Project Management for Managers
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Lecture - 58
Quality Management (Six Sigma Tools)

Hello friends. I welcome you all in the session. As you are aware in previous session we were discussing about; six sigma, DMAIC approach, and we have seen couple of six sigma tools. Let us look at some other tools.

There is an important tool is called check sheet. Check sheet is basically told to collect data and which is very simple tool. So, let us say if you want to find out billing error has happened because of wrong amount. So, on Monday how many errors have happened?

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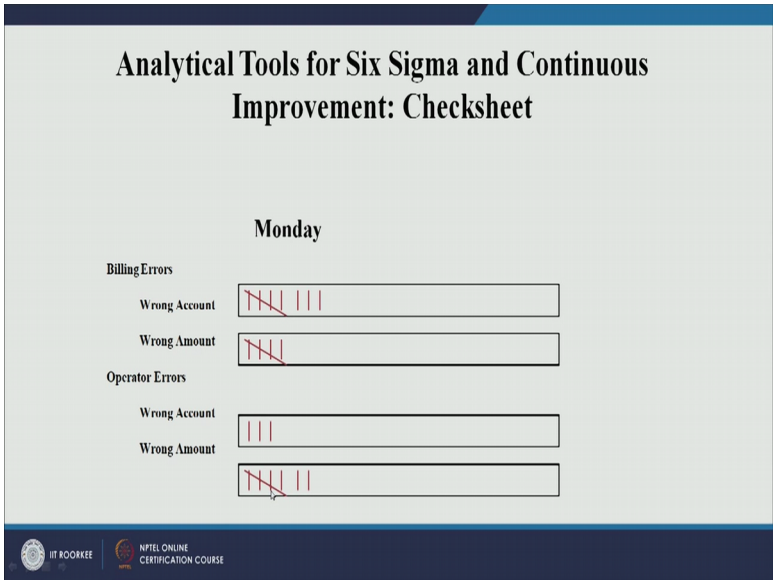

So, 1, 2, 3, 4, 5, and 3 so there is nothing but at telechart. Similarly, operator errors can be due to again 3 and here again 7; so this how you can collect data. So, if you are in organizations let us say- 5 assembly lines or let us say there is 1 assembly line and in that line there are 5 machines. So, you can go to each machine and collect how many defective parts are there. So, machine 1 machine 2 machine 5. And you can just collect defective parts on those machines. So, this very simple tools called check sheet use for data collection.

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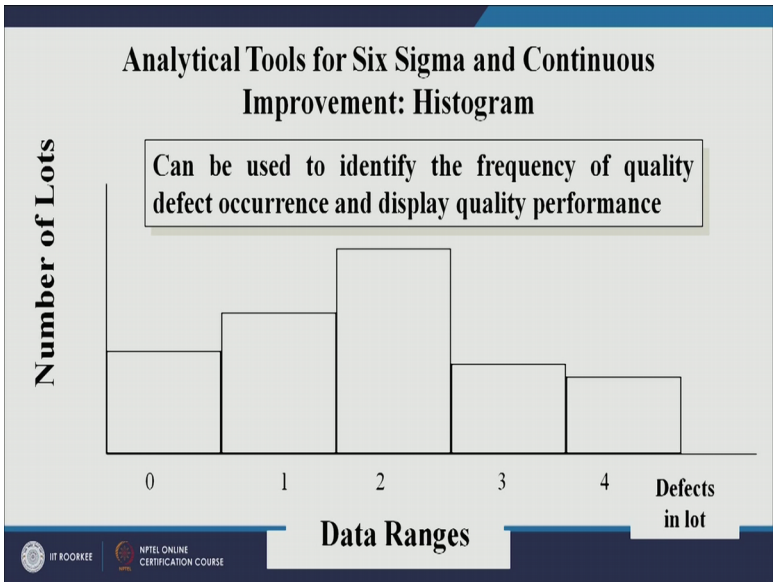

Of course histogram, all of you would be knowing histogram is basically a tool to identify the frequency of quality, defect occurrence and display quality performance. So, this is quite a simple tool histogram.

Let say I will give you an example: let say your producing 100 parts per hour and you want the height of the part should be 5 inches and in 1 hour as I said you are producing 100 parts. Now for some of the parts the height is 95 centimeter and for some of the parts it is 105 centimeter. So, 100 plus minus 5 is the tolerance.

