Economics, Management and Entrepreneurship
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Lecture - 33
Product Development

Good morning, welcome to the 33rd lecture on Economics, Management and Entrepreneurship. In our last 32 lectures, we discussed about economics and economics issues related to economics and of course we discussed principles and functions of management. From now onwards we shall discuss various issues related to functional management.

In particular, today we shall discuss about issues that arise in developing new products. So, the topic for today is product development. Before we start, let us talk about products and services. Basically these are output of any system, any transformation system. Industrial output today consists more of services than products.

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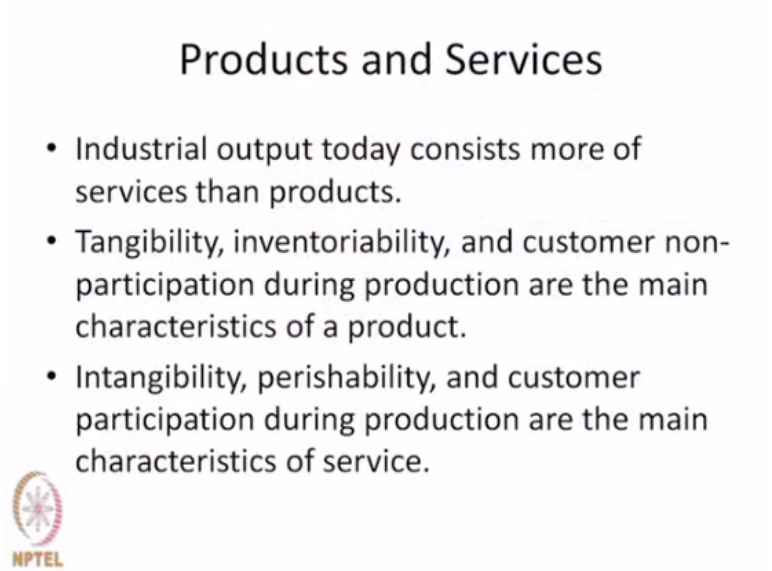

There was a time in particular we used to call our society an agricultural society, where the output was basically grains, rice, wheat and so on and so forth. All our, most of our population in the world were engaged in production of these outputs. Then came the industrial society where most people of the world were engaged in working in industries in producing various types of goods.

Then goods that were tangible in nature, goods that we could store for a while. But then we found that there are more service oriented industries. More service oriented human activities, health care, education, telephone, transportation and things of that type fall in these categories of service. That is what we are writing down here. Tangibility, inventoriability and customer non participation during production are the main characteristics of a product.

A product is mostly tangible. We can see it, we can touch it, it can be stored or inventoriable and usually the customer is or does not participate during the transformation process. But as in case of service, it is intangible when offered it perishes it does not get stored. It is not inventoriable and when a service is given customer is inherently present. He participates actively in the service delivery process.

So, these are the 2 main difference or rather 3 main differences between a product and a service. However, there is more to it.

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This we write down more elaborately in these 2 columns. As I already told, products are tangible things that we can carry. Services are intangible and perishable. A product waits to be consumed or used, here the system waits to deliver the service. The service does not wait. The whole system, people of products or goods constituting the system of delivering the service, they wait for the customer to give the service.

A product can be produced to inventory and are made available off the shelf. Services cannot be produced to inventory. Consumption of a product can be delayed, services are consumed

as they were produced and delivered. Customer participation is minimal in the conversion process or the delivery process, but extensive customer participation. The conversion process requires many steps, many processes. Services required less number of steps usually.

Products are equipment intensive. Services are usually labour intensive. I say usually because they may also require lot of equipment. A telephone service may also require lot of resources. A computer information service may require also lot of equipment. But usually they are labour intensive. Products can be the quality of products are easy to measure, quality of services is difficult to measure.

The demand for product are usually important on a weekly, monthly, annually or seasonal basis. But in services because the system is hourly, daily and weekly fluctuations are also important. The market served in a product could be regional, national or even international. The markets served in industries are local. Manufacturing units for products can be very large to take advantage of the economies of scale.

Service units are very small to serve local markets. The manufacturing units are located in relation to the total market. Total market means not only local market but also regional, national, international and even the input market, the labour market, the material market, raw material sources and things of that type. Whereas, for service it has to be located near the local market.

So, we see that there are sharp distinctions between products and services. The main distinctions being that products are tangible whereas, services are not tangible they cannot and they get perished. The system delivering the service there the products are to be consumed and there are other things that we just now talked about. However, whenever a product is given it gives a service.

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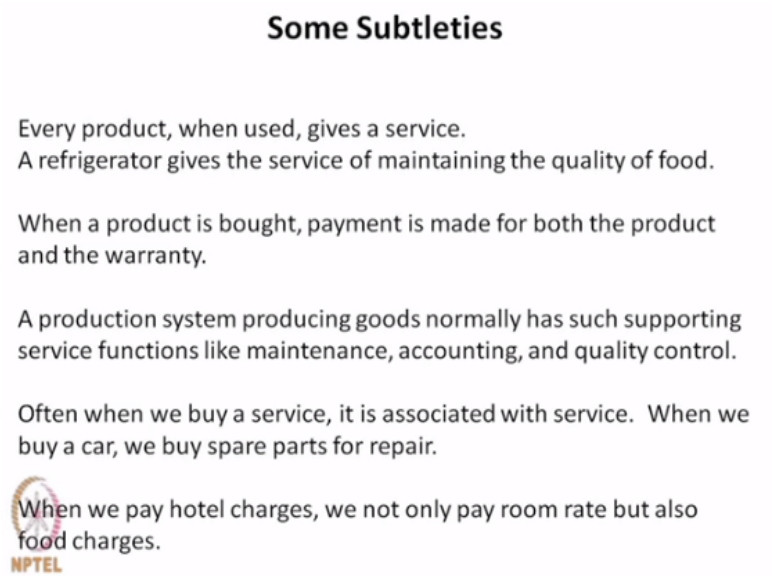

A refrigerator gives the service of maintaining the quality of food. When a product is bought, payment is made not for the product only but also the after sales service. For example, for warranty and even for spare parts we may make the payment at the time of buying it. Therefore, we not only buy the product but also buy certain types of services associated with the product.

