation as well as the quality of ideas that you are able to get in the brainstorming session. So, this is how the brainstorming will be done normally. So, you can actually use a whiteboard and chalk piece of different colored chalk pieces and ask everyone to come forward and then start writing their ideas or expressing their idea or sketching their ideas whatever it is, whatever way they would like to express.

So, you can actually ask people to give ideas and record it on the whiteboard or a blackboard. And this should be done for the 30 to 40 minutes, so that you will be having a large number of ideas. That is the way how the brainstorming will be carried out normally.

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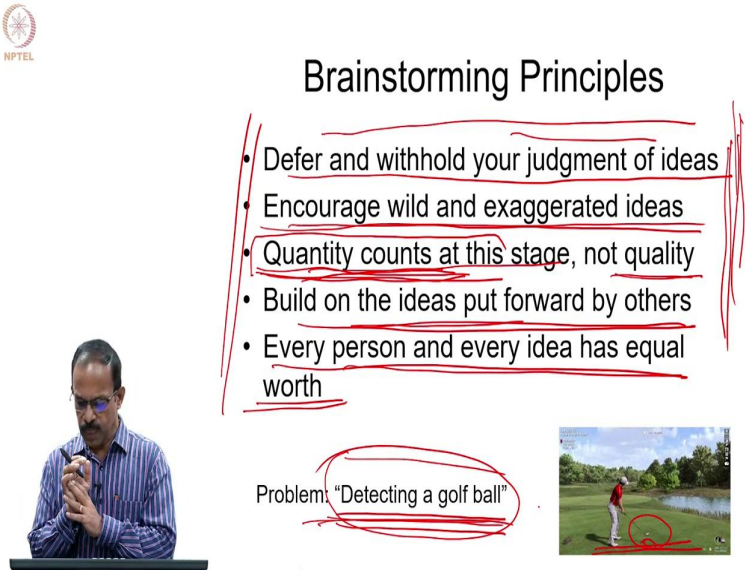

So, before we get into the brainstorming, there are some principles, these are proposed by designers, those who do brainstorming as an effective means to get ideas. There are many design houses in various places in India and abroad. There are many design houses which actually come up with new designs for the product or they will be involved in developing products for multinational companies.

These designers when they go for a brainstorming session, they fix some principles saying that, you need to follow these principles if you want to be part of the brainstorming session. And they are not very complex, they are very common sense approaches, but this is basically to ensure that the brainstorming will be effective. So, they follow these brainstorming principles. These are actually proposed by a designer from the US and he has got his own design firm in California.

This was actually mentioned by you in the previous slide also, defer and withhold your judgment of your ideas, a very important part. Because when I say, I have an idea to solve this, the other person should not say, no, that will not work because of so-and-so reason. So, nobody is there in the group to judge an idea. So everyone is there to give an idea, so never judge an idea.

For example, if I say, I can fly, you should not ask me, ``How are you going to fly? What is your propulsion power?" These are not the questions to be asked or to be the idea to be judged during this stage. For example, if someone says that there is a problem, suppose they are solving a very, very simple problem, because if you look at men, they have to shave their beard almost every day.

They are trying to find an alternative solution for this. Is there a way to solve this problem, or can we reduce the number of shaving to be done, or is there an easy way to do this. Instead of spending 10 to 15 minutes every day on trimming the beard or shaving the beard, is there a way to solve it? So, somebody says that, what you can do, you can have a gas burner and then actually kind of attached to your beard and then have a controlled burning.

If somebody says, you can have a controlled burning of the beard, you should not say that, no, no, that is not possible that is going to hurt the person. So the fire will actually cause a lot of smell and all those things, that is not the stage here. You are saying, if somebody says that,

probably you can use burning as an option, you take that as an idea and that is all. So do not ask the question

And if somebody says that you can have a lotion when you apply the lotion, all the hair will come down. That can be another idea somebody is suggesting. So you do not judge that idea saying that no, no, that is not possible that will cause skin infection or it will cause cancer or something, that is not what is supposed to be done here, you should never judge any idea, you allow everyone to give ideas.

If you feel that that idea can be improved by some other method, you can suggest it as an improvement of the idea, rather than judgment of the idea. That is what it says, defer and withhold your judgment of ideas. Now, the next one encourages wild and exaggerated ideas. Whatever maybe the idea, however exaggerated it is, however wild the idea is, you encourage that one or, because sometimes very wild or an exaggerated idea is the one which is actually trying to or going to solve the problem.

We do not know. We do not know at this stage what is going to be the solution. Sometimes a much exaggerated idea, which may appear to be completed illogical, impractical, may turn out to be a good solution at a later stage, because that is the way how we can solve creatively a problem, as creative solutions are not the one which is always already existing or which seems to be very logical.

