Product Design using Value Engineering

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Lecture - 05
Value Engineering vs Cost Cutting

Namaskar Friends! Welcome to session 5 of our course on Product Design using Value Engineering. So, whatever we have covered till now, we will try to augment, we will try to further develop our understanding of the concept of value engineering here on. We have covered the basic aspects of product design and development. We have seen that each and every company wants to maximize the profit, wants to improve the financial health of their organization, wants to be profitable in the market, wants to capture as much as market share as possible.

So, with these objectives, the companies normally try to use different strategies to focus on the profit and we have seen that there are three important strategies; just to revise the companies tend to increase the selling price, they tend to increase the quantity of their sales or the number of sales, as well as they try to work on the cost aspect of their product.

For example, I am using a pointer. Again I am taking an example. So, we can focus on three things, when we want to improve the profit. For increase the profit we may like to increase the selling price of the individual unit or we can try to sell more number of units or we can try to reduce the cost that is being spent on manufacturing this product.

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So, as far as the understanding of value engineering is concerned, in the previous session that is the basic aspect of value engineering and historical perspectives we have seen, that we try to reduce the cost of the product without compromising the functional aspects of the product. So, without compromising the functions, our target is to reduce the cost. And today we will try to just have a brief review of the concept of value engineering.

Review means we will try to further add certain important points that what are the application areas of value engineering, and then we will try to compare value engineering with the concept of cost cutting, but because many times the readers or the learners confuse between the two aspects that is what is value engineering and what is cost cutting. So, for every product we can apply both approaches, we can approach the product design problem from the value engineering perspective, we can also approach the product design problem using a cost cutting perspective.

So, what is the difference between the two perspectives that we will try to address today and hope by the end of this session; that is session number 5 and the first week of our discussion will close, today. So, within first week, at least the basic aspect of value engineering why it is required, how it is relevant to the product design process, and how it is different from cost cutting, all these aspects must be clear to all the learner. So, let us now quickly focus on the importance of value engineering.

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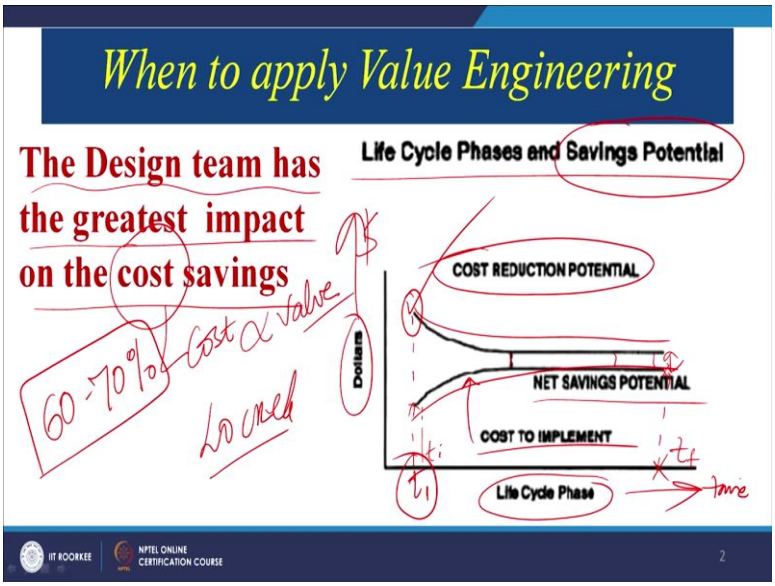

So, on your screen, you can see that the design team has the maximum impact on the cost. So, here we can see the design team has the greatest impact on the cost savings. So, our focus is basically on cost and cost is proportional to value, it may be directly proportional it can be indirectly proportional, but value and cost are related to each other. So, the design team has the maximum impact. How, we can see the life cycle phases and the savings potential.

Savings potential means that how much money we can save at different stages of the life cycle. So, these are the life cycle phases on the x axis, and on y axis we have the money, it can be rupees, dollars, pounds, euro whatever. So, on y axis, we have the money or the finances and on x axis we have the time, basically the life cycle.

