Work System Design
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Lecture - 17
Method Study: Steps

Namaskar, friends. Welcome to Session 17 in our course on Work System Design. So currently we are in the 4th week of our discussion on this topic. And as you know the course is divided into 12 weeks. Already we have finished the first 2 weeks based on the topic of productivity and tried to understand that why do we need to conduct work study. How we can calculate, what are the various measurement techniques for productivity; what are the causes of low productivity, what the factors affecting productivity.

How we can calculate productivity, what are the productivity improvement techniques were some of the lectures we have covered during our discussion of productivity during the first and second week of our discussion. In third week, our focus was primarily on work study and try to understand the concept of work study also to try to understand what is basic content, what is the excess content or excess work content.

How or what are the factors leading to excess work content; what can be the reasons, causes of excess work content and what can be the remedies or the possible reasons or not the reasons but possible area in which we can put our efforts to reduces these causes or eliminate these causes which lead to excess work content. We have also studied during our topic on work study, that if you take man as a productivity element what are the advantages and limitations.

If we take machine as a productivity element what are the advantages and limitations. We have also tried to understand just the basic concept of the techniques employed for work study, that is the method study and work measurement. So in third week we have laid out a foundation for the further discussion on this topic of work system design. And now in 4th week we started our discussion with method study.

As I have already indicated in the beginning of previous session that our target primarily is now to understand 3 important topics which are relevant for the work system design. In 4 weeks, we will be covering the most important topic of the major topic of method study and then we will focus on work measurement and finally there will be 2 weeks of discussion on Ergonomics which is an important aspect when we are designing any work system.

So method study in the very first week we have covered the basic concept, definition of method study and tried to see that how method study can be conducted. Basically, we have seen what are the advantages of conducting the work method study, what is the scope of method study, what are the various objectives of method study, so all these brief topics where covered in the previous session that is session number 16.

Today as you see on your screen the title of the topic is method study, steps involved in method study. So we will see, if you remember the definition that we have covered in the previous session it is a systematic technique so systematic means there is a step-by-step procedure which has to be employed in order to solve or in order to attack any problem within the various graphical tools or various standard procedures that are followed in method study.

So there will be a step by step process, if we follow the step by step process we will invariably be able to develop a better a cost efficient, a effective, a efficient method for doing the work which will also productive, it will be safe, it will be environment friendly. There can be n number of criteria for comparing the 2 different methods that is existing method and the proposed method.

So our target major objective is to work upon the plant and equipment, work upon the material only system, to work upon the persons involved in performing the task, to work upon the environment that we are providing to the workers for a competition their task. So these are the focus area. Why do we need to focus on these areas? Because we need to improve our current method of doing the job.

How we can achieve that? We can achieve that by eliminating the unnecessary operations involved in the task, by simplifying the way we are conducting the work as well as by combining 2 or 3 operations by the use of certain assistive devices. There can be n number of approaches which can help us to improve the way we are doing our work. So today we are going to see that if we have a problem at hand how we can solve the problem step by step.

So on your screen now you can see flow chart depicting the steps involved in method study. And we will try to see today in today's discussion maybe next 20-22 minutes our focus primarily will be to understand each of these steps.

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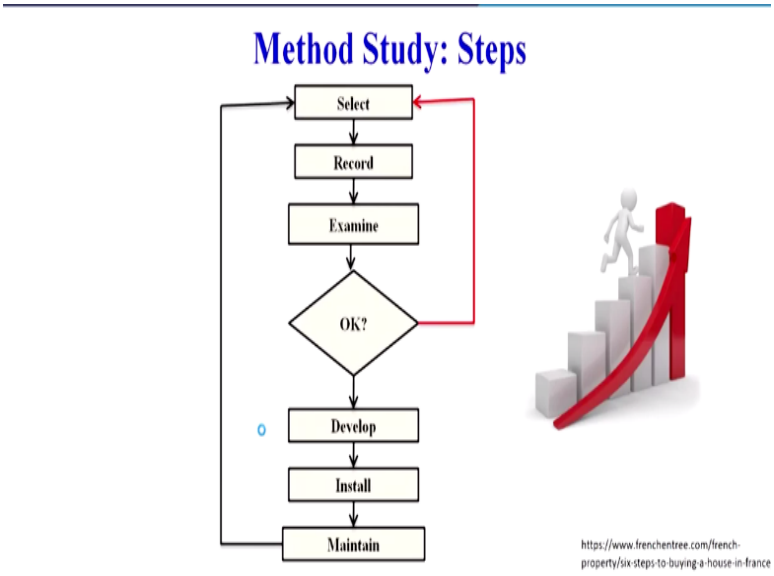

