Rapid Manufacturing
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Lecture – 4
Product Development Process (Part 1 of 3)

Welcome to the next lecture series in this course on Product Development Processes.

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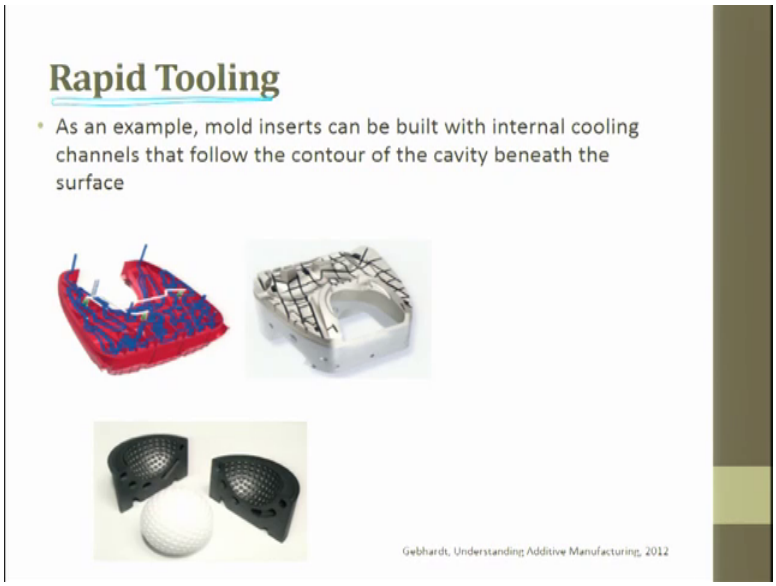

So, there were few comments and queries raised by students that they wanted to have some more clarity with some examples. So, here I have added first 2 3 slides on just giving clarity, to those queries which were raised, so I will the go back and give you some examples and then get into the new topic of product design. So, Rapid Tooling as it explains here it is a mold insert can be built with internal cooling channels that follow the contour of the cavity beneath the surface, so this is shown in this example.

So, what we are trying to talk about in rapid tooling is you are not making the product you are making the tool for making a product in a rapid fashion; why? Because you are trying to reduce the product life cycle time, so this is what it is called as a Rapid Tooling. So, a tool here the example what you are talking about is a die where in which generally when you try to make a dice if it is a complex geometry (Refer Time: 01:51) control over

the form fit strength, then we always look for cool better cooling channels. So, in this example what we are trying to say is we are trying to impress you that the die which is a tool for making products can be quickly made using this rapid tooling.

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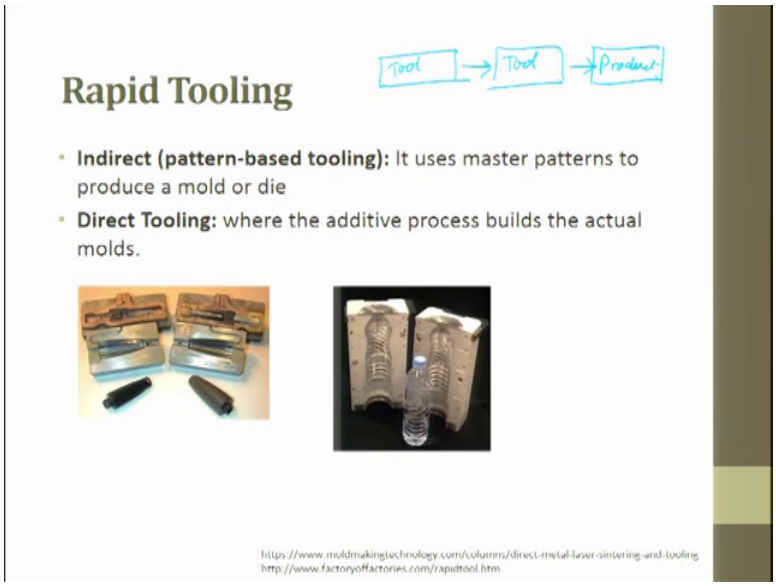

So, Indirect tooling is it uses a master pattern to produce a mold or a die is indirect tooling, to produce a die you need a tool. So, if you can produce that, that is called as Indirect tooling. So, here so you should understand we are trying to make a product this is a product ok, here we need a tool and then again for making this tool you need one more tool which is called as indirect tooling. What is Direct tooling? It is directly to produce the given output.

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So, Prototype Tooling these are tools, these are tools which are used for prototyping just to see the outlook, for example here what we are trying to says we are trying to make a tool which is used for making prototypes, so that you can show it to customers, try to impress them and get their feedback improvise. You should also understand once you are trying to make these dice or tools for mass production including making tool is expensive.

So, only for that we are trying to talk about the concept of prototyping of tool. So, here the tool is made as a prototype and after this the corrections will be made and the final design will be accepted and directly this tool will be produced that is called as rapid tooling. I hope I have made the things clear and however you are most welcome to get back and then tell us clarifications required.

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So, here is an example which I was trying to talk to you on the first day ok, so this is indirect processes. So, where and which first we try to make the replica of the ear then, we try to make a die, we try to make a part and you see this is a part which is made by rapid manufacturing technique and this is a original ear for a human being, so this is called as a indirect process.

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So, now let us get back for the discussion for this lecture series is going to be on product design development. So, here the content of the lecture is going to be product and it is

characteristics, we will see evolution of a product development, sequential product development, we will see stages in generic product development process, design specification in the process and conceptual and detailed designing.

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See yesterday when I was travelling I was trying to think for myself and I was trying to ask a question to myself, Ram if you want to develop a product what would you look for? Then I was trying to see if I have to look for a product so, then I would first have to decide the customer. So, then I thought I decide a customer and then do what? Then try to figure out what is their requirements, then I would try to convert the requirements into some engineering requirements and then look for can I develop of product based upon his requirement and develop a product and show it back to him and make him happy. Then I said yes which is what I can do, I thought I will start looking forward, so then I there is a component can finance which came into existence.

So, what is this finance, finance will try to dictate what should be the product which I am making should I look for a 10000 rupees product, should I look at 1000 rupees product, should I look at 10 rupees product, should I look at 5 rupees product, so then the finance also comes into existence. Then I decided that finance along with the customer need has to be encapsulated and then you have to look for a product, and then I realize identifying a product for your customer itself is a big challenge. If I can identify a product that itself will solve the problem very fast.

So, the big challenge is product identification and then you start developing product so and once you start developing a product comes down the product development cycle ok. So, here what we are more focused is towards you are not focused towards costing, you are not focus towards what how do you access our customer, we assume that those 2 are existing we have identified a problem then what we are moving in the direction.