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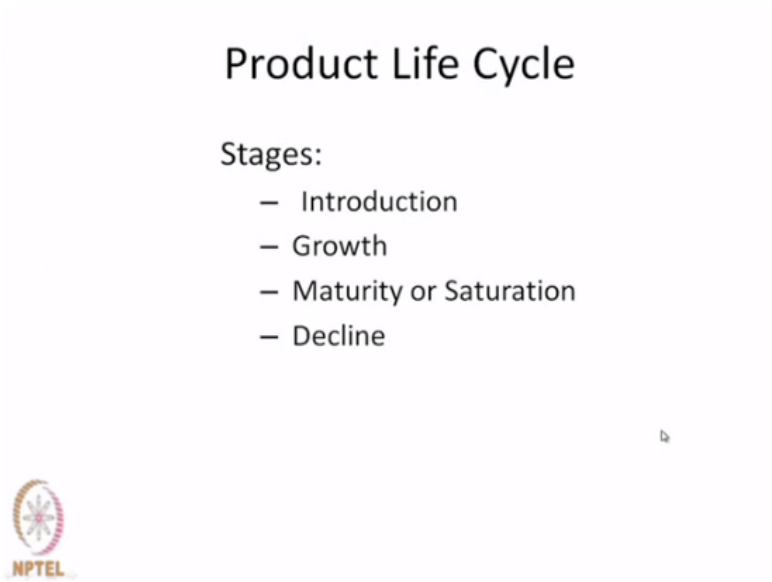

Now, we talk about a very important concept of product namely product life cycle. When a new product is launched then depending on its potential in the market and depending on the awareness about the product that a company brings in the market, the product enters the market, the sales increase but how long? It will depend on a large number of factors. Whether the product is intrinsically good?

It satisfies the requirements of the customer, whether it is available at a low price a reasonable price that can be afforded by the consumers and whether there are competitive products that give similar or better quality features at a lower price. So, depending on this the product sales will rise it may become saturated and after a while when a competitive product comes to the market then the sales may vary.

The company may lose its sale in that particular product and this is known as the product life cycle. It has naturally, usually we say that there are 4 stages associated with product life cycle. Introduction to the market that is introduction stage, growth stage, maturity or saturation stage and then finally the decline stage.

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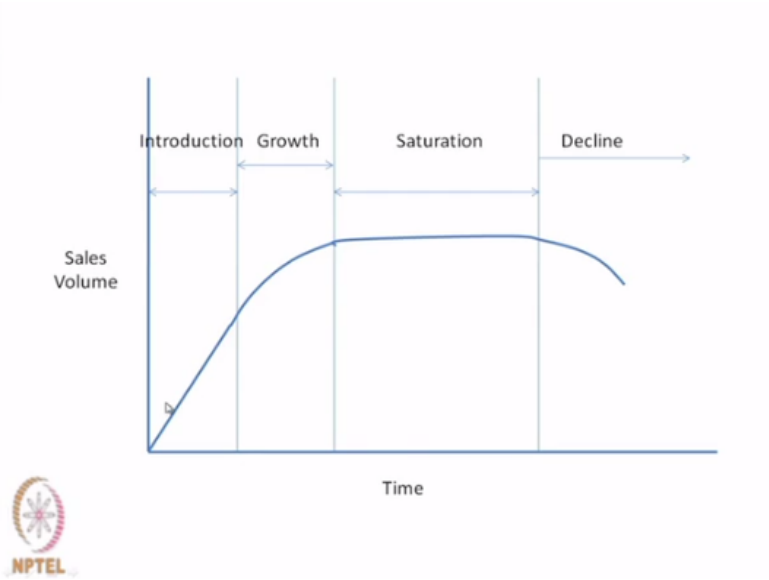

And usually it is shown in this form. The x axis is time, normally years and the y axis is the volume of sales. In this diagram the first part the introduction. Normally there is introduction is not so sharp. I would like to change this curve in a different way.

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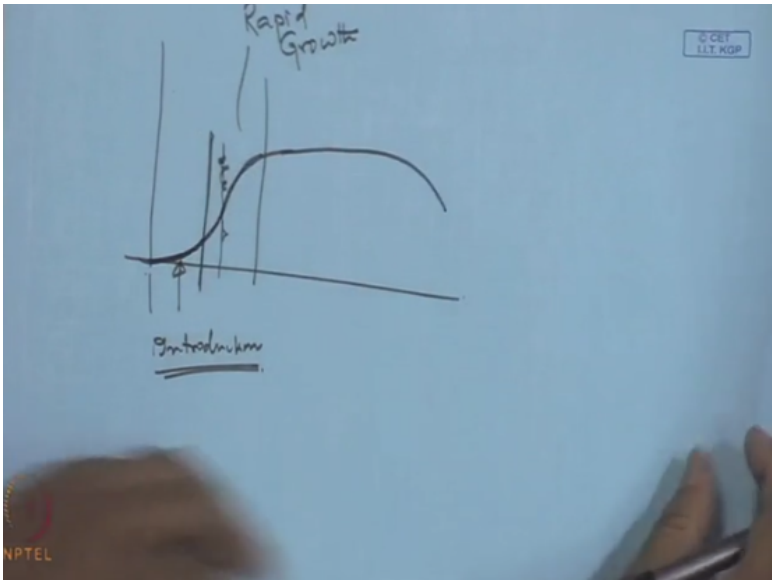

I would say that it goes up like this and then like this and then falls. So this is the introduction phase. The introduction phase is usually takes longer time may be up to this may not up to this may be up to this it is introduction and then there is a rapid growth phase. So, I would redraw it.

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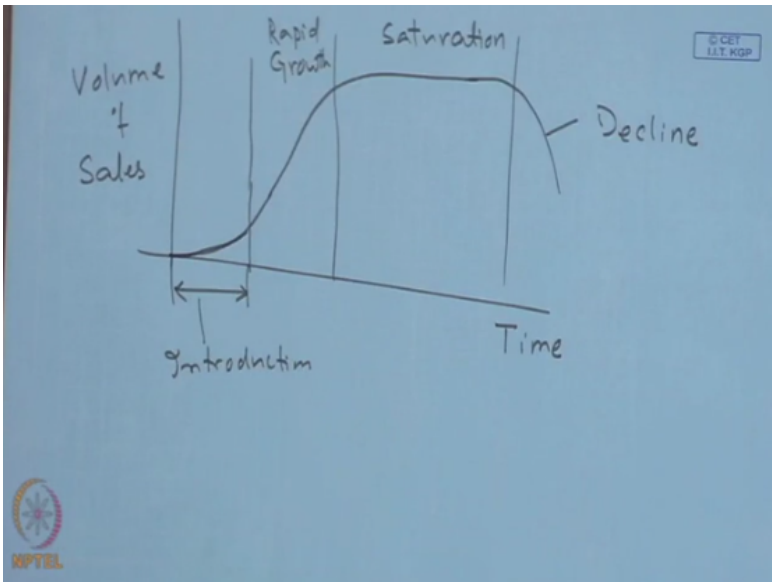

I would say that this is introduction, this is rapid growth period or growth space, this is saturation or maturity phase and this is the decline phase. This axis is time and this axis is volume of sales. So, what I am basically trying to say is that this aspect you should not take as a linear rise. It should look like this. So, basically it means that it takes longer time to get into the market and very slow rise in the sales activity.