So first one is Select. Now if you go to any organization a lot of work being done. Maybe suppose a company is producing axles, so there can be number of operations that are done to produce this axle, or if a company s producing a laptop there can be so many operations assembly operations maybe somewhere manufacturing operations will also be there, so you are producing some parts, buying some parts there will be some assembly taking place at some place.

So there will be inspection taking place before the product is sent to the market. So there will be number of different types of operation being done in an organization. How to identify? That in which area you are going to focus your work study efforts. It is not possible that start talking all

areas simultaneously. So first you need to identify you need to select that let us first start our work study from this particular area, as we have taken an example of investment casting process.

So maybe the company may decide less, let us first focus on the investment casting procedure only and let us try to improvise the way we are doing our investment casting process. So first one is identification, selection of a work on which we want to perform the method study. Second one is record which is very, very important. So we have to systematically record all the information related to the work area or work sewer or work element that we have decide into analyze using the principles of work study.

So recording may need that how much quantity we are producing, how much time each operation is taking or how much time each work element is taking, what is the sequence or route which is followed by the raw material before being converted into the final product. So all these information, how many people are involved, how many operations are being done, how many transportation motions are there, how many times we are inspecting a particular job.

So all that things will be scientifically and logically recorded and documented. So first one is identification second one is recording third one is examining. And many things at many places we may find that the work is being done automatically or portion of the work is being done automatically or a section of the work is being done automatically. So we may feel that already we are using the best possible technology for this work.

And currently there is no better method which can further reduce the time taken for this job or may not reduce the involvement of non-par in this particular task then we say okay this area we may not be able to get much benefit so we may go and see that whatever area we have selected not much improvements are possible so then maybe we will go back and select another task on which we can perform that analysis using the techniques of work study.

So by first 4 steps if you identify your work maybe for example, using the current technology we are doing this work of recording the lecture. If somebody analyzes this particular work and say that whatever is the technology being followed that is one of the best which is possible in today

scenario then we may say okay there may not be much advantage of conducting the work study on this particular work, let us focus on some other area.

So maybe the record studio maybe found but there are other elements there are other work elements involved where the work study procedure can be carried out. So then we will, if the averaging is going on maybe as per the level of performance or the desired level of performance we may select some other work element for further analysis. But suppose we found that we know it is not okay then we will do that, we can think of developing a better method for doing the job then the next stage will be developing a alternative.

And there can be step alternatives. We cannot say that only one alternative we will develop and that will be the best solution, no, we may look for 4,5,6,7 different alternatives then we will do a scrutiny, scrutinizing each and every alternative based on certain criteria and the best alternative then will be selected.

So we will develop a better alternative a best alternative for doing the same work then we have to install it, install it means we have to put the thing to practice, we have to document it, we have to lay out a standard operating procedure for that best better method or best method that we have developed doing the method study. And one it is documented it is put into practice and you have to maintain it.

The top management, the middle managing, the supervisor is staff has to ensure that whatever better method has been put in the practice is followed by the workers. Many times you see that the standard operating procedure is skipped is not followed by the workers and which has led to a lot of issues and times major accidents have taken place because the drivers or the pilots may not have followed the standard operating procedure or skipped the standard operating procedure.

So we have to ensure we have to maintain the SOP so that each and every worker performs the work as per the standard method which has been developed following the principles of method study. So this is the brief outline of the steps involved in developing a better method for conducting the work or for performing the task. So let us see now one by one I think I have

explained each one of the so maybe nest 15 minutes when we see which one of this with an example probably it will become more clear.

