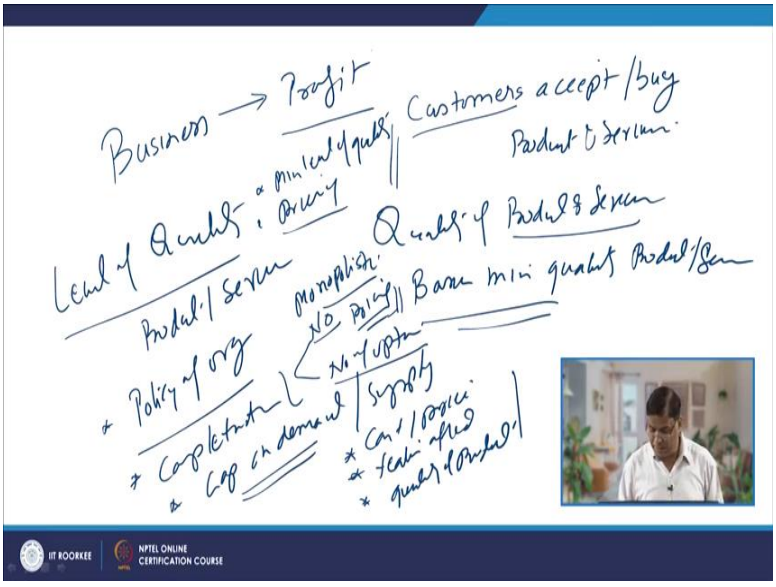
Principles of Industrial Engineering
Professor. D.K. Dwivedi
Department of Mechanical and Industrial Engineering
Indian Institute of Technology, Roorkee.
Lecture 53
Quality Control: Introduction.

Hello! I welcome you all in this presentation related with the subject, principles of industrial engineering and in this presentation, I will be starting a new topic that is related with the precisely control charts but it is more about the quality control or much bigger point is about the quality management.

So, under the quality management, we have quality control and one of the techniques is the control charts about which we will be talking at length later. First of all, we will try to understand the need of the quality products and services in businesses and how to understand the quality related with the products and services.

What are the things that constitute to the quality when we say that the quality of the product or the service is good or it is bad and if at all we need the quality products and services, then how to realise that. What are the approaches, which have been used to come up with the quality products and the processes and services so means we will be talking about the evolution of the quality and approaches for controlling the quality.

(Refer Slide Time: 2:04)



So, we know that, in any business, the profit is the ultimate goal and profit will be there only if whatever products and services being offered by the company in a given business. The customers accept/buy those products and services being provided by the company. If and this will be possible only if the quality of the products and services within the reasonable limit.

There has to be basic minimum quality in products and services for its absorption in the market, then only customers will be able to buy or will go for those products and services. So, acceptance of the customer to the products and services are important for absorption of these two things in the market and that will be happening only if the product or services have some basic minimum quality.

So, the level of the quality that is incorporated in products and services, that will depend upon the number of factors, like the policy of the organization which is the company is offering the like the kind of competition which exist in the kind of the gap in demand and supply, the kind of demand and supply situation. Just for an example, if the market condition is such that there is no competition, means the situation is monopolistic. In that case, the profit of the organization can be easily determined to the suitable pricing.

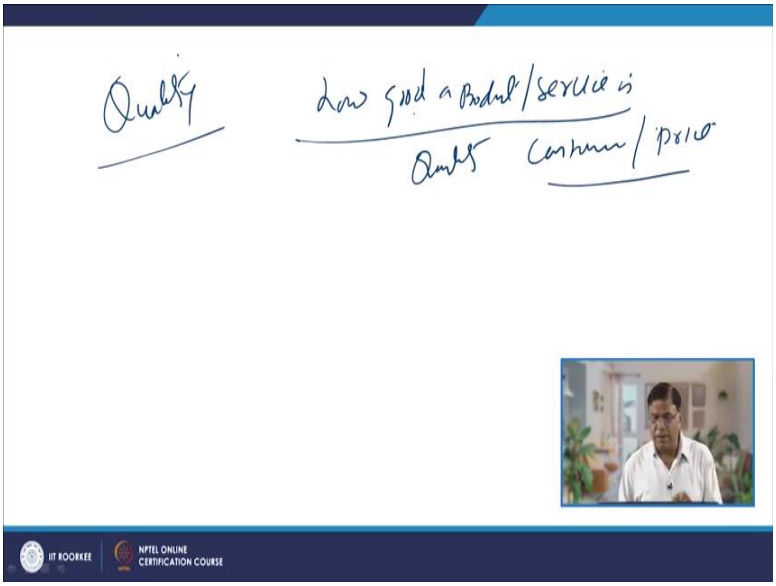
Since, there is no other competitor, so whatever it produces that will be sold in the market and so the price in that case will be determining the kind of the profit that will be earned by the organization. But, when there are many options available with regard to the product and the service, then not just means we do not have the monopolistic situation but extensive competition exist wherein the number of options are available for that kind of product and service which is been considered.