So, we can see that cost to implement, this is cost to implement. So, we are saying a cost to implement is increasing with the time, and on the contrary, we can see the cost reduction potential is reducing. So, initially if we focus on this point and we drop it down on the lifecycle, suppose at time t 1. So, t 1 is a very early stage in the product employee or in the product development stage, so, t 1 is quite early.

So, what does that mean, that the cost reduction potential and we will see try to understand it in a subsequent slide also that when we should apply value engineering. So, value engineering must be applied at the very beginning of the product design process,

why? Because during the initial stage only we lock, I am saying the word LOCK. So, we lock most of the costs. Why?

Because, we will be selecting the material during that design stage, we will be selecting the shape that we are going to use, we are going to select the functions that the product is going to satisfy, we are even going to lock the process by which the product is going to be made. So, most of the things are going to be locked, freezed, finalized at the design stage only. So, mostly in the books you will find out that 70 percent, maybe 60 to 70 percent of the cost of the product is locked at the design stage only.

So, if we apply the principles of value engineering at the design stage; that is the initial stage of the life cycle, we have lot of potential of cost saving or the value enhancement. Whereas, if we try to change our design at a later stage of the life cycle phase maybe when the product is under manufacturing.

For example, if we are making a house, the architect may have laid out the house, may have done all the planning related to the house, the structural design is already ready, the layout of the rooms, the other facilities kitchen, washrooms everything is already ready, at that point if we apply value engineering we can make use of the concepts and save a lot of money.

But suppose the construction has already started, we have already erected, the walls the foundations have already been laid for the house, and at a later stage we decide to change something. Obviously, it is going to not help us much, whereas, we are going to spend even more money in bringing out that change. So, here we can see that the net saving potentials is the cost to implement. This is a net saving potential which is going on reducing, the cost to implement is keeping on increasing.

So, if we bring about a change here at this stage; that is supposed to t final(t_f)and we bring about a change here that is say t initial(t_i). So, initially, in the beginning of the life cycle if we are bringing a change, easy to implement, at a later stage if we are going to bring about a change it is difficult to implement. So, all of us must realize that when to apply value engineering we must be very firm and affirmative in our answer that the value engineering concepts must be applied at the very beginning or at the early stages of the design process. So, this is the crux of this slide.

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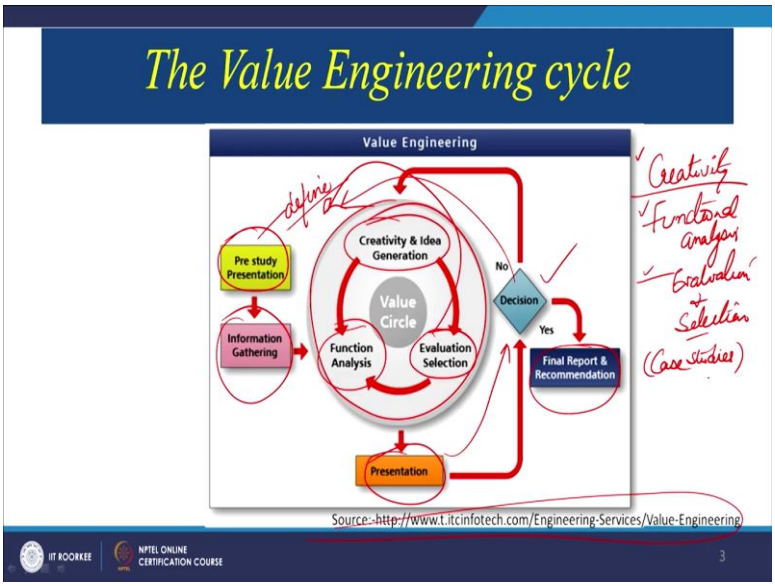

Now, this is a value engineering cycle, it has been taken, the source is already mentioned on the slide. So, we can see that how value engineering study is done. So, quickly we can see, there is a pre study presentation. We will go through a value engineering job plan also in our subsequent slides. We will see that how systematically, we must approach a value engineering problem, but this is a general framework of solving any problem using value engineering.

So, initially we do a pre study, then we will gather all the information, then we go to this cycle. And in this cycle suppose we start with the creativity and idea generation. So, we have a pre study where we define the objectives of our study, we know what we want to do, we want to change the material or we want to reduce the weight of a particular product. For example a tennis racket, we want to reduce the weight of the tennis racket, so, that is our objective.