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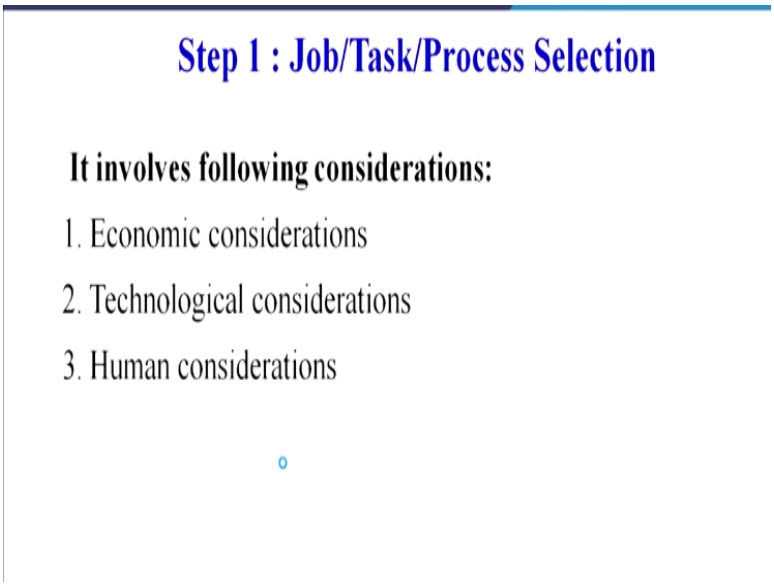

So step 1 s Job task or process selection so first thing is we have to select the work. Now which work we will select so common sense says that wherever we can source a major advantage where we can see that we will be able to make major profits major changes we will try to focus on that work as I have given in the example maybe if you want to do a work study of this studio we may not get major advantages because everything is more or less optimized.

But if you focus on some other area where we see lot of changes can be done and the work method can be improved so frequently we will try to focus on that and that will involve considerations like, Economic considerations, if we put efforts we definitely would love to get some returns, we are doing some investment in terms of our creativity in terms of our times, in terms of our effort, so our investment must need certain re-positive returns.

Technological considerations we have to take into account because currently we are following a standard method of recording maybe let us take example of recording studio again. We are doing the recording process here. We may look for technological advancement that have taken place in the last 2 years or last one year. There may be certain areas which we have further improved the

way we are recording these lectures and technology can be there which can be included incorporated so that thing can be taken into account that is another consideration.

First consideration is economic, second consideration is technology, third consideration is human consideration. If while recording suppose I am not fully comfortable, I am sweating so definitely we can work on the environment, we can work on the air condition system, so that a recording person feels comfortable. So human consideration is there, technological considerations are there as well as economic considerations are there.

So whenever we are selecting a work which we want to analyze using the principles of method study we can focus on these 3 important words that is the economic considerations, the technological considerations and the human considerations. Now economic considerations which will help us in selecting the work are cost effectiveness.

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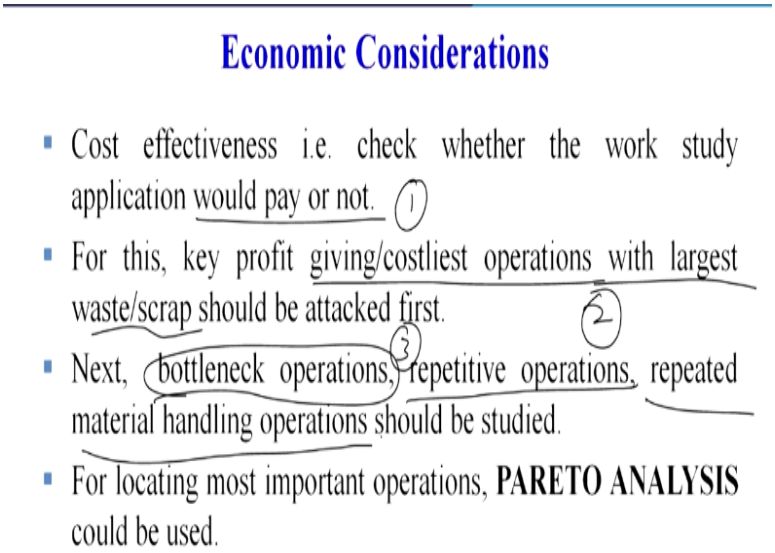

That is check whether the work study application would pay or not. Whether we will get benefited in terms of many or not. For this, key profit we will costliest operations with largest waste/scrap should be attacked first. So first point is if we say which will help us to select the work is whether we will be benefited or not. Second one is costliest operations with largest waste and scrap, you can focus on these type of operations which are producing lot of scrap and which are involving lot of money.