So, the product development life cycle this is what we are trying to shrink, we have identified a product we are developing a product for a given customer which is all frozen. We can improvise the product that is a different story, but the product to a large extend (Refer Time: 08:20) then only we can come to this product life cycle ok. So, the product life cycle is a sequence of all the required activities that a company must perform to develop manufacture and sell a product, so this is what is the definitions for product life cycle.

Product life cycle is a sequence of all the required activities that a company must perform to develop manufacture and sell a product. So, these activities can include marketing, research, engineering design, quality assurance, manufacturing and a whole chain of supplier and vendor these activities whatever it is there. So, the process also comprises all strategic planning, capital investment management decision and task necessary to create a new product. So, all these things are part of product life cycle.

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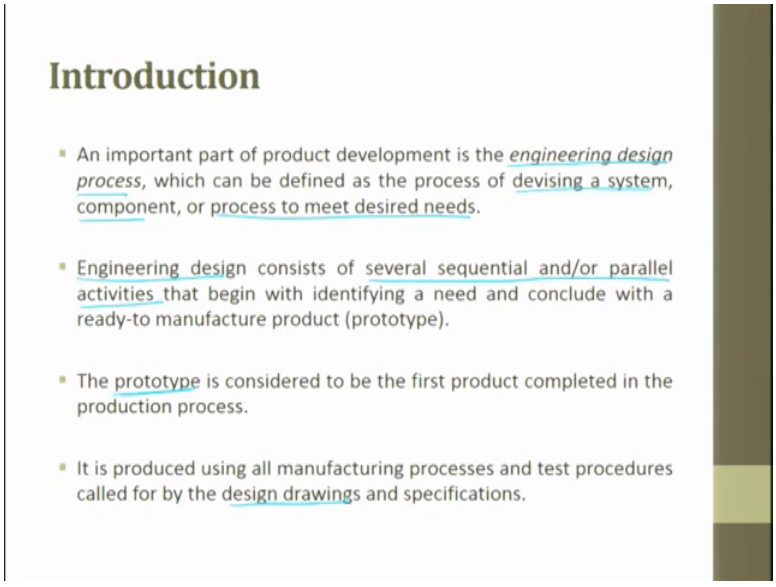

And important part of product development is the engineering design process, which can be designed as a process of devising a system component or process to meet the desired requirement. Engineering design is different, product design is different engineering design process which can be defined as a process of devising a system component or a process to meet the desired needs. Engineering design consists of several sequential or parallel activities that begin with identifying the need and concluding with a ready to manufacture product.

So, here it is very clear several sequential or parallel activities can be done. The prototyping is considered to be the first product completed in the production process, prototyping or POC they call which is nothing, but proof of concept. The prototyping is considered to be the first product completed in the production process. It is produced using all manufacturing processes and test procedures called by the design drawing and specification.

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The product development is evolving from a sequential process carried out primarily by engineers to an integrated process incorporating a cross functional team. So, there will be multiple teams, these teams have to work cross functioning has to happen and engineers try to do a job in getting out the process.

Similar steps are followed in either cases, but there are accomplished concurrently and with the higher speed in the integrated process environment, 4 logical group of activities

can be identified in product development: is 1 identifying an opportunity or a demand for a new product, which I said identifying is a biggest problem. I gave you an example of 10000 rupees product 10 rupees product 1 rupee product, so first identifying the opportunity and then that is equal to demand.

Creating a technical specification for the new product idea, big challenge I would like to buy a shoe can you tell me the specification of the shoe, if somebody asks me I will have a tough time I can say the size, I can say even the colour, I can say the comfort, but more than that I cannot given my specification. But shoe has so many things which is to be specified and which is not specified, but a customer expects hidden specification.

So, this is a big challenge creating a technical specification for a new product idea, developing the manufacturing process to produce the new product this is also challenge there is nothing called as a unique universal manufacturing process. For example, for drilling a hole you can do it by drill, you can do it by water jet, you can do by EDM you can do it by laser right. So, there are multiple processes which you can do. So, developing a manufacturing process or a sequence of process to produce the new product, then at last will be fabricating of the new products, these are 4 logical groups active group of activities which are to be followed in product development cycle.

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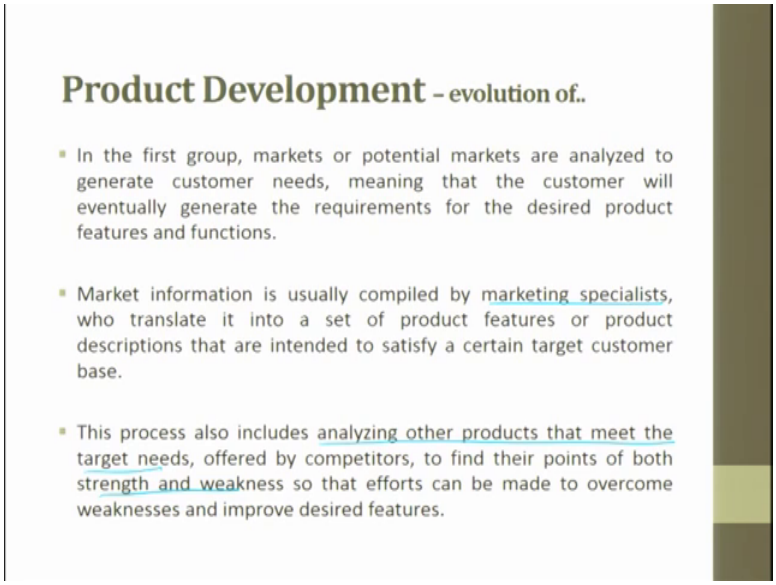

In the first group market or potential markets are analyzed to generate customer needs, meaning that the customer will eventually generate the requirements for the desired

product features and functions which very rarely (Refer Time: 13:24). If somebody asks you what would you like or what is your expectation from a pen. So, it is very difficult as a customer I just say it has to smoothly; write is it all about that? Then I will say it should not flow then I will say it should not get refilled or it should it should exist for infinity time, then it is very difficult. So, only I gave 3 specification did I talk about weight did I talk about when I said smoothly it should write how do you characterize smoothness.

So, then I said it should work for infinity time. So, what is my infinity time I literally did not mean infinity I thought for a long time. So, what is my time? So these are specifications, smoothly it has to write it should not flow it should not ooze out or it. So, we are putting all those constraints ok.

So, these are customer needs, some are needs some are (Refer Time: 14:28) some are not (Refer Slide Time: 14:30), so you have to understand everything and integrate it into your product ok. Many a times we go to a restaurant and we expect they keep tissue papers that is our expectation some hotels have, some poor hotel does not have, but what do you expect from hotel in that specification we do not put that tissue paper has to be there on the table ok.