This is the introduction phase, introduction of the product to the market. Once the features of the new product is understood by the market more and more customers are inclined to buy this product and therefore sales increase and therefore there is a rapid growth of sales of the company but finally as this qualities of the product are known by the competitors lot more competitors join and therefore the sales do not continue to rise.

It reaches the maturity phase or a saturation phase and then after a while when more products with newer features come to the market. There is a decline in the sale of the product. So, this is the product life cycle. Now, associated with each phase there are certain features that can be observed.

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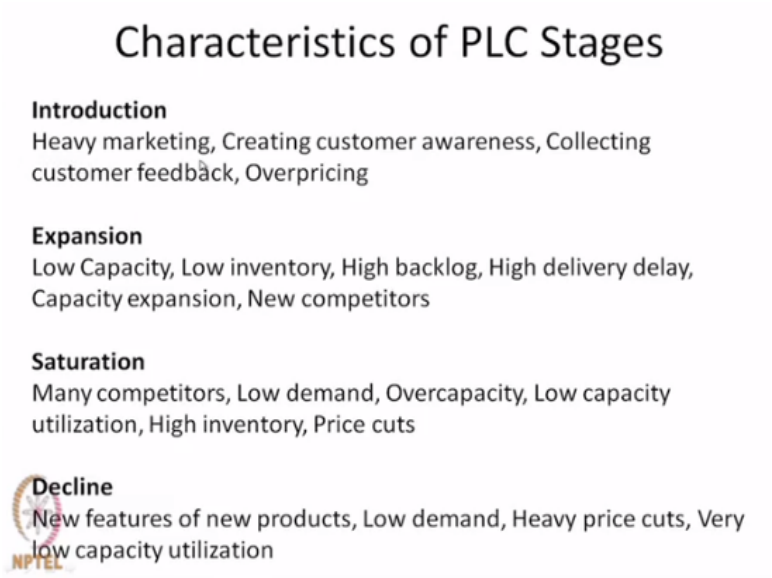

Naturally in the introduction phase what is needed is heavy marketing because this is a new product. One has to improve the customer awareness regarding this product that the company is launching and there has to be a lot of advertisement may be door-to-door campaigning, distributing palm lets or TV advertisements in TV and newspapers.

All these are required to create an awareness among the potential customers that a product with certain desirable features will be made available in the market in this particular time and at a price that is affordable by the customers. So, initial or the introduction phase is normally marketing activities are more financial involvement of the company is more. So, initial investment probably will be high initially.

Next we come to the rapid expansion phase. Provided that the features the quality features of the product are very desirable then the sales will rise in the market. So, that is the time when we will face a situation where capacity cannot be expanded in the way we would like it to be to meet the customer satisfaction.

So, this is a phase where we shall encounter low capacity, high capacity utilization, low inventory, high delivery delay because customer orders are piling up and we do not have enough capacity, we do not have enough inventory and therefore the time to meet the customer demand on the whole will rise. Therefore, more and more orders will be placed for capacity expansion.

And therefore our investment, funds required for investment will also be quite high. And this is also the time when the competitors will come to know about your product and they will also try to bring in their products with similar or even better features. However, only during the, when they succeed in bringing up new products then the sales of your product will become more or less saturated.

And that is the time when compared to the capacity that you will hold you will have less demand because you had already placed the order for capacity expansion hoping that they will get more demand but then in the saturation phase when capacity starts coming and you install them you find that you have more capacity than what demand you are getting from the customers.

So, this is a case of low capacity utilization because of low demand and high capacity and this is also the time when you will have more inventory than what you would like to have and naturally here you would like to cut your prices. Do lot of advertisements, do lot of sales promotion and also like to cut your prices.

Finally, you will have a time when new technology, new products, new processes with low prices and better quality features will surface may be by you or by your competitors. So, that the demand for this product may actually fall drastically all your efforts in price cutting and advertisement will not able to halt the downward trend of sales. Therefore, you will be definitely forced to stop production of this product.

So, this is the product life cycle and essential feature of any new product design, launching and manufacturing.

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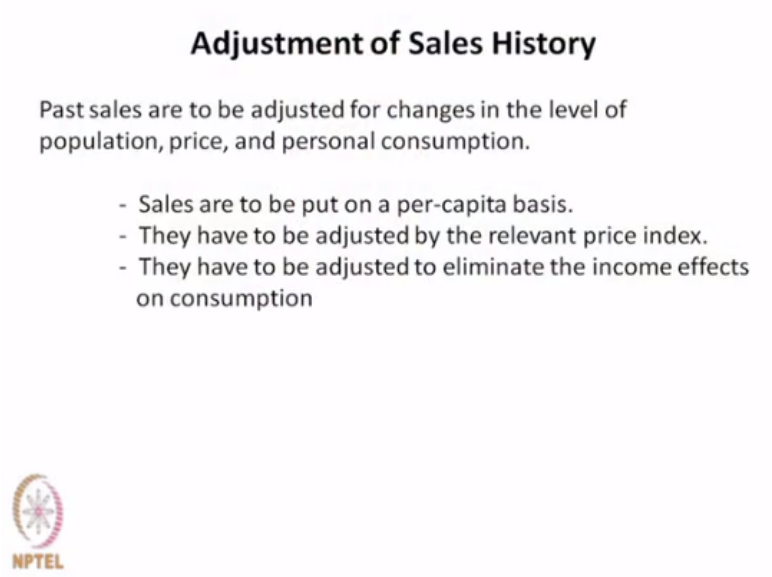

Of course, let me plot the y axis some method say that they have to be adjusted for 3 things. One is that they have to be put on a per-capita basis. Second, they have to be adjusted by the relevant price index and third they have to be adjusted to eliminate the income effects on consumption. Basically, these adjustments help one to know the real capacity of the company to be able to sell and real sales that are taking place.

Sales are measured by Rupees and therefore inflation effect must be taken care off. Income effects of the market should also be adjusted for and it should be calculated on a per capita basis.