Because creative ideas may appear to be, initially may appear to be very illogical or very wild, but that is the one which may lead to a good solution, that is why you need to always encourage wild and exaggerated ideas. The next one is the important one, quantity counts at this stage. So, we are at the idea generation stage, we are not at the concept stage still. So, we are actually trying to get ideas. So, the quantity counts at this stage, the more the number of ideas, the more the chances of getting a good concept.

If you have very less number of ideas, then you are actually having a very less chance of getting a good concept. So that is why we need to have a large number of ideas at this stage, that is why the quantity counts, not the quality at this stage. Of course, the quality of concept is an important one, but we are not talking about the concept, we are talking about the ideas.

Here a large number of ideas and then probably we will get the quality aspect at the next stage and then look into the quality. But at this stage, what we need is a quantity.

So, we need a large number of ideas to solve the problem. And build on the ideas put forward by others. As I told you, so, if you, if someone proposes an idea, and you feel that that can be improved by adding something to that, that is a welcome thing. Because you are actually giving it another idea or you are trying to build upon the idea proposed by one person, that means you are actually giving a more concrete form to that idea, or you are actually getting a better idea from the idea proposed by the previous person.

So, that is a good thing. So instead of judging the idea, you try to build on the ideas put forward by others. So, these are the common rules to be followed. And the last one is every person and every idea has equal worth. Many times when you go for a brainstorming session, there will be a few people who are actually a little bit dominant and try or vocal, and they try to dominate the brainstorming session, they only will give you ideas and they will sometimes try to stop others from giving ideas.

So all these things should be stopped. And in a brainstorming session, everyone is important, whether he is a technically qualified person or not, or he is from the same field or from a different field. All are important because when you choose a team for the development, you know that they are all worth, they are all important in the team and therefore, every person and every idea has equal worth.

There is no special consideration for any, anybody, just because there is a leader, a team leader, does not mean that the team leader's idea has got more importance than others. Nothing like that every person and every idea has equal worth. So, that is and these are the brainstorming principles to be followed when you do a brainstorming session. So, I want you to do some brainstorming sessions along with your classmates or your friends who are taking this course.

And we will give you some examples, I mean some exercises to do this, but keep this in mind when you do the brainstorming session. This is what you need to keep in mind when there is a brainstorming session planned for. So with this background, let us take a very simple example and then see how the brainstorming can be done and how we can actually create the

mind map for ideas or how can we generate ideas and how can we map them or do a mind mapping to organize the ideas in a better way.

Let us take an example of detecting a golf ball. This is the problem. I am taking a general problem rather than a product design problem, because we are trying to understand what is this method or brainstorming, how it can be done. So, I am taking a very general problem of detecting a golf ball. All of you may be or most of you may be knowing what is golf and how it is being played.

As you can see here in this picture, this person has got this on the golf ball here, and he will hit this ball and it will go far away. And will, I mean his target is to put it into the hole and he will hit from here and then it will fall somewhere and then he has to go close to that and then hit again to put it into the hole. Now, one problem that you can see here is that as he hits the ball, he does not know where actually it is going to fall and then he has to go and search for it and then find the ball and then again hit it.

We are trying to see, is there a better way to detect the ball once it is hit or where it is falling? Can we find out the location of the ball once it is hit? So, this is a problem. And then generally looking you can say, we can have a very easy solution, you can actually, you must be thinking, this can be done this way this way. But that is something which anybody can think or any person can actually come up with those kinds of ideas.

But we are looking for a creative solution which can actually solve. Since there is no solution at present, which means nobody could really come up with a good solution, though there are very what you call obvious solutions that somebody can think of. There are practical difficulties in implementing it, which is why it is not being solved. So, can we come up with a very creative solution for this problem? So, that is the problem here and we want to do a brainstorming, we want to have a brainstorming session to get a large number of ideas to solve the problem. So, at this stage, we are looking for a large number of ideas and to see how to solve the problem.

And suppose now you are a part of this group, so you have to follow the principles so I am just showing it again. So you have to keep this in mind before you go for the brainstorming. Now, if you are a part of this group, as I told you, you need to do some background study.

You need to get some information regarding golf balls, what is the type of balls, how far it is being hit, what kind of surfaces are there, what kind of environment is there, all those things you need to understand and have some ideas about how this is done in different other fields also.

For example, in cricket or in other sports or in any other scenario, how some detection is being done, detection of something, or searching for something, how it is being done. So you do a lot of information gathering and then come for the brainstorming session. So the leader will explain, the team leader will explain the problem to all the members and tell what is, what they are trying to solve.