Now you want to know how many parts are in one particular range. So, first of all you should do what you should count how many parts have got height equal to 95, how many parts I have got height 96 and so on. And then you just come up with class interval. Let us say class interval can be; you can have 5 class intervals are you can have 15 class intervals or any number between these two.

So, once you have got class intervals you can count actually what is the frequency in each class interval. So, histogram is nothing but is the, it is basically a data representation technique when we have got large amount of data we first of all prepare different classes and then each class we count the frequencies. So, this is quite an important tool as for as quality is concerned.

This is again an important tool cause and effect diagram. It is also called fishbone diagram, because it looks like fishbone. So, you have got a problem or you have got a defect in an assembly line. Now you need to analyze what are the reasons for that particular defect. The defect could be due to as I said multiple reasons. Many times you do not know why defect has occurred even after doing analysis, isn't it. So, you need to re analyze the causes how that particular defect.

So, this is your cause or this is your effect; this circle this is your problem. Now this problem could be due to main in proper training given to the worker.

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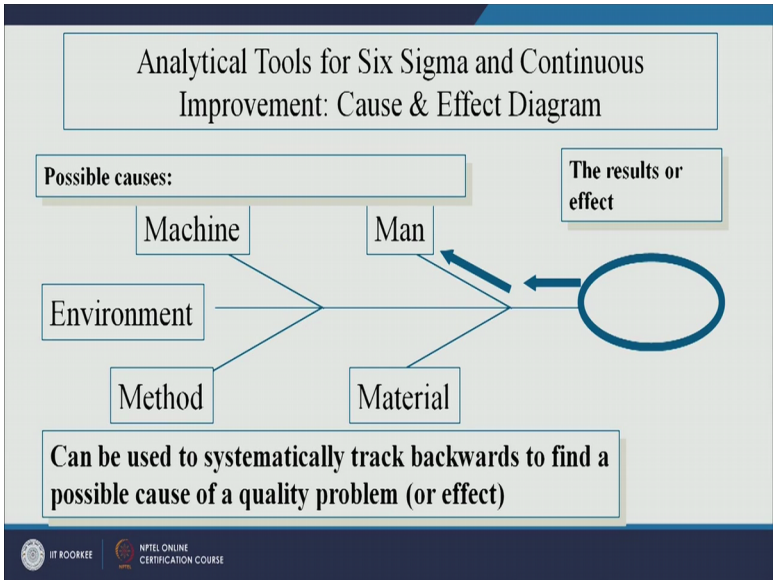

He is let us say he is overworked and because of overworked employee he is making mistakes. So, there could be again several reasons of this particular problem. Material: you may have faulty material. So, this could be another reason: machine, method, environment. So, when you see machine, machine is a problem right and because of that machine you are getting defective part. Now machine has got again you can come up with different reasons. What are the problems in machine? Is there an a problem of speed or its speed or depth of cut or vibration or some other reason.

So, each of these reasons should be explode in detail then only you will come to know the cause of the problem. So, this is quite an interesting chat as for as qualities concerned. Fishbone diagram are c diagram right cause and effect diagram.

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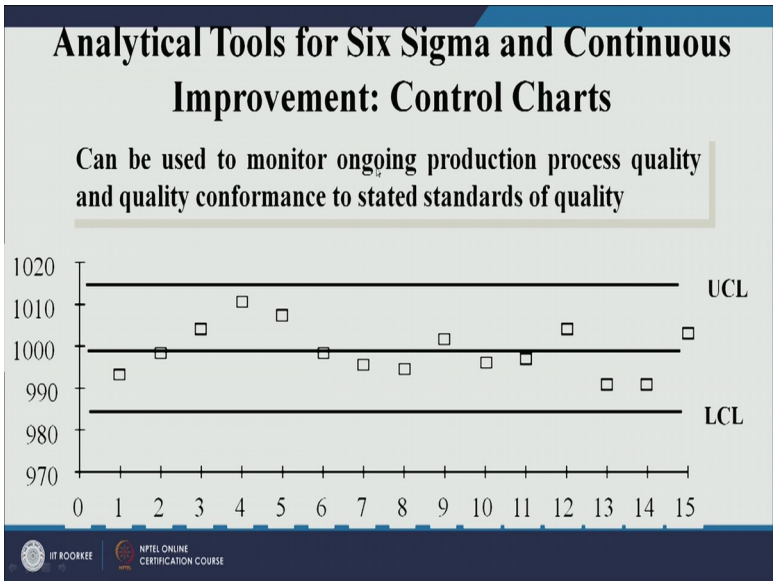