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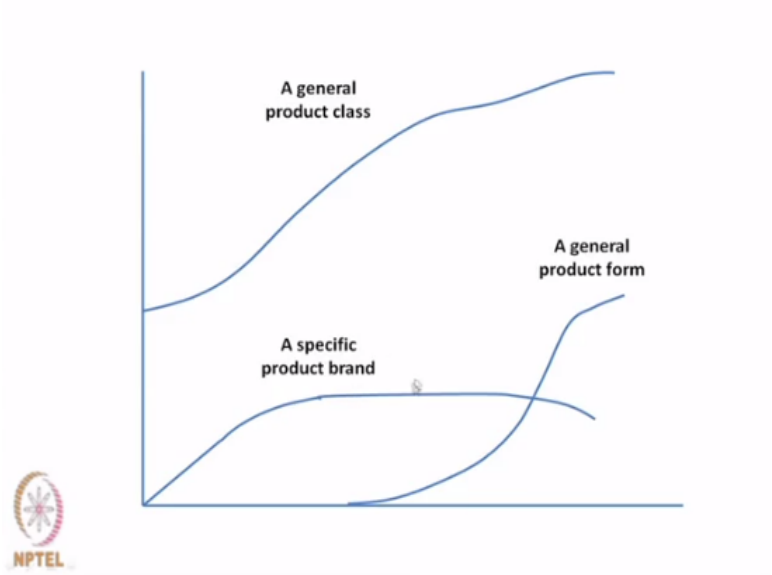

Now the same, what we had drawn earlier the diagram that we had drawn earlier is basically a specific product brand but then there can be a situation where a general product class can continue. Say for example, I talk about TVs in general. So, TVs will continue they will not actually decline so fast. TVs as a means of mass communication will continue for long but a specific brand like Konark TV for example may saw a rise and may fall and some other brand may come in its place.

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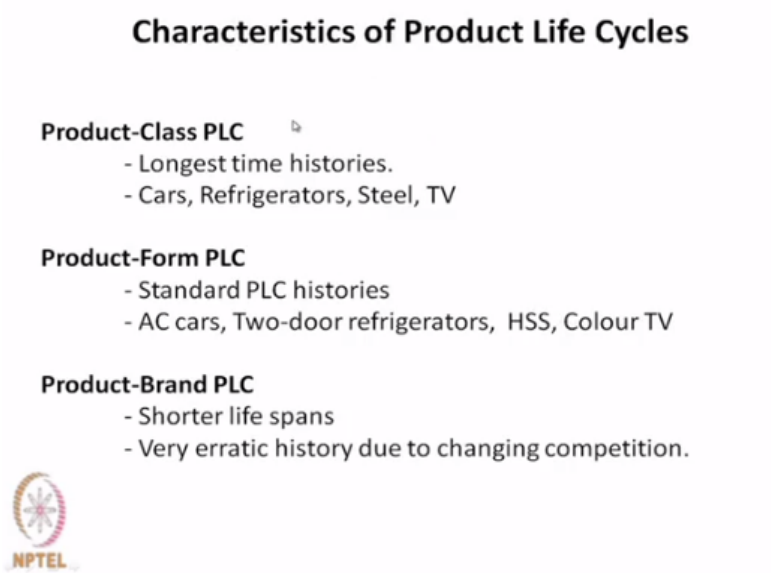

Now, there can be different characteristics of product life cycles. Product-class PLCs, product life cycle, Product-Form PLCs and product–Brand PLCs. Product-class PLCs are longest time histories such as cars, refrigerators, TVs, etc. Product-form PLCs they have standard PLC histories, just as AC cars, 2 door refrigerators, high speed steel color TV. And the shortest life spans belong to the product brands.

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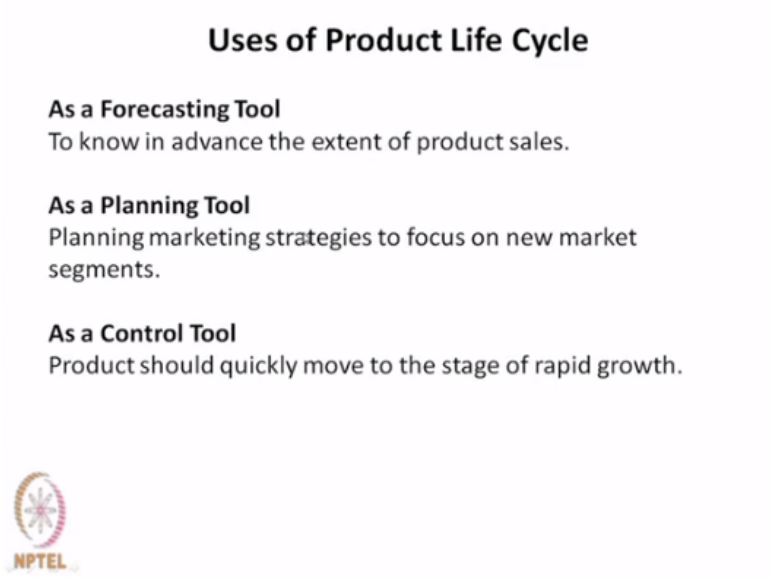

Product life cycles can be used in 3 ways as a forecasting tool, as a planning tool, as a control tool. As a forecasting tool it helps to know in advance the extent of product sales. As a planning tool it helps to plan marketing strategies to focus on new market segments. As a control tool it helps to quickly move to the stage of rapid growth from introduction.

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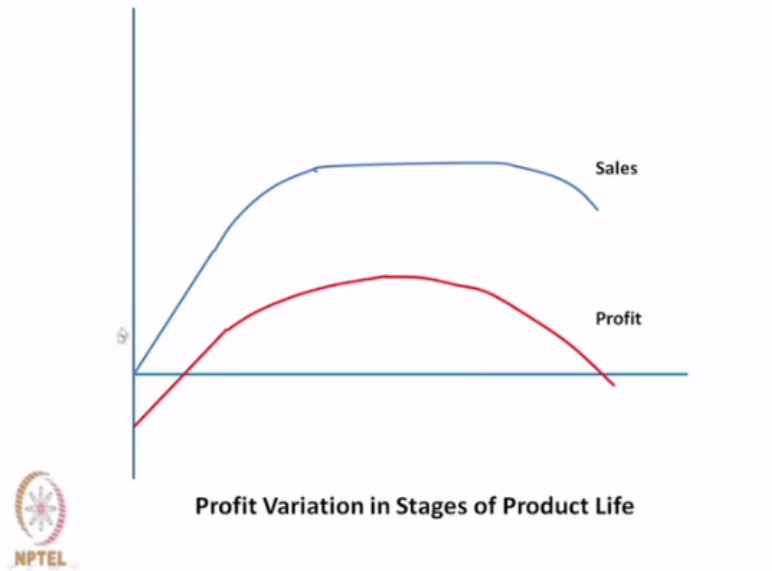

So, this diagram shows that how the profit goes up and down. Initially when there is an investment in the introduction phase profit is negative. Then profit rises reaches a maximum during the maturation phase and then slowly declines to become negative again as the sales decline. This red, the curve drawn in red shows profit variation.

