Quality Design and Control
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Lecture – 02
History and Evolution of Quality Control and Management (Contd.)

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Ok so our, I am going to discuss the next sub topic under history and evolution of quality control and management. From ancient times to present era quality in ancient times, quality in medieval Europe and quality in the present era, one thing you must have you know must know at this stage.

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That you know the importance of quality is not an new issue and since time immemorial quality has been a serious concern in all that mankind has developed and used. In fact, the quality of civilization when you talk about we say that what is the quality of the living standard of the people, the quality of the products, the quality of housing quality of roads and the this awareness regarding the importance of quality it is not a new one, it started with the onset of human civilization, but so before we refer to various kinds of tools and techniques we use under quality design and control we should be very aware of that how the quality the concept of quality used to be perceived in the ancient times and then say from the ancient times we will be referring to the medieval ages and then we will be referring to the present era.

Mostly the post 20th century onwards and you will find that this the quality has passed through certain evolutionary process and as a student of quality we should be aware of. So since time memorial quality has been a serious concern in all that mankind has develop and used as I have been telling you and it has been a constant endeavor of any culture of society to design and develop the finest piece of quality in all walks of life.

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So, and there are 100 such the creations and they are referred to as in the history of human civilization, they are referred to as the finest examples of quality. So, I will just to high light a few one there are numerous such examples like, pyramids of Giza in Egypt this is an wonder in fact and how could you design and manufacture such a product, high roads and sculptures of roman empire hanging garden of Babylon these are the first examples of quality when there are designers there were quality experts they were manufactures, so they have created all this systems or the unique examples of quality.

Great wall of china this is not hall it is a stage it is a great wall of china Ajanta paintings the Shiva temple at Ellora, Borobudur Buddhist temple at Java Indonesia these are the examples Angkorwat in Cambodia, Taj Mahal at Agra and many more. So, you are all aware of you know the such creations, whenever you make a visit to any place so you see many creations and the in 100 such cases these are the finest examples of quality.

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Now, this continued for say 1000 years 2000 years, now when you talk about the medieval Europe. So, European organizations European systems has contributed since the days of renaissance a lot to the field of quality, so in renaissance Europe in 15 16 centuries during 14 to 17 century exactly there had been finest paintings in architecture developed, craft guilds where formed in fact initially when they started creating quality products or quality systems you know it was the response for creating quality it was responsibility of one individual, so he used to be the designer he used to be the manufacturer and he used to be the seller of the products all in one.

Now, subsequently when the demand increased what actually you need to do that means under that utilage under the guidance of one such quality experts, now the many you know the persons are to be trained and in medieval Europe accordingly the craft guilds where formed, guilds where apprentices used to be on trained on quality of carpentry painting cloth washing tanning machinery etcetera. So, you know so this is very unique you know I should say in an in today's contexts like, we have industrial training institutes, we have you know many kinds of test has been carry out where you know we try to build in skills among the persons who are motivated among the work man and all those so and so this is a must in fact, so without having skills how can you produce a quality product so there are and obviously for creating quality product you need human liver so the skills are very important.

So, the craft guilds where formed in during the medieval age, a so many centuries back and you know in the craft guilds use to have a positions like apprentices, then the journeyman and the master in craft guilds is it ok. So, this is and their focus a had seen all through say why do not you become a good designer and if you become a good designer we expect that you will be a quality expert in course of time there are many such examples in fact.

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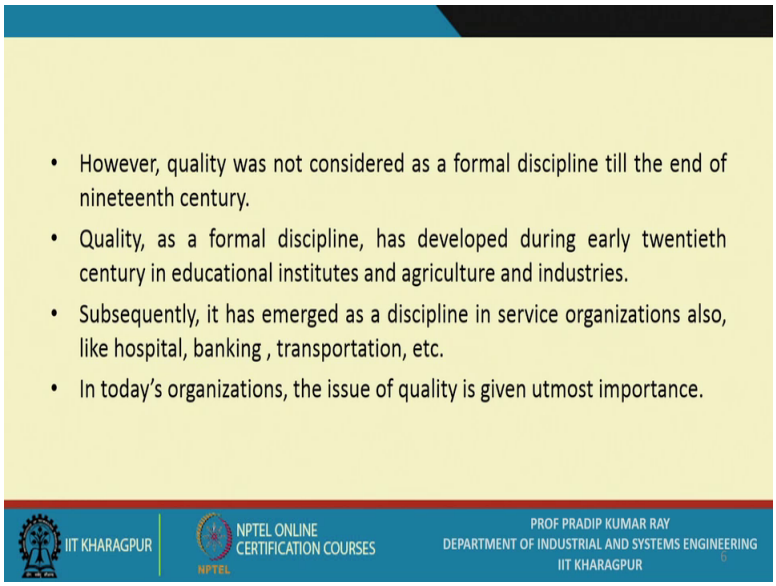