So if that is the case, then not just the cost or the price of the item will be governing the kind of quality that has to be incorporated but it will also be affected by the features being offered by the competitors. The price at which the competitors are offering the things, the quality of the product and services being offered by the competitors.

So, basically, the external factors significantly govern the pricing as well as the quality features that need to be incorporated in products and services if there is competitions. Further, if there is very wide gap in the demand and supply, so even the lower quality products can also be absorbed in the market if the demand supply gap is extremely wide.

So, to remain in the market while facing the competition from the competitors, it is important that the product and services are designed to have some minimum level of the quality as well as the pricing is also competitive so that the customers are attracted towards the products and services being offered by the company.

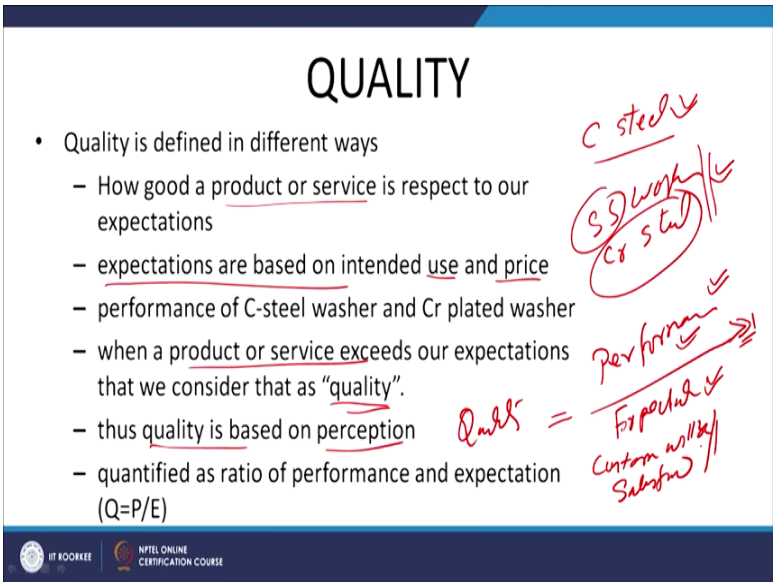
(Refer Slide Time: 7:38)



So to understand the quality, actually the meaning of the quality changes significantly with the situation like say, how good a product or service is, that determines the quality. But, this is a very general thing and who will be determining this? Of course, the customer who is user and paying the thing, so he is paying the price for.

So, for a given price of product and the service, if the customer is happy, then the quality of the product and service will be considered good otherwise, it will be bad.

(Refer Slide Time: 8:42)



So if we see, the various aspects like the way by which the quality is defined, like the quality is defined in different ways. How good a product or service is with respect to the expectation of the customer? Means, if the customer is expecting less for a given price, then he will become happier even with the moderate quality of product and service. But, if he is paying heavily for a given product and service, then his expectations from the product and service will also be high and therefore, the quality must be high.

So, expectations are based on the use and the price. If he is paying heavy price then his expectations will also be high. For example, if the customer is buying the carbon steel washer, then he will expect the moderate performance as compare to the stainless steel or the chromium steel washers. So, since that the materials are different, pricing will be different so then accordingly the chromium steel washer.

So, stainless steel/chromium steel washer's performances will be different than the simple carbon steel washer and accordingly the pricing will be different. So, the two different products will be offering the different qualities and accordingly the pricing will be different. A customer who is buying cheap quality product, he will expect the moderate performance but when he is paying heavily for a good quality product, then the expectation regarding the performance of the product and the service will also be high.