Now another tool is control chart. We have already seen run chart right and this is control charts. So, what is the difference between these two? Just think for a while; what is the difference between control chart and run chart? The basic difference is in control chart you have got control limits. So, you have got upper control limit and you have got lower control limit. So, when you collect a data over period of time, you will come to know that at which particular point the process is out of control. Let us say if this data had been here, then you would have said process is out of control, isn't it. So, this is control chart you will have control limits.

Of course, can be used to monitor ongoing production process quality, and quality conformance to standards of quality.

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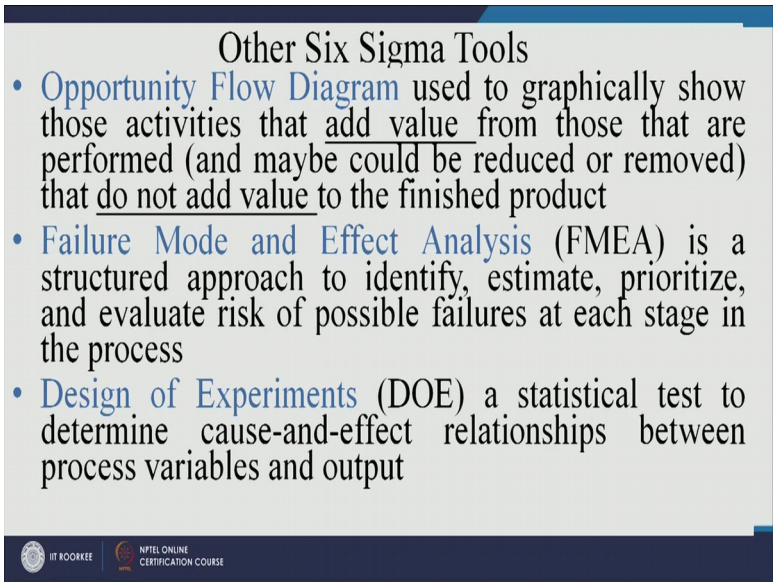

Then you have got some other six sigma tools. The first one is opportunity flow diagram: we have already seen flow diagram, so opportunity flow diagram is basically diagram which will tell you in a process what are different value adding activities and what are different non value adding activities. So, you will come to know where is the opportunity to make improvement. Since you know what are non value adding activities you can improve them right. So, that is why it is called opportunity flow diagram. Then you have got failure mode and effect analysis: FMEA. Failure a mode and effect analysis is quite important tool. In fact, this can be done before failure occurs, in fact this should be done before failure occurs.

So, first of all you should to in failure mode effect analysis you should know what are the possible failures and what is the probability of occurrence of those failures, how severe those failures are, isn't it. And then on the basis of all those things we will calculate something called risk priority number. In fact, in next slide it is there. So, you should calculate risk priority number for every potential cause of failure.

Then you have got design of experiment. In fact, this is quire broad area design of experiment. In fact, we have seen in previous session that the value of why gets affected because of several controllable variables and because of several uncontrollable variables. So, setting those variables to improve value of why is nothing but design of experiment.

So, how you are setting your input variables in a process to get desired output is nothing but design of experiment.

So, if you look at this control chart and design of experiment: control chart as I said we will tell you with which particular product is faulty product or at which particular time your machine is producing faulty product. And then you take corrective action using cause and effect diagram. But if you look at design of experiment it is basically proactive approach; cause and effect diagram is reactive approach. So, fault is occurred and then you are analyzing causes. That should not be done actually, isn't it?

So, you should try to make your processes in such a way that you do not produce defective parts and that can be done through design of experiments. So, before actually producing a product on a machine you can perform some experiments. Let, if my input is changed from let us say minus 1 to plus 1 al let say if you speed of a machine is increased from 200 rpm to 500 rpm what will happen to surface quality, isn’t it.

So, you can have a different input variables, those input variables we will have different settings. So, you can have two levels setting or three levels or four levels right. So, you can perform several experiments and there are some methods available for using those methods you can effectively and efficiently perform these experiments. So, there is something called 2 k fraction design 2 k minus 1 fraction design and so on. You have Taguchi method of design of experiment.