However during those days, quality was not considered a formal discipline till the end of 19 century well it is like individual best that means under the kingship you know he the king may find someone who is really you know a quality expert he is having some exceptional skills and the knowledge, so he used to be hired he used to be you know or say you know consulted for creating say a quality palace or the quality roads or the quality painting.

So, there are many such examples there are great persons in fact and but this is absolutely individual best but as such there has been no formal system to create quality. So, quality as a formal discipline has developed during early 20th century in educational institutes and agriculture and industries, that means around 1908, 1910 is it when the 40 model was introduced is it is the mass production we are going to mass production and then when you go for the mass production obviously there is a requirement of the formalize the system and that system is a quality system.

So, for the last 100 years or so you know the quality the discipline exist as a very unique the discipline, subsequently it has emerged as a discipline in service organization also for the last 50 or 60 years also like hospital, banking, transportations and etcetera and during these so the last 100 years or so particularly the contribution made by the military organizations so the defense establishments is a you know something very the tremendous you know the contributions they had all the defense establishments like US department of defense and many other defense organizations the idea has been very clear that unless you have the quality weapon you cannot win the war.

So, many such new tools and techniques they were they were developed in the field of quality during the second world war days and later on those tools and technique those approaches where successfully you know implemented or adapted for civilian products. So, in today's organizations the issue of quality is given atmost importance it cannot name a single organization anywhere in this world.

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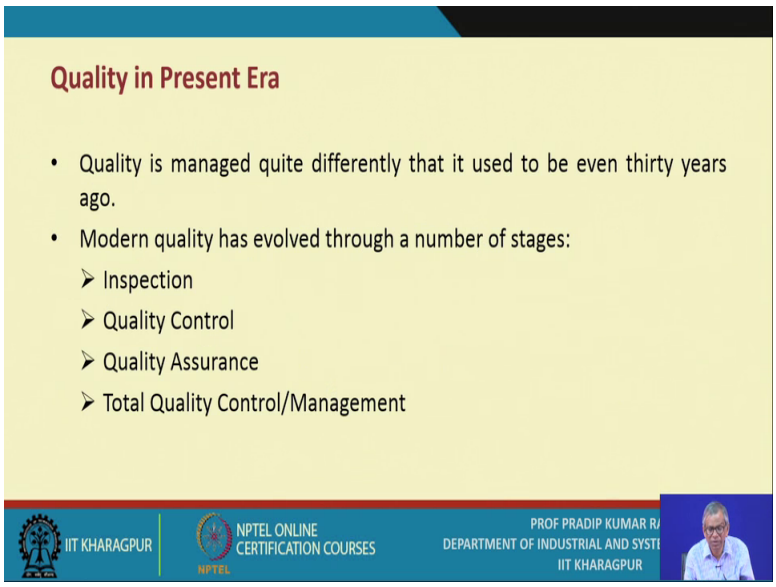

Where the quality aspect is not considered and we really concerned about in many cases how to improve the quality of any systems and it is a continuous improvement philosophy, that means even if the quality is considered to be the best but you say even best can be bettered there are any examples in fact.

So, the quality in the present era is basically managed quite differently than it used to be even thirty years ago first thing is in order to you know consider the quality aspects in

products in components in the systems what you need to do you must have a formal system. So, the modern quality has evolved through a number of stages; that means so starting in 1910 1920 then it was is to be the inspection based quality control, that means if you want to focus on a quality you say why do not you create an inspection department.

So, the quality activity used to be equated with the inspection related activity, later on during 40's 1940's 1950's you know we brought in the concept of quality control, that means while the process is on obviously I have maintain the quality of each and every component which I produce. So, it is essentially we try to have an online real time control systems at the shop floor.