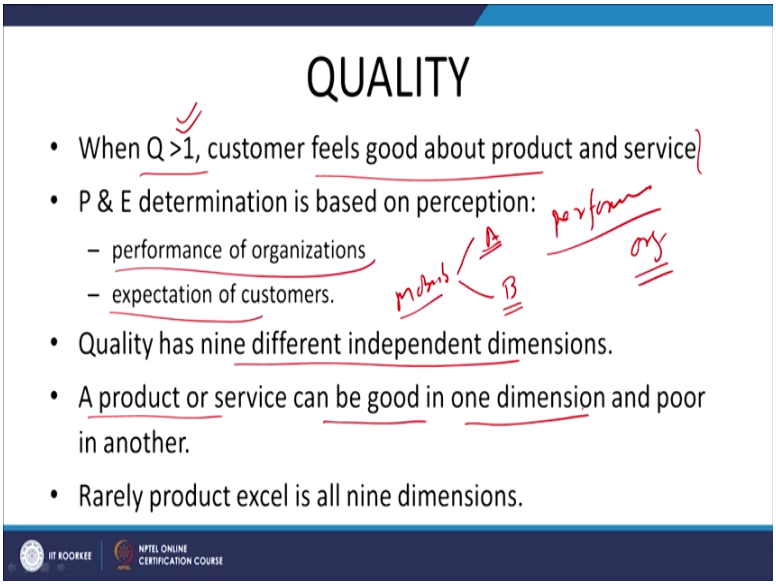
So, when a product or a service exceeds the expectations of the customer, then he considers it as a quality product. So, when a product or a service exceeds the expectation of the customer means whatever he is paying for a given product and service and he is getting much better performance he is getting delighted with the product and services which are been offered to him for a given price, then he will consider that as a quality.

So if the product and service exceeds the expectation of customers then he considers that as a quality product. So thus, the quality is based on the perception and perception means, there is no absolute way to measure the quality and although there are different parameters which can be used to see how good product or service is.

So, those will be termed as the dimension of the quality or quality characteristics. So, if you want to quantify them there is a very general term like the kind of performance of product a service is offering with respect to the expectation of the customer from the product and services. If the performance of the product and the service are higher than the expectation, then this ratio becomes greater than 1 and in that case, if the ratio like the quantification of the quality, if you want to do, then the ratio of performance and expectation, both are actually based on the perception only.

So if the performance of the product and service is better than expectation, then the ratio will be greater than one and in that case, the customer will be satisfied. Customer will be satisfied and he will consider the product and service as quality product.

(Refer Slide Time: 12:41)



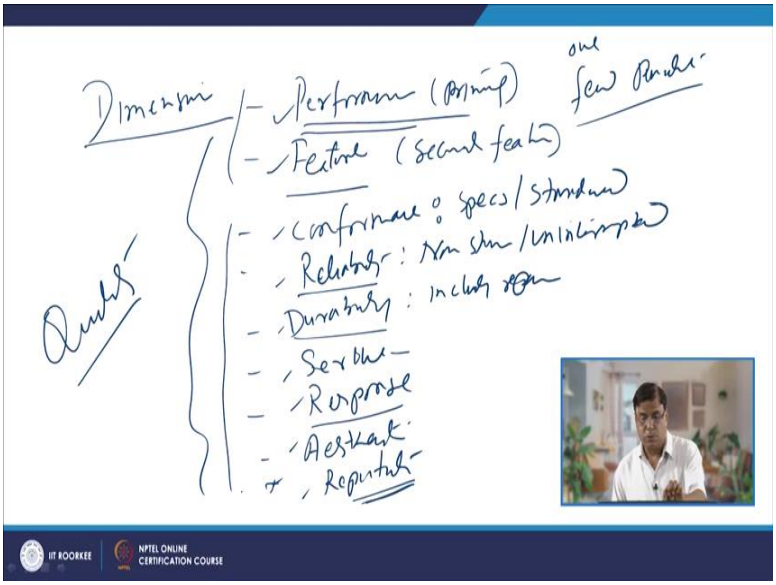
So when the Q the ratio of performance and expectation, is greater than one then he feels good about the product and the service and he will be going next time also for the same quality, same product again, if the quality of the product is good means this ratio is greater than 1. The factors, which are determining the performance, that depends up on the organization.