Bottleneck operations which are leading to problems repetitively. So then there are repetitive operations. From human consideration point of view, we have seen that 3 considerations are there, which are these 3? Economic, so first one is related to economic, in selection we will see whether the efforts are going to payback or not, so that is a economic considerations, second one is also economic, we must focus on the high cost areas.

Third one is bottleneck operations which may be related to technological consideration. The repetitive operations both technological as well as human considerations because none of us like to do the same task again and again over a period of 8 hours then in over a 40 hours' in a week or maybe month of after month. So we do not want to do same job again and again and therefore, the concept of job rotation, job enrichment have been introduced in the work study.

So repetitive operations we can attack repeated material handling operations which is also related to technology should be studied. For locating most important operations, Pareto Analysis could be used. So this is one technology which can be employed to found out that which process we must attack so that we are able to get the maximum effects. So let us see what is Pareto Analysis just a brief introduction of Pareto.

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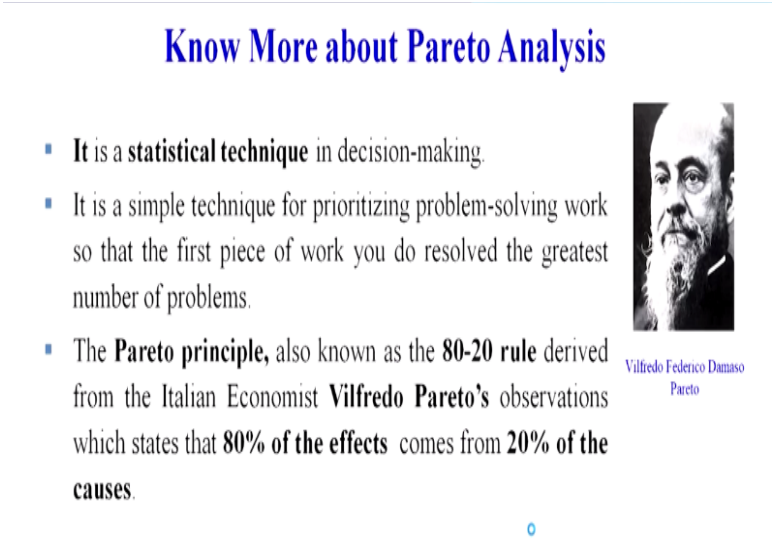

It us a statistical technique in decision-making. It is a simple technique for prioritizing problem-solving work. So what we need to do, we need to prioritize. What we are doing? There are 7 steps involved, so first one is selection of the problem maybe Pareto analysis may help us to select the work area where we need to put our efforts. How it will help? It will help us in prioritizing the problem solving work.

So that the first piece of work you do resolved the greatest number of problems. So maybe we are able to identify one cause but it may solve 4 or 5 different issues or it may lead the resolving of 4 or 5 different types of problems existing in the system. So that is we need to identify those areas which will help us to solve the maximum problem. The Pareto principle also known as the 80-20 rule many of the learners may already be knowing about the Pareto Analysis or the Pareto principle.

80-20 rule derived from the Italian Economist Vilfredo Pareto's observations which states that you see 80% of the effects comes from 20% of the causes. So that we need to identify, we need to identify when we are selecting the work to be analysis using the principles of work study or method we have to target this 20% causes. If we are able to target if we are able to identify if we are able to select this 20% causes and leap the evil in the bird, you solve these problems solve these causes automatically the 80% effects will get improve.

So that is the target. How to select the work analyzed using method study?