So, design of experiment is the tool to get right quality product these days. So, this is DOE. Let us look at couple of charts which can be used in different phases of DMAIC approach.

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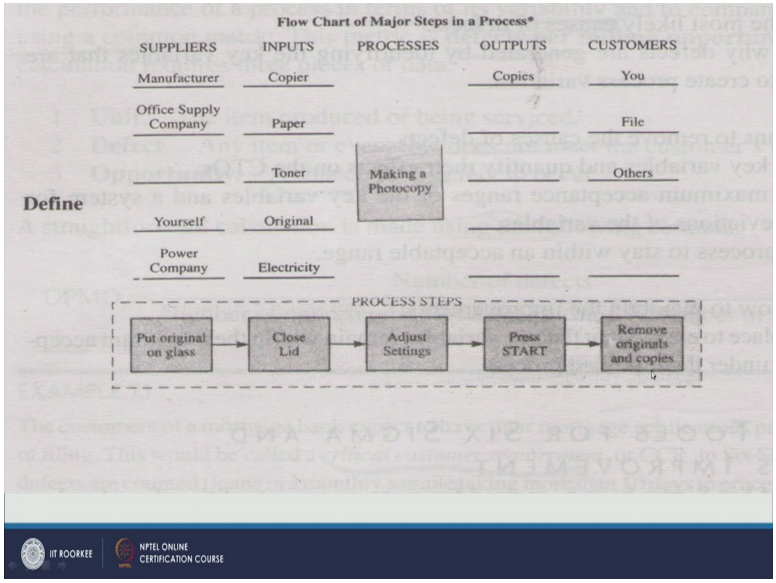

So, as I said DMAIC- D is stands for define right we will define the problem. So, this is basically a flowchart. So, you can use flowcharts in define stage. It is not necessary that you can used flowchart in define stage only, you can use in other stages as well. So, if you look at this flowchart of a process let us say you are doing photocopy of an original document. So, the process is put original on glass, close lid, at the setting right what kind of contrast you want, what kind of let us say size you want whether you want 200 percent size or 50 percent of the original document. Press start and remove original and copies right. So, this is a process.

Now this process can be converted into SIPOC diagram, it is called SIPOC chart. SIPOC stands for a Suppliers Input Process and Output and Customers. So, this is SIPOC- S I P O C. So, it will tell you which are value adding activities and which are non value adding activity. Actually, SIPOC diagram will give you bird-s-eye view of the process. You can see what is happening in the process.

So, let us say who are the suppliers in this entire process of photocopying. So, you have got a manufacturer, you have got office supply company, you yourself because you are doing photocopy, power company, inputs are photocopier, right paper. So, office supplies nothing but paper then you have got toner; toner is also kind of office supplier. Yourself you are keeping original, original document. Then electricity and the process is what; it

is you are making photo copyright output is what a photocopy right or you can have multiple copies. So, this is your output.

Customers are you yourself, if you want to keep a copy of the document in your office file so that would be also a customer. If you want to send it to others then there are also customers. So, this is a process in which you can know SIPOC diagram, so supplier input process output and customer. So, this is define phase.

If you look at measure phase then these are couple of charts you can use.

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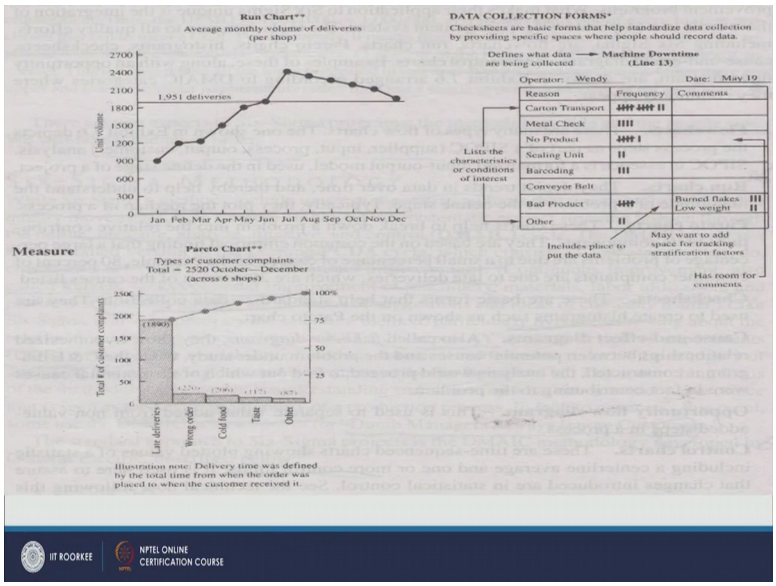

So, you can use a run chart. As I said you want to measure something right, in measure phase there should be some numbers. So, this is run chat, this is pareto chart, I have already talked about pareto chart. And this is nothing but data sheet for collecting data.