So, we started talking about quality control and then here well the utmost importance is given to so the quality of a component it is not the quantity there are two aspects, one is the quantity and the second one is the quality and as you may be aware that in many cases we say that if you focus on the quantity production there is a high chance they may neglect the quality aspect, so in that context you say that you may be slow you may not be that productive but never you compromise on the quality, so the quality is job number one.

Now, next in the sixties onwards now there is a we moved from quality control to quality assurance, that means here is an assurance system you know I do not bother about it is quality check, I do not bother about inspection I am sure I am assuring you that the component which I produce it will be a quality product there will be no defects there will be no defectives. So, that sort of assurance system you have to create and then only and there are many such examples and then only it is referred to as the quality assurance system. And later on you know after the quality assurance we say that I have my direct activities mostly related to the product manufacturing, so I will be concentrating on that but I may not concentrate on the indirect activities like say the maintenance, like the security, like the material handling, like say you know the purchase systems.

So, these all were supporting systems actually creating or the supporting the production systems so you need to look into a all sorts of supporting systems and their quality. So, when you consider all this we move from quality assurance to total quality control or total quality management systems and this is also referred to as the company wide

quality management, that means while you know all the subsystems of a company or an organizations they must have the quality standards and the and they try to improve in their performance is and you say you know never ending you know exercise or never ending activity.

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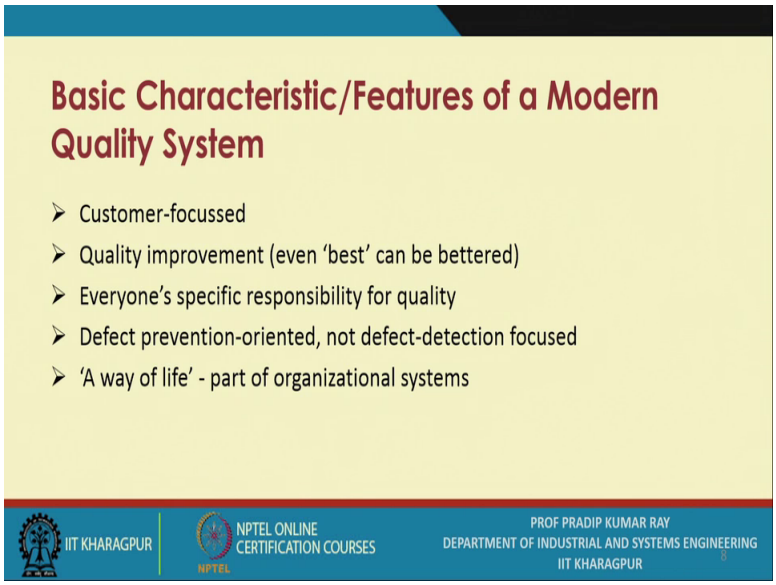

So, when we are concerned about or we are really interested in incorporating quality in all sorts of systems not only in the production systems then it is referred to as the total quality control systems. So, if you look at the characteristic features of a modern quality systems is it means we refer to sometimes a bench mark system, means as a student of the quality control and the design you should be you know aware of that what is the base systems the mankind has created with respect to the quality features.

So, when you look at such systems and there are numerous such organizations you will you and you study their quality systems and in the today's context you will find that this quality systems which is sometimes refer to as the modern system it has got some specific features, so as a student of quality you should be aware of first one is the customer focused that means there must not be any argument with the customer, that means the product which I am going to sell to the product that means the quality I will incorporate quality in that product as demanded by the customer is it then it is not that what I want to deliver to him means what I what I feel that this should be the customer the requirement, so it should be based on the full filling the customer requirements.

Then any exercises quality it is essential in exercise for quality improvement, obviously there will be an assessment but once you assess the quality or the quality systems obviously there will be some deficiencies there will be some gaps and it is implied that once the gaps are known the deficiencies are known you have to think of implementing ways and means to improve the quality level, that means from say one specification level you have to move to the next specification level so one level of fitness for use you must go to the next level of fitness for use ok.

So, I must have believe in the concept called you know even best can be bettered, if I feel that I have list to the best systems and no further improvement is required essentially you lose your credibility or credential as a quality expert or the quality student. Every ones specific responsibility for quality that means you must believe in a total approach it is not that there is a qualities it is a responsibility only of the worker, obviously he will be he will be creating the quality among the parts which he produces, but I must also look into that this is the product quality is very much dependent on the process quality.