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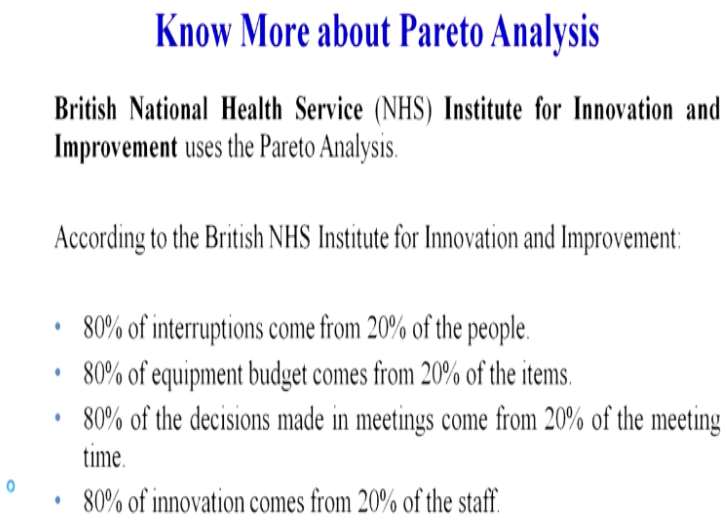

Now know more about Pareto analysis just one case we have taken the British National Health Service Institute for Innovation and Improvement uses the Pareto Analysis. According to the British NHS Institute for Innovation and Improvement we can see 80% of the interruption that is the effect come from 20% of the people. 80% of equipment budge come from 20% of the items. 80% of the decisions made in meetings come from 20% of the time spent in meeting.

80% of innovation comes from 20% of the staff. So 80% innovation that is the effect, what is the cause only 20% staff are causing the 80% innovation. So basically, we need to identify the 20% causes which are affecting 80% of the output or leading to 80% of the effort, so we need to do a scientific analysis to identify that which work element which work process which operation which method we need to found out on which we will work so that we are able to develop a better technique better method of doing the work.

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Technological Considerations

- The analysis involves application of work study for the selection of the operations/processes where new technology e.g. automation/ robotization should be introduced.

So technological considerations we can see. The analysis involves application of work study for the selection of the operation/processes where new technology, for example, automation, robotization should be introduced. So this already we know the economic consideration, technological consideration, human consideration so we can identify the work which is more repetitive in nature which is more involved.

And if you refer that to our discussion where machine be used as a productive value met, we have seen the advantages and limitations. So if we focus on the advantages of using machine as productive value met we will found out that where we should put our machines. And when we are analyzing the work being done in any industry or any organization we must look for places where there are chances of automation where there are chances of robotization.

And today morning only I read in the newspaper some engineers from Kerala have developed robot which can go and help in the cleaning of the sewers. So maybe that cleaning of sewers many times because of poisons gas is generated there lead to death of workers which is highly you can say not accepted, highly unacceptable.

So these students have worked and even today morning I read that they have been given an invitation by the Prime minister office also to visit the office and make a presentation related to the technology that they have developed the robot that they have developed. And they are already

implementing this thing in the State of Kerala. So that is one place where the human is cannot go there as the risk to his life so at that place we can use the robots for doing this cleaning of the sewers.

That is one good technology which has been developed. Now there are people who will say, if everything is automated, people will lose their jobs. So that also in the newspaper they have mentioned. These innovators these developers these engineers they have highlighted that the technology they have made so simple there the people who were doing the things manually they will train these people so that they only operate these robots and lead to cleaning of the sewers.

So it is not going to lead to unemployment it is going to enhance the technical skills of the people who are already involved doing the same task which they were doing manually they will do it using the technology. So technological considerations are also very, very important when we select the area where we have to put our efforts. Then the human considerations which are already I think I have highlighted.