So, these are some of the charts which you can use in measure phase of six sigma.

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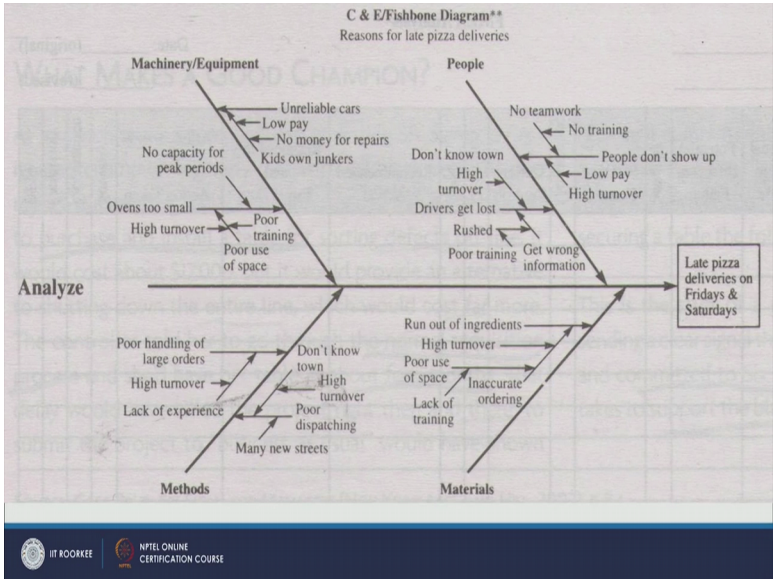

Then you have got, we have already discussed this in analyze phase what you do you analyze what are the reasons for problem isn't it. So, this nothing but cause and effect diagram. So, let us say late pizza delivers on Friday and Saturdays. Now you are trying to find out what are the reasons for late pizza deliveries.

So, let us say people. So, people do not show up. So, that is why you are not able to deliver pizza in time. Let us say material. So, you have run out of ingredients, so because of that you cannot supply pizza in time; similarly machine and method. So, you can have not only these four seasons, you can have some more reasons added to this particular diagram. So, this analyze phase. The next phase is what? What is the next phase? I right improve; improve. So, let us look at which type of diagram you can use in improve phase.

So, there is something called opportunity flow diagram. As I said in opportunity flow diagram you will come to know which are value adding activities and which are not value adding activities. So, we will take the same process of photocopying of an original document.

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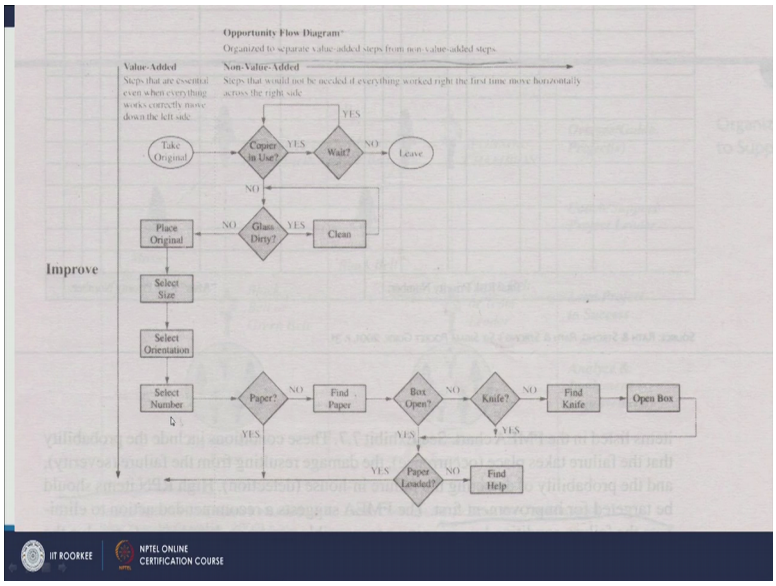

So, let us say what are different value adding activities. So, you are taking original document, then place original on photocopy machine, select size, select orientation, select how many numbers you want. So, these all are value added processes.