So, you understand customer needs is very difficult to understand, but for that customer need you have to make a engineering requirement and make a product. The market information is usually compiled by marketing specialists who translate it into a set of product features or product descriptions that are intended to satisfy a certain target customer base.

So, the other important thing we should understand as there is nothing called as a universal product which everybody would like and everybody will buy, even in a pencil what you by people have humpty number of specifications. That is why today you see even in a pencil when you want to buy you have humpty number of brands, humpty number of pencils with rubber eraser attached to it, then there are pencils which are red in colour with pencils which are full of cartoon figures, pencil which has a soft holding so many things are there right.

But market information generally there is a specialist, there are specialist available, so this specialist try to identify and then try to get it back right they try to identify and then they try to convert the customer voice into a spec and then they give it as an input to the

engineering design. This process also includes analyzing other products that meets the target needs offered by competitors to find their point of both strength and weakness, so that effort can be made to overcome weaknesses and improve the desired feature.

So, you decided that you will make pen, so once you have decided that you will make pen or pencil. So, then what you go you quickly go to the market collect all the pen pencils ok, I was recently working on how to develop a dosa making machine and my dosa making machine is only for domestic purpose. So, I went around so then first thing what I did was I ask my wife, then I ask my mother I ask my sister then I ask them to do the process in front of me and I walk then I went to my friends house, then I went to a professional hotel then I went to 6 7 hotels.

So, what did I do I just when to 6 7 people and then looked at what is the process, is the process everybody follows is it unique then after they do that taste whatever it comes is it the same. But before that please remember what I did was I went and give a standard starting material to all those personalities, so that I tried to make sure my end product has the starting input the same.

If there is a taste variation and that I can come out and say this is because of the process. So, what I did I went and I analyzed all 10 people different people who are making and then I wrote down the weaknesses and strong points of each person making dosa and then what did I did I did a cluster analysis, I start at writing each person what was his plus, what was his minus, what was his plus, what was his plus nothing against the person, but again now I want to understand the process.

So, then what I did I picked up certain things from certain people and then I made a unique process, now with that unique process I have started working on how to develop a dosa making machine. So, this is what it is. So, even before doing that I went to different people from different families and I asked them suppose if I make a dosa making machine what can be the affordable cost you can give, people in South they said they would like to have dosa once in 2 days, people in North they said I can make dosa or I would like to make dosa once in a week.

So, now in the North if they say once in a week they want to make dosa naturally the cost investment for them is going to be less and second thing you should also understand the dough making in North is going to be very difficult, because in winters the

fermentation cannot happen, in summers it is going to ferment very fast. But whereas, in South to a large extent it can be within the same bandwidth, so the external features also affects the process performance.

So, what I did was I had to understand several of these things and then what I decided is, now I decided that I cannot make a machine universal for South and North I can make it only for one cluster of people and for that cluster I have started making. So, I have understood the market, I have studied how people make dosa and then now I have fixed who is going to be my target customer and then start attacking in developing a solution for it. So, all the cycles all these things which happens is part of product development.

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The selling price range South Indian, North Indian; South Indian once in 2 days, so he would like to give more for the machine whatever I develop, but North Indian will say I have only once in a week so I am least using it. So, I would like to give only x is the money and where as maybe in people in South who has a daily requirement say x cube will be the price I could give.

So, first I have to ask them what is the price range that also has to be estimated at this point by analyzing the pricing of a similar product, if there is no product you can say you can charge as high as possible because, then you are getting into a domain where your failure is going to be fast. So, you should always look at the domain where it is and then you make a small profit and make a product out of it. If it is new, try to give it still at an

economical price such that you reach out to lot of people, this in addition to a value of desired profit margin will set the criteria for the economical feasibility of the new product, the data are translated into cost and quality specification, these data cost is now translated into quality specifications.

The next step is to formulate the product into a concept based on the product features set identified by marketing in the previous step that is a first version of how the product will look and perform is created. After getting all these things you try to make a POC proof of concept and then show it to the people, then the technical specification of the products are developed. So, when you talk about dosa, so what are the technical specification the technical specification is going to be time and then it is going to be in terms of taste and third it is going to be in terms of maintainability.

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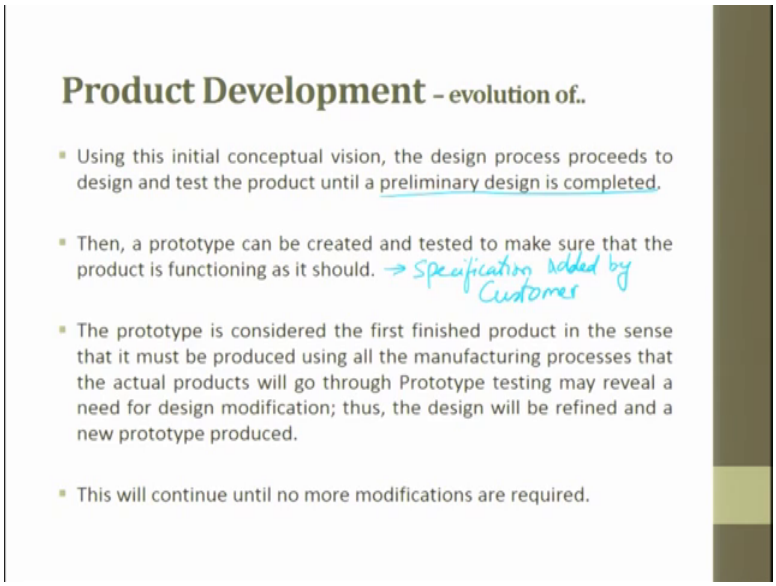

Using a initial concept vision the design process proceeds to a design and test the product until a preliminary design is completed. So, POC and then design specification is now to a large extent it is now completed, but please understand you will never be able to nail at the ultimate specification at this step. Then a prototype can be created and tested to make sure that the product is functioning as it should, at this point also there will be specifications which is added or reiterated by the customer; specifications added by customers. They might say it looks heavy, it does not look nice the shape dosa so it

cannot be done on a box, so the form should be a circle, may be so many things they can give.

The prototype is considered as a first finish product in the sense that it must be produced using all manufacturing processes that the actual product will go through prototyping testing, thus the design will be redefined and a new prototype is produced. So, here itself what happens multiple prototypes are produced specifications are revised and ultimately when all the prototypes are made these specification is frozen then we go for batch production.

So, recently I was talking to an entrepreneur who was making a product, he said he has made 80 prototypes to go to a final specification and today his product is very successful in the market. So, he had to make 80 prototypes, each prototype has a variation from the previous one ok. This will continue until no more modifications are required several prototypes will be made so he said he has made 80.