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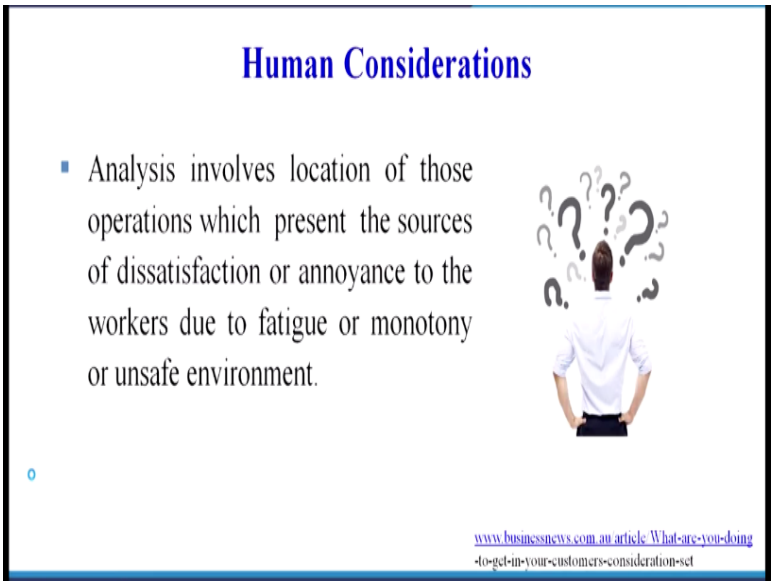

Analysis involves location of those operations which present the sources of dissatisfaction already happen repetitive work we are doing, people may not like that work. Or annoyance to the workers due to fatigue or monotony or unsafe environment. 3 things are there, one is fatigue

second is monotony, same work doing again and again and third is safety the unsafe environment.

So this gives us an idea that when we are trying to locate that where we have to put our effort which work element we have to select, which work area we have to select where the workers are getting fatigue, the work is very monotonous in nature, it is unsafe we must first attack that area using the principles of method study. So first and foremost is getting the right work right area where we must put our efforts.

Once we have identified the right area then we have to use our common sense. We have to use the scientific principles of engineering and then try to develop the better method. So once that is done—

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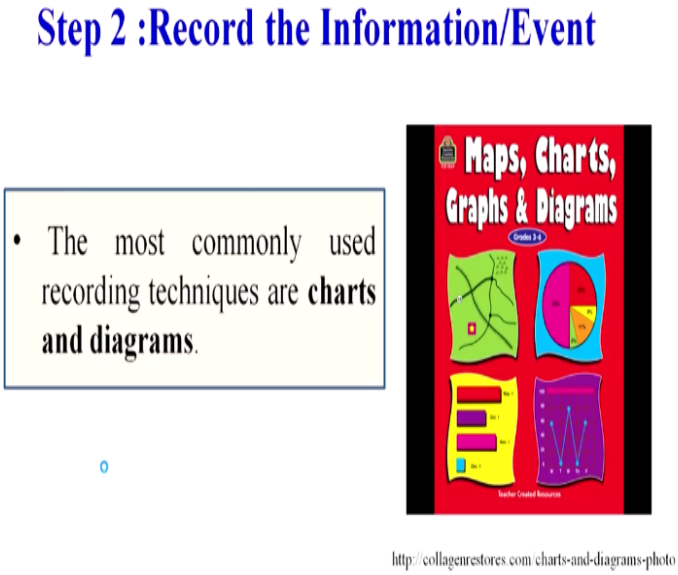

Then the most commonly used recording techniques are charts and diagrams. Once we indentified the work then we can use the techniques that we are going to study in today's maybe we will just outline the techniques in today's session maybe in the next subsequent sessions we will focus in each one of the technique that how to record the information. So there are standard recording techniques, I think in the next slide we have a list.

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Charts based on **SEQUENCE:**

(a) Outline Process Chart

(b) Flow Process Chart

(c) Two-Handed Chart (Left Hand and Right Hand Chart)

Chart based on **TIME** scale:

(a) Multiple Activity Chart

(b) SIMO (Simultaneous Motion) Chart

So we can record the process or the work that we have identified to be analyzed using the outline process chart, flow process chart, 2-handed chart left hand and right hand chart then based on time we can have Multiple Activity charts, Simultaneously Motion, SIMO charts are there all these charts we will see one by one in our course of work system design. So first thing is you have to logically, scientifically select the work which you want to analysis.