And then there will be, there can be having some kind of exercises to make sure that everyone is in a good mood. So, these are normally done in brainstorming rooms. So, all the 6 or 7 people will sit for some time and then they do some simple exercises, exercises in the sense of some kind of a game so that everyone will be in a good mood to start the brainstorming session.

So, this exercise can be completely different from the problem that we are trying to address and there are few exercises, such exercises also, we will try to have it in the lab session, something like that. Now before we start the brainstorming session, we will have a whiteboard or blackboard, and there will be different colored chalk pieces or different color pens available for everyone.

And so, each one can have a different color pen or a chalk piece. So that you know who is writing what or who is giving the idea, just to have a record of it later. So, the team leader can actually write the problem at the center of the board.

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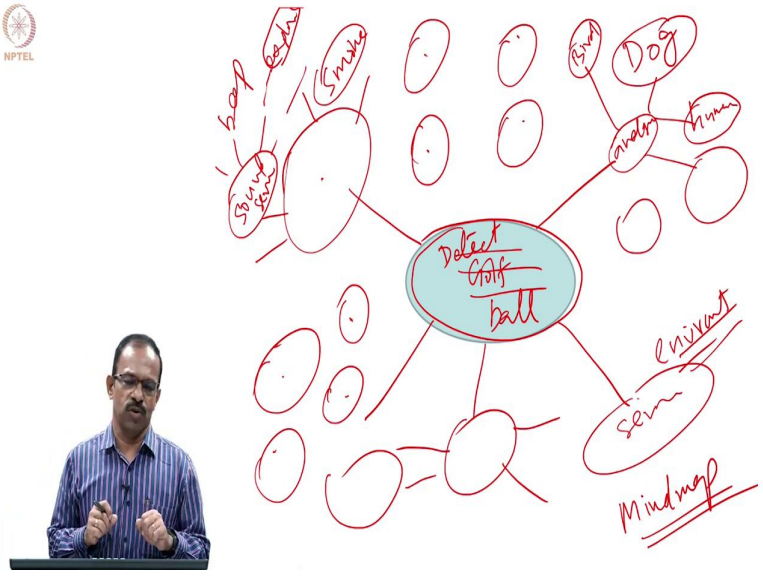

You can actually have a circle to define the problem that you are trying to solve. So this will actually help us to create a map also later or doing a mind map also can be done with this kind of arrangement. So he will write what needs to be done here, so he can actually detect the golf ball. So, detecting golf balls is the problem here. Now, he will ask people to suggest ideas. So, people can keep starting to give ideas.

You can also give ideas, what are the possible ideas that you can think of. So, you can see that the ideas can actually come from different things. So, whenever the idea comes I need to or the leader will try to categorize it possible otherwise he will just leave it or he will ask the persons to write it on the board itself. So, for example, somebody will say, we can actually have a dog to search for the ball, maybe a good solution.

Or somebody will say, oh, we can have a human to or human member can be there, you can actually employ people and ask people to stand in different locations, and they will tell where it is. So you do not need to search for it, if a ball is falling in that area, that person will give you, flag you and then you can go there and take the ball or you can find the ball there. So, then can be a dog or a human.

Now you see that this actually talks about some natural or analogous thing. So, we have some natural analogous thing, something we normally do. So it is actually, it can be like this or you can actually have something else also here, something which is similar to the or you can have

a bird, trained bird, you can have a trained bird who will be flying and then whenever it falls, it will actually locate the ball. And these are the very, something which anybody can think of.

Now, somebody will say oh no, no, you can actually have a, you can actually get some sound. Somebody will say, you can have a sensor which actually generates a sound. So basically sound based, sound sensor or a sensor which actually or some devices produces noise, there can be one. So, here actually you can have a beep sound or you can actually have something else or you can actually have some smoke coming, not sound, a beep or as an explosion, explosion can actually give you some sound.

Make a cracker can be there, it will give you a sound or there can be a smoke generation. So, somebody can say, you can actually generate some smoke, so that you will be able to see. So, this all will actually come under some category where actually we are saying that we can attach something to the ball and then get the sound or the smoke or some indications coming out. That is one thing which actually we will be talking about some modification to the ball.

That is one category you can change, modify the ball and then get some ideas. Or somebody will say, why not we change the environment itself. So you can actually have the surface, you can say you can actually attach some sensors on the ground. So, whenever it hits the ground, it will give you something you call light or sound or something.

This is again sensor-based, but it is basically talking about the environment change, not on the ball, but on the environment you can make some changes. Or somebody will say that no, you can actually attach something to the stick. And when you hit, then that will actually calculate the force, how much force is applied and what is the direction of the force and you can use an analytical expression to find out the trajectory and position it.