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The next step is to finalize the product documentation and then the manufacturing process development may be initiated, until you fix the specification you cannot start the manufacturing process development, POC proof of concept is I would say easy. Next when you move into manufacturing you will have a huge challenge and in manufacturing comes the biggest challenges manufacturing process decision as I told you making a whole can be done by drilling, can be done by water jet can be done by laser, can be done

by trepanning operation whatever it is the it can be done by EDM it can be done by ECM all these processes can drill a hole.

Now you have to decide upon the specification which process to choose and how it will satisfy your requirement. The manufacturing process must be created so that the product can be produced in the production facility.

So, now when you have decided to make a product one way is you buy all new machines, other way around is you look at your existing facility look at whatever you have and tweak the product whatever you developed for the available facilities ok. Purchasing new equipments and training worker may be required if new technology is to be used, if you are trying to automate and produce in 1000s, so then it is good for going for a new machine, it was going to be a back size production.

So, the existing facility can be tweaked fixtures can be made, machines can be modified something like that can be done tool fixtures and the sequence of steps in manufacturing processes must all be developed to allow rapid high quality cost effective production. Also it must be necessary to rearrange the production facility to adopt for the new manufacturing process. All these things are product development in the evaluation of product development.

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After the product design and development of manufacturing process are completed the business for producing and shipping of the product begins. So, even before getting in to business there is something called as packaging today there is lot of importance given for package design.

So, there is lot of importance given for package design. So, the raw materials can be purchased and the production facility can get into operations ok, during the first two production period some problem may arise as a result of technical production problem which will lead to design modifications to resolve these new problems and reach the expected production rate with the intended quality, so this is also an important step.

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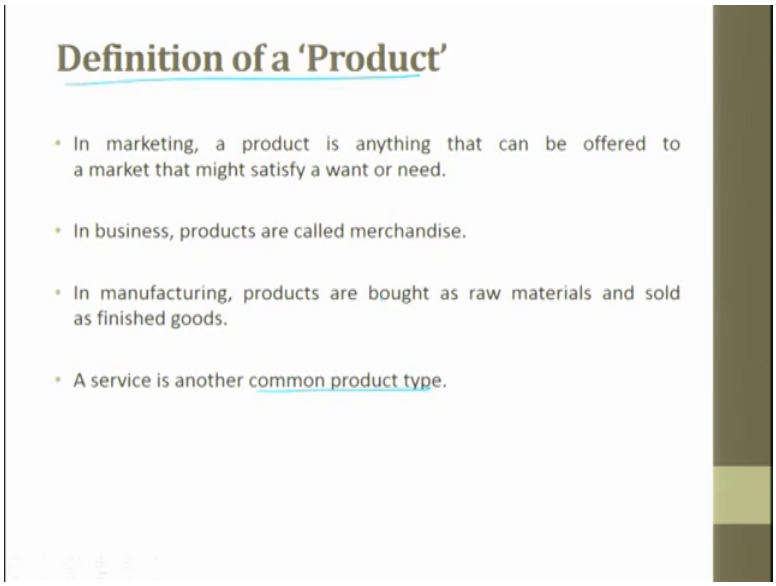

So finally, when we go into definition of a product in marketing a product is anything that can be offered to a market that might satisfy a want or a need that means to say customer please, understand; business models also can be used as a product according to this. In business products are called as merchandise, in manufacturing products are brought as raw material and sold as finished goods, look at it each industry has it is own definition a service is another common product type ok. So, you look at it there are 4 definitions which according to their industry they give their definitions.

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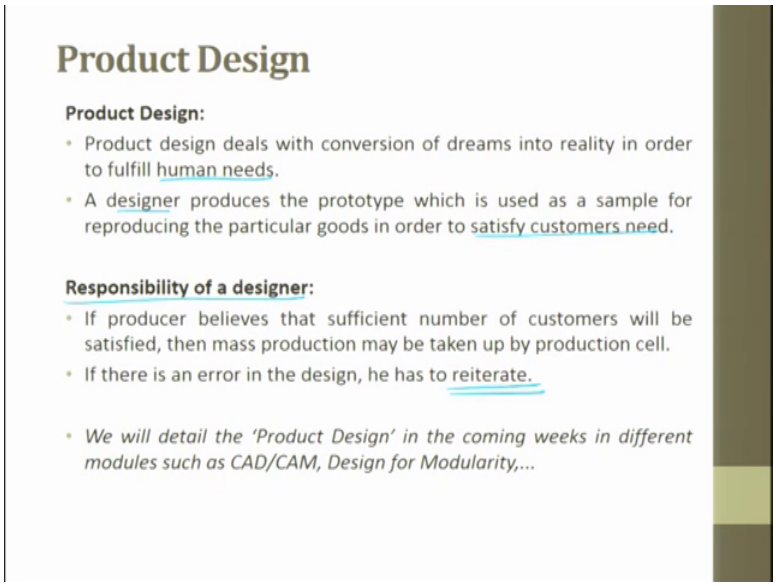

Product design deals with conversion of dreams into reality; in order to fulfill human needs this is what is the product design. A designer produces the prototype by the way the designer means it is not an artist designer means you have a customer asking the customer their needs developing a product and bringing all optimization into it and developing a product so that it can be sold.

So, that is designer artist is different designer is different, people always try to think an artist as a designer no, the designer what we talk about is a person who could understand customer why make prototypes evolve prototypes make a final product where in which he integrates science technology form fit everything and gets into the market, so that for those persons are called as designers.

A designer produces a prototype which is used as a sample for reproducing a particular goods in order to satisfy customer needs, ultimately a designer means you should have a; you should have a customer if there is no customer if you say I am a designer I produce parts it is of no use ok.

So, everywhere you should have you should see that designer or a design is always done for a product for that product there has to be a customer, if there is no customer no point in designing. Responsibility of a designer if producer believes that sufficient number of customers will be satisfied then mass production may be taken up by the production cell, if there is an error in the design he has to reiterate, designer has to reiterate. We will

detail the product design in the coming weeks in different modules such as CAD CAM design for modularity etcetera etcetera ok. Responsibility of designer: he should never feel bad to reiterate you should never feel bad as a designer to reiterate your specifications, all you make sure your customer is always happy.

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Distinctiveness for successful product a key factor for to a successful product is distinctiveness, provide excellent value for the money spent and enhanced quality perceived is very important. So, this is the key factor for successful product, distinctiveness customer focuses and market orientation. So, customer focus is develop and intensive understanding of the trait of the market, recognize the competition these 2 are customer focus and market orientation, this should be a key factor for a successful product.