Now, what are non value adding activities? This copier in use, if it is in use you will have to wait. So, waiting is a non value adding activity. If glass is dirty then you need to clean it right, that is a non value adding activity. Is paper available? if no then you need to arrange papers isn't it.

So, using opportunity flow diagram you can find out what are different value adding activities and non value adding. So, just focus on these non value adding activities and try to improve these activities. And what is the final stage of DMAIC process is controlled. So, you can use control chart.

So, this is how you can use different types of charts in different phases. And as I said it is not necessary that you should use one particular type of chart in one particular phase. You can use a chart in different phases also.

Six sigma is basically a process in which as I said you have got your responsibilities to reduce variability. And whenever you take six sigma project it has got certain objectives. The major objective is to reduce variability. Sometimes you take six sigma project to reduce cost of a process. So, you can have different objectives for a six sigma team. And

in six sigma team you can have five to six members. So, you can have different six sigma teams working on different projects. And in a team you will have on different team members; so there would be a team leader, and there would be some other members.

So, the objective of six sigma is to a take on defects. So, that is the designations are the titles given to team members are related to you know, is called karate. So, in karate you just oppose your opponent; you are taken on your opponent. So, here in six sigma also the team effects on what defects, right. So, the objective of team is to a take on defects. So, the terminologies have been taken from that particular game; it is judo karate. So, you have got black belt, right. So, you can have black belt, you can have master black belt, you can have green belt. And you can have some more designations.

So, there are different roles and responsibilities. So, executive leaders must champion the process of improvement. So, first of all the organization we will have to decide whether they want to go for six sigma or not; so at the end of the day is the top boss right executives and they will have to decide whether this process is to be adopted or not. So, the shears would be the champion of the process.

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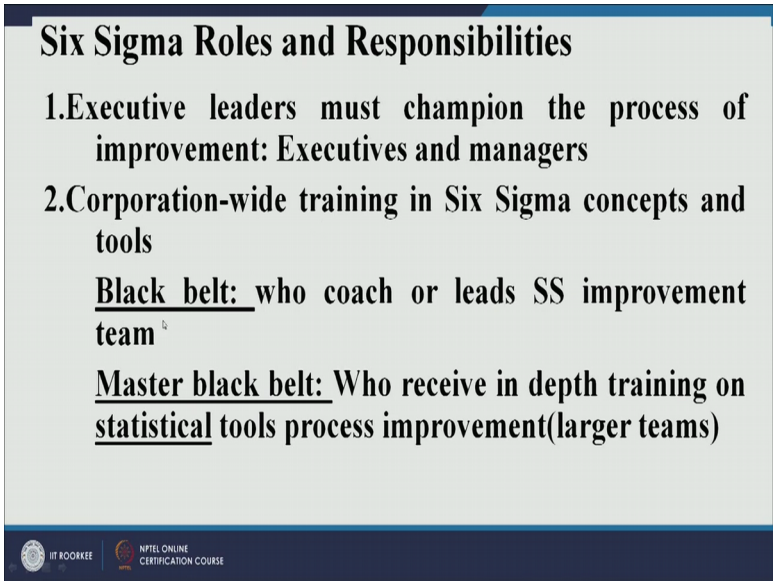

Then you have got black belt right: a person who coach are leads six sigma improvement team would be a black belt. Now, then you can have master black belt: who receives in depth training on statistical tools statistical methods. So, he knows what is mean, he knows how to collect data, how to find out standard deviation, he knows how to find out

let us say relationship between number of hours and employee and employee working and defects is producing. So, he will have to look at let us say analysis like a regression analysis. So, master black belt has got some knowledge about statistical tools.

