Project and Production Management
Prof. Arun Kanda
Department of Mechanical Engineering
Indian Institute of Technology, Delhi

Lecture - 25
Introduction to New Product and Service

In today's lecture, we are going to be talking about the first major phase in the life cycle of a production system which is introducing a new product or a service. This is a very strategic decision because the choice of the right product or the service actually has a long lasting impact on the performance of the system and therefore it is very important that we make this decision very carefully. What we are going to be talking about is the major aspects in new product design and the kinds of decisions which are required when one has to make a decision about new product or service. Incidentally we are talking about both product and services together. You know the world is making the transition from products to services and you know that both these require similar kinds of decisions and therefore we talk about both products and services in one go.

(Refer Slide Time: 02:34)

Let us see how ideas for new products or services originate. What is the source of these ideas? It has been seen that the customer need is generally the major driver for launching a new product. Whenever there is a customer need, the needs are dynamic. They keep changing, you keep on generating more and more needs and therefore there is always need for generating more products. Quite often it is seen that the marketing department of a company is generally responsible for generating the maximum number of new product ideas and the reason for this is that, this is the department which is in intimate touch with the customers and they know what the

customer wants. Therefore they are immediately able to suggest that the new products should be able to satisfy such and such need of the customer. Production department could also be a source for a new product idea but generally the kinds of ideas that come from production departments are ones which are more concerned with manufacture ability of the product.

Talking more about how products could be assembled, design should facilitate those kinds of things and so on, normally companies have design and development departments and the purpose of the design and development or the research and development department in any company is to generate new ideas, develop new material, new technologies and new products. Quite often it happens that the number of ideas for new products ironically generated by this department of design and development becomes very limited. Vendors and subcontractors in an organization can also give you a large number of ideas because they are the people who are intimately concerned with development of the product. They provide the right kind of materials, the right kinds of subassemblies and they carry out a large number of other tasks associated with the product and therefore apart from this intimate knowledge, they also in touch with customers and other people in the organization. Therefore their ideas too can be very valuable at times.

(Refer Slide Time: 05:40)

The top management is the another source from where ideas for new product and services come and of course the reason why top management is capable of giving these ideas is primarily because of their concern for organization. They have their money invested in the company, they want to make sure whatever products have been made are actually being sold and therefore they listen to almost everyone who visit their office. They get intimate feedback on their products and therefore are also in a position to suggest what kind of products or the services the company should be able to launch. The introduction of new products is also triggered in many instances

by the development of new technologies, new materials, and new processes, and as a consequence, you have new products coming in. Of course finally, the changing life styles are responsible for the generation of new ideas and so on like fashion.

Cross functional team means that you have a team from a marketing department, production department, design and development and they could all be contributing to offer you ideas. In fact, cross functional teams have become very important these days. This is because there is a great pressure on reducing lead time, cutting down cost and therefore these teams which contain people from all these departments are able to contribute very effectively, because their job is to develop products which are much more efficient. Once again, cross function teams are very important to changing life style. As I said, it will change the kind of products that you need to produce totally and this happens for instance, very frequently there is a demand these days for faded jeans. You know normally you will not wait for jeans to fade after 2 years. You want it to be faded right away. So there is a new product and they have to process the product appropriately. So similarly, changing life style can affect the way people live and the kind of products they use and therefore the life style is an important source of how individual products will be used and developed.

(Refer Slide Time: 08:44)

What is the motivation in introducing new products this way? Interestingly in these products it is essentially that there are 2 parties. There is a set of consumers on this side who are the people who are actually looking forward to satisfying their needs primarily. There is an entire product organization which is headed by the boss and his production facilities and the marketing department, because these are major functions as a whole in any organization. This entire organization is generally driven by profit. There could be other goals as well. It could talk about social service and so on. So we must remember therefore that these people who have these need, are the people who cash up on their needs and try to keep on developing your products. And

in fact it is on the interest of these people; especially the marketing guy to keep on spanning the needs in such a manner that your needs keep on generating. It is very much like if you bought a (Refer Slide Time: 09:56) from the person sitting on street with a small furnace and if you fan the furnace little vigorously, you find spark coming out very vigorously out of the whole thing. Likewise are the needs in human being. If you fan these desires, you have more and more desires coming out and that is what these people are actually cashing upon in terms of generating new products. So this is the primary motivation and they are interested in profit and you are interested in satisfying as statistic lead.

(Refer Slide Time: 10:48)

We were talking about sources of new product ideas. Earlier let us see what kinds of contributions different departments can make to these kinds of new product ideas. Incidentally we have already seen that among sales and marketing people, there was a survey carried out and the results of that particular survey showed that sales and marketing people are in close touch with the customer or are responsible for generating the largest number of ideas for newer products. Of course next in the sequence come top managements according to the survey. Which is an active listener to both visitor and customer feedback? You listen very carefully only if you have something at stake. The top management has everything at stake. It is their investment that they would like many to show, that the products are doing well and therefore they would be very keen to find out the feedback on the product. They may be suggested what kinds of products are to be floated in the near future.

The production department generally concerns with ideas which are limited to production ease and economics. It means, you make sure that the product is made in with the right kind of tolerances so that fitting various kinds of products or components are easier. It is easy to machine put together and those kinds of considerations. Normally if a designer is thinking in terms of an abstract design of

the product, he might not be concerned about how it is going to be made. Whereas the production department has people giving much greater thoughts to how it is going to be made and therefore their contributions generally lie in this particular category. Of course research and development people are generally the last. That is the irony of the situation. A department which is generally designed to make new types of products is generally the department that comes last in the list. They are designed to generate new products or ideas. Why do you think this is? We are referring to this particular survey that has been done in the context of automobile sectors. They have found that new kinds of products and designs are developed. Generally the research and development department takes over only after an idea is given. It is not that they given idea for a new design, they seldom do that, i.e., the idea and the reason for this is that whenever it becomes a routine job for some, like if it is your job to generate new ideas, you would give new ideas for the two or three days and thereafter it will become a routine, mundane affair. Once it becomes a mundane affair, your efficiency would tend to droop. Probably it is the same kind of situation here but yes, R and D job is generally prompted by new development in materials and technology. So they are **aware** about the happenings of what kinds new materials are present, what is the nature of technology and their contribution to new products, in terms of utilizing these new products and new technologies. Let us try to now look at how new product ideas could be generated by an organization. What would be the procedure?