We have seen we have done lot of discussion on that today. Second is record all the effort related that work, and what will help us in this task, it with all these charts and diagrams help us.

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Diagrams:

- Flow diagram
- String Diagram
- Cyclegraph
- Chronocyclegraph

There are diagram like Flow diagram, String diagram, Cyclegraph diagram, Chronocyclegraph all these techniques will help us to document to record the way we are doing the work or to document the procedure, document the method by which we are doing the work. Mind your current method only, we have not yet developed any new method. The current method only we will document with the help of these charts and diagrams. Then we will examine the information.

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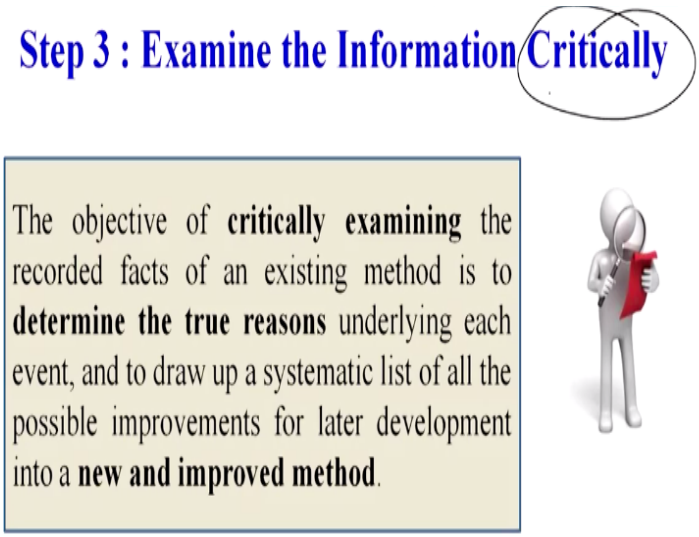

And one important thing on your screen you can see, we have to examine it critically. Critically means we have to see where there is scope of improvement, whether there is a scope of improvement or not. If not, then we may switch over to some other work and analyze the work where we find some scope for improvement. The objective of critically examining the recorded facts of an existing method, must I again address.

We are currently focusing on the current method existing method only is to determine the 2 reasons underlying each event and to draw up a systematic list of all the possible improvements. Systematic list of all the possible improvements for later development into a new and improved method. So we have to find out, and if we cannot make a systematic list of probable improvement then maybe we will refer that again to selection and try to see--

That we find out a work element or we find out some areas works fair where we can put our efforts. The facts recorded process chart can be examined critically by applying the questioning

technique. So that is this questioning technique? It can be purpose based, why is the activity necessary or why is this work necessary, why at this place only then maybe person based-wise also, who is doing this work why he is the only person doing this work, there can be number of questions which can be put towards why this work is being done and then this way.

Because that way and that why will help us to identify that there can be better methods of doing this work.

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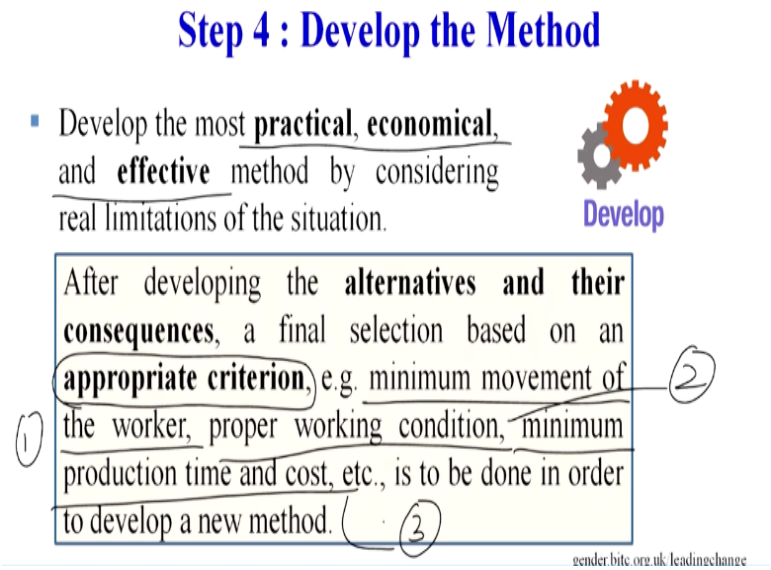

So after examining we have to develop a new method. Develop the most practical, economical again criteria are listed and effective method by considering real limitations of the situation. So if everything is available in abundance we need not study all these techniques. So there will be certain constraints, so under those constraints we have to develop a new better, practical cost-efficient, effective, productive, profitable, safe method for doing the work.