So, as a process engineer or the process designer I also must be aware of the ways and means or ways and methods which I am supposed to implement or suppose to use to improve the quality of the process. So, normally what we do in order to improve the quality of the product of a process we need to focus on the settings of the process that is very important, so many a time the process engineers involve in quality improvement exercise they look into these aspects is it later on we will discuss all these aspects how to reach the best possible process settings so that the product quality is assured and just at this point in time I should high light that there is you know this product quality is very much related to the process quality these are interrelated, that means and with respect to the process quality it is a total systems you have to create where everyone specific responsibility for quality must be known.

And defect prevention oriented not defect detection focused this is very important in fact, like say you know the prevention of suppose the defect detection essentially inspection based quality control, so essentially when you know you just only bothering about the inspection and you know that the inspection that means I will be producing some 1000 units say and I know that the production system is so complex that all these 1000 units cannot be defect free is it ok so what I need to do that means i expect that always there will be some defects or the defectives.

Now, I create an inspection system and I will be very prompt in identifying all this defects or the defective, so that is the detection the defect detection waste but that is actually not a quality improvement exercise, where is a what you need to do that means I must know that what are the causes for the quality deficiencies and I will create the system in such a way I will design the product in such a way that you know there will be prevention of so the defective items or the defects while i produce the products. So, the basic message is defect prevention not defect detection, so that is should be your goal for quality improvement and ultimately it must become a way of life part of organizational systems.

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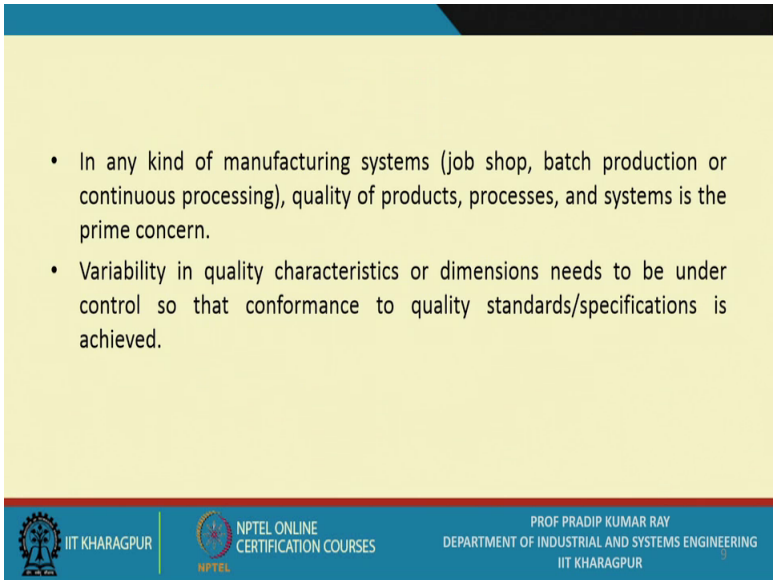

Now, you know we are we come across several types of manufacturing systems and for example, the manufacturing systems are grouped under three categories, one is what one extreme you have the job shop at the other extreme you have continuous processing and you have the batch productions so that is why I have written job shop, batch production or continuous processing like say chemical plant, so the batch production normally they repetitively manufacturing like say you know the car manufacturing systems and there are numerous where the job shops we have.

Now, here in any kind of manufacturing systems quality of products processes and the systems is the prime concerned, it is a by means never you assume that only I will be looking in to the product quality, so I must also simultaneously look into the systems

quality as well as the process quality. Now variability in quality characteristics of the dimensions needs to be under control you know the suppose you are you know the specifications it is a 20 plus minus 1 0 1, that means the tolerance range is say 19.99 to 220.01 is it ok so that is the tolerance range, that whenever you produce 1 unit you check whether that exact value is it whether it is with in this range or not, if it is within this range you say it is conformed to the specifications and you accept it if it is outside of the specification range is it suppose it is say 20.5 obviously you are not going to accept it. So obviously when you produce a 1000 units or 10000 units consequently the same value cannot get that means there will be variability unavoidable even if it is the most sophisticated systems each and every dimensions cannot be the same so it ok.