(Refer Slide Time: 15:10)

The most commonly used method of generating new products and ideas is, as our friend said earlier, by using cross disciplinary teams. So normally you do brain storming and brain storming is preferably done by interdisciplinary team where you have people from different departments, so that all aspects of the problem are reflected. It is that brain storming which is done. This team is apprised of the company objectives and the long term goals are,

1. What is the current economic scenario?

2. What is the preferred field of activity or expertise?

If you are in an organization into the fast-food industries, for instance, will you know that is the area of your expertise? Therefore we have to think of new products in that area and

3. The approximate budget for the new product that you like to spend.

Once the team is briefed on this, (normally the team members are the members of the company, but at the same time they are all given) these basic goals and constraints have to be specified and then this particular team goes about the task of generating new product and ideas. So, each one generate ideas which are recorded without criticism or evaluation. This is the significant feature of brain storming. When you are doing brain storming, you do not evaluate ideas. You do not criticize ideas. Even if an idea is stupid, you record it and do not start criticizing the person who has given this particular idea. The reason for this is basically at this stage, we are talking about encouraging innovation and creativity. In the individual you know creativity can be flowing. If you try to curb it at that initial stage, if the flow ideas would stop, therefore at this stage you might generate 40-50 ideas. The team would generate these 40-50 ideas which could at the latest stage be subjected to evaluation. Evaluation comes but at a later stage. You are not going to criticize or evaluate the idea because that would for instance, take this example, if a small child comes to you and asks you a simple question which might be very stupid, the immediate response from your side would be to ask him to shut up. If you do that what would happen is, you have totally clogged the creativity within him and hence he is not able to ask a question, which in that particular stage, is simple and natural. It does not mean that you do not evaluate the idea. I think it is that brain storming and you will allow all ideas to come forth and to encourage those ideas. We do not criticize or evaluate that.

(Refer Slide Time: 18:50)

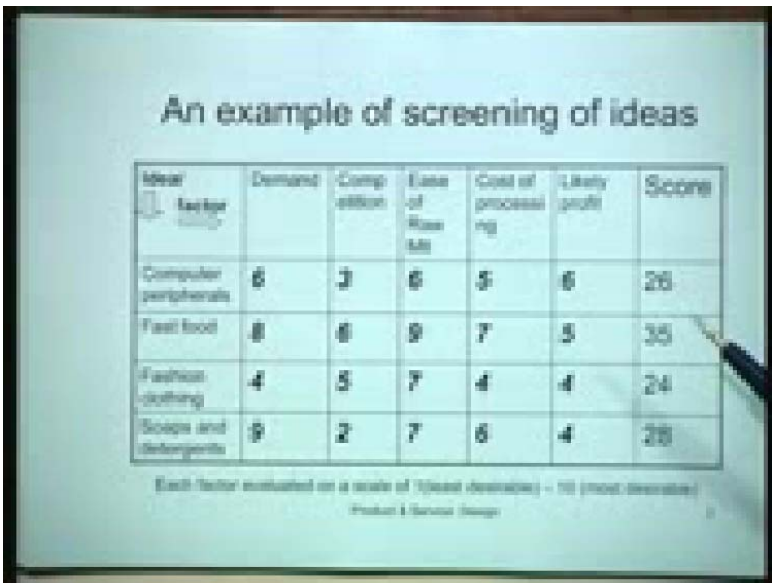
After you have generated a list of say, 40 ideas, the next stage in the process evaluation is this new product idea. Now you can afford to be critical. You can set norms and then you can find out whether an idea is good or not. It is like saying once you have water in the bucket, can you actually count the number of glasses. So the first thing is during the brain storming, you are filling up the bucket. Now you are evaluating all that you have got in the bucket. So the evaluation of the new product ideas could be done on a number of criteria. What are these criteria? They demand a pattern of growth. That means for the product that you are proposing, what you think is likely demand and how do you expect the demand to behave in the future? These are two very fundamental questions. Do you expect the demand to go up or do you expect demand go down in the future? That is why we talk about the likely demand and pattern of growth and ease of raw material availability. You might have selected a product which you think is very good. You have to find out whether the raw material for that particular product is going to be easily available. Do you force a kind of change in the government policy which will probably make that material either absolute or difficult? Do you have to import it, so this ease of raw material availability is an important factor too?

2. Availability of production technology: Everyone is manufacturing the product or the machine is required for making it available. Where do you have to import them from? Sweden or from US or Ludhiana and these kinds of issues become relevant.

3. Competition and likely market share: This is a very important issue because your product has to compete in the market where it is going to face other competitors. So you must know roughly what is going to be your market share. So it becomes an important aspect. Then from all these questions you come down to what are the likely revenues and what are the likely costs of operation.

4. Then of course, we talk about the entire product life cycle that means, you are talking not only about the product at the stage of inception, but the product after 2 years, after 5 years and may be after 7 years when the product is likely to be dumped. What is going to be the pattern of the revenues and the cost as it goes along during its life? An example to illustrate, the process is taken up next. Next what you can do is, this is only illustrated. I mean the example which I have taken up for you is just to illustrate the process of screening of ideas.

(Refer Slide Time: 21:57)

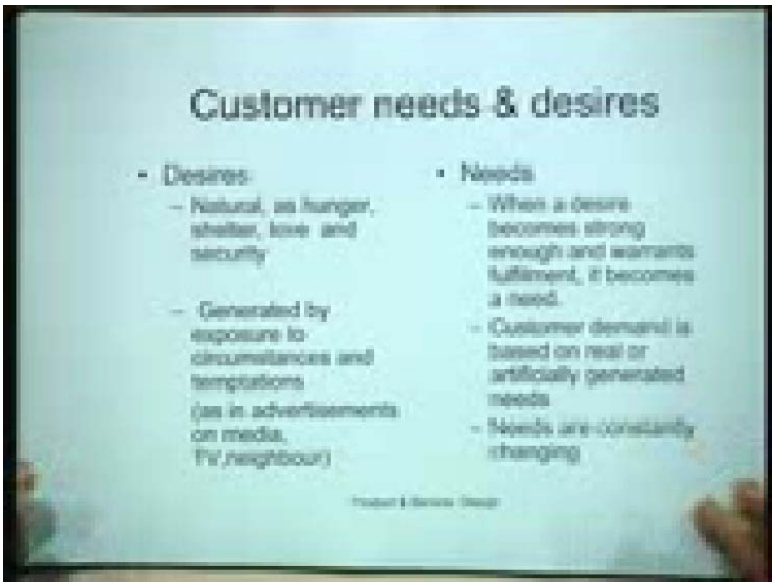


Let us say that we are as a company thinking in terms of launching some new product. So as a consequence of the brain storming section, people suggest that we can get into the manufacture of computer peripherals (lot of scope), fast food (let us try to compete with McDonald's), fashion clothing. It is an area which we can possibly try to work on. Soaps and detergents are relatively conventional area and these are relatively model areas. This list could be very long. It could be like I said 40 ideas, 50 ideas, just to illustrate. Suppose we have these 4 ideas and we would like to assess this idea on a number of criteria which we just mentioned, you would then want to know the demand for this. What is the competition for this? What is the ease of raw material availability? What is the cost of processing? What are the likely profits and all these factors that are evaluated subjectively by the interdisciplinary team? They gave 1 mark to the least desirable and 10 marks to the most desirable. For instance, computer peripherals, it is felt by the team, that they desire to get a score of 6 on a scale 1 to 10, in terms of desirability in a competition. There is severe competition if the score would be less and if there is very less competition, the score would be more.