For example, there can be mobile phones of different companies. So, the people have the perception of even for the same specifications, one company may be offering like company A and company B. So, the two companies offering mobile phones of similar specifications but the people perceive that the mobile phone of company A are much better than company B and that perception is based on the way by which a particular organization creates its image in the public.

So, the performance is primarily determined by the organization. And expectation is of the customer. So, when the organization is doing extremely good to produce the good quality products and services then the performance will be high and for a given price, if the customers are getting also good quality products, then their expectations will be met and in that case the quality will be greater than 1.

So as I had said, there are different characteristics of different dimensions of the quality and those dimensions will be determining the way by which the quality can be seen if you want to check the quality of the product or service. Product and service can be good can be good. Since there are number of dimensions of the quality so that the product or service can be good in around in one of few dimensions while it may poor with regard to other.

(Refer Slide Time: 15:12)



So, really we will find that the product is good in all the dimensions. What are these dimensions or independent parameters of the quality with regard to which we try to see the quality of a product or service? The first is like the performance. When a product is delivered to the customer, how good it performs during the use. The second is about the feature. So this is basically the primary purpose. Whatever is expected from the product that function, it should perform in any case.

The feature are like the secondary functions or the secondary features. Features are about like the additional features, which are being given in a product. For example, in a car, there can be AC, there can be automatic transmission system, there can be music system. Those are the features only. Primarily, the engine should work and it should give good mileage for the fuel.

So the performance is for the main feature or the primary function and features are about the secondary functions, which will increase the comfort and increase the functionality of the product. Then, there the conformance. Conformance is about that how good a product or service is close to the specification or quality, which has been committed. With respect to the specifications or standard, how good or how close a product is.

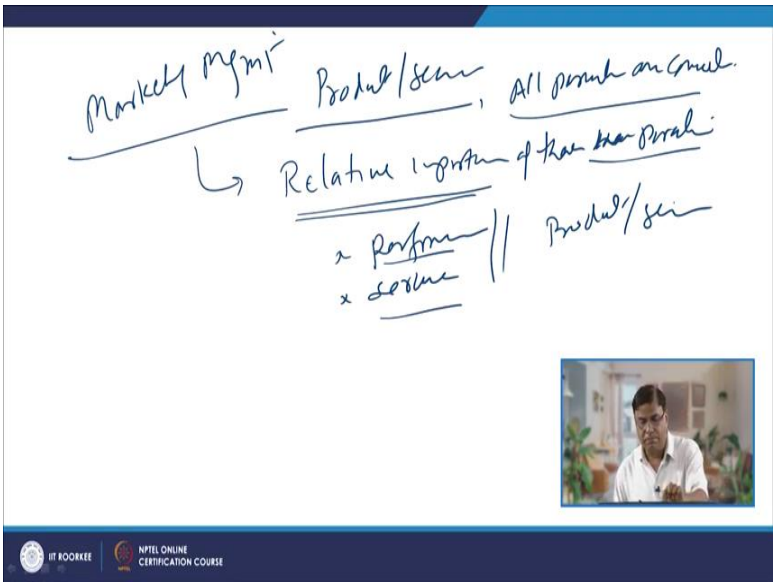
The next is the reliability. How long a product will perform consistently without break? So, that is about reliability. Durability means, including the repairs, how long a product can be used during the service? So, it includes including repair. This is non-stop or uninterrupted performance. How long or the period for which the product delivers the uninterrupted

performance that indicates the reliability and like say, what kind of service, after sales service will be available.

So, service after the sale for regular maintenance that is available. Then the response, like whenever there is a problem, how the company responds to the grievances or issues related to the product or service. Then there is aesthetics. It is all about the looks or the appearance. How good a model or product or how good presentation of a service is. Then there is reputation. That is about the kind of ratings, the different rating companies giving rating to the products. So, the kind of rating of the kind the perception of the users feedbacks, reviews regarding the product and the services of a particular product or service.

So here, these are the nine different dimensions as I have said related with the quality. Also, quality of a product or service can be asset using these nine independent parameters. Product or service may be good in one or few parameters while it may perform very badly on other parameters. So, efforts are made to improve the quality of products on all nine dimensions.

