Production and Operation Management
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Lecture 37
Modern Quality Management and Total Quality Management

Welcome friends, In our last session, we discussed about development of quality management, particularly the role of services in the quality management, what are the different dimensions which can affect the quality of services. We also discussed about determinants of quality, that quality starts from the design, and then after sale support can also help you in providing a better quality of the product.

So, it is not simply limited to production function which is responsible for the quality. We discuss that, how quality is a collective responsibility of top management and various other functional activities which include your procurement, which include your designer, which include your service provider. So, so all of them are involved in making a quality experience. So, it is not simply the quality management of the productive rather, as a customer I want to have a quality experience from the product.

So that experience is only possible, that I have good experience when I am using the product, when I am going to retailer and I am purchasing the product what kind of behaviour is done with me, when the product fails, how quickly the service centre people respond to my query, all these things put together help in making a sound experience, a quality experience for the product.

So, we have, you can say evolved the concept of quality, which was earlier limited to product only, but there are large number of attributes around the product which help us in defining the quality, and all those things we discussed in our previous session. Now, we in the last of that session, we discussed that what will be the consequence of poor quality. If quality is not good, the cost of your production system will increase, the productivity of your system will go down, your liabilities will increase, and as a result of all these things you will start losing the business.

So, the consequences of poor quality are very severe. No organization, no organization can dare to think that organization can survive with low level of quality. So, this is such a competitive era. And earlier, we were thinking that if you are going to have a good quality, you have a competitive advantage, but nowadays good quality is no longer an advantage. We

expect that there has to be a level of quality. So, we all assume that all products are providing good quality products, but how you are able to provide some additional features, how you are able to provide, or how much you can exceed my expectation.

So, I know that whatever products are available in market, they are going to fulfil my expectation. But now the question is coming, whether you are exceeding my expectations or not. So more you exceed my expectation, more quality products you are. We all use Gmail, a very common service we all have for email purpose. Now, Gmail gives 15 GB free space for our email purpose. Now, we all have assumed, with this 15 GB there is a enough space, so we all assume that Gmail is a free kind of service we are using.

But our expectations are continuously, that if any new feature is coming in Gmail that has to be free of cost and that is what is happening also. So, our expectations are continuously increasing day by day. Now, same is happening with any other product. Earlier you were going to a hotel and normally you go to a hotel for stay. So, we used to give extra payment if we want to use the internet facility in a hotel, but now wi-fi facility is part of your basic expectation.

So, our basic expectations are continuously increasing and the service provider, the products need to make themselves to fulfil all our extra expectations. So, in this particular context, quality has become a very, very important discussion and the meaning of quality is more important that, how you are going to define the quality. Now, after understanding the basic premise of quality management.

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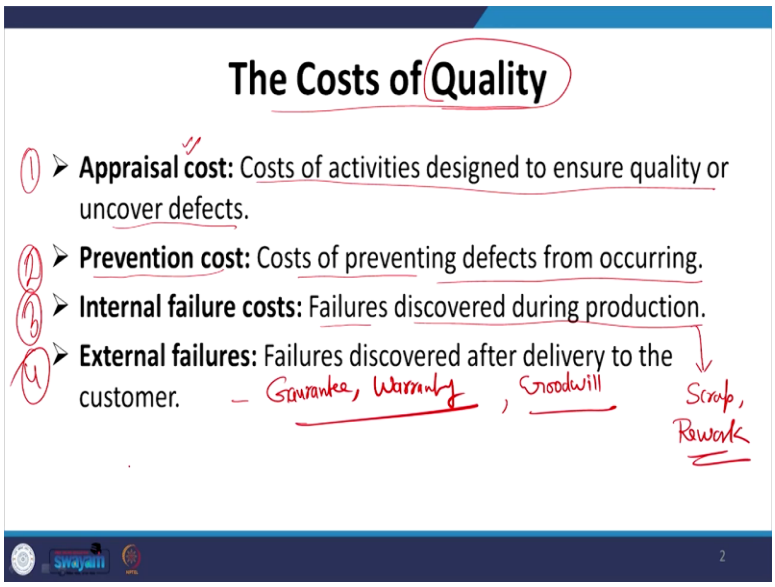

Now, we are going to discuss the important concept of cost of quality. There are 4 different types of cost of quality. And these are mentioned here, the first is, the appraisal cost. The appraisal cost, is the cost of activities designated to ensure quality or uncover the defects. Now appraisal means, evaluation. So, for evaluation of your products quality, you will put various quality inspectors, they will check the quality of your finished products, and they will ensure that the defective product should not go to the market.