What we are trying to say is it more favorable or less favorable. Here the competition factor was estimated to be 3 and similarly, ease of raw materials, cost of processing, and likely profit in some idea on a subjective scale of 1 to 10 from which

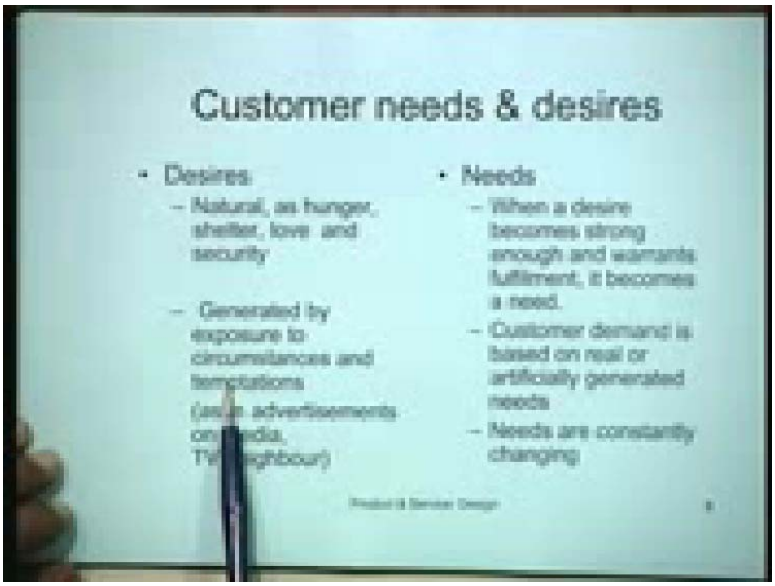
the team can decide. So what you can do is, you can simply take a score and you can say, these are the scores for the various products and ideas that we had. So we are screening the ideas. So may be out of this, the best idea is a fast food idea. You can give any weightage here, w_1, w_2, w_3, w_4 and then multiply that way. You estimate these weightages. Whatever the team considered is important. Whatever the company considers important. Obviously all these things are important. But probably your likely profit is very important. This is also important. This is also important. So you subjectively decide what the team decides. This is not a regressive evaluation; it is only evaluating the ideas, which we have generated. You want to evaluate them; you can add it or if you want some weightages to be given to them, add the weightages. Conceptually, I am only trying to say that you can make the process of screening the ideas more quantitative rather than only qualitative and this is the manner in which it can be done.

(Refer Slide Time: 25:19)



After all the product is satisfying a customer's needs. What is the need and what is meant by desire? How exactly do needs and desires come about? Desires are natural right natural. Now these desires are generated by exposure to circumstances and temptations in life as in, advertisement and media, TV, Neighbor and so on. You may have seen in newspaper advertisement yesterday, how Harid store in London has brought a Brazilian model that would sit in the window cafes of that particular shop and tempt customers. That is basically what you are all doing. It is an advertisement. If there is someone who wants to sell chocolates, you have to get a couple pretty girls to advertise it. There of course the chocolate has nothing do with girls. What we are trying to say is that by and large, we were talking about the example of spanning desires.

(Refer Slide Time: 26:49)

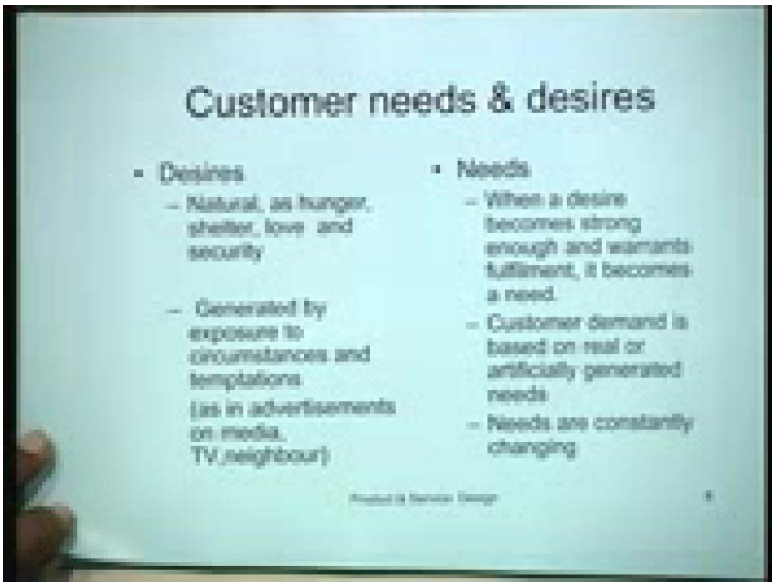


You can span desires by exposure to circumstances and temptations. Of course they say in Indian mythology, the true yogi is not affected by external temptations and desires. So that is another philosophy all together. If that was true, the entire concept of manufacturing and generation of new products and goods would go flop because you would not need any new products. But anyway so when does a desire become a need, it is actually the need. So we have so many desires. Not all of them get fulfilled and in fact one way you can define happiness is the number of desires fulfilled divided by the number of desires entertained. If you define happiness in that manner, we generate so many desires and a small fraction of them, not even 5 percent of them happen. Your happiness coefficient is only five percent from that point of view. On the other hand if you look from the Indian perspective what they say is the so called emphasis and advertising. Modern advertising is increasing the number of desires, entertained and then the man tries to satisfy more and more desires and hopefully becomes happier.