That is changing the stick which is used for the, for hitting it. So, that is another approach that you can do. So, you can actually change the environment, change the ball or change the city. Now the approach may be, why do not we have a thread attached to the ball and when you hit, you will actually see the thread moving and then you can actually follow the thread and you will get it that can actually give you some ideas.

So, like this, you will see a large number of ideas actually can come from people and then you start writing all those ideas. And whenever you get less number or whenever you are,

whenever you see that the ideas are not coming, you ask some questions, how can we do this, or how is it that being done in some other games, or what kind of methods are used in defense to search for something, search for people or search for objects or search for bombs or whatever it is.

What kind of methods are used? So, can we use some of those methods to get this done? So this way, you keep on getting participation from everyone and get the ideas, as many ideas as possible. And later on, you try to reorganize it in such a way that you have a clear picture of all the ideas generated and these ideas are actually categorized based on the solution methodologies proposed and put a create a mind map. So, that is the next stage where you cover the mind map after the idea generation session.

This will go for 20 to 30 minutes and you will stop, after 30 or 40 minutes you will stop because you cannot continue for a long time, which will actually not be very productive. So, you need to have a high energy brainstorm for 30 minutes, which is the requirement. And if required, you can do it later after taking some break. So, once you do this you will be getting a large number of ideas on board, on the whiteboard and you can create a mind map.

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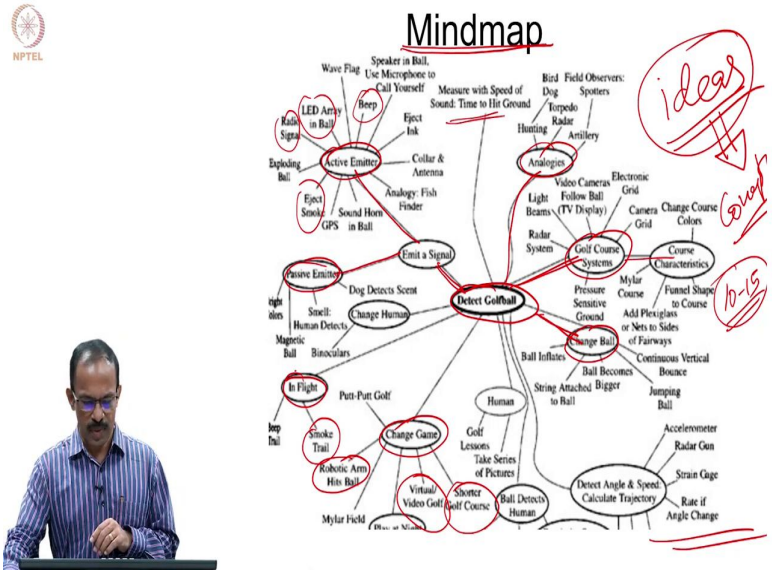

So, the mind map will be something like this. Now you can see the same problem again, see the detect golf ball as the central piece and you can get ideas based on different things. So, basically you can say change the ball or you can change the golf ball systems or you can have

an emitter signal or analogy for the hunting artillery, dog, bird etc. And then under the emitter signal. Again you can see passive emitters or active emitters.

You can have a passive emitter, which actually smells and other things, or active emitters like smoke, LED, radio signal etc, or a beep sound. So these are active emitters and then passive emitters and then you have a smoke trail that is in flight you can have a smoke which actually the trail of the smoke can be checked to find out the location. And change the game that is again a very wild thinking.

You can have a robotic arm hit a ball, and then the robotic arm can predict it or a virtual video of golf or a shorter golf course so that it can easily detect the thing. So these are all again, very wild and exaggerated ideas, but then we do not stop any of those ideas, we do not judge any of those ideas, we will keep recording all these. So, you can actually have all these ideas, again they are actually categorized and put it in proper categories.

No, that is the mind map. So, a mind map is the first stage in getting ideas. So, all these are ideas only. So, what you are having is ideas. Now the team has to sit together and then look at each of these ideas and then start developing concepts. So, these ideas need to be converted to concepts. And that is again a creative stage where everyone will sit together and look at each of these ideas and then see which one is not within the scope.

That is for example, having a robotic arm, we will say a probably robotic arm may not be the solution. So, we are not looking for it, so we do not consider it at this stage. But if there is something possible from here, can we take some ideas from here and then combine with something else and that may be a good solution. So, instead of a robot, the humans still hit it, but what is the robot doing, what is the advantage of having a robot, it can actually repeat the same thing and then based on that, if that can be the angle of hitting etc can be easily, can be correctly measured, then you will be able to predict the position also.