So, we will try to gather all possible information about the tennis racket, how it is fabricated, what are the materials being used, what are the innovations been reported in the manufacturing of a tennis racket over a period of time, and then, once that is ready we know our objective, we have all the background information related to our product. Then, we go to this cycle or we can say a cyclic process of creativity and idea generation, we will use our creativity. We will also have a session on creativity, maybe in the next session.

So, we will use our creativity, we will generate lot of ideas and from there we will do the evaluation and selection based on our defined objective, then we will also do the functional analysis. So, in functional analysis, it must satisfy our basic function; that is for a racket it is to play tennis.

So, we can say that when we are designing a product, it has to satisfy the basic or the primary function of the product. So, this cycle will continue and we will final come out with the best alternative, make a presentation and if it satisfies the defined objective, it will be selected and final report and recommendation will be made. And if it is not selected, again we will use our next best idea and try to work on that idea to develop a product which is functionally suitable, which satisfies the function reliably at the minimum possible cost.

So, this is a basic a very primitive type of framework for solving any problem using the concept of value engineering. And if you see, there are three important things here, we have first is the creativity. So, we will like to have a session on creativity, then you can see the other important aspect is the functional analysis. So, we will have sessions on functional analysis also, and the third is evaluation and selection.

So, we will try to have sessions on evaluation and selection also where we will try to take some case studies where the concept of value engineering has been applied and the problems have been solved. So, this is the general framework for solving any problem using the concept of value engineering.

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Now, what are the application areas? Today, only I have taken an example of our construction of a building. So, most importantly value engineering concepts are used in construction sector in civil engineering. Then the manufactured product also, it is shown here raw material than the preparation, cold drawing out which is a forming process, straightening, machining, assembling and finally, the final product is ready, surface treatment is also done. So, value engineering concepts can also be applied in the manufacturing industry.

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Then it is not only relevant to tangible or hardware oriented projects only. The concepts of value engineering can also be applied in the aviation industry, it can also be applied in hospitals, and the concepts can also be applied in restaurants. So, wherever service industry is involved, the concept of value engineering can also be applied, even in business systems and processes, the concepts of value engineering can be applied.

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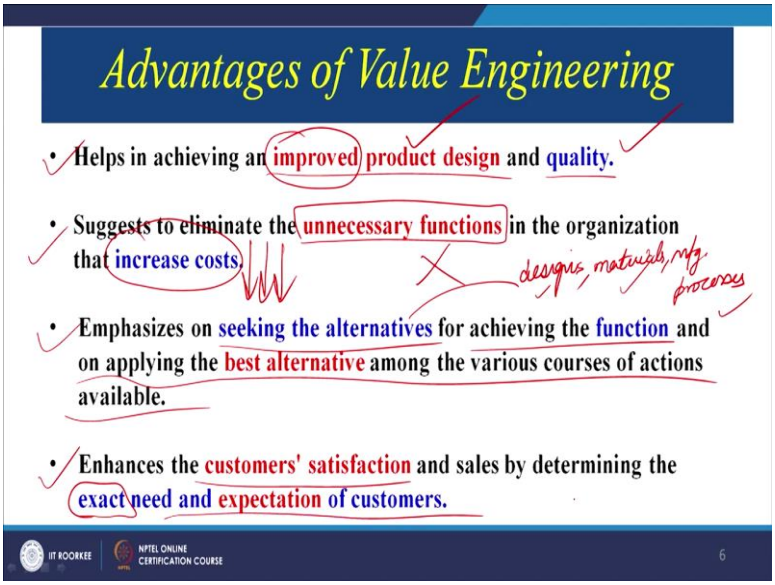

Now, what are the advantages? Now, we have seen that what is the basic concept of value engineering. We have tried to understand that how value engineering is relevant in the different areas of science and engineering. We have also seen today in the very beginning a general framework of solving a value engineering problem.

So, basically we will apply all these concepts, because we foresee that it is going to help us in solving our problems that is one thing and the time effort, energy and money that we are spending on doing a value engineering study is definitely going to yield better results or at least in the books it has been documented that breakeven is almost certain. Which means that if I spend 100 dollars on conducting a study, at least benefits derived out of this study will not be less than 100 dollars.

