Work System Design
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Lecture – 16
Method Study: Basic Concept

Namaskar friends. Welcome to session 16 in the course on work system design. Today we are going to start our discussion for the fourth week as all of you are well aware this is a 12-week course. The first 2 weeks were focused on the concept of productivity then in the 3rd week our target was to understand the basic concept of work study and understand the importance of conducting these types of studies.

That why do we need to study the work or the way of doing the work. We have seen that there is a particular work content which is a combination of the mental and physical tasks that any worker performs on the shop floor. Then what is the importance of work content? What is the basic work content? Why excess work content is usually added in any industry? What are the reasons of the excess or for the excess work content?

What can be the remedies for excess work content all that we have studied then we have seen that when we analyze the work what are the various techniques that can be employed? So we have seen that method study and work measurement or time study are the two important techniques that is method study and work measurement which are usually helpful to analyze the work, to standardize the work, to standardize the process.

Or the sequence of doing the work, to standardize the procedure of doing the work. As well as to standardize the time required to perform the task using the defined method. So, we have seen that method study and work measurement are two important techniques. Then we have also seen what are the behavioural issues involved when we want to conduct the method or the time study or in general the work study. What is the role of the management?

What is the role of the supervisor? What is the role the workers? How work study correlates with these 3 stake holders of any organization, the management, the supervisory staff as well as the

workers. We have also tried to understand that when the work has to be conducted there are two major organs or two major we can say ways in which we can accomplish the work. Either the work can be performed manually or the work can be performed using a machine.

Either we can use man as a productive element or we can use machine as a productive element and we have seen the relative advantages and limitations of man and machine as the productive element in session 15. So with this understanding now we know that each and every organization wants to improve its productivity they want to improve the utilization of the 5 M's that are involved in manufacturing.

They want to make use of the money that they are spending for conducting the various types of operations. So they want to be economical, they want to economical in terms of material, in terms of man power that they are using. So, in order to achieve these objectives there has to be certain tools and techniques which can help us to achieve these objectives of productivity and profitability. How that is possible? That is possible if we systematically analyze the work.

Do some critical examination of the way the work is being conducted, develop certain alternate methods based on our creative approach, analyze, examine those developed methods. Try to find out the most economical, the most safe, the most easier method of doing the task. And then find out the time required for doing that task. So what are the various tools and techniques that are used that are broadly classified into two major areas?

One is the method study which is related to finding out one best method of doing the task. And the other one is the work measurement which deals with finding out the standard time required for performing the task using the standard method of doing the job. Or the standard sequence of operation or the standard operating procedure. So these are the two broad categories. We have already completed discussion for 3 weeks.

Now for the next 4 weeks starting today our focus primarily will be on method study and the tools and techniques that are used for conducting the method study. We will see different types of process charts. We will see micro-motion study, principles of micro- motion study. We will try to

understand the man, machine charts, string diagrams which are used for optimizing the lay out.

So we will be focussing our attention on various techniques which will help us to improve the way by which we are doing our work. We will try to find out the one best method of doing the job. So the different types of tasks there is no universal solution. For the task whatever we are doing suppose somebody is loading apples on the conveyor belt this is one example. A person is manually loading the apples on the conveyer belt and the conveyer belt is taking the apples to the next station.

This person job is to take the apples from the box and put it on the conveyor belt. This is one type of job being done. Other person is soldering may be a particular joint on the circuit, an electronic circuit. So these are two different jobs. So there cannot be a single solution to both these situations a person loading apples on the conveyer belt and an electronic technician doing soldering on a circuit. So both are doing different jobs.

Both are doing different work but for both of these jobs we can try to find out one best method. One best method for loading the apples on the conveyor belt now that method must be what are the criteria for developing the best method? Must be cost effective, must be easier, must be safe. It must not tire the worker. The worker may not feel work related fatigue. There may not be any musculoskeletal disorder leading to some kind of injuries for the workers.

All these criteria we will try to find out that what can be the best way whether any assistive device or any tool or equipment can help this worker to perform this task in a more easier and a more safe manner that is going to provide us a solution. We will try to list down various alternatives which can help the worker to perform this task in a more efficient and productive manner.

Similarly, a person doing soldering operation in electronic industry we can try to find out what can be the best way of doing this task. What are the problems associated with the current method? How we can improvise on those problems? What alternatives are available with us? What can be the best alternative to solve this problem? So that is basically going to provide us

local solutions but the overall objective will be to make the work easier.

Safer, productive efficient and effective. So out target will be to make the work best in terms of all these criteria which I have listed or the work method must be best in terms of criteria which I have already highlighted. So the basic concept of method study is to find out that what can be the best method and for this background why I am emphasizing the point again and again because now for the next 4 weeks our target will be on method study only.

So we will learn different techniques so when we go for a particular technique we must know that what is the overall objective with which we are trying to understand this concept? So basic concept is we need to improvise on the current method of doing the job and that is what we are going to understand today with the standard definitions of method study. So let us start our discussion now.

Let us first just quickly have a historical perspective of method study Gilbreth is considered as the founder of modern motion study techniques. So this is Frank Gilbreth and Lilian Gilbreth.