So, you cannot develop a product for a customer who does not exist, you cannot develop a product which is not market orientated, so that means to say you can never say that I will try to make it for something which will come in future, it is very difficult to cell ok. Preparedness: work proceeding actual product design is critical in determining if a product will be successful is preparedness. You should be always prepared, you should be always agile, so this is a key factor for a successful product; sharp and early product definition.

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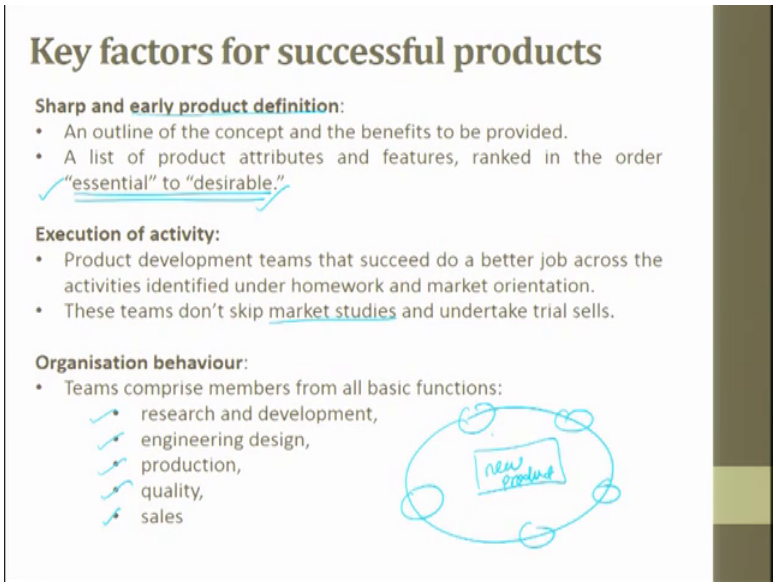

An outline of the concept and the benefit to be provided that will be one of the factors for successful product. A list of product attributes and features; attributes features are different, attributes good bad features some specifications ranked in the order essential and desirable these 2 are very very important things we should think of. It is essential, it is desirable. Essential means it must be there, desirable means if it is there it is ok. So, you cannot say that the desirable quality is slightly different and if somebody has desirable property that does not mean if he fulfills the essential quality it is good. For example, if for a job if somebody says 10 th standard pass is required, maybe that is an artist post ok.

So, desirable qualities if you would have been practicing art for 8 years that is desirable. Suppose if somebody is there saying that he has 10 years of experience in artistic field, but he has not passed the 10 th standard so he cannot be called for the interview. In the same way a list of product attributes and features has to be listed and they have to be ranked in the order of essential to desirable. If the desirable qualities are not there still a product can be sold with some compromise, but if desirable qualities are there and essential are missing your product will never be successful, please understand the difference between these 2; that is what is early product definition.

Next is execution of activities: product development team that succeeds to a better job across the activity identifies under homework and market orientation, so this is one of the

key factors for a successful product. The team should not skip market studies and undertake trails sell so market study has to be done. The organizational behavior this is one of the key factors for a successful product the team comprises members of all basic functions research and development engineering design production quality and sale.

So, all of them sit together and try to contribute in a product development, so this is what is called as concurrent engineering all of them they will sit together and develop a new product. So, everybody tries to give there essential and desirable qualities at the beginning itself such that the product right from the beginning involves in the fashion such that it can lead to success.

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Then project selection that is very important factor for a successful product. People would have chosen a good product but it would have been implemented in a bad time. For example, if all these smart phones would have got into the market and in the market if there is not much of infrastructure for example, 3G 4G 5G is not there then the smart phones cannot work.

So, we should choose a project looking into the infrastructure what is available and then choose it. So, there was a time when people were using pager, pager was instrument or a device where and which you get a SMS and we could quickly send across data. So, that the data can be seen, other than calling this data could be sent, so this was called as pager and those days smart phones were not there.

So, after the pager the technology developed then came the cell phone, then it was all punched type cell phone, there was no possibility of transferring images then came smart phones where transferring of images today we talk about 4G sitting and watching movies and sitting and watching dramas, sitting and watching cricket matches all these things could happen.

But if it happen only recently, if somebody would have chosen a project knowing that this is going to come they would have develop a product some big company like Apple or Samsung would have develop it would have been a failure. So, project selection is something very important that happens with respect to time, with respect to the rest of the infrastructure with respect to the need of the customer we do, is this factor also leads to success. So, involvement of multiple projects scatters valuable resources among many candidate projects however, not all projects are likely to materialize.

So, we have to choose the proper projects and start working, telling the world you have good product legitimate promotion of your product is very important, launching new products with appropriate forums and adequate allocation of the resources for marketing should be one of the key factors for your success. For example, if you run a school, if you run a school and you do wonderful teaching in that school and you produce lot of good results right. Everybody who studies there gets 100 out of 100, but if you do not advertise you will not be able to sell the brand value of your school.

So, it is always necessary to give some money for marketing and advertisement, such that the schools quality will go high. There is one way of doing it which some companies do follow it is they do not invest in marketing or they do not invest in promotions sale promotions, they always say that by word of mouth they get popularize yes. But they cannot be thought of or a grand success they can only look forward for a small incremental success over a period of time yes they might reach.

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The other key factors for successful product are, factors listed have unexpected effect on the success of a new product. Order of entries, innovativeness and the nature of benefits by having this product are some of the things which we do it. So, a business simply cannot introduce a product and on the basis of price advantage alone except to succeed, a business simply cannot introduce a product and on the basis of price advantage alone expect to succeed ok. So, you cannot introduce a product saying that it is very very economical, people will buy in many no it is not possible.

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So, the successful product development attributes are going to be one is cost, value time and technology know how; cost includes the cost of both producing and developing. The value is the quality of the product is the value time is for assessing market needs to product sales is the time, from assessing market needs to product.

So, this is where rapid manufacturing is today talked about where and which we would like to reduce the time to a large extent technical knowhow the actual procedure to follow that also should be one of the attribute for producing a successful product. The products that sell well and make a healthy profit, if they have these 4 attributes if they give proper attention they can succeed.