So, therefore, many organizations have introduced a concept or a philosophy of value engineering all across the various domains of their organization. So, that the company can become profitable, the company can be improved its financial health. So, therefore,

there are certain advantages of value engineering which the companies are taking advantage of or companies are leveraging these advantages.

So, what are the advantages? So, first thing is as I have told today and we have discussed that we must apply the concepts of value engineering at early stage. Early stage means that we must a focus on the early stage of the life cycle; that is the product design stage. So, advantage of value engineering is that it helps in an improved product design and quality.

So, two important things are improved product design. So, we challenge the design of the product in the value engineering analysis. We try to challenge that why this product has been developed in this particular manner only? Why there cannot be any changes in this product design? What can be the additional functions that can be added into this product? What are the redundant functions which can be eliminated from this product?

What are the functions that can be combined together to make the operations of the products simpler? So, there are a number of different questions that come to our mind and when we address all these questions, our product design will be improved product design, as well as the quality of the product will improve when we will apply the concept of value engineering.

Second point is, it suggests to eliminate the unnecessary functions which I have already highlighted. So, unnecessary functions are eliminated from the product design and these functions sometimes lead to increased costs. So, if we reduce these, the costs will also automatically come down.

Then the value engineering emphasizes on seeking the alternatives. As we will discuss and we have seen in the previous session also that our major focus is on thinking about the new product designs, new shapes, new sizes, new concepts in the product design approach,. So, we will seek alternatives. Not only in that designing, we seek alternatives in terms of advanced materials, we seek alternatives in terms of the manufacturing strategies that are being adopted to manufacture the products.

So, therefore, when we talk of alternatives, we talk of alternatives in terms of designs, alternative designs, alternative materials, we seek alternative manufacturing processes. So, when we seek alternatives in all these aspects for achieving the function, we apply

the best alternative among the various courses of action available. So, we try to select the best design, the best materials, the best manufacturing processes, but still our target is that the cost must not escalate or above the buying capacity of the customer. So, we have to satisfy the customer's requirements with the best design, best materials, the best processes, but at a reasonable cost which he or she can afford.

Then, one of the other advantage is that it enhances the customer satisfactions and sales by determining the exact need and expectation of the customer. So, as you know that in value engineering our focus is directly on the functions. So, we have to satisfy that function, we do not start with a design, we start with the function, this is the function, this is the exact requirement of the customer and our product must satisfy this function.

We must not be prejudiced with certain designs, that if the customer wants to sketch something we should not start with pencil, that pencil is used for sketching. We must start from the basic need that he wants to make a product or he want to make some marks. Now, those marks can be made by finger also, those marks can be made by some another form of design, which is entirely different from a pencil.

So, our focus is function in the value engineering concept not a modification in the already existing product design. So, already there may be a design existing, but we will start from the even basic level that this function has to be achieved. So, our focus here is customer satisfaction and focusing on the exact needs and expectations of the customer. So, if we are able to satisfy the exact needs and requirements of the customer; obviously, we will be profitable and we will make our company, maybe competitive as well as successful.

Now, coming on to another important aspect; that is value engineering versus cost cutting. So, at least the value engineering concept by now is clear to all the learners.

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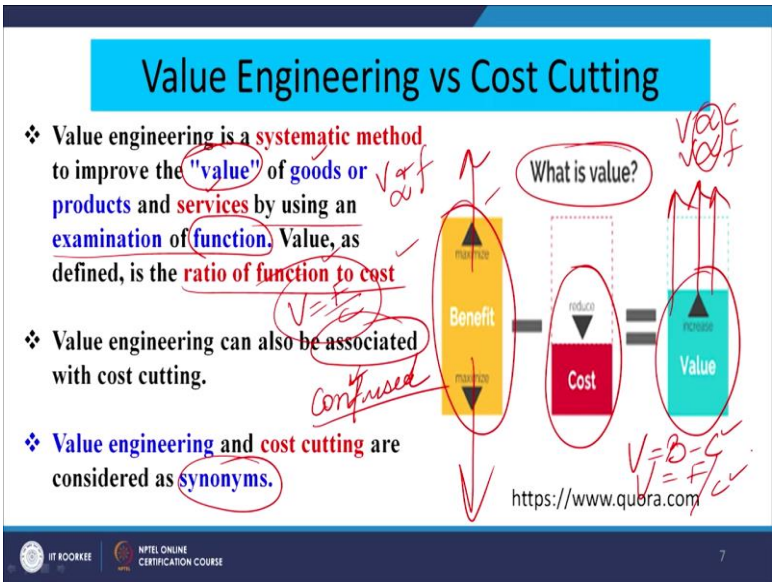