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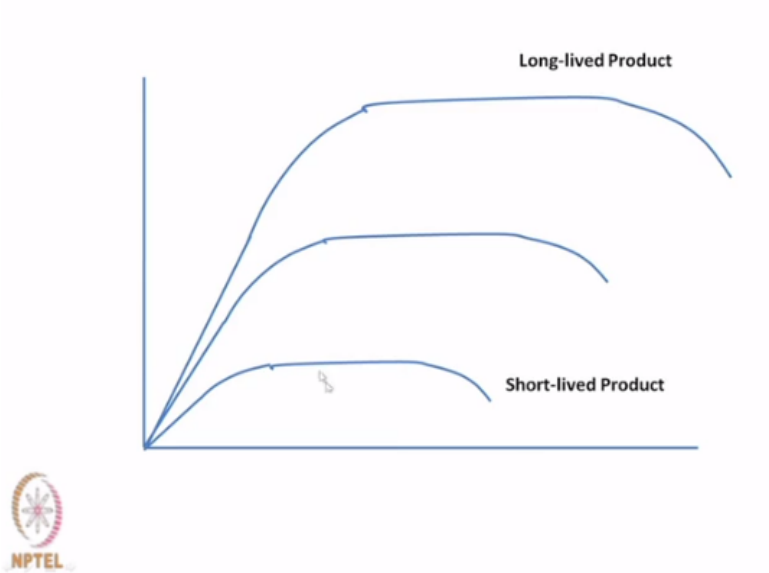

Now, here is a long-lived product. Here is the short-lived product. The product that has quality characteristics that are acceptable by the market to live a long life compared to one that is not so acceptant. It may have only a year or 2 life. Some others may continue for 5 to 10 years.

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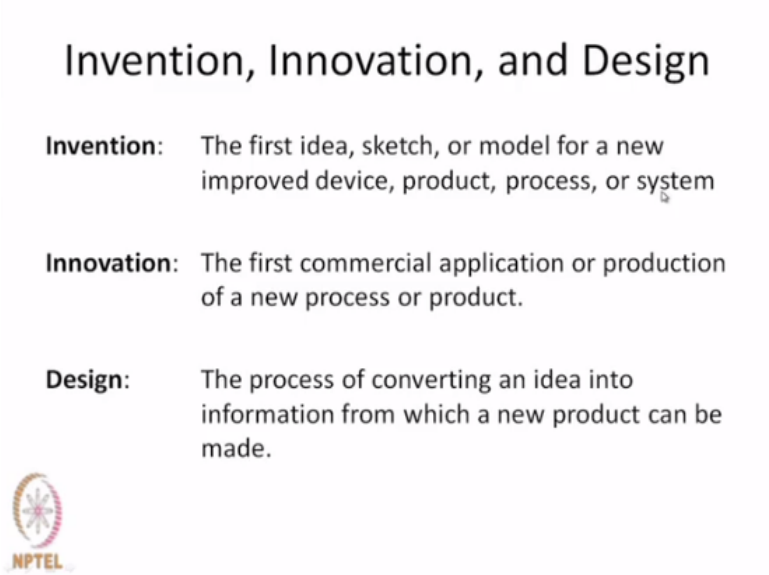

Now that we have discussed what is the meaning of products and services how they are different and what is the product life cycle. Let us study the process of designing a new product that is connected with 3 concepts, invention, innovation and design. So, let us first of all study what these 3 concepts mean to us. Invention is basically the very first idea, sketch or model for a new improved device product process or system.

Which is basically an idea or a sketch or a model or a product, process, system or device. Whereas innovation is the first commercial application or production of a new process or product. So, that is the stress of innovation is on commercial application or production. Whereas invention could just be an idea or a modular sketch. And what is design?

Design is a creative process of converting an idea into information from where a new product can be made. So, basically it is a new product that is innovation. So, a design is closely linked or bridges the gap between invention and innovation. What was an idea? Well it does not have to be always an inventive idea may be an old idea but converted into a commercial application in a new way is a new design.

So invention is something like a new idea about a device, product, process or system. Innovation is the first commercial application of a new process or product and design is the process of converting an idea into information such that a new product can be made.

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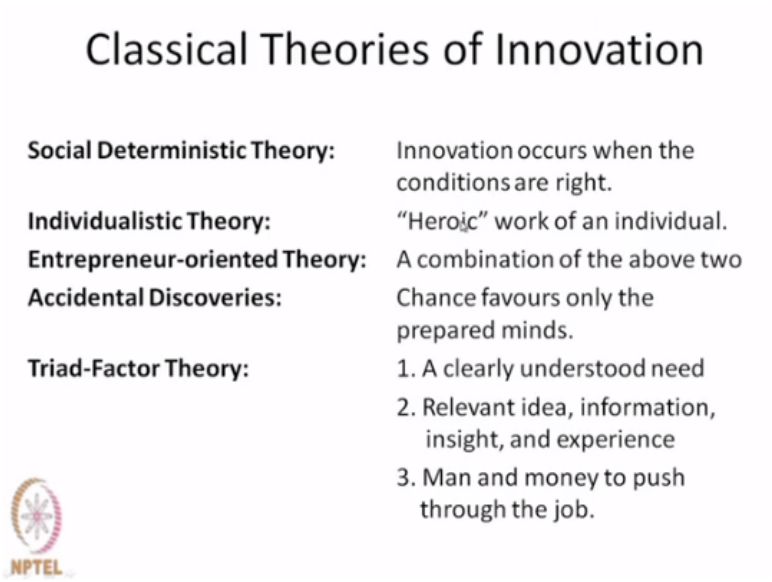

Now, there are different theories of innovation. Quickly let us go through it. First theory is Social Deterministic theory. It says that innovation occurs when the conditions are right, when the conditions demand it. Individualistic theory some heroic work of an individual. And on Entrepreneur basically combines these 2. Conditions are right and he works like a hero to develop a commercial product from out of an existing idea because there is condition are right.

Accidental discoveries chance favors only the prepared minds. And lastly the Triad-Factor theory there has to be a need, there has to be an idea and there has to be a person with enough money and willpower to convert that idea into a product so as to meet the need. Thus there are different theories of innovation, let us not dwell upon these theories greatly. Instead let us talk about how a new product development actually takes place.

There are again a few stages in the development of a new product. It starts as you know with an idea or with many ideas in fact that need to be screened out to look at their economic feasibility and commercial feasibility and technical feasibility and finally they have to be produced. But they have to go through the process it has to have many more intermediate processes for the idea to be transformed into a commercially viable product.