But the Indian perspective is totally different. It says forget about all those who try to reduce the number of desire entertained. You are not talking about the denominator of this particular ratio. When you reduce the number of entertained, ultimately if it 0 your happiness goes to infinite. That is bliss that is what they say nirvana in that script of the term. But anyway so when does desire become need? When desires become strong enough and gets fulfilled, it becomes a need. Essentially it is what it is and what these marketing guys make sure is they first generate the viewer desire and gradually keep spanning it. They make sure that the desire becomes strong and it gradually becomes the need. Kellogg's sold corn flax in Japan. Kellogg's wants its marketing policy and we are talking about. Kellogg's sell corn flax and normally corn flax is had with milk. Unfortunately, the Japanese did not have the habit of drinking milk at all. It was not part of their diet. so as a long term strategy, what Kellogg's did was it started distributing free milk in Japanese

schools so that over the years, the students started liking milk and when that happened they introduced the product. Of course gradually you see the conflicts. It is not very popular in Japan as well. This is called spanning the needs. I am trying to tell you as a long term strategy to basically do this. Customer demand is based on real or artificially generated needs. This is an important thing. Your needs could be real or they could be artificially generated. Much of the misery in the world is because we are running after artificially generated needs which do not really need. Your wife or girl friend requires a real leather purse or a very expensive product. Why does she want all that is not really required? It is a futile thing. She can actually carry most of the stuff in a canvas bag and she does not have to do that. Now if people have that attitude that would be different. So the point really is that the marketing and sales people have played a significant role in trying to convert desires into needs and that is where they survive.

(Refer Slide Time: 31:20)



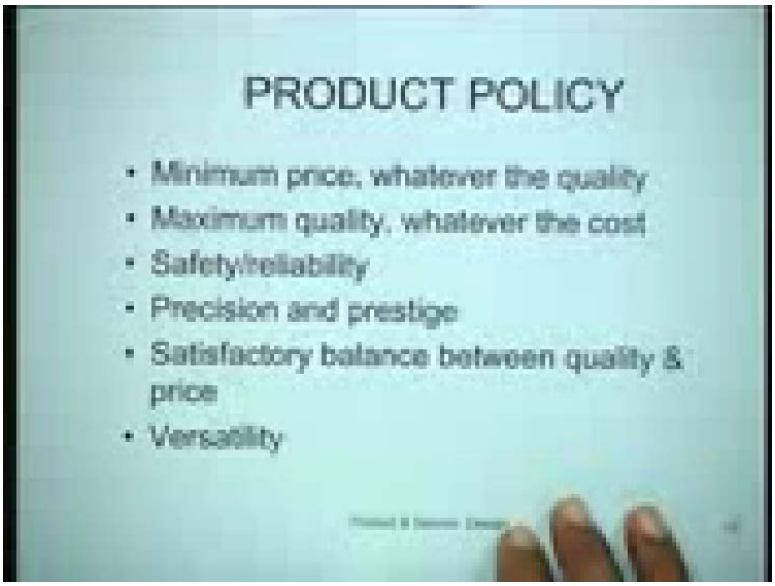
The customer's demands could be real or artificially generated and needs are constantly changing. I think this is important. Why are needs changing? It is because your life style is changing. Earlier people used to cook in ordinary huts. So you would need wood and the flue would go out. If you look at the modern kitchen, the modern kitchen has the gas stove, and other fancy equipments in this. It has all kinds of drawers. It has very nice chimney. It has all these things. It has all these products. Why? Because life style has changed and therefore the changing needs of the situation have actually generated this problem and basically new product development has brought this change. We are constantly in the process of change and we are trying to make use of this particularly. We were talking about generating ideas.

(Refer Slide Time: 32:32)

So now what I have here is a graph which shows the number of ideas you have generated at brain storming. This is estimated on an average for every successful product you have to generate, something like 35-40 ideas of course. This is just indicating these ideas behave in certain manner. These ideas are dying down. It is the process of death for these ideas. You have generated 40 ideas and ultimately you select only 1 idea for implementation. So the remaining 39 ideas have died during this process. That is why we call this curve as mortality of ideas and there are some typical stages in this entire process. The first stage is the screening process that we talked about. In the screening process this is the steepest part of the curve (Refer Slide Time: 33:32) and then the slope keeps reducing as you go along so roughly. All the ideas die in screening when it is subject to regress economic evaluation; you find that many of these ideas do not stand up to a regress, economic evaluation.

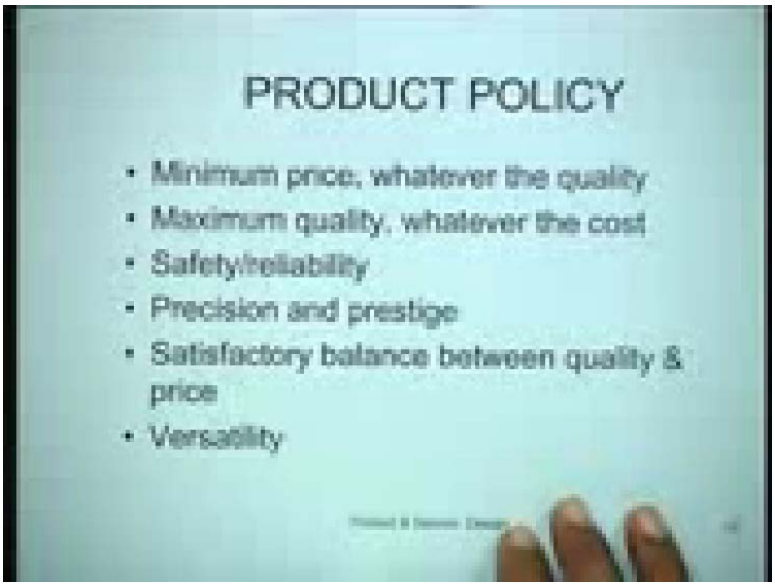
Many ideas have died during this process. Subsequently in the process of development of the product and developing the prototype, there are casualties. But casualty rate is smaller here and at the stage of testing, generally there are very few casualties. When you are developing something during testing of the product, and after testing, you have the stage of commercialization. So what is happening is that the time required from the first stage of thinking about the product to the stage of commercialization is actually the lead time of the product or the time required for producing the product and getting into the market. This could be anything depending up on the product, anything from, let us say 3 months to 24 months depending up on whatever the product is. First is developing an aircraft for Boeing these days. The development time is something like 1.5 years, but developing a new electronic item or new design of a camera is too rapid. That is the kind of lead times that we are talking about mortality of ideas. What exactly do we mean by a product policy?