So, that is the appraisal cost, that more number of inspectors you are going to put they will ensure that none of the defective piece, none of the defective product go to the market but that will increase your appraisal cost. So, it is a very important decision that how many supervisors, how many gazes you are going to have for checking the quality of your end products. More number of people, more sophisticated gazes you are going to have, these things will ensure that no defective piece go to the market. But whether it is justified or not, that is a important decision you need to take.

The second is the prevention cost, you are developing the capability of your systems in such a manner that defects are not occurring, you are preventing defects from occurring, so you can do things on a more sophisticated system. For an example, for defects not to occur, you can replace human power, the man power in your shop with robots. So, there is a welding operation and some personnel are doing that welding operation.

But because of personnel involvement, it is possible that there are some cracks in the welds and out of 20 weld, maybe in 2 on an average, there will be cracks. So, to remove those cracks, you thought that I have to check the quality of weld and in those appraisal, we realize that there are 2 defective welds, on an average. So now, those 2 defective welds should not occur, you replace those human, those welders with robots, now robots are doing the welding work.

So, that is cost of preventing defects from the occurrence because installation of robots may be much more costlier, than the cost of those defects itself. So, that is going to include in your prevention cost, that what you first you are doing for preventing the defects to occur. Then the third is, internal failure cost. Now internal failure cost is, failures discovered during production. When production is happening at that particular time some checking is happening and as a result of that you realize, that some defects have occurred and now that will go to scrap, that will go to rework.

So, some rework, some scrap generation will take place and that is going to add into the internal failure cost. Though, it is good that you have identified the defects the within the system, so the scrap or rework can be done easily. But it is also possible, that you may not be able to detect during the process and then it may result into external failure cost or external failures. When the product has gone to the customer, when you have sold the products to the market and when customer is using the product, then some defects surfaced out. And as a result, you have the offers of guarantee, you have warranty.

So, in that guarantee, warranty kind of offers you have to either replace the product, or you have to repair the product. So, and also it may affect the goodwill of the organization. Because if your products are coming faulty in the hands of the customer, it is certainly going to impact your perceived quality dimension. We have seen in our reports that sometimes some company has recalled so many number of vehicles because of some faulty emissions, some company has recalled so many number of mobile phones because of poor battery, some company has recalled vehicles because of poor steering designs.

So, many such examples we keep reading in newspapers, where large number of products are recalled because of these external failures. So, these are the different types of costs which are directly associated with the quality. We have to develop a good quality management system; we need to develop a good quality management system which can minimize all these 4 types of cost. We have to minimize the appraisal, prevention, internal failure, and external failure cost because any of these cost will actually going to increase the cost of our production.

And one another important thing is there, that we are going to discuss. Normally people say that if you are going to produce a quality product, if you are going to produce a quality product the cost will increase, the cost is only going to increase because of these 4 things 1, 2, 3, 4. Maybe for a quality product, you think that I have to invest seriously on prevention and appraisal cost, I need to have very sophisticated machine, and I need to have more rigorous inspection of my end production, so this will increase your 1 and 2.

But is it justified? We need to have good process capabilities, so that we can make better products where appraisal is not required, we need not to have more sophisticated machines rather, we should increase our process capabilities which can help us in giving the desired level of conformance. So, these cost of quality are very important guiding principles, so that we can continuously monitor that whether our quality management system is moving in the

right direction or not. Sigma of all these cost should continuously go into the lower side or in the negative direction.