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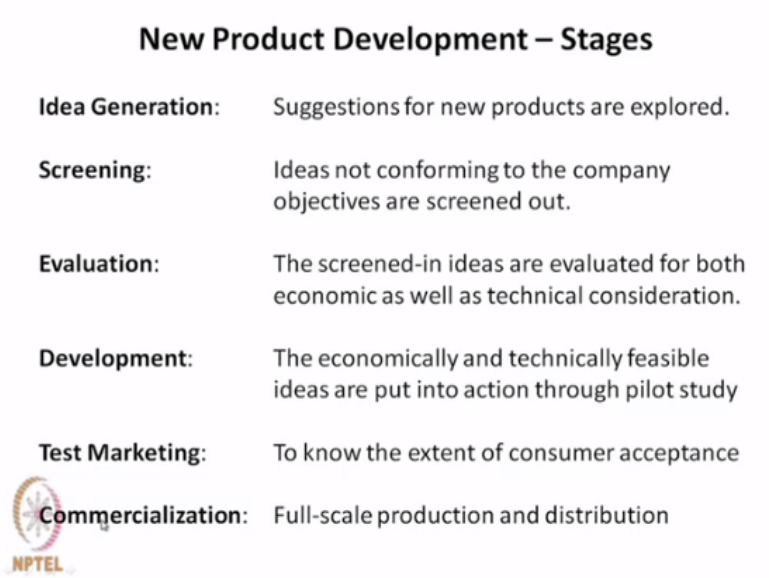

These stages are idea generation, screening of ideas, evaluation of the ideas, development of prototype for study of feasibility, initial marketing or test marketing and final full scale production. Idea is to be generated for that you need to have lot of suggestions for new products and they have to be screened out because the company objectives and the ideas may not be aligned with each other.

The remaining ideas need to evaluated on both economic and technical considerations. Then there has to be prototype or a pilot study to see the economic and technical considerations. And in an initial production should be utilized to test in the market how the consumers accept your goods and then final full scale production.

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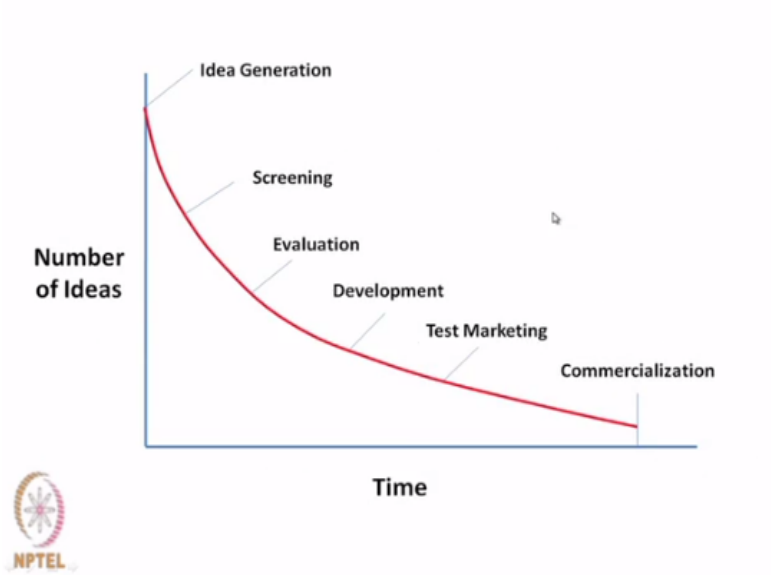

So, here we are showing how the number of ideas as time processes. We have large number of ideas here they are sprint out because of non-alignment of these ideas with the companies objectives. Further reduced when they are evaluated, further reduced when prototypes and pilot studies are made, further reduced when customers are not happy they may suggest new features to be introduced.

And finally the design engineers, manufacturing engineers may also suggest changes. Thus the number of ideas may be a few dozens in the beginning finally only one may emerge in this process.

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Thus, we can say the product design requires lot of inputs and there are quite a few criteria against which the design effectiveness of a design is judged and the requirements of

resources. We saw them in this picture. Inputs have to come from marketing department, who will actually do a customer survey and market survey and give input on what the customers require, what the market requires.

Because the functional requirements are given by the marketing department. The engineering or the design department converts that those ideas or those requirements into tangible products and production department actually manufactures the product. So, inputs come from 3 specific departments and the criteria for evaluation are both economic as well as user requirements functional.

Functional requirements is the usual requirement also at the same time there are aesthetic requirements of how the product looks whether it is nice, whether it is small, whether it is portable. So, these are aesthetic requirements and of course there are economic retirements such as rate of return.

The resource requirements, the need for money, capital, processes have to be designed, proper specifications of materials have to be designed. A proper organization has to be designed, who will do it, whose department will do it, what sort of departments they will have and any special skills required by the work force to do the developmental work. The manufacturing, the design and the development work. These are the estimated resource requirements.

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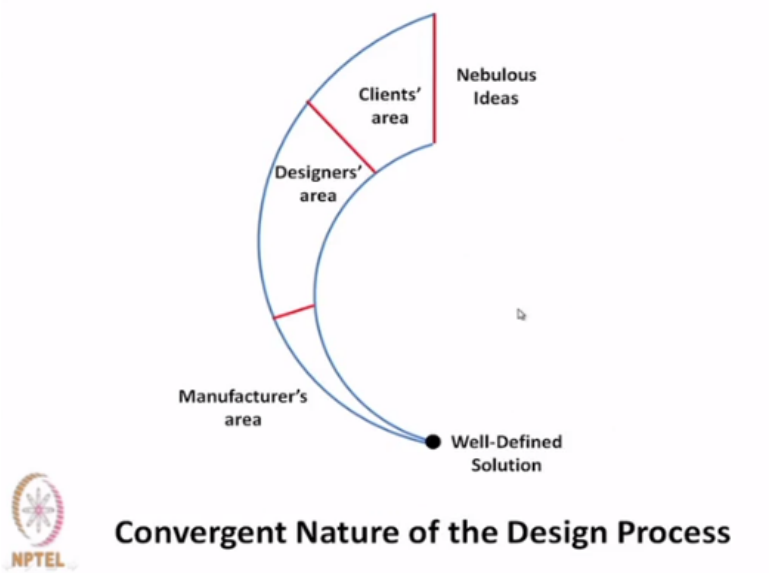

In this diagram, we show how once again the ideas which are many in the beginning coming from the customers, so the clients which are nebulous not well formed. Sometimes expressed in intangible things but it goes through this process of marketing, designer or engineering and manufacturing, finally a well-defined solution emerges.

So, this is how ideas from many converge finally to a solution in terms of a product or a service.

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Now, there are as you know 3 types of functional managers who are involved in the process. Managerial functions could be in this product development can be major managerial functions come from marketing, design and manufacturing. You will see that each one of them has got a separate one. Marketing department focuses on functional and aesthetic requirements as desired by the customers.

And it should complement the firm's general product line. It should boost the firm's image in terms of quality. It should increase the volume of sales. It should be price competitive and delivery delay should be small. These are the concerns of the marketing department. Production departments want that the process of production manufacturing process should be a simple process.