Now, can we take that idea of measuring the position of the force etc, and apply it in a different solution or a different idea, then probably we will be getting a good solution. So, that is why we need to look at those intuitive ideas and then see if something can be taken or not and if possible, try to combine them. So this way we will try to look into each one of these ideas and then start developing concepts.

And at the end of this, now, we have a large number of ideas, but we need to have around 10 to 15 good concepts at the end of this, I mean the concept development stage. So ideas, we need to have a large number of ideas. And then from there you can have any, as many concepts as possible, but there would be a minimum of 10 to 15 concepts. Then only we will be able to get a good concept to take it forwards. So, this is the way we do the brainstorming session.

I hope you got the idea. So, this actually to be done practically in order to make sure that you get the feel of doing the brainstorming. So, try to have a brainstorming session with your peers or your friends and then see how you can develop good ideas to solve a problem. So, not only in a product design, you can apply it in any other situation also.

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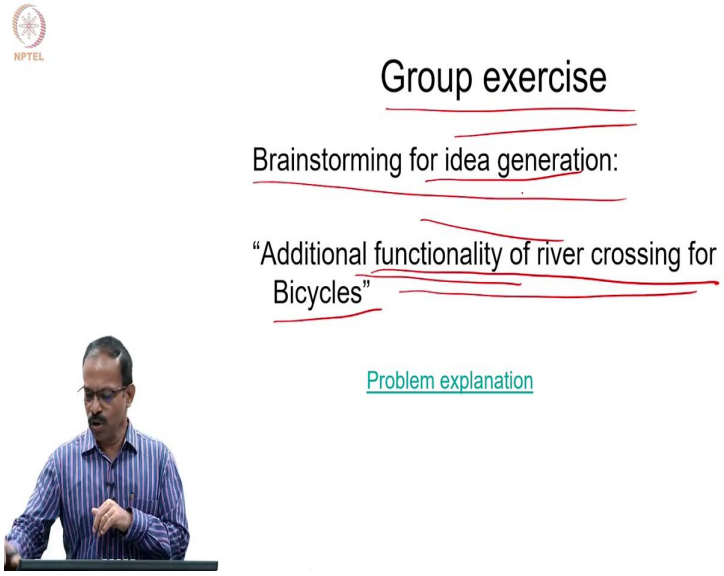

Alright, so, I am giving this as a group exercise for you for idea generation. So, take this problem and then try to have a brainstorming session. So, take this problem as additional functionality of river crossing for bicycles. So, all of you know that cycles are used very commonly for transportation, for commuting from one place to another. And whenever there is a river or some smaller streams which you want to cross, especially in dangerous cycling, you may find it difficult to do this.

Think of or if you can come up with some ideas to modify the cycle in order to have additional functionality of river crossing. So you assume that the cycle is a normal cycle, but you want to have a functionality of river crossing. So, what you need to do is to do a

functional decomposition, identify the functions needed in the cycle in order to have it cross the river. And then take the functions which are new functions and then see what kind of concepts can be developed for that.

And to develop that concept you need to have ideas. So, generate ideas based on the function that you are trying to address and have a brainstorming session and get a large number of ideas to solve. So, that is the exercise for you. So, that is brainstorming.

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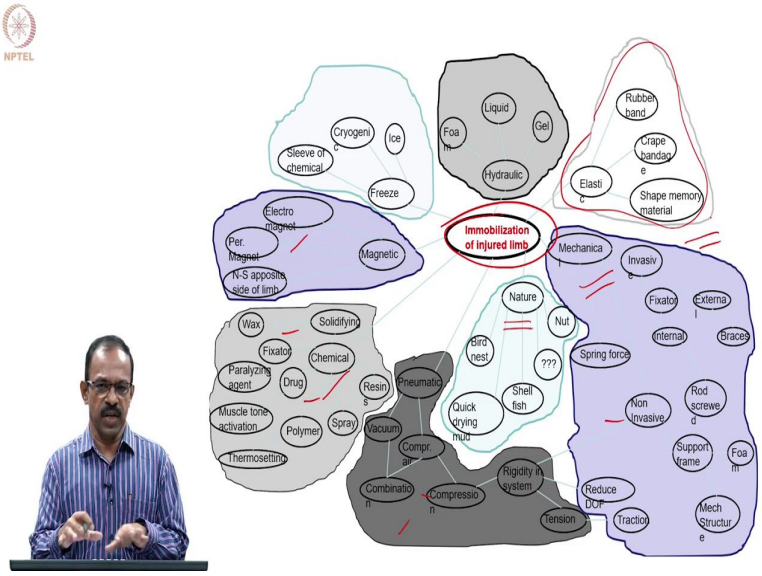

So, these are some examples for mind mapping. So, this is for immobilization of an injured limb, which is for when somebody meets an accident on the road and breaks his leg or the arm. We need to immobilize it till he gets the treatment at hospital, otherwise if it is dangling and it may get, the injury may become more severe. So, is there a way to immobilize the injured limb as we take it out till the person gets treatment?