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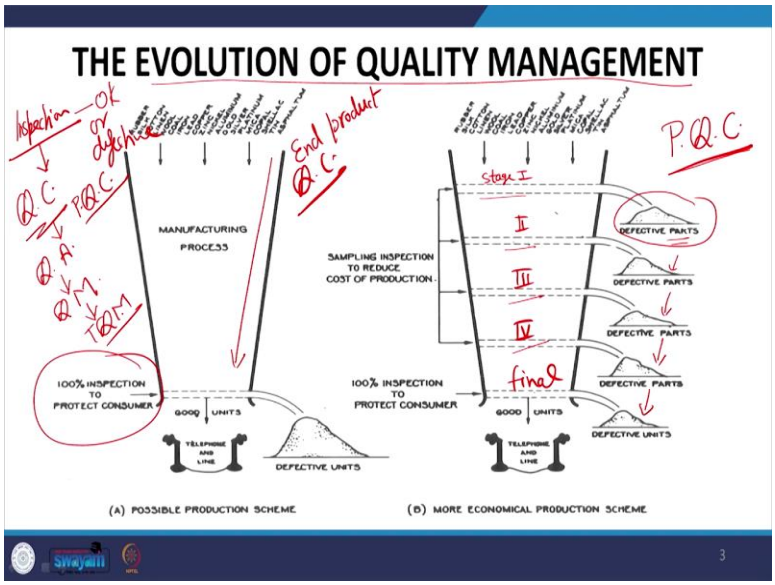

This particular diagram is going to help us in understanding the evolution of quality management. The quality management initially started; the concept started as 100 percent inspection of the final products. Whatever products you are making, so the inspection of that product was the idea of quality management.

So initially, the quality management was simply the inspection, that was the original idea of quality management that at the end of the line there used to be an inspector, and that inspector used to inspect the final product if it is okay, it goes to the market, if it is not okay, it goes to the scrap or rework. So, that is, inspector use to say okay or defective. After that era, after that initial era, we started the system of quality control and where the system of process quality control came into picture, that is shown by the second diagram where we are having process quality control.

Here in this case, only end product quality control is taking place, that entire manufacturing process is happening from here to here, and only at the end you are checking the quality of the product. But here in the process quality control, what is happening that at different stages, this is let us say stage 1, this is stage 2, stage 3, stage 4, and final. So what is happening, you are not adding. If you understand this diagram properly, you see that because you are not doing any intermediate quality check, so you are adding value to these defective parts also, these defective parts are also having the value addition.

And therefore, unnecessarily you are incurring extra cost because which is already a defective part at the first stage itself, you are still adding value to that. So, that value addition is consuming your resources, and it is not going to pass the test of the time and therefore, you need to identify defective pieces as early as possible in the production process. So, at different stages we are doing some intermediate quality check and that intermediate quality check is able to determine the number of defective pieces at that particular stage.

So, the value addition is only taking place in a filtered manner. Those products which have caused a particular stage and at that stage if the products are okay, only in those products the next value addition is being done. So, your value addition is only done in the actually passed the products, so the cost of production process reduces, here the cost of production process becomes very high. So, the next part of quality evolution is the quality control where we started the system of process quality control, that intermediate quality control is being done.

Then after that, many of us believed that C is not a good word because control gives a kind of feeling that somebody is giving some kind of authoritative in this particular field. So, people thought that what can be a better word, so the concept of quality assurance came into existence, that we are assuring the customer that this product is going to fulfil your expectations. So, we are now moved to from quality control to quality assurance and whatever is desired that we are assuring.

Over a period of time, more thinkers came into quality field and they said, we can manage the quality because we do not require those things in our product which are not needed by the customer. We have to be very, very particular that we only, that level of quality which is required by the customer and that way we will provide products within the budget, within the expectations of the customer because before that the believe was that with more quality, cost is going to increase.

So now the concept came of quality management, that I am not only assuring but I am able to manage the quality, as per the changing requirements of the customers. Then people said, before this particular time from inspection to QC to QA to QM, quality was mainly the responsibility of the shop floor people. But then people said, it is not the responsibility of the shop floor people alone.

If purchase people are not able to supply good quality of consistent raw material, then how will you produce a quality product, if after sale service people are not able to maintain the product properly, if design people are not able to design the product properly how the

production people will deliver the quality, and for all these integration of various functional activities a proper directive from top management is required.

So then, quality was considered to be a very pervasive activity which is to be followed right from the top to the lower level. So, the concept of QM became as TQM, Total Quality Management, that all the people in organization, in all functional areas, at all levels are collectively responsible to provide quality products to the customer. And it became a very popular philosophy in the quality management, that how quality is now not restricted to production, but it is a very, very wide scope activity in the entire organization.