Now, value engineering is a systematic method to improve the value of goods or products and services. We have seen that value engineering is not only related to products, it is also related to services also. So, key word here is the value. So, value engineering a systematic method to improve the value of goods or products and services by using an examination of the function.

So, two things; value and function, it means are interrelated to each other. So, when we improve the value of our product, we are examining the function and trying to achieve that function reliably at the minimum possible cost, value as defined is the ratio of function to cost.

So, in the previous slides we have seen that value is proportional to cost, value is also proportional to the function, how this proportionality changes. So, we see that value is directly proportional to the function and inversely proportional to the cost. So, here we can see value is defined as the ratio of function to cost

V= F/C

V= value of product

F= function of product

C= Cost of product

So, we have to address this equation maybe number of times during our discussion. So, value engineering can also be associated with cost cutting. So, this word associated, I will say confused value engineering must not be confused with the concept of cost cutting, because both the concepts are entirely different.

Value engineering and cost cutting normally people use them as synonyms. So, people confuse value engineering with cost cutting normally. If you have a basic understanding of value engineering you will be able to address this point that how value engineering is different from cost cutting.

So, what is a value? This diagram is explaining it in a very simple way, these are the benefits. So, our target is always to increase or maximize the benefits. Now, benefits we are getting, but by spending some money now, we are recording this session what is the benefit? Benefit can be that number of people will get an idea about the basic concept of value engineering, how it is different from cost cutting. So, that is the benefit of this recording session.

But what is the cost involved here, the camera is involved, the recording team is involved, the time is being spent by me, by the teaching assistants. So, those are the cost components of this recording session. So, we have to maximize the output, maybe we have to maximize the benefits, we have to minimize the cost involved, and the difference between the benefits and the cost will give us the value, and we have to try to maximize the value of this process.

So, this you can take in the form of example can be taken in the form of a product also. A product we have to maximize the benefits, the customer is deriving out of that product. We have to maximize the functions that a product is satisfying or the customer is expecting out of the product so, that is the benefits maximization. But the customer has to spend some money to get those benefits, so, that money or the cost must be reduced and the difference between the two, the benefits, the person is getting and the cost he or she is spending that must be the gap, must be as large as possible, more benefits less cost where the product is more valuable.

So, benefits minus the cost basically we can see is value. So, two different frameworks for value, we can see, the first one is value, can also be said as benefits minus the cost value, can also be said as, the functions divided by the cost. So, we can see, cost is

coming in both the definitions and therefore, value engineering has to be different from cost cutting, and what are the differences that we will try to address.

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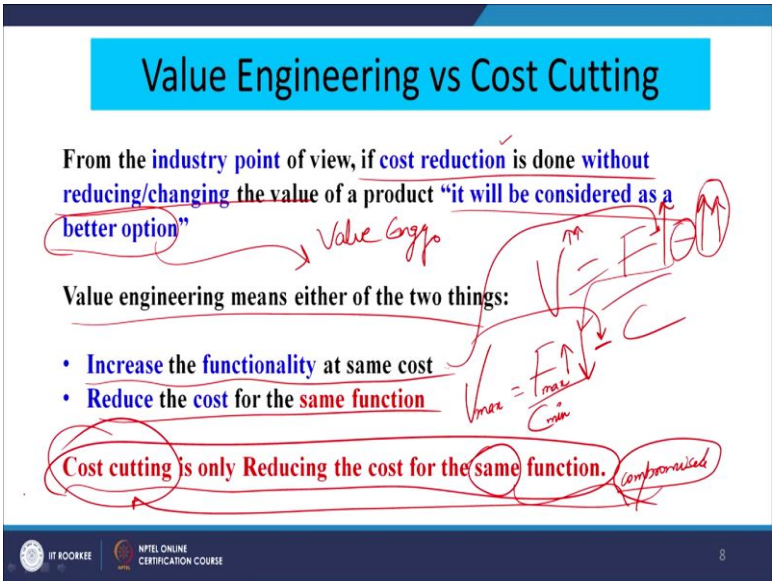