There should not be too many number of setups and with each setup long production runs to be made. Setup changes below so that their productivity increases. The process should be quickly installed and material should be available, raw material and skill should also be

available. Finance people of course wants that return in investments should be high and money should be available to make the investments.

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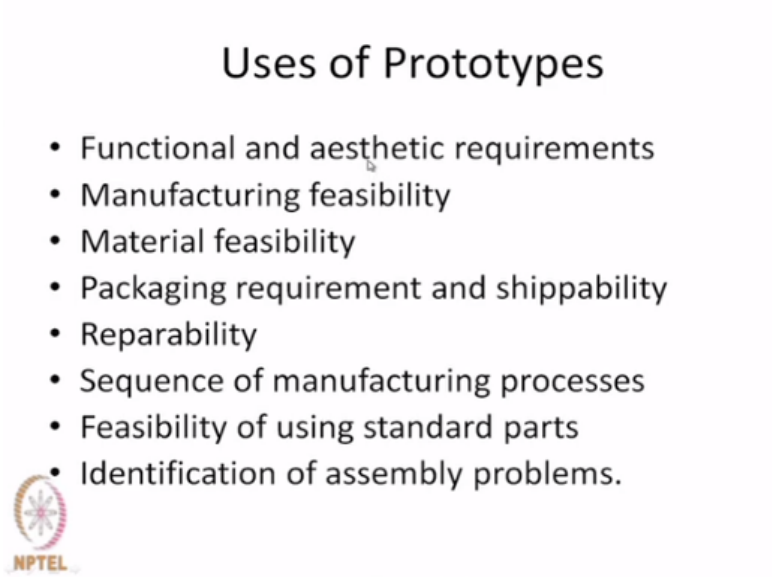

Now, when we make, when the company makes a prototype it looks for various things. Not only functional and aesthetic which are the most essential feature of a prototype but it also looks at the feasibility with regard to manufacturing, material, packaging and portability, reparability, sequence of the manufacturing process, feasibility of interchangeability of parts and it also helps in identifying the assembly related problems.

Prototyping is extremely important because here you can identify most of your future problems and if you can solve them it will help you in solving your future problems as well.

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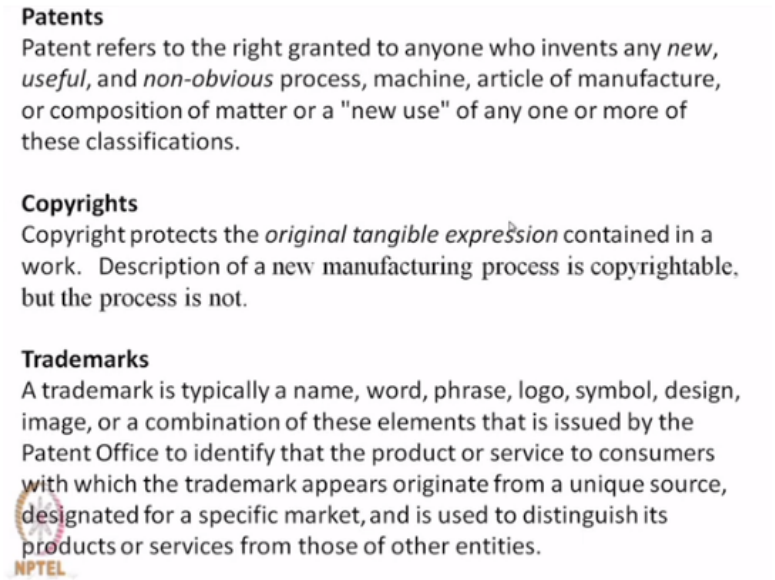

Next in the context of product development, we talk about 3 things. One patents, 2 copyrights and 3 the trademarks. One should understand what they are. A patent refers to the right granted to anyone who invents new useful and non-obvious these are the 3 key words, new, useful and non-obvious, process, machine, article of manufacture or composition of matter or a new use of anyone or more of these classifications.

You should be make it italic. New useful and non-obvious who invents this is also another key word, compare that to copyright. Copyright protects the original tangible expression whereas this, a process can be patented, a machine can be patented. The article of manufacture can be patented; the composition of matter a new matter can be patented or any new use of anyone of these 3 or 4 can be patented.

But copyright, an expression in the form of a word image is copyrighted. A paper is copyrighted, a book is copyrighted, a cinema is copyrighted. The description of a new manufacturing process is copyrightable. So, it is this expression which is copyrighted but not the product not the process itself. Trademark, a trademark is typically a name, word, phrase, logo, symbol, design, image or a combination of these elements.

That is issued by the Patent Office to identify that the product or service to customers with which the trademark appears originate from a unique source designated for a specific market and is use to distinguish products or services from those of other entities. So, what we are basically saying is that when a product, a new product is developed it is better that it be made it is patented in a particular country for a specific time period.

New process may also be patented. A new material can also be patented. And anybody else using it can be charged with doing wrong things, illegal things one can go to court against it. So, patenting is very much required. At the same time, we would like also to say that copyrighting is different from patenting. An expression can be copyrighted. Thus a book can be copyrighted. It cannot be patented. An idea can be copyrighted.

A trademark, sometimes a patent of a particular product to show that this product belongs to this particular company and for a particular market or a country and for a particular period. So, you might have seen TM being written this is unregistered trademark, R for registered trademark. They are like that.

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Next we will talk about 3 more issues that are relevant to product development diversification, simplification, product simplification, product line simplification and standardization. Diversification is basically increasing the variety of products manufactured by a company. If a company manufactures only one product it is possible that due to seasonality a company may not always gets sufficient orders to keep its resources in fully utilized condition.

Therefore, the liquidity position of the company may also fluctuate. So, in that situation if a company has got more than one product then probably the liquidity position, the sales position of the total sales, the total revenue of the company may not fluctuate due to seasonality that much. So, diversification is the process of multiplying product variety either adding new products or new model of old products lead to diversification.

Helps to capture new market, increases the total sales of products results in financial stability and most marketing department wants that the company should have a variety of products. But the manufacturing departments normally regret they are not happy because of the high cost of manufacturing, small lot manufacturing, large set ups and they are therefore not happy.