After developing the alternatives and their consequence, a final selection based on an appropriate criterion, now this criterion is very, very important and may not be a universal criterion. Depending upon the requirement the criterion may change. Depending upon the type of work the criterion might change. For example, we are doing a method study operation in a banking sector so the criterion maybe different.

Suppose we are doing the method study on a technological operation for example, turning operation on lathe machine so the criterion for developing the better method maybe different. So the criterion is not universal but example is given, that is minimum movement of the worker on the shop floor can be one criterion then proper working condition can be the second criterion, minimum production time and cost can be the third criterion

Then based on this criterion, we will try to develop better method of doing the work.

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So once we have developed then we have to define the new and improved method. Now defining has to very, very crisp, to the point. If we start defining the method writing paragraphs and writing books maybe people may not be able to (()) (28:29), people may not be infer what exactly we want to implement. So definition must be very, very crisp and clear. So defining the improved method means to develop the written standards to follow or to establish the standard operating procedure for doing the work.

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Step 6 : Install the New Method as Standard Practice

Installation is the most crucial part of every analysis or every change to incorporate.

Then install the new method as standard practice. Once we have developed the new method we have to install it, install it means that we have to start implementing the method on the shop floor or in the service industry like banking or maybe in the hotel industry. Installation is the most crucial part of every analysis or every change to incorporate. So already in the slide it is mentioned whenever you want to propose a change there will always be number of questions.

So we have to be read to answer all these questions. So installation is important. Once we have developed it we have defined it we have to install it that is you have to put it into action and once you have put it into action you have to maintain the standard practice.

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Steps 7 : Maintain the Standard Practice

Maintain the standard practice by **regular follow up.**

Once the installation phase is over, it becomes necessary to check whether the improved method is being used.

http://mobileapps.its.umich.edu/maintain/

So maintenance is also very, very important. May time you will see it has been documented that a new method was developed it was taking slightly more time, the workers when they are under supervision they are performing their work as per the standard method which has been defined and installed. But when they are not under supervision they are using their own method which is not as the better method which has been developed using method study.

They have their own method which may take less time that may affect the profitability f the organization because that may lead to certain defects in the product. But when the workers it is easier for them to perform it that way they are skilled, they are trained they are doing it for so many days the existing method so there is a tendency among the workers to switch over to the existing method then the method which they have been following for the last 10 to 15 years.

They have the tendency to get away from the better method which has been developed using the concept of method study. So the maintenance or maintaining the SOP is very, very important that is Standard Operating Procedure. So with this I think we will conclude the today's session. The most important part of today's discussion was the how to select the work which we are going to analyze because once we have selected the right work which we want to analyze the right area in the organization where you want to put your effort the rest all methods are standard method only.

And the second method is to develop a better method. How to develop the better method, that we will try to see maybe we will try to see certain examples certain case studies which will help us to train our minds in that direction that we start thinking creatively, we start challenging the norms of current norms of doing the work, you develop that kind of thinking process that yes there can be better method of doing the work then the methods that we are following today.

So that is important. Just to summarize once again that there are 3 important considerations when we are going to select a particular work so there that can be the economic consideration, the technological considerations and the human considerations. And we have tried to see that they are interrelated among each other. And if the focus on the area is where the improvement is possible.

And if we are able to judicially, scientifically, logically able to select the area or the works where we want to put our effort it is definitely going to lead to the success of the study also, success of the organization also and it will lead to further improvement in the profitability of the organization. So with this we come to end of today's session. Next session we will discuss another topic related to method study.