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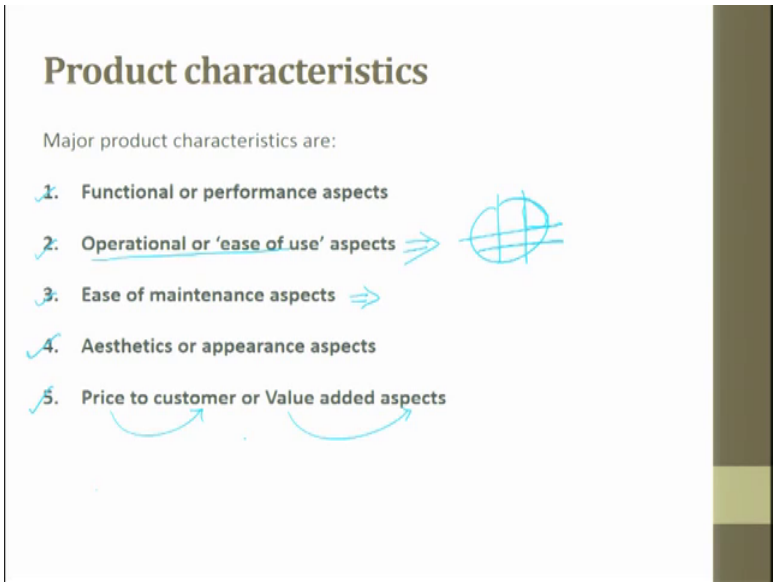

The major product characteristics are functional or performance aspect, major product characteristics operational or ease to use aspect, yesterday when we were dining interestingly we few of my friends where trying to have a dish ok, in this dish it was so soft it was sweet and it was also very cold.

So, the biggest challenges how do we cut that ice cream which is soft right, they could not poke it with fork; they could not poke it with fork they could not cut it with a knife, so it was pretty interesting we were struggling for a long time to see how to how to eat that food it was so delicious, it was an ice cream it was. So delicious, but it did not have operational ease to use; that means, to say it did not have a device or a product or a

spoon which could which could accommodate that smoothness and softness to scoop it out ok.

So, we wanted a large piece to be segmented into several pieces which we could not and we wanted to be exactly cut into that shape whatever we want we could not. So, this is one of the thing operational and ease to use aspects then easy to maintain aspect, today people talk more about it. In fact, when we buy furniture's today earlier days people were looking at rich royal furniture's.

Today people have started thinking the furniture's whatever we buy should have one of the major factor is how is it is for maintenance, when we buy a car that is what we ask and when you buy a shirt or a pant and that is what you ask right what is the ease for maintenance.

Then the next thing is aesthetic and appearance of aspect of it and the last one is price to customers or value added aspect I pay this money and what will be the customer satisfaction happening by buying this product. Today we always put this price to customer so price to customer or value added aspects. So, this is very very important, if I buy 10 rupees pen what will be the value addition to me? If I buy a 100 rupees pen what will be the value addition to me? So that is what people are looking forward.

So, these are the 5 important product characteristics which have to be taken care and we have to keep that in mind when we try to develop a new product, functional or performance aspect operational or easy to use ease for maintenance aesthetic or appearance and price to customer are some of the things which we are supposed to focus.

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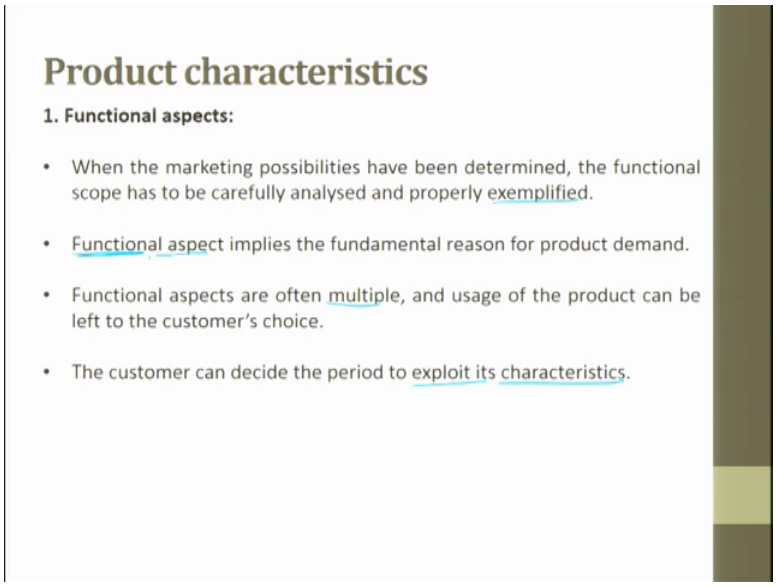

Functional aspect: when the marketing possibility have been determined, the functional scope has to be carefully analyzed and properly exemplified. That means, to say it has to be clearly specified, functional aspect implies the fundamental reason for product demand. If the functional aspect is not satisfying at some point of time American started giving lot of importance at some point of time. They gave lot of importance to form and slowly slowly there importance in form was so high they started missing out, functional aspect, then they realize that functional is to be taken on priority they started doing. Whereas in European countries and Japanese countries they always give lot of emphasis for functional and then they give it for form.

So, you should have a very clear distinction right. So, functional aspect implies the fundamental reason for a product demand, functional aspect are often multiple and usage of the product can be left to the customer's choice. For example, functional aspect you have to make a pen heavy, right just for holding it, second thing I might use this pen as a paper weight. That is my way of looking at the usage of the pen when after writing I like to keep my pen on top of a of a set of paper I would use it as a paper weight.

So, my functional aspect of a pen which I was using to write underline to do all these things, so they are often multiple and the usage is left to the customer; the customer can decide the period of exploit it is characteristics, period to exploit it is characteristics.

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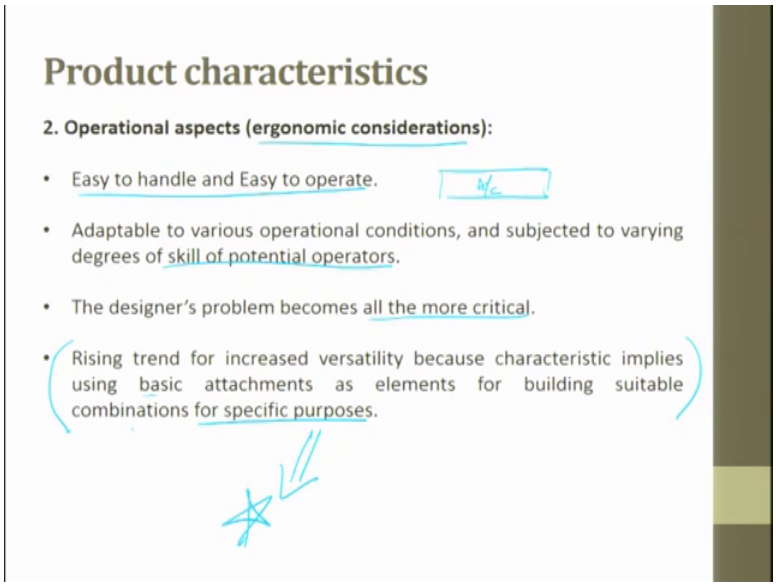

You operation easy to handle an easy to operate adaptability to various operational conditions, many a times the AC whatever we buy in India they concoff when the temperature goes above 48 degrees or 47 degrees because, it is too much of heat generation in the compressor side the heat in the compressor could not be extracted. So, it concepts so until the compressor cooled you are AC will not work.