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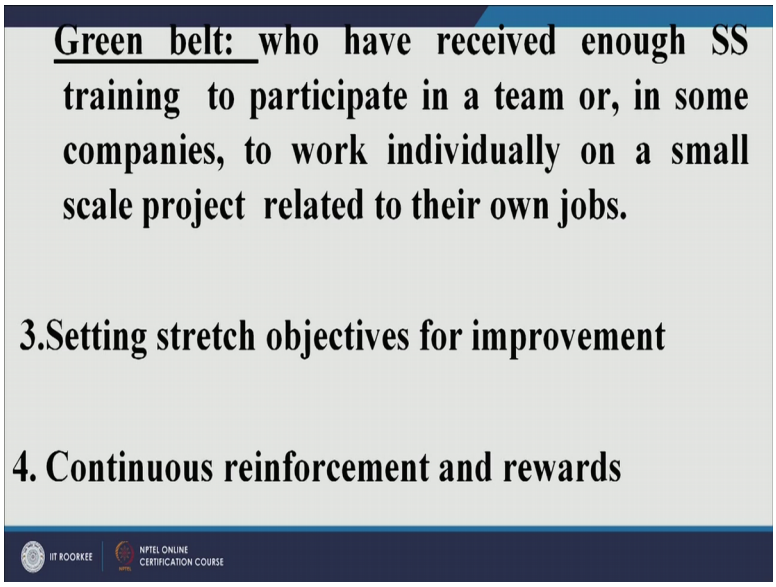

Then you can have green belt: who has got enough six sigma training to participate in a team or in some companies to work individually on a small scale project, right. So, these are other roles and responsibilities in a six sigma.

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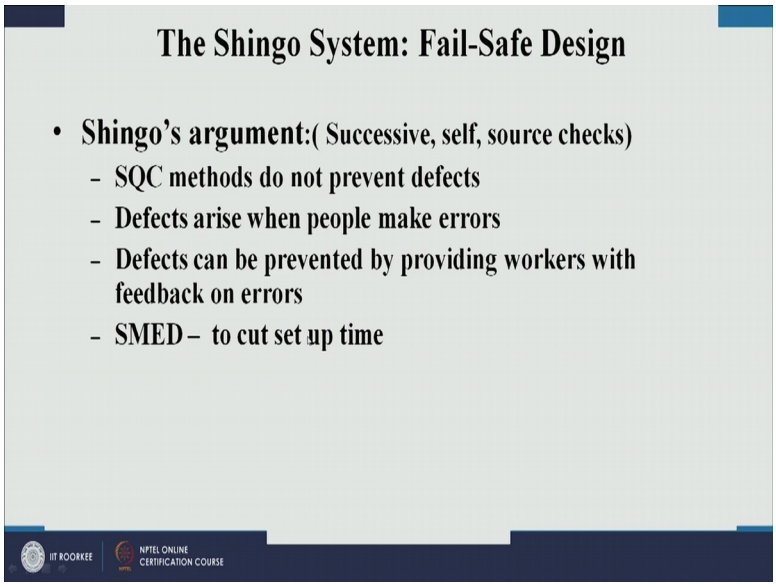

Let us look at some more to which for six sigma; there is something called Shingo system or its also known as fail-safe mode. You should design your product in such a way that it should not fail. So, your design is basically safety against failure, right. So, you should design in such a way that it should not fail. And Shingo came up with several important points. He said that SQC methods do not prevent defects. And he said that is the employees who make mistakes or who are responsible for defects.

Defects can be prevented by providing workers with feedback on errors. So, he focused on training and training of employees. He also focused on something called single minute exchange of dice. In fact, what happens in an assembly line you have got different machines and you have got different jigs fixtures, you have got different dice also. So, let us say in a price machine you have got different capacity of price in an assembly line of let us say an automobile company. So, you are producing components using a particular price. And let see if you want to use some other component if you want to make some other component then you need to change the dice, right

So, the point is trying to make is that you should reduce the setup time of changing dice, isn't it. You should change your jigs fixtures and other cutting tools in as much small time as possible. Single minute of exchange does not mean just one minute right, is not saying that you should take one minute. The objective is to reduce the setup time as much as possible.

So, Shingo's argument very important, and their now there is something called poka yoke. Poka yoke is another quality controlled tool, is basically safety against anything doing wrong. For example: whenever you go to an ATM, if you insert your card in properly then you get a signal on the machine; many times the card comes out. So, that is process of making process full proof- a mistake proof process. So, poka yoke is quite an important tool for quality management.

Let us look at some of the other points related to Shingo system. So, before going for this let me summarize or let us proceed with this particular slide. So, as I said they the reasons for defects are because of employee's and due to some other reasons as well, right.