So, if you do a brainstorming session you will get a large number of ideas like this and you can categorize them based on the area. So, this is a hydraulic, this is for freezing or the temperature based on magnetic and this is again chemical based and this is Vacuum based, based on the nature or analogues to the nature, what we have mechanical solutions etc.

So, you can categorize them in different categories and then look at each one of these and then see which one will be the best way to solve the problem or which ideas can be taken forward or combined together to get a concept. So, now from here, you start developing

concepts, you modify these or look at these ideas and start developing concepts by sketching and then trying to give an explanation.

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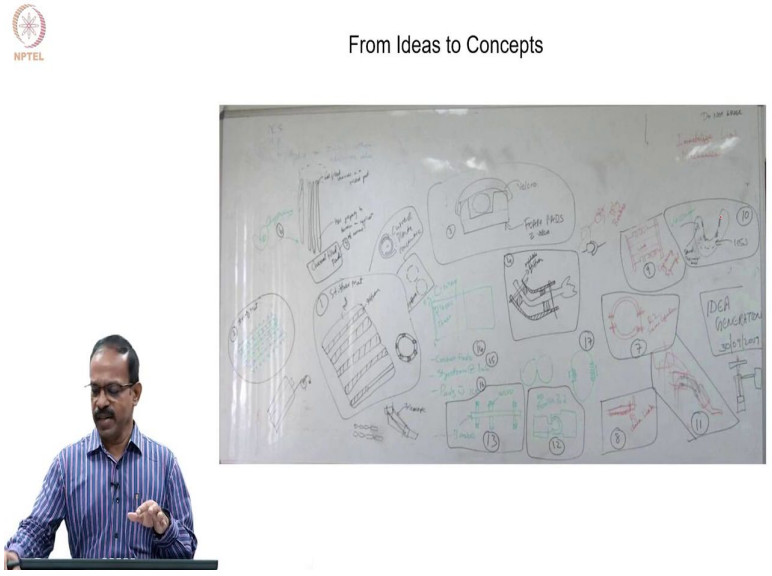

So, try to give a more detailed explanation or description of the concept by taking the ideas or different ideas and then start sketching the concept.

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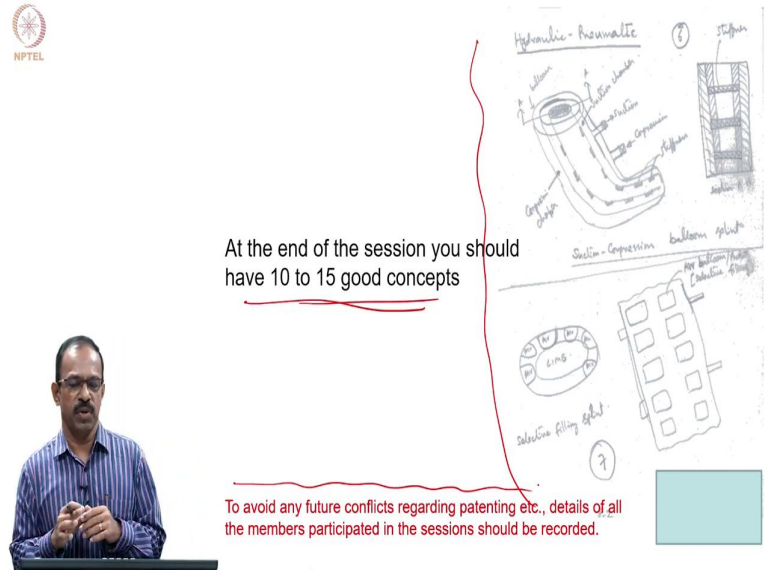

So, you can do this as a group and then you will be getting many sketches like this, these are some examples, you can actually have many concepts like this and at the end of all the session you should have 10 to 15 concepts to solve the problem. So, that is the way how it

progresses from ideas to concepts. So, at the end of the session, you should have at least 10 to 15 good concepts to solve and good concepts to solve the given problem.

So whenever you do these kinds of exercises, whether it is for product design or any other thing, you need to keep a record of all those who participate in the session. This is to avoid any data conflict regarding patents or ownership or anything like that. Because whenever you come up with a new idea or a new solution for a problem, there is a potential to get a patent for that invention. And whoever participated in the brainstorming session or concept generation, they are all eligible to be called as inventors for that solution.