And many people like me, they say that TQM is a philosophy that how to run your organization. This is the guiding principle of TQM, so it is less of tools and techniques, it is more of mindset, it is more of how you conduct the business. So, that is the approach which is guiding my quality management discussions in next few sessions. Now, once we have understood this evolution of quality management that how we have moved the from the period of inspection to total quality management.

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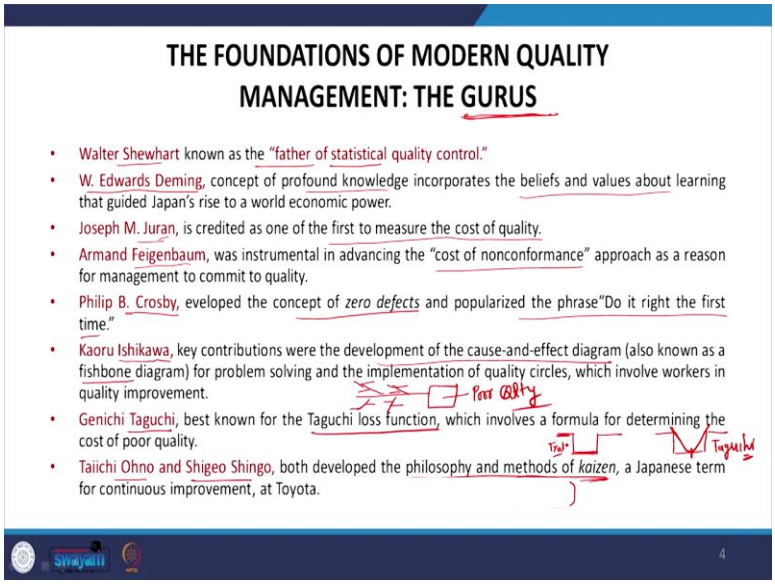

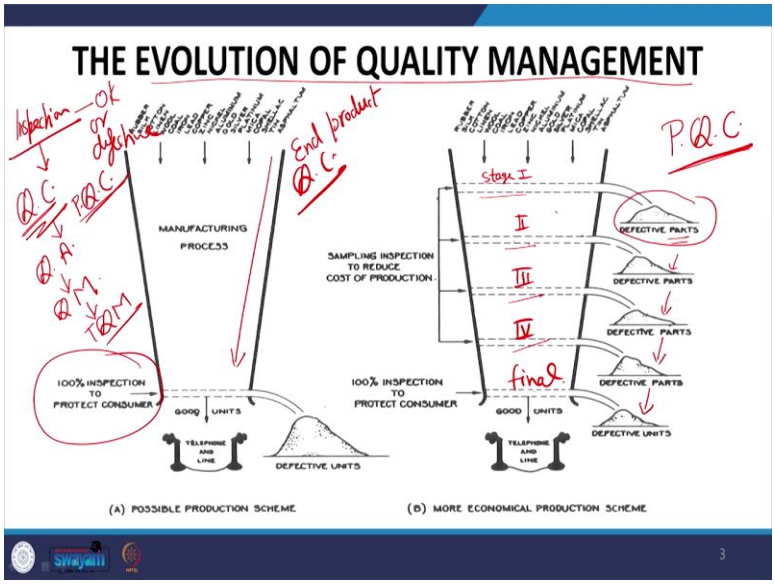

We will see the contribution of various quality gurus, those thinkers, those practitioners who gave important concepts in this journey of quality, we call them quality gurus. Though guru is a Hindi word, but it is well accepted in the quality management literature, that people who have contributed in the development of quality management they are known as, quality gurus. So here, in this particular slide we have some important names of quality gurus and we have also given the important contribution of those quality gurus.

So, one important name in this list is Walter Shewhart. In our discussion, we just discuss that quality control through process quality control, in this process quality control how much sample we should take, because at different stages you are taking the sample, what should be the size of sample, how to evaluate the sample, and how to take inferences from the results, all these are done based on statistics or you can say based on principles of probability.

So, inclusion of principles of probability and statistics in quality control was done by Walter Shewhart. And because of his immense contribution in bringing probability and statistics into the field of quality control, he is known as father of statistical quality control. The second important name is, Deming. It is a very, very important name in the modern quality period and he is basically, an American but his most of the work was done in Japan and he also gave some very important beliefs and values about quality management.