So, from the industry point of view if cost reduction is done without reducing changing the value, so, this is very important. Cost cutting is done without reducing or changing the value of the product it will be considered as a better option and what is this better option?

This better option is value engineering which means that the cost is getting reduced, but without compromising the functionality, without compromising the performance, without compromising the quality, without compromising the reliability, without compromising the maintenance, free service of the product. So, without any compromise and to some extent by improving all these things improving the quality, improving the functionality, improving the performance, improving the reliability.

$\text{Value}^{max} = \text{Function}^{max}/\text{Cost}^{min}$

So, we are improving all the important aspects that define the value of a product to the customer, so, that we are improving. On the contrary, the cost we are reducing or we are keeping the cost same that is the basic concept of a value engineering, but on the contrary if we are keeping the functions same that the product is satisfying the same function.

For example, this is the product, a pointer marker on the console or the screen and function remains same, we try to reduce the cost of this product that also to some extent can be value engineering. The function is remaining constant, it is not decreasing, but the cost is reducing that is also may fall under the purview of value engineering.

But if the functions are reducing the life of this has reduced, we changed the material. Now, it is only usable for 2 months, earlier it was usable for a year, but the cost has slightly reduced, so, that will be a basic you can say approach of cost cutting. So, in cost cutting we can, we may compromise on the performance, quality, reliability and functionality of the product. Whereas, in value engineering there is not going to be even iota of compromise on any of these aspects; in fact, all these aspects have to be increased, have to be pushed onward and upward at the same cost or at a lower cost. So, that is the basic difference between value engineering and cost cutting.

So, value engineering means either of the two; in the previous slide we have seen, value is equal to function by cost. Now, simply, if we focus on this mathematical representation of the concept of value engineering we can have number of options, we can increase the function of the product and can keep the cost same, it is the overall value mathematically will improve.

We can keep the function constant and reduce the cost again our overall value will increase. We can increase the functions significantly and slightly increase the cost, some implement in the cost, but there is an overall increment at a much faster or much higher rate in the functions of the product. Again, it can be considered as a concept of value engineering. So, value engineering can be increased the functionality at same cost; so, which is this example increase the functionality at same cost. So, cost is not changing, but the functions are increasing, reduce the cost for the same function.

So, the function remains the same, not change in the function, but the cost is reducing. So, we can have different combinations of functionality and the cost and we will see certain case studies of functional cost relationship. Also we can have different combinations of function and cost, but our overall target is that, we have to maximize the value. Our target is to always maximize the function, and our target is to minimize the cost, so, that is the basic aspect of the concept of value engineering.

So, cost cutting, on the contrary, is only reducing the cost for the same function. So, even here the same function will also sometimes we compromise. So, the performance, quality, reliability of the product will be compromised in case of the cost cutting procedure. So, this is the basic difference between the two approaches.

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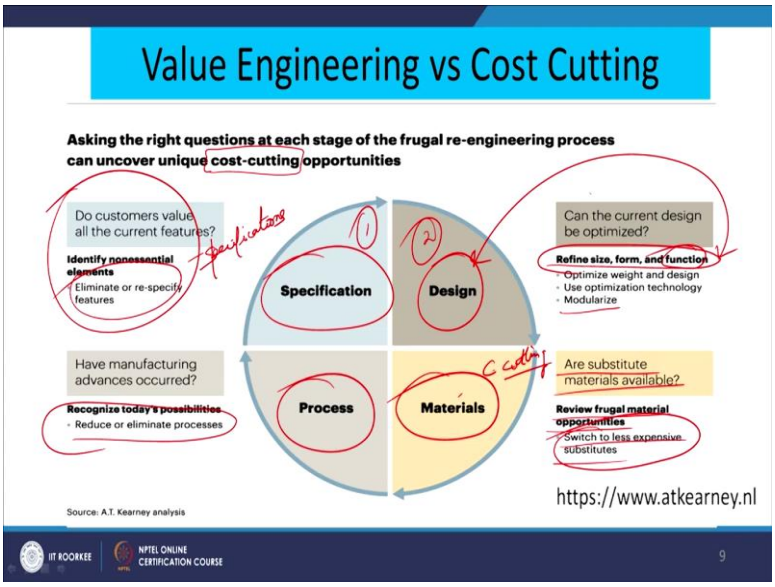