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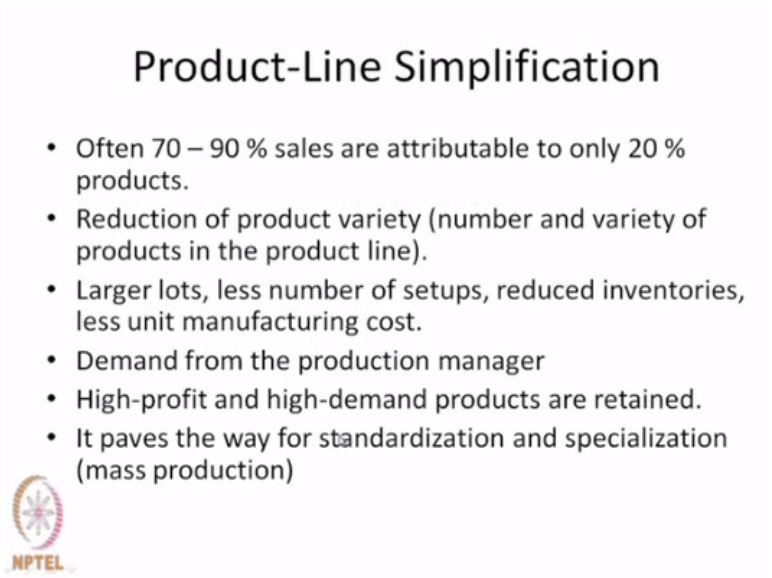

Reverse is product line simplification. A company which has got many products may find that sales, maximum sales take place only for a few products. The question therefore comes why not we reduce the product variety and that is product line simplification. Once we reduce the product line number of varieties of products we can concentrate on larger lots, less setups, reduced inventories and reduced manufacturing cost.

This is the demand usually put by the production manager. The high profit and high demand products are retained and the low profit low demand products are eliminated. Once you have less number of products produced in mass you can go for standardization and that is the next topic.

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Standardization involves establishment of technical uniformity. Normally it is possible to go for standardization in the maturity phase when the developments are more or less stopped. There are different types of standards, company standards, association standards, national standards, internationals standards.

Because of standardization there is an ease in specification and interchangeability of parts is possible resulting in reduced production cost reduced repair cost. It yields advantages of low cost production, higher quality and high substitutability but one should always review the old standards and new standards should be set up separately. It can also create skill, the creative skills of an employee.

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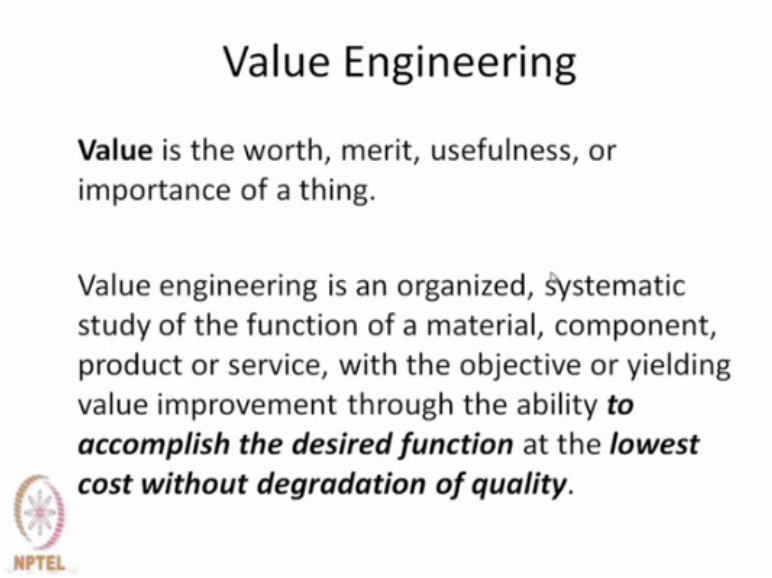

Last topic that we would like to take up in course of our product development is value engineering. What we mean by value is the worth, merit, usefulness or importance of a thing. So, how is it? How a thing, a product is useful to the customer? It is not just that at what price this usefulness has been derived. So, it is the worth / by the cost which is = value. So, if cost is low the value is high and if its usefulness is high value is also high.

So, in value engineering we try to give the same utility to the customer to the user for a minimum cost at a minimum cost. And that is value engineering it is an organized systematic study of the function of a material, component, product or service with the objective or yielding value improvement through the ability to accomplish the desired function at the lowest cost without degradation of quality.

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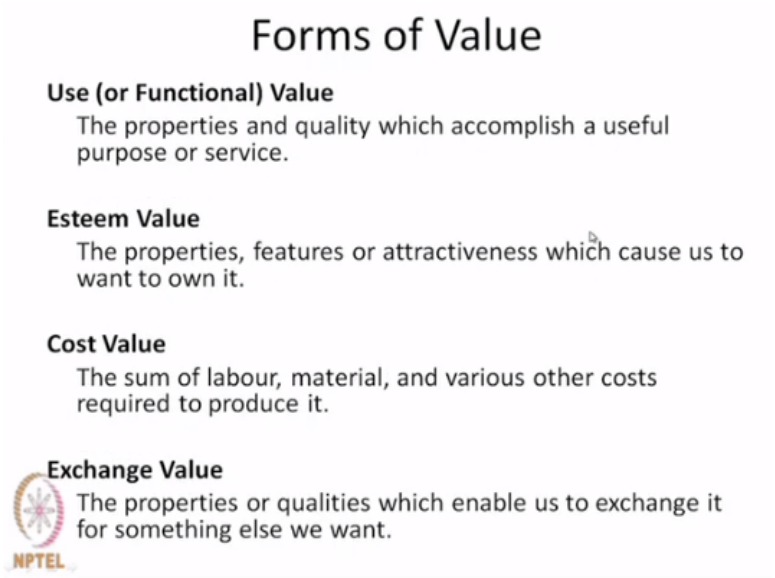

Now in this context, we can find 4 forms of value. The 2 most essential requirement of value of a product is its functional value or use value and aesthetic value. The functional value is the basic minimum function that is required of a particular product. Such as a pen, a pen should be able to write something on the paper that is the minimum requirement out of pen. But the aesthetic value would be what material it is made of.

So, the use value maybe only if deliverable by or within Rs.1 or even less. But we have seen a pen may cost more than Rs. 100. That is because it has many other aesthetic values given to it during the design and manufacture. Then there are 2 other types of cost value. One is cost value and the 4th is the exchange value. Cost value is nothing but the sum of the labour cost, material cost and other overhead costs required to produce it.

So, from the manufactures point of view cost value is important but from the users point of view it is the use value or the esteem value which is important but at the same time he pays for something and that is the exchange value. The properties or qualities which enable us to exchange it for something else that we want.

So, in any product design we should always build in the basic use value and try to put in as much esteem value as possible depending on the cost that it involves and the market to which the product is directed. These are the things that we should keep in mind. So, friends in this lecture we have talked about different aspects of development of a new product. So, first we discussed about the differences between products and services.

Then we talked about a very important concept of product life cycle and then we talked about different stages of product development and finally we talked about different other concepts related to product development such as patterns, trademarks and then finally diversification, product life cycle, product line simplification, standardization and value engineering, thank you very much.