So, but whereas the AC's which are sold in middle ease they have anticipated the temperature will got a 50 or 55 degree Celsius. So, they make sure there compressors are made safe to operate till 55 degree Celsius and then they concoff. So, adaptability to various operational conditions subjected to varying degrees of skill of potential operators ok.

So, you should always think of that a dumb person is using your product and make sure that you design your display boards or your buttons or your or norms in such a fashion even a semi skilled labour could understand and start using it and he should find it easy to use.

But designer's problem becomes all the more critical when we start looking from the ergonomics point of view, rising trend of increasing versatility because characteristic implies using basic attachment as element for building a suitable combination for a specific purpose has become the need of the arc. So, this is also important,t rising trend

for increasing versatility because characteristics implies using basic attachments as elements for buildings suitable combination for specific purpose.

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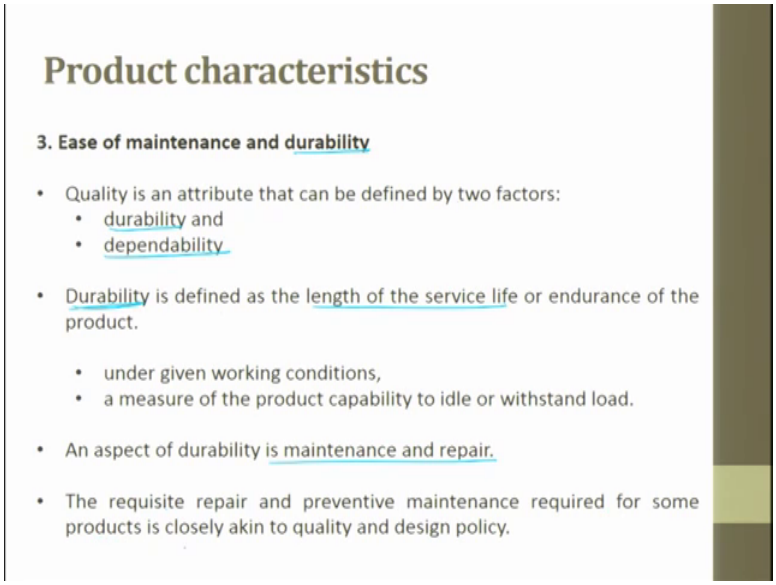

Ease for maintenance and durability, the quality is an attribute that can be defined by 2 factors durable and dependable, when you buy a shoe we always look for durability and dependability. Durability is defined as the length of the service life or endurance of the product; under giving working condition, a measure of the product capability to ideal or with stand load is the definition for durability. How many times I can wash this shirt, how many times I can open and close the laptop how many times I can drop this pen, how many times I can drop a smart phone but still works durability that is very important.

Today we look at a product which can be used, which can be abused, but still performs to the expectations. So, people abuse that means to say people try to use the same product in a very hard conditions in a condition which is not call for, but still the product has to be performed, so that is what is abused condition use abuse. Even in abuse conditions if you see it if you see many products today do not fail. That is where the success of a products and we are supposed to make a product foolproof and durable and aspect of durability is maintenance and repair the requisites repair and preventive maintenance required for some products is closely akin to quality and design policy.

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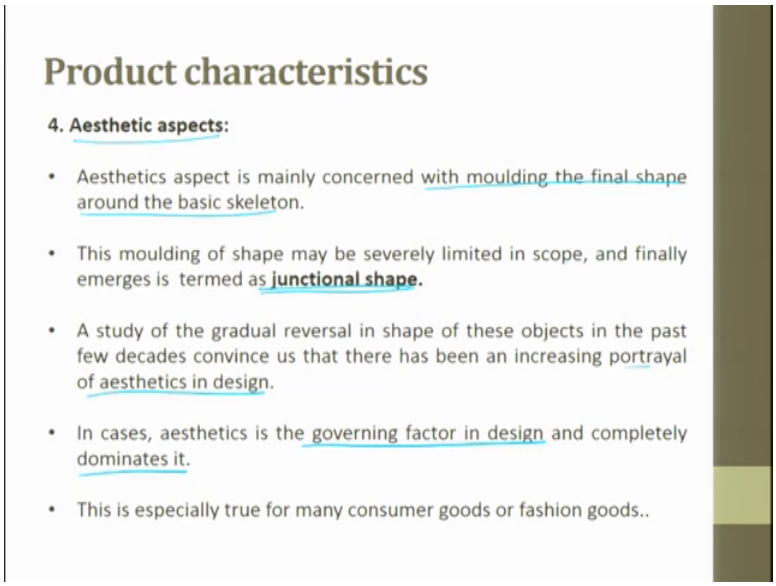

Aesthetic we can drop, aesthetics and say that without aesthetic my products will good I will do good, but that is not possible today aesthetics something which is also important. So, aesthetic aspect is mainly concerned with moulding the final shape around the basic skeleton, but still that plays an important role right. This moulding of shape may be severely limited in scope and finally emerged in terms as junctional shape. A study of a gradual reversal in shape of these objects in the past few decades convinced us that there has been an increasing portrayal of aesthetics in design.

In cases, aesthetic is the governing factor in design and completely dominates it; governing factors in design it is essentially true for many consumer products or fashion goods that aesthetic plays a very very important role.

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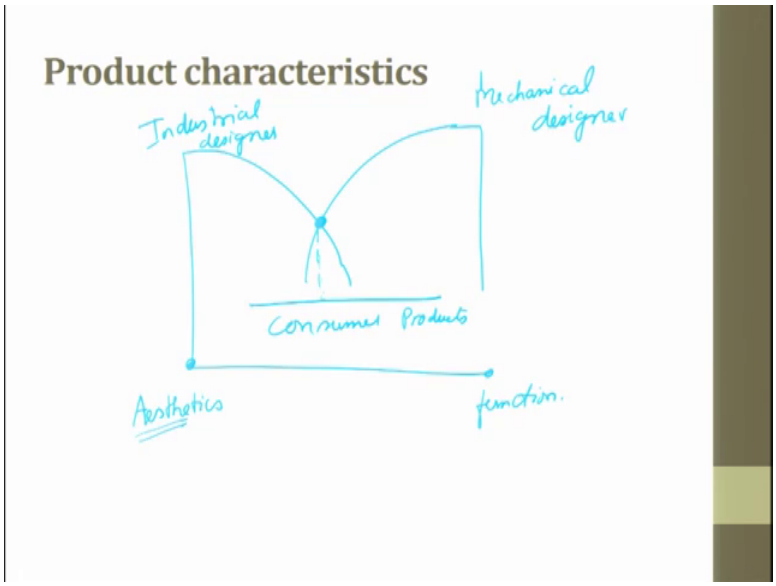

So, when you look at profile where and which I put aesthetics and then I write function here. So, here is mechanical design, here is industrial design or designer mechanical designer and here are we would say consumer products.