So, under this conditions what you need to do, that means you must get an idea about the variability with respect to the quality characteristics, so sometimes you say that these variability must be under control right, so sometimes you say that any exercise on quality is essential in exercise on variability. And the and these variability should be measured and we have to take actions we have to take measures so that the variability gets reduced and for controlling variability you need to you know consider many options or many you know alternatives like, the changing of say the raw materials or say the changing of say work holding devices in a in a machining operations or you know the changing of the basic technology you imply.

So, one thing we should be aware of any exercise or any assignments we carry out on quality control and improvement essentially at the ground level it is an exercise on variability, later on I will just tell you that how many different ways what are the alternatives available you have with you to measure variability when the data are collected.

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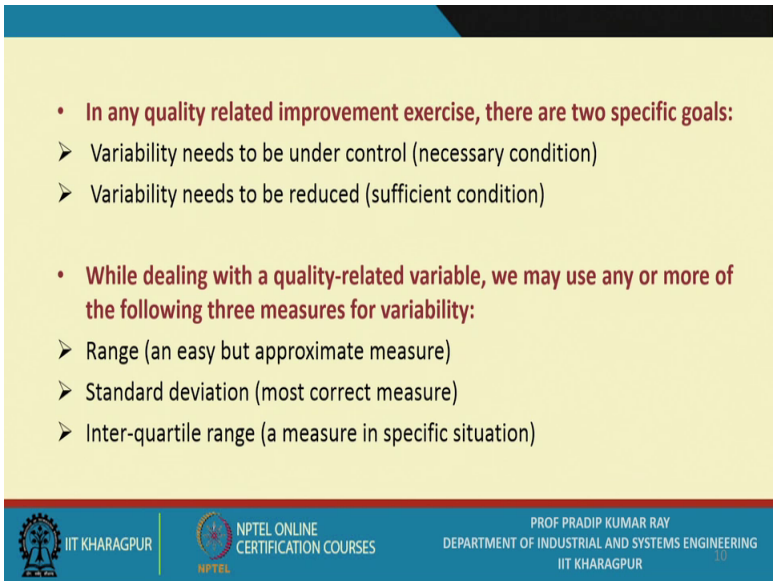

So, here just I want to focus two thing that is the variability, in any quality related improvement exercise there are two specific goals, first one is the variability needs to be under control that means if the variability is measured with sigma suppose sigma today is 0.25 with respect to a particular quality characteristic. now you have to think of ways and means to reduce this variability that measure whether these 0.25 this is the value of sigma whether it is under control or not, so this is the necessary condition now you always talk about improvement so improvement that means whether you can reduce it from say 0.25 to say 0.15 in one step or multiple steps, so that is basically controlling variability or reducing variability so that is the sufficient condition. So, any exercise on quality you must remember two things, first thing is what is the present level of variability whether this is under control or not once this is under control next you think of how to reduce the variability.

So, while dealing with a quality related variability we may use any or more of the following three measures of variability, like say the range it is an inaccurate measures, but sometimes you know you take a sample of the values it related to a particular quality characteristic this way you collect data that is the first level is it ok, so what you try to do that means in a sample of size n, so n may be it is a say 100 n may be it is a 200 n may be 25 so you have to the select the sample size based on you know certain rules, so later on we will we will talk about this like whenever we say do we look into developing the quality control techniques, so the starting point is you know that the formation of sample,

So, so in the sample you know when you get say some 10 such values. So, you know you so in a sample you know when you get a, some 10 such value so you know you have a maximum value you have the minimum value, so the difference between the maximum and the minimum it is referred to as the range.

So, you please note it down an easy but approximate measure that means if say the value of n is greater than 10 obviously you know it may not be that accurate as a measure of dispersions of the variability, but in many a time when you deal with the variables data, your the sample size is kept within 10 so this may be acceptable to you range as a measure of variability or dispersion the most accurate measure is the standard deviation most correct measures ok.

So obviously you are aware of how to the standard deviation the standard deviation for a sample and in certain cases we also measure variability or dispersion with interquartile range or the IQR. So, while you carry out the exercises on this so later on so we will consider all these aspects, so depending on the type of problem, depending on say the so that accuracy level you want obviously you know you have to select the appropriate measures. Now this is one and so thank you so much and I hope that in the topic all this sub topics we here creating a mindset, that means I am giving you a total view and ultimately you know this is the base we are trying to create is it so.

Thank you so much.