And Deming's principle, we will discuss in more detail also, because there is a list of principles which Deming has prescribed, so we will see that what are the contributions of Deming. And just to give you an idea that in recognition of Deming, Japan government started Deming excellence price and that is given every year by the Japanese government for

those organizations which have done exceptionally well in implementing the concepts of quality management, as proposed by Deming.

And because of Deming's principles, which were adopted by Japanese organization, Japanese industries gave tough competition to American organizations. Then another important name is the name of Juran, he proposed a very detailed handbook of quality management. A very detailed, voluminous contribution came from Juran and he is also one of the father figure in the development of quality management principle, and he was one of the first person to measure the cost of quality. So, in that particular direction, the Juran's contribution is highly regarded.

Then another important name is Feigenbaum. Now the Feigenbaum was particularly known for his work, in the area of cost of non-conformance. And as a result, he mentioned or rather he emphasized that why management should focus or commit towards the quality. We discussed in our previous session, the consequences of poor quality. So, some of those consequences of poor quality are influenced by the work of Feigenbaum.

Then, another important name to be mentioned is Philip Crosby. And Philip Crosby, wrote a book known as quality is free. That is a very important book, interesting book also, you can read it, quality is free. And he evolved the concept of zero defects, if you have zero defects then he says, that quality will be free. And he also popularized the phrase, do it right the first time. He says that there is no trail, whatever you do right from the first time you have to do it correctly.

So, you need to have a very good plan and when you are executing the plan there should not be any scope of mistake. And that is a very, very interesting concept again from Japan about the quality management. Then Ishikawa, we will discuss about Ishikawa's contribution in detail in our coming sessions; where he developed a very specific type of quality control tool which helps us in identifying the various reasons for our poor quality or defects.

So, this is known as cause and effect diagram and sometime it is known as Ishikawa diagram also. And other popular name, which is used in our day-to-day discussion is fishbone diagram because of the shape of this particular diagram is like this. So, this is poor quality and these may be the causes of poor quality, and causes of poor quality are related to manpower, machine, material, method, etc. So, if these things are contributing that may result into poor quality. So, Ishikawa's this fishbone diagram is another important contribution in the quality management.

Then Taguchi, he is a very recent phenomenon, that Taguchi also gave a very important, you can say change to the quality discussion. In earlier, we were having either a product is acceptable or a product has to be rejected. So, we were talking only in yes or no. If it is acceptable, there is no cost of quality and if it is a rejected product, then there is a cost of quality because of scrap, or rework, or guarantee, warranty, etc.

But Taguchi said, no it is not true, as you are moving from the mean values the cost of quality starts coming into picture. So, he gave the concept of Taguchi loss function, that as you start deviating from the mean values, the customer has to pay additionally for the deviation. So it is, earlier was like this kind of step function, that either there is a cost or there is a no cost. But Taguchi says, no it is not like this, Taguchi says it is like this.

As you are moving from the mean value, this is the mean value, so you are not incurring any cost quality here, but as you are moving away you start incurring the cost. So, this was the traditional view, and this is Taguchi view. So nowadays, lot of research is happening that how to actually get to your mean values of your specification. Earlier we were taking advantage of tolerances, some limits were given to us, so we used to take the advantage but with the theory of Taguchi, our focus is now becoming more on mean values, because that gives you the lowest cost of quality.

And then Taiichi Ohno and Shigeo Shingo, they are also very important contributor from Japan and they developed the philosophy and methods of kaizen, this is a Japanese term which means, continuous improvement. So, you can continuously improve the quality of your processes, you can continuously improve the quality of your products. So, we need to work in an environment where continuous improvement is our driving philosophy.

And that is demonstrated by them in Toyota, which is an epitome of continuous improvement. In many other organizations, this kaizen is being followed. In India is, in India also every year we see that some of our organizations receive the Deming prize because of successful implementation of kaizen. So, you continuously evolve your organization, so that these organizations are now performing better, and better, and better continuously and that is nothing but kaizen.

So, these are some of the important quality gurus, who have contributed immensely in the development of modern quality management principles. For some of them we will be discussing in more detail in our coming classes. So with this, we end this particular session. Thank you very much.