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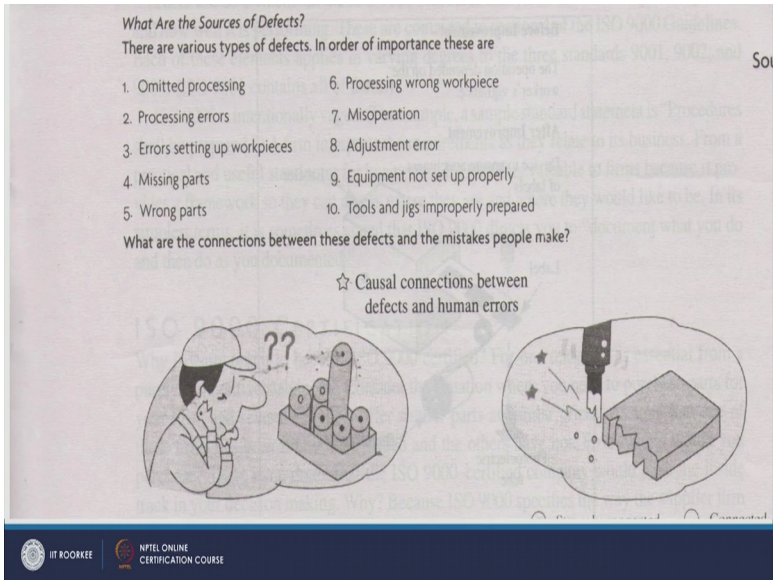

So, the reasons could be let say a Omitted processing, processing errors, maybe due to wrong parts error could be due to tools and jigs improperly prepared, isn't it. So, we need to find out what is the connection between mistakes people make and the defects- if you are able to do this then you are done. So, you should know you should find out you should come up with a correlation between what kind of mistake has been done and what is the defect- if that chart is ready then you can remove those mistakes.

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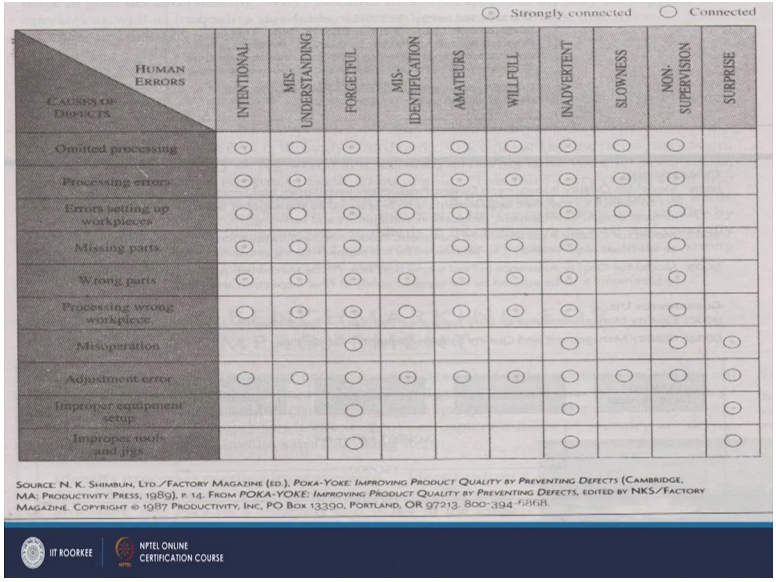

So, kind of chat like this can be prepared. So, let us say we are saying that the errors are occurring due to human beings, right. So, the errors could be due to intentional error or misunderstand; the worker did not understand instructions properly, so misunderstanding. Forgetful; the forget things, right. Miss identification; will full; slowness because operator is very slow there would be defect. Non supervision and surprise- sometimes mistakes occur in spite of having all the things in place right. So, it is because of surprise you may make mistakes. And these are possible defects. Let us say omitted processing, adjusting error improper tools and jigs. So, in previous slide itself you have you know listed all these defects.

So, chart like this can be prepared and we can say that that whether the misunderstanding is the reason for omitted processing defect. This was the cause right. So, you can come up with strongly connected and connect circles. So, let us say look at this. Because of slowness this is the cause. So, this kind of chart can be prepared and once you have done with and this kind of chart you can know what are the reasons for failures.

So, with this let me stop here will have next session, will discuss some something more about quality and we will take up and new project management knowledge area.

Thank you very much.