Now, this is a value engineering versus cost cutting. Again we are trying to understand the basic concept or how systematically we apply the concept. So, asking the right questions at each stage of the frugal reengineering process can uncover unique cost cutting opportunities. If you have understood the concept of cost cutting we can see, we can start from the specifications, do customer value all the current features, identify non-essential elements, eliminate or re specify the features.

So, first thing is, we can work on the specifications of the product what the customers want, and what the customers do not want and try to eliminate the unnecessary features. So, that may compromise with the product that we are offering to the customers, then, can the current design be optimized. So, second focus, first focus maybe on specification, second focus can be on design, can the current design be optimized, refine size form and function again in the designing stage. You can see the concept of function is coming into picture, optimize the weight and design use optimization technology. Modularize we will see certain examples of modular designs also.

Then, the third aspect are the materials, are the substitute materials available, review the frugal material opportunities switch to less expensive substitute. So, when we are switching to less expensive substitutes they may focus on the quality or they may compromise on the quality of the product. So, when we are selecting the material from the cost cutting point of view, we are compromising on the performance of the product. Similarly, the process also have the manufacturing advances, they are may have some new processes that may have been developed over a period of time. So, reduce or eliminate the processes. So, this is the basic concept. So, this same diagram can explain both the cost cutting also and the value engineering also.

So, in cost cutting we are ready to compromise on certain important product features, product functions, and product lifecycle costs. We are ready to compromise on certain aspects. So, the word compromise here must always be remembered by the learner. That in cost cutting we may compromise on certain things, whereas, in value engineering there will be no compromise on the essential functions of the product.

Again I am emphasizing on one important word that is the essential function in value engineering also, we will try to eliminate the unnecessary functions. Whereas, in cost cutting we may focus on, we may not be focusing too much on design, in value. In cost cutting, our focus will more beyond the manufacturing aspects, the materials that are going into the product.

Whereas, in value engineering we will try to first and foremost attack the design of the product that this is the function, why only this design will satisfy this function? Why there cannot be alternative design? Why cannot the function be satisfied without even making a product? How this function can be achieved or by integrating this function with some already existing product?

For example, just product design is coming to my mind that we are using wristwatches many times, if you ask a time from a person in today's scenario he or she will take out a mobile phone and show you the time that the time is this much. So, it means that the function of a watch or a wristwatch has already been integrated into the mobile phone.

So, what is the basic function of a watch? The basic function of a watch is to show time. Now, that function there is no need of a watch, already there is a product that is existing in my pocket which can show me the time. So, the basic function only has been

integrated into an additional product. So, that is we can say that we our focus in case of value engineering is to attack the design that why this design is at all required.

Whereas, if you focus on cost cutting we will see that yes this watch is there, let us change the material of the chain, let us change the material of the dial, let us change maybe the process by which we are making it, let us make a less precise gearing system in the watch. So, our focus is more on materials and processes rather than; rather than on the design or the basic function that the product is going to satisfy. I think, this example has made it absolutely clear that in value engineering focus is on the function. Whereas, in case of cost cutting, the focus is more on manufacturing materials and trying to compromise on the quality and performance of the product with an overall objective of reducing the cost of the product.

So, with this we come to the end of today's session. I know that there are two or three important aspects that have been left when we compare the concept of cost cutting, and value engineering that we will try to cover up in our next session, and in our next session our focus will again be on creativity, because in today's session we have seen that creativity is a key ingredient for coming up with alternative approaches or alternative ideas for improving the quality and performance of our products. So, with this we conclude the today's session.

Thank you.