(Refer Slide Time: 35:28)



The product policy could mean we are actually defining priorities. We are defining what the product should be doing. So in some products, the first policy may be very relevant. Minimum price whatever the quality is, which means that there is no focus on quality. You are only interested in a minimum price for the product quality. Of course some minimum level of quality should be present. Can you give me the example of such a product in which you are concerned with minimum price and quality is not important? When you are dealing with such product, your approach to product design will be different. So this kind of a policy would generally be relevant for those products which are like use and once throwaway. You use once and throwaway. So there could be many such products. Amaze tic for instance, is a use once and throw it away. So you are very keen and interested in the product price. It should be at a minimum. Let us take the other example of maximum quality and whatever be the cost. What do you think this kind of policy would be relevant for? What kind of products? Quality is paramount. Cost is not an important area. Normally such policy should be relevant where danger to human life is involved.

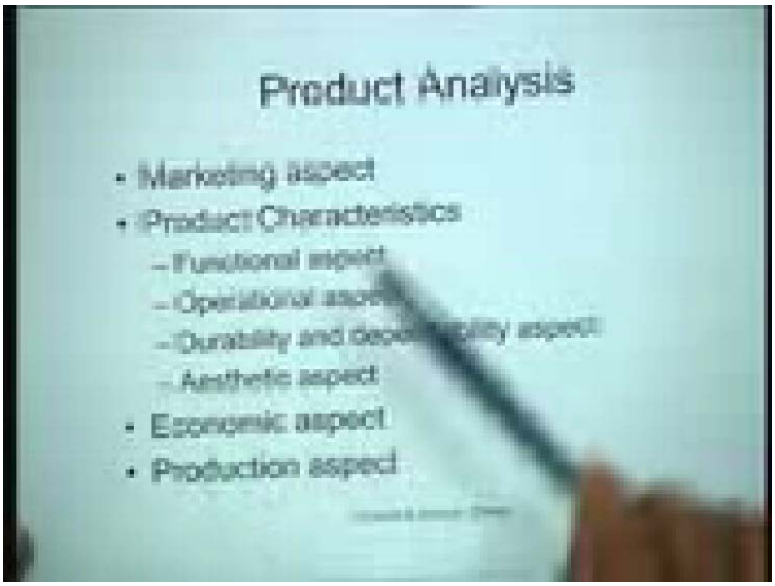
(Refer Slide Time: 37:16)



You are designing aircraft, safety systems, of course cost is important but the primary aspect is the quality. Similarly there could be other situation. Safety and reliability could be paramount in certain products; a certain other products might have precision and prestige value. What you mean by that? Is there is an interesting story about precision and prestige. Say for instance if you are talking about Rolls-Royce making cars, it is a very expensive car and for that event Mercedes Benz car, it would apply even to them. They are making very good cars. Taking the example of Rolls-Royce, they are making cars. It is not that particular product features greater revenue by virtue of the technological developments which are there. It is by virtue of the prestige. So many years of work have gone to it and there is a prestige. It is the same about Swiss watches like Omega and others. Basically the prestige value, there is more important and so on that could be the aspect.

Normally most consumer products fall into this category, satisfactory balance between quality and price. That is what the modern Indian housewife looks for when she goes to shop. The housewife looks for the same thing the husband looks for. There has to be a satisfactory compensation between quality and price. You want a good detergent but not an expensive one. Of course depending upon the segment here, of course another aspect could be versatility. You could try to build versatility into the product. That is the objective so the point really that we are making is that, depending on the product and depending up on its range of applications, you can you have different objective functions. You have to choose and design a product depending on its application. Product analysis, how do we do product analysis?

(Refer Slide Time: 39:50)



We talk about these 4 stages. We talk about the marketing aspect. We talk about the product characteristics. We talk about the economic aspect and we talk about the production aspect. In this particular lecture, we will try to talk about these production aspects. In this particular lecture, we will try to talk about the various aspects, except this economic aspect which we will talk about in the next lecture. When you talk about the marketing aspect like, who the customer is, what his needs are, how do you reach him, and similar stories, product characteristics which talk about the functional aspect, how the production function is, is it easy to operate or not, what is the operational aspect, its durability, dependability, aspects of quality and aesthetics. Every product should do well on these friends and then of course it must able to do well in the market and give your rate of return and the production aspects where you are talking about the ease with which you can produce it or the economics of the production. It should be taken into consideration right at the stage of designing the products itself.

(Refer Slide Time: 41:16)

Let us talk about these aspects in detail. When you are talking about the marketing aspects of the products, which are generally more important, we would like to know who our customer is, is it just one factory located in Hyderabad or is it a group of individuals located in the North of the country or somewhere else. So

1. Who is the customer?

2. What are his needs?

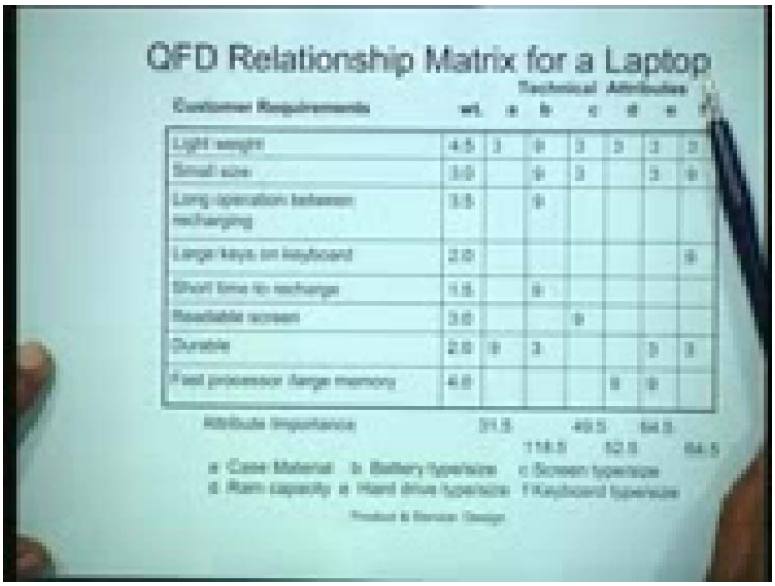
3. How to reach him? This in fact are designs the logistic system when you talk about the product.