(Refer Slide Time: 20:00)

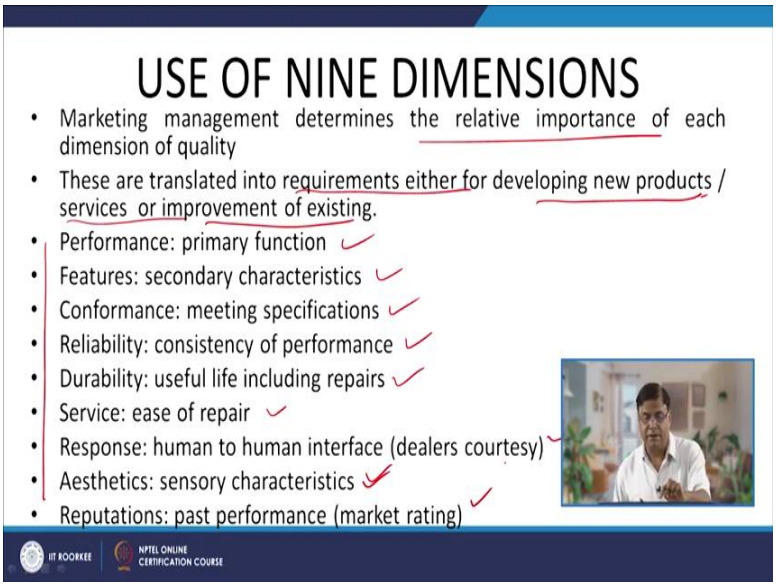


So, that was about the dimensions of the quality and how it is used like say, the marketing people, marketing management for a product or service. They will consider all these parameters, all nine parameters are considered. Since, it is not a good idea to work on all components in one go and to come up with very good quality products and all parameters may not be equally important.

So depending upon the type of product and the type of service, the management will be looking into all these nine parameters, then they will identify the relative importance of these parameters, whether reliability is important, whether performance is important or does the features are important. So, which factors is important and there can be continues change in the relative importance of these parameters.

So, the management will be working on the relative importance of these nine parameters and based on that so, it will prioritize basically, these parameters, say if the performance and the service are coming at the top for as desired by the customers, so then the management will have to look into these two, performance and service related aspects more seriously than the other parameters so that the product and the service can be improved accordingly for increased saleability and increased absorption of the product and the service in the market.

(Refer Slide Time: 21:50)



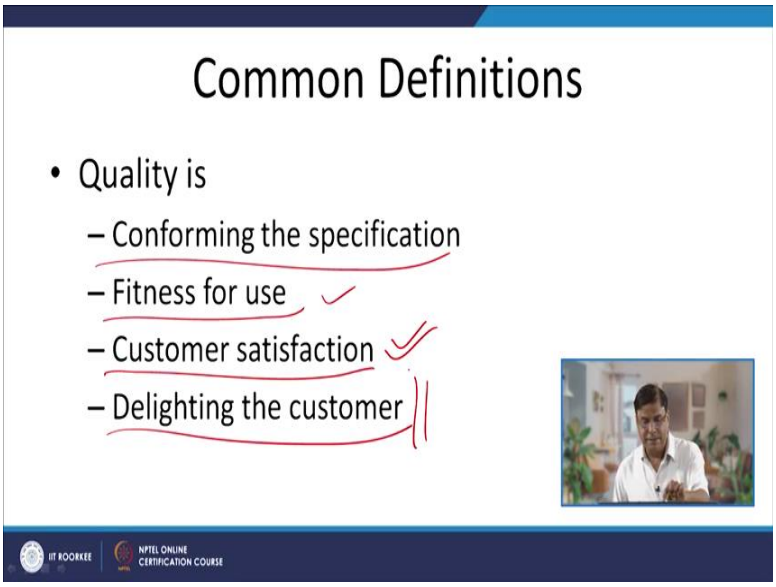
So that is the purpose of doing the study of the nine dimensions like the management determines the relative importance and then these are translated into the requirement for developing either new product or service or improving the existing one. Based on the relative importance we will find out really what can be done for improving the existing one or to come up with the newer products.

So, as I said, the nine dimensions, these are the nine dimensions. Performance is related to the primary function. Features are about the secondary characteristic. Conformance is about the meeting with specifications. Reliability is about the consistency in performance, non-stop performance, uninterrupted performance and durability is about the useful life including

repairs. Service about the ease of repair and how effectively issues related to the product and service are addressed.