And if someone creates a problem later saying that I also participated in it, I also contributed but my name is not included in the patent, which may lead to legal issues. That is why you need to keep a record of all those who participated in brainstorming sessions and concept generation sessions. So that is applicable to all other types of brainstorming, I mean all other types of concept generation methods also. So that is about the brainstorming session, brainstorming.

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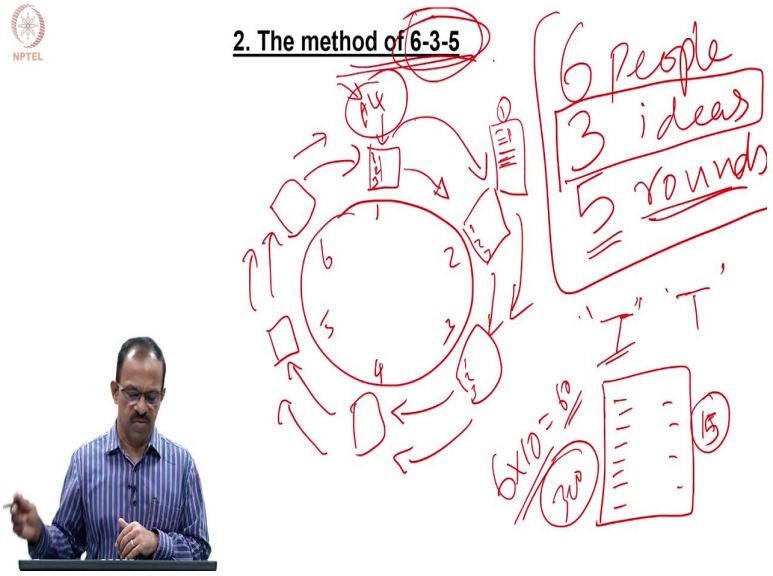

So, one of the main issues with brainstorming is that we keep on giving ideas, but we are not really able to explain what it is. Or I may be giving an idea, but the other person may not really understand what I am trying to explain, what my idea is. So I do not get a chance to

explain how it is or how it will look like; that is what is actually missing in brainstorming, it is more of a vocal expression of ideas.

And that may sometimes lead to someone misunderstanding the idea and then trying to, at a later stage trying to drop it or they may try to build upon it, thinking that it is something different. All these actually are some issues with brainstorming. And that is why to avoid it and to make it more detailed, there is another method called 6-3-5. This 6-3-5 method is used for idea generation to avoid some problem with the brainstorming, but we can actually do both brainstorming and 6-3-5 also to get solutions, because brainstorming will give you some ideas and 6-3-5 also can again generate more ideas. So, 6-3-5, 6-3-5 actually stands for 6 people and each one gives 3 ideas and 5 rounds of idea generation, which is basically 6-3-5.

So you have 6 people, 3 ideas and 5 rounds, so that is 6-3-5 method of idea generation. So, how is it working? So, you have a round table and 6 people will be sitting around the table. And, of course we will do the other exercises; like explaining the problem for the first few minutes.

And then each one will be given an A4 sheet paper. You will give you an A4 sheet paper. So, I will consider this as the paper itself. So, each one is given a, so this is 1, 2, 3, 4, 5 and 6 people and each one is given an A4 sheet paper. So each one will be having an A4 sheet and we will ask each one of them to give 3 ideas for solving the problem. So, the problem is already given and each one of them will be asked to give 3 ideas, independent 3 ideas without any discussion.

They can sketch or explain or whatever the way you want to explain the idea, it can be done using this A4 sheet. So, here they will be writing 1, 2, 3 ideas. So each one will be writing 3 ideas. Now, this will be given for T minutes so we can say, initially given 5 minutes to complete 3 ideas. This the T can actually be decided based on the problem. So, we give some fixed time, say that, you finish all this, and give 3 ideas within T minutes.

At the end of T minutes, we will actually pass the paper to the next person. So, you pass your paper to the person who is sitting next to the place and then ask him to go through the paper and then modify the ideas, I mean, suggest new ideas, completely new ideas, or based on what he is seeing in the first paper, he can write new ideas here. So, the first paper will come

here to the second person. So if this is the first paper, it will come to the second person, already there are 3 ideas.

Now he will look, the second person will look into these 3 ideas and then see whether these 3 ideas, now since he has not thought about these first 3, he will be trying to get new ideas based on that. So, he will write 3, additional 3 ideas there. So, based on these 3, he will get some new thoughts and he will have another 3 ideas written here, 3 or more depending on what he actually feels. And then each one will be having like this and again given T minutes to complete this and this will continue, this paper will keep on going like this, and this complete keep on doing after every T minutes the paper will be handed off to the next person.