The tools and technique that you have to answer these questions are doing Marketing research, Forecasting, Advertising etc. All these aspects are important when you are talking about the assessing the demand, finding out where the customer is, reaching him and so on. So this is the crux of the marketing aspects because you must know the customer for whom you are designing the product. You must understand whether the customer is a frail, dainty housewife or rugged coal miner in Bihar. This makes considerable amount of difference in the design of controls and so on. Suppose you design a battery for both these people, if you want to design the battery for the coal minor which has to operate in an environment (where you have fumes and liquids coming down), you just go down into the trolley, it is very dark and you need a very rugged kind of a torch maybe. Just hammer it and then you should come out with something like that. Whereas on the contrary if we are designing the same torch for an Indian housewife who is so frail and vulnerable, she has to basically make sure that the controls can be there with just one take of the hand. The difference of knowing the customer is important and this is what we mean by the marketing aspects.

(Refer Slide Time: 43:41)

Then we are going to talk about how we go from the customer needs to the product specifications. This is our customer, be it a coal miner or a housewife and their demands. How do we go from there to designing the product? These are some of the tools available to the product designer, commonly used tools, Quality Function Deployment QFD, which basically translates the customer requirements into the product specifications. That is important for the product design. They are Value analysis, the taguchi method, Computer Aided Design, Design for manufacturability, Design for assembly and Prototyping. These are all available to the product designer and this will help him make a transition from the stage of the customer needs to developing the detail products.

(Refer Slide Time: 44:48)



Let us say for instance that just to illustrate few aspects of QFD or quality function deployment, let us say for a laptop we want to design a laptop. For this laptop, you talk to your potential customers. Who are the potential customers for a laptop? Where you need information on that? People in academic institutions, marketing and research and in various organizations who carry laptops in Airplane do not talk much. They are busy on the laptop all the time. Let us say that the customer requirements which are collected from the customers are that they want the laptop to be light weighted. They want it to be small sized; there should be a long operation between the recharging of the battery. That means once you charge a battery, I should be able to go from London to New York and back to London and back to Singapore. I do not have to charge the battery. That is what it is saying. A long operation between recharging, there should be large keys on the keyboard and not small keys, it should take a short time to recharge the whole night and half an hour, one hour whatever it is. There should be a readable screen.

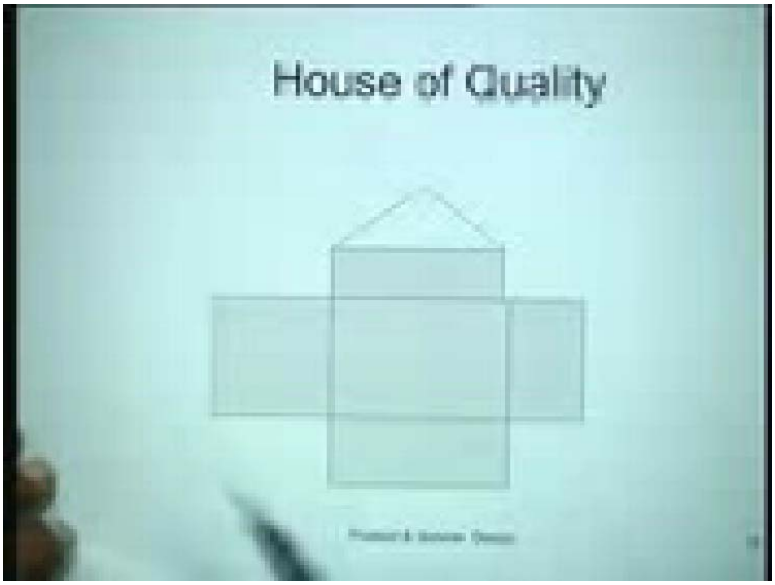
It should be durable and it should have a fast processor and large memory. These are some requirements that have been given by the customer. Then you can ask the customer his priorities. This can be used as a pair wise comparison and anything let us say the result is this on a scale of 1-5. So, light weight gets a weight of 4.5, small size gets this (Refer Slide Time: 46:28) weight and so on. Then what is important is these are customer requirements. All of these, we would like to relate to the technical attributes of the product which the product designer is going to be talking about. The product designer has identified let us say 6 of these attributes, what are these attributes:

a is the case material that is used for the case
b is the battery type/size
c is the screen type/ size

d is the ram capacity
e hard drive type and size and

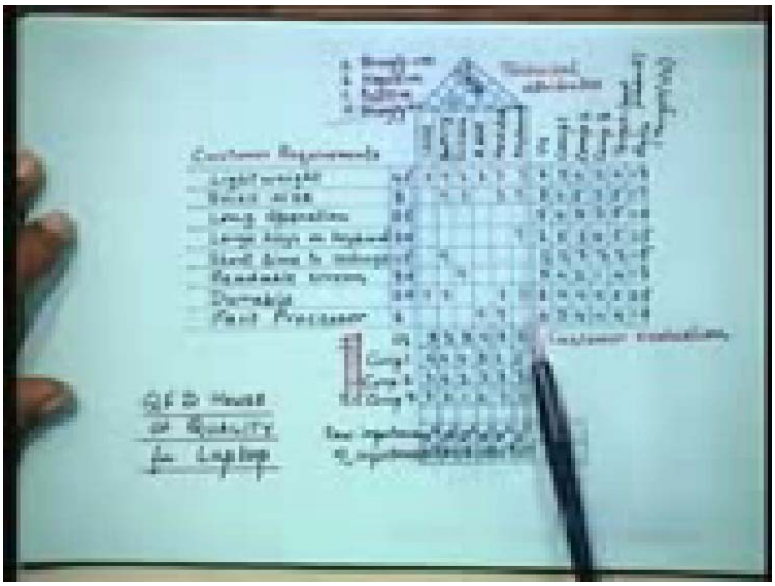
f is the keyboard type and size because he can play mainly with these particular things. So a, b, c, d, e, f and the important attribute on a scale again from, let us say 1-10 is something like saying that as far as the lightweight is concerned, it can be contributed by a, which is the case material to the extend of you know small contribution 3 but b which is the battery type size is generally very heavy. Therefore it can contribute to a very large extend on this particular requirement of the customer and similarly for the various attributes. This interpretation within this box here (Refer Slide Time: 47:57) would be made by the product designer. Let us say roughly how much they contribute to various things. Having got this matrix what you can easily do is, you can find out the weightage that should be given to individual attributes. What it means is for instance to a 4.5 into 32.0 into 9 and the total weight is 31.5 and similarly for each of these. So we know the weights that have to be given to the individual attributes. Here now this information can help us in deciding the focus and the contributions that should be made on different plans. For instance there is a term called house of quality.

(Refer Slide Time: 48:43)



It looks like this (Refer Slide Time: 48:43). House of quality for our example is shown here for the laptop, so we have the customer requirements here.