Response is about the human-to-human interface, the courtesy of dealer. Aesthetics characteristic is about the sensory characteristic. How good a product looks. And then reputations is about the past performance or the market rating related with the product and reviews of the customers.

(Refer Slide Time: 23:08)



So, there are the different definitions, which have been given for better understanding of the quality. The one is like, “quality is defined as the conformance to the specification.” Different people have given the different definitions. So, one definition is like quality is the conformance to the specification. A product, which conforms to the specifications, will be considered as a quality product and another definition says that a product or service, which is fit for use, can also be considered as a quality.

So, the degree to which a product or service is fit for use that is also considered as a quality. The next is the customer satisfaction. When a product or service that is able to satisfy the customer requirements, then also it is termed as a quality product or service. Another one, it is not just the customer satisfaction but delighting the customer. Coming up with the products and the services, which will make the customers happier, exceed their expectations so that the customers are delighted, that also is termed as quality.

So, the quality is about the conformance to this specifications, how degree to which it is fit for use, the making the customers happy and satisfied and coming up with products and services which will delight the customers by exceeding their expectation. So, those were the definitions related with the quality.

Now, we will see like what are the various approaches, which have been developed so far for maintaining the quality.

(Refer Slide Time: 25:11)

So, here it starts with the Operator quality control. So, in the beginning, when very few units were being manufactured by the individuals or small group of the individuals. At that time, the quality of the products like the blacksmith, the carpenter, the painter; how good—even now these people, it will depend upon the individuals who are working on to provide a service or to come up with a product. Even now also, when the person is working at individual level or small group of people is working to produce a product or service.

Even now also, the quality to a great extend depends upon the individual. So, that is about the operator quality control. Like, the person who is dong the electric ironing of the clothes. So, how good the work he is doing that will depend upon that individual only and he will dictate, he will determine what quality of the work he is doing.

Then, as far as the industrialization is concerned, up to the 1900, there were individuals or small groups of people, which were working in the organization to produce goods and services, and at that time, the operators were solely responsible for the quality. Gradually,

with the increase in industrialization, increase in the number of products which were being manufactured, mass production came into picture.

So the number of workers increased and in that case, the foremen used to give responsibility to come up with the different products that the workers under him were supposed to work in. So in this case, mass production concept came in where the products were produces partially by the individual workers. So, one worker was not solely responsible for producing a particular product but the work was been done at the different stations or at the different department.

Like say, one work—one product is been processed to these four. So, in this case, the worker one was not aware of like at the end, what quality of the product will be produced at the end. So, this led to the loss of motivation because he was not really what quality of the product will be coming at the end. So, there was a loss of motivation due to the because he was not in position to accomplish the complete work in the case of mass production. In this case, the foreman was given the responsibility to see that he is doing the right methodology, right tool to produce the quality work.

Thereafter, with the further increase in the number of workers and the volume in the units which were been produced. The inspectors used to come on the shop floor then they will check the quality of the products which are been manufactured randomly and then they were given the job to see really if they used to find the defective products and those defective products were used to be separated and the reworking and repair used to be done.

But this was also leading to the number of rejections and excessive reworking. Thereafter, around 1942, only the SQC, Statistical Quality Control, approach was developed by Shewhart in US and these two professors, Deming and Juran, they gave number of lectures in Japan on the SQC and the people in Japan appreciated the efforts of US people on the Statistical Quality Control and they implemented first in Japan for better quality products.

Later on, the quality circle concept came in Japan which is more about the participative style of the management, where people at the different level, groups or the circles of different people were made to look into the problems been faced by them so that they can find the solution and come up with the kind of steps needed for improving the quality.

Then the total quality control organization concept was brought in where all the people were made responsible to produce the quality products and services. Thereafter, Statistical Process Control, Total Quality Management and Design of Experiment came in late 80's and then ISO 9000 and ISO 14000 came in. these are about the quality assurance and ISO 14000 is for environment management system.

Now, I will summaries this presentation. In this presentation, I have talked about the need of having the good quality products and services. What are the different dimensions of quality? And what approaches have been tried? And how the evolution of the quality control methodologies have taken place. Thank you for your attention.