There is a breakeven point or there is a meeting point where and which this industrial design and mechanical design it is very important if you want to make a successful product. And here I have put aesthetics industrial gives more importance to aesthetics, mechanical designer gives most important to function. But these 2 should meet at a point and very successful products consumer products are developed at this point.

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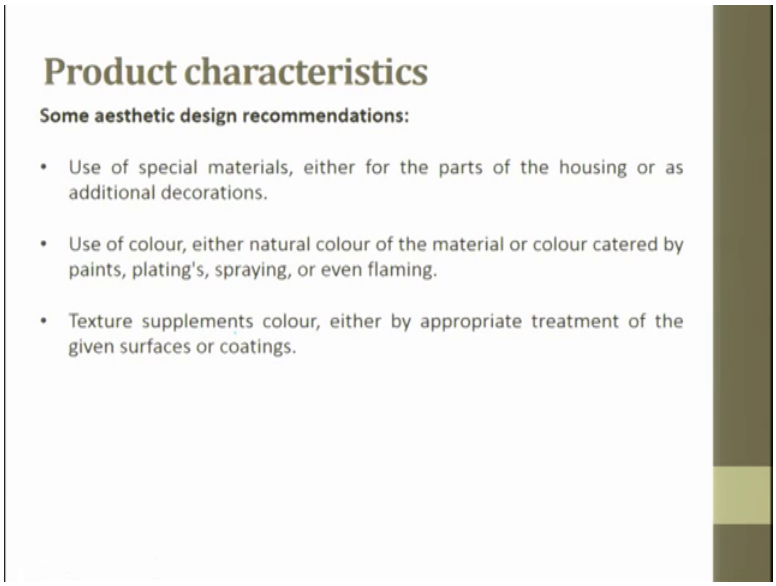

So, this is very important graph which tells who plays what role and it also tells you that both roles has to be played to make a successful product. Some aesthetic design recommendation: use of a special material either for parts of the housing or as additional decorationals. So, this is some recommendation, use of colour either natural colour of material or colour created by paints plating, spraying or even flames. So, some aesthetic recommendations can be given in the product. Texture supplements colour either by appropriate treatment of a given surface or coating.

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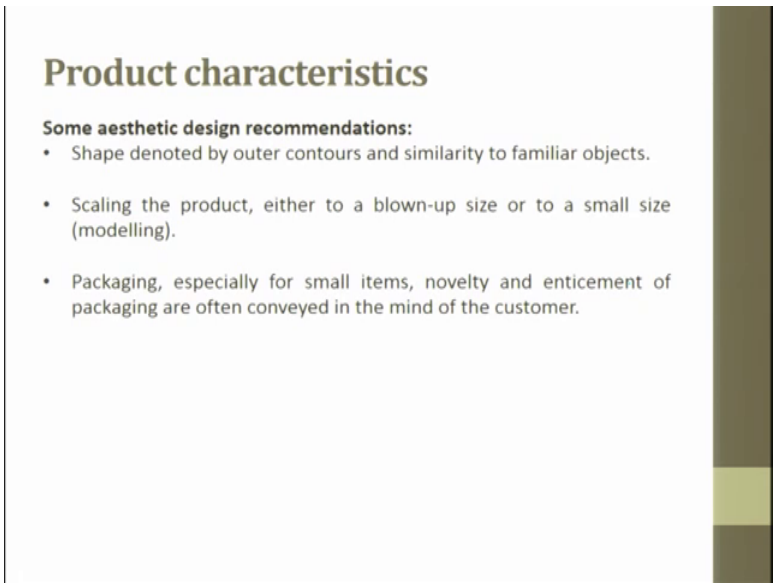

Shape denoted by outer contour and similarity to familiar products; scaling the product, either to the blown up size or to a small size modelling. So, these are some aesthetic design recommendation packaging especially for small items novelity enticements of packaging are often conveyed in the mind of the customer.

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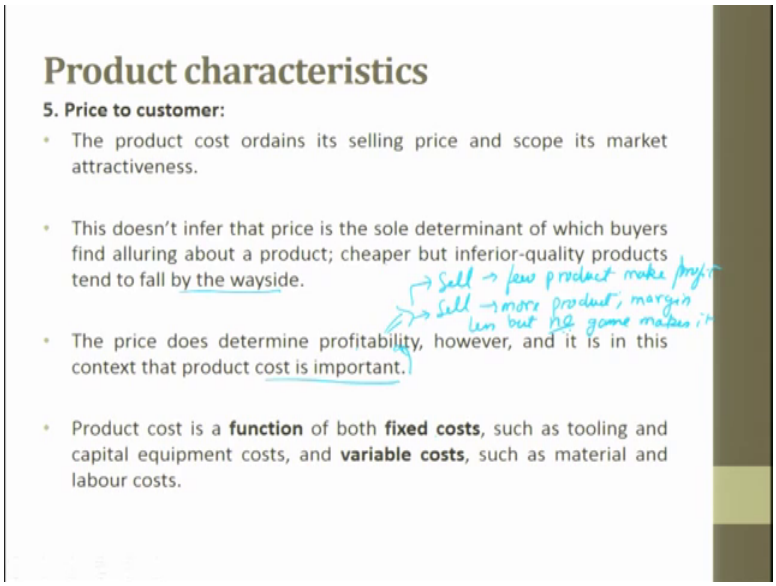

Price to customer the product cost ordains it is selling point and the scope it is market attractiveness, it this does not infer that price is the sole determinant of which buyer finds alluring about a product; cheaper but inferior quality products tends to fail by the wayside.

So, the price does determine profitability however, and it is in this context that product cost is very important in terms of profitability, product cost is the function of both fixed cost such as tooling capital equipment cost and variable cost such as material and labour cost. There are 2 ways of gaining popularity, one is sell few products make business make profit, you decide. Next is sell more products where margin is less margin is less, but number came makes it. So, you can decide how do you want to make your profitability.

Thank you very much.