(Refer Slide Time: 48:56)

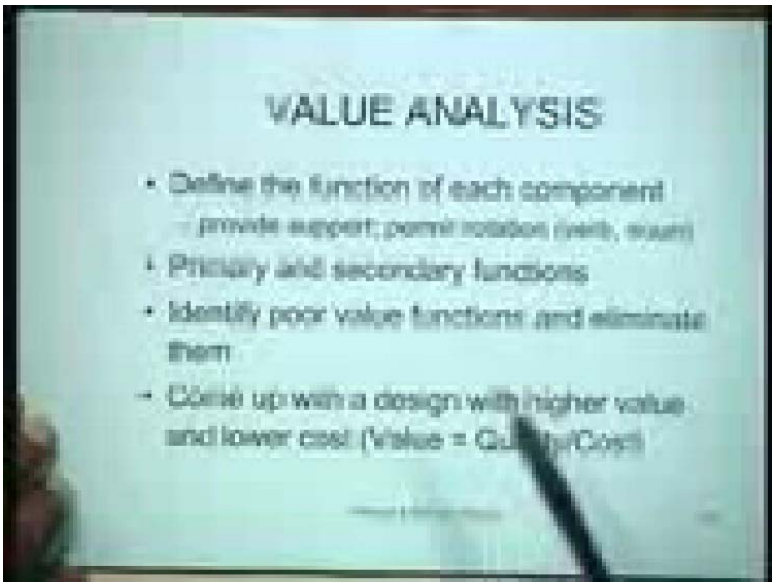


These were the important weights which we computed and this is the matrix (Refer Slide Time: 49:02) which we just filled up and then we can talk about these technical attributes. The technical attributes of the case, battery screen, ram, hard disk and keyboard, we can actually convert in the crown of the hut. We can see how these factors are correlated. For instance we can see how the case and the hard disk or strongly negatively correlated. It does not make any difference in terms of these and similarly for others. So this is that correlation and then you can compare yourself, your company which is us with various competitors. So competitor 1, competitor 2, competitor 3 and then this is the target (Refer Slide Time: 49:49). Normally this evaluation is done by the customers. In the eyes of the customer, as far as lightweight is concerned, we are number 3. We get 3 points.

Competitor 1 gets 3 points; this competitor gets 4 points and so on. Whichever is the best that is the largest, that is 4. So 4 divided by 3 is 1.3, so it shows that, the best is 1.3 times better than us. That is the implication of this ratio and it tells you how to go and similar things can be done here (Refer Slide Time: 50:28) in this particular aspect of long operation. The best is 5. So this aspect is nothing but the customer evaluation. This (Refer Slide Time: 50:41) is the target which is the best product and the ratio which is the target to us compared to whatever it is and we can also do an evaluation of the various firms on the various products like case battery and so on those are shown here (Refer Slide Time: 51:03). The raw important which we have calculated by multiplying these weight is 31.5, 118.5 and so on gives a total figure of 381 and finally converted into percentage, it shows that ultimately, you need to give 8.3 percent weightage to case 31.1 percent to battery most importantly, 13 percent to screen, 13.8 to ram, 16.9 each to hard disk and keyboard. So let us say we want to basically consolidate information pertaining to the customer requirements and from the customer requirements, we used what should be the weightages given to designing the individual components of the product specification. Of course you

have also this information on how you compare with other attributes. So this is a very useful bit of information, you can get from the house of quality.

(Refer Slide Time: 52:09)

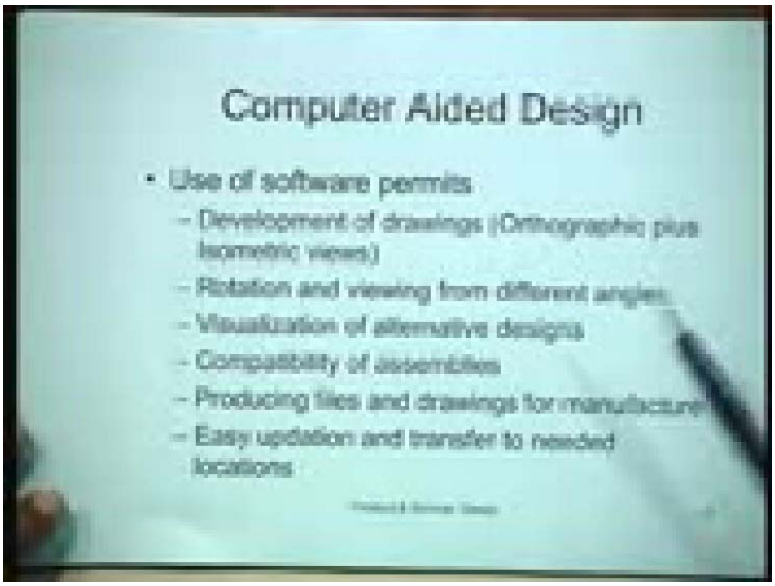


Another tool that the product designer has is his value analysis. You know something where you define the function of each component; we talk about primary and secondary functions. You can identify poor value functions and eliminate them and come up with design which has the higher value and lower cost. It that means you critically analyze each component and see what functions it is performing. Is it performing functions that it was designed for? This is basically the attitude in value engineering.

(Refer Slide Time: 52:49)

In taguchi method, what you are doing is you develop a robust design that is the intention. How you develop it, you use a loss function with appropriate range aimed at target value. If any particular specification in a product is violated, there is a loss to the company quality loss. So keeping that in mind you identifies which are the design parameters of interest, which affects the quality function and you design experiments to determine which combination of parameters affects quality most. Normally the use of arrays limits the search and based on these experiments, you can develop a robust design. That is the basic objective in robust design, means that you are talking about a design which is capable of operating not only within one value but at a range of temperatures, pressures or whatever the parameters are.