And at the end of the one round, the first person gets his own paper. So, at the end of one round, the first person gets his own sheet. Now, he will look at his sheet. So, he had 3 ideas initially, and by the time it came back to him, he would see there were a large number of ideas in the paper. The 3 ideas have become 10 or 15 ideas in the sheet. That is actually one round, so one round is completed.

Now, we will have a discussion for 5 minutes about all those ideas, what they are seeing in the paper. If they have any questions, they will try to discuss this. And then this will continue for another 4 rounds. So, 5 rounds will be completed like this, and if needed additional papers will be used. But you will see at the end of this, you had 6 papers with the first round, you had 6 papers with the minimum 10 standard or an average 10 ideas, and you have 60 ideas at the end of one round.

And now you do this for another 4 rounds. So you will be getting an average of 40 to 50 ideas per round. So you will be getting around 300, roughly 300 ideas to solve the problem. So this is the 6-3-5 method where you will get a large number of ideas by following the principle of 6 people, 3 ideas and 5 rounds. So, that is known as the method of 6-3-5.

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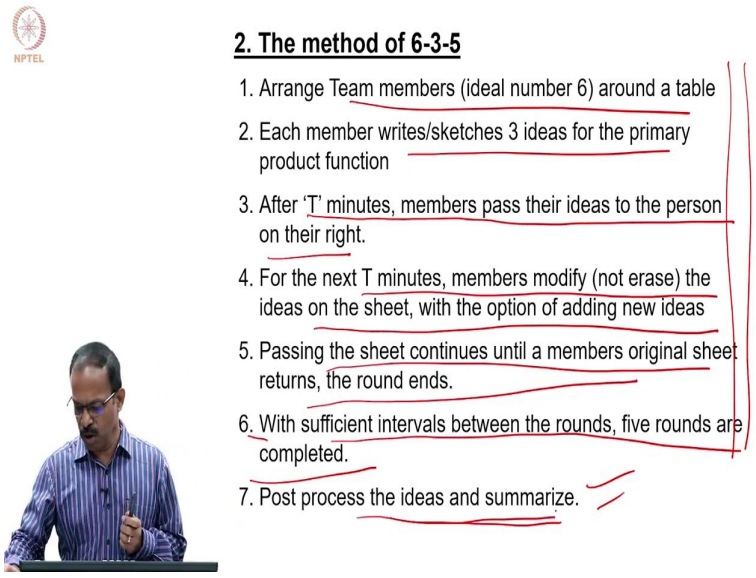

So, I will just tell you this, the steps involved are already mentioned, arrange team members, ideal number is 6. Each member writes, sketches 3 ideas for the primary function, and after T minutes, members pass their ideas to the person on their right. And for the next T minutes, members modify the ideas on the sheet with the option of adding new ideas and passing the sheet continues until a member's original sheet returns to the, returns, the round ends, that is the first round ends and then it continues for the other 4 rounds.

So this way, you will be getting a large number of ideas in a short time, each one will be creatively thinking about the solutions and getting ideas. So this is known as the 6-3-5 method of idea generation. So, sufficient intervals between the rounds 5 rounds are completed. So, this is the method by which you can get a large number of ideas. So we will take an example in the next class and then see how this 6-3-5 method can be used for solving design problems.

So, once after the ideas, of course, you need to summarize and then develop concepts based on the idea.

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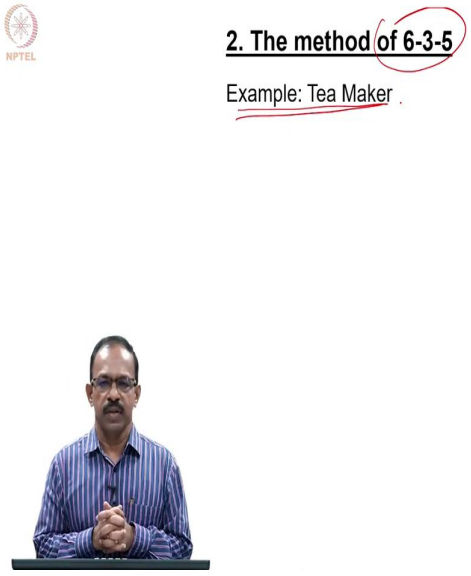

So, I will stop here, we will discuss this in the example in the next class. So, we will use the material 6-3-5 in the case of designing tea makers. So, that we will see in the next class. Thank you.