(Refer Slide Time: 53:45)

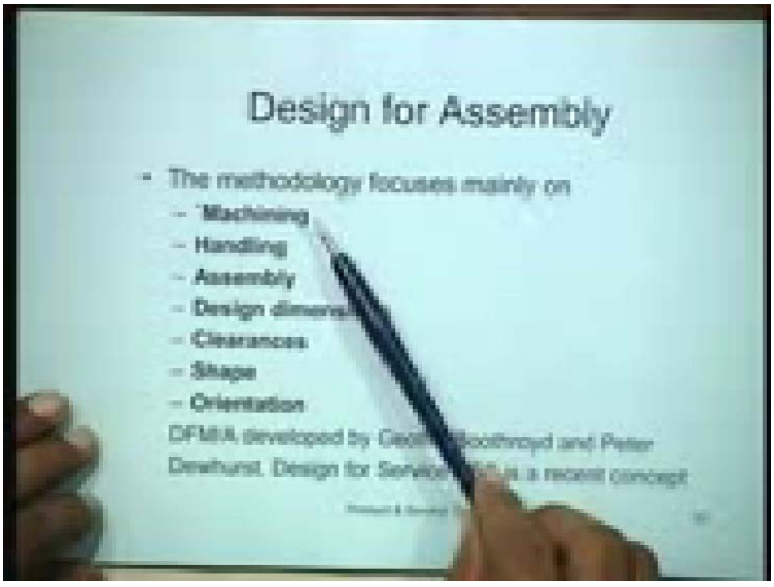


Of course you are all familiar with CAD. What does CAD do for the designer? So the use of the software that you have in CAD permits development of drawings, orthographic plus isometric views very quickly. It permits the rotation and viewing from different angles which is generally very difficult and otherwise for complicated parts, you have examined drawing of an engine. You want to see an engine from different views. It could be pretty complicated there. Visualization of alternative designs becomes easier. Compatibility of various assemblies can be found out. You can find out whether this door design in a car will hit something or not, or will hit something if the door is closed without before designing the door for the car, which is the idea. Producing files and drawings for manufacture becomes easier. Easy updation and transfer to needed locations is another advantage of CAD. You can have a design office in Delhi. You can do the manufacturing in Bangalore and transfer the files immediately on a through the internet.

(Refer Slide Time: 54:53)

In this concept of design for manufacturability, basically what we are trying to do here is to make sure that the product is easy to manufacture and you take care of this aspect during the design itself. How do you do this? You use catalog of information guidelines, checklists, tables, charts, diagrams and graphs to develop a design plan, decompose products into components and assemblies, evaluate the production costs of production designs and simplify and improve product design. This is what we do.

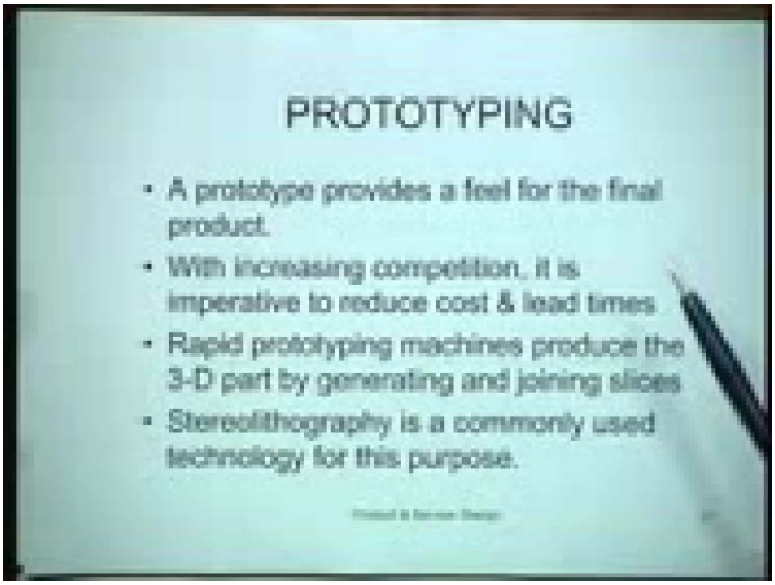
(Refer Slide Time: 55:33)



Design for manufacturing and design for assembly are very much linked and the methodology focuses mainly on machining, handling assembly, design, dimensions, clearances, shape and orientation. So you choose these aspects and see that the whole

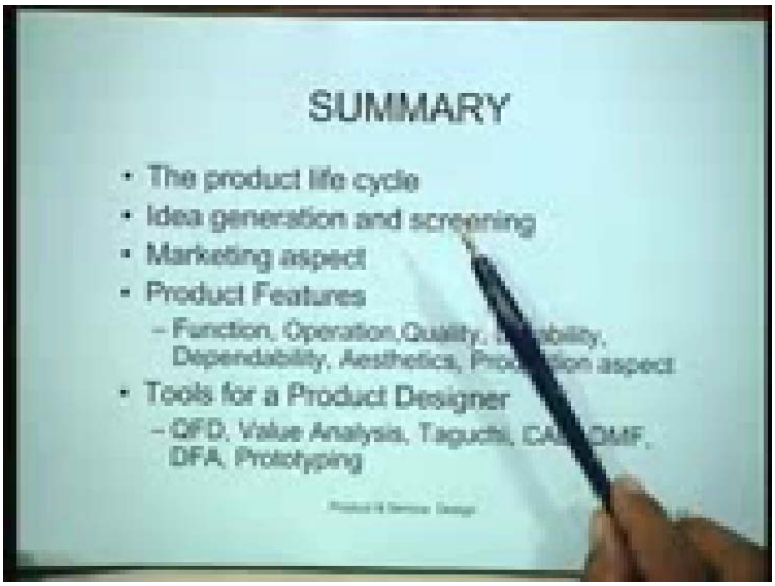
thing is easy to make. So design for manufacturing assembly was developed by Geoffry Boothroyd and Peter Dewhurst. These days they are talking of a new concept. It is the design for service, DFS. It is a recent concept which says that when a product is made of a certain component, it requires frequent service. It should be kept at the outside or an easily accessible place.

(Refer Slide Time: 56:17)



Prototyping, generating the prototype basically gives you a feel for the final product. So with increasing competition, it is imperative to reduce cost and lead times. Rapid prototyping machines produce the 3 d part by generating and joining slices. You generate slices of parts and put them together and generate a 3 dimensional shape and stereo lithography it is a commonly used technology for this purpose, though of course other technologies are also available these days.

(Refer Slide Time: 57:00)



So finally in conclusion we can say that we have looked at the product life cycle starting from the stage of generating ideas by brain storming to the stages of economic evaluation prototype till the stage of commercialization. We have seen how the process of idea generation and screening takes place. We have looked at the marketing aspects; we have looked at the product features like function, operation, quality, durability, dependability, aesthetics and the production aspects. In order to build these functions into the design, we have seen the commonly used tool for a product designer. We are merely trying to look at some of these tools and terms of quality function deployment which actually takes the customers' word and translate into the specification of the product value analysis. Then there are Taguchi methods, CAD, DMF, DFA and prototyping. We have as I indicated to you, not looked into the aspects of economics. So in the next lecture, we will focus on the economics on new product launch and see what kinds of techniques, what kind of financial tools are necessary for doing this particular analysis.

Thank you very much.