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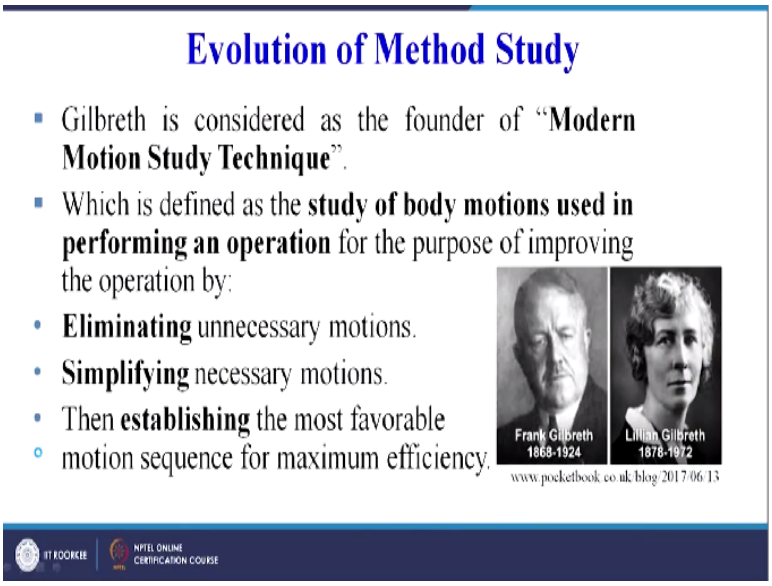

So they were you can say initial researchers who have done considerable research in improving the way the work is being done. And we will see the concept of therblig also during the course of our discussion on method study which is named after their name. So, Gilbreth couple they were

considered as the founder of modern motion study technique. This is defined as the study of body motions.

Already I have told I have taken two examples without referring to this slid one is the person loading apples on the conveyer belt. So body motions are involved. He may be moving, bending, taking up the applies placing them on the conveyer belt. The other one is he is taking may be using a soldering iron. So body motions are involved there also. So, basic motion study technique or the modern motion study technique involves the study of body motions.

Used in performing an operation. Two operations I have already told. Loading of apples on the conveyer belt, one operation and then may be soldering an electronic circuit using the soldering iron is another operation. So basically they studied the body motion involved in performing an operation. What was the purpose why do we need to analyze? Why do we need to study the motion with the purpose? Now what is the purpose? The purpose is given here.

What are the purposes? First one is eliminating the unnecessary motions. Many times we will see when we analyze that two or three motions may be unnecessary we are doing. So if we improvise the way we are doing our job they can be easily eliminated. Second is simplifying the necessary motions. So first we can list down may be there are 7 motions we can find out that out of the 7 these 3 are unnecessary motions they are not adding any value.

To the way we are performing our operation. If we use the four motions only four basic motions the work can still be accomplished to let us try to eliminate the unnecessary motion. Number 5 whatever 4 motions are necessary basic motions let us try to now improvise on them we can combine 1 or 2 motions we can use equipment to perform 1 or 2 motions. So that our work becomes easier and it becomes more productive.

So then stablishing the most favourable motion sequence for maximum efficiency then we will like to see that what is the sequence of operations that we must follow in order to achieve the maximum efficiency in terms of time taken in terms of effort involved in performing the operation? So the study of the motion was done or the study of the body motion was done in

order to understand or in order to develop a better method of doing the job in which we do not have any unnecessary motion.

The motions are simple and the sequence of motion is such that it gives us maximum efficiency. So this was you can say basic historical perspective of motion study. Now this is in the current scenario any manufacturing industry uses the following resources which we have already seen.

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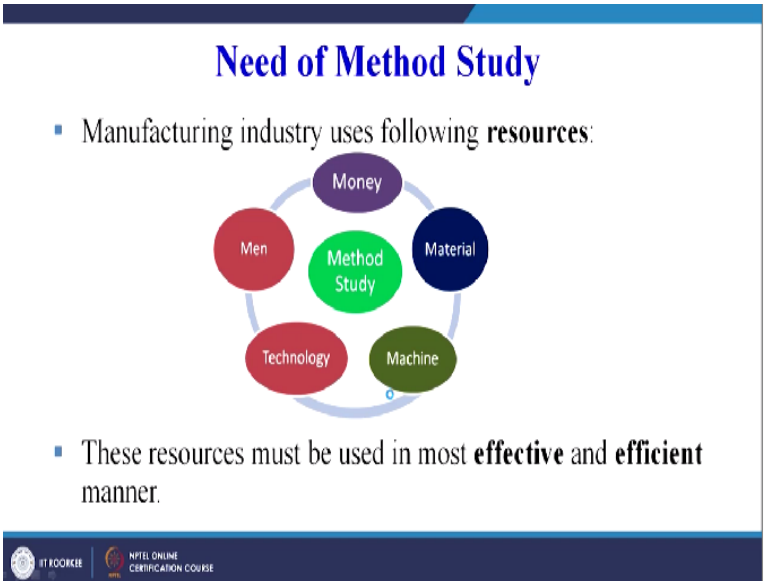

There is money, material, machine, technology, men. So we have to optimize the utilization of all these resources. So these resources must be used in the most effective and efficient manner. So if suppose we have 10 men available with us for performing a particular work we will definitely like to optimize their efforts so that they accomplish the maximum possible work which can be done by 10 men.

That is, we will focus on the excess work content in any work that has to be done and try to eliminate it so that their efficiency and productivity or we can say we have seen the partial productivity measures in which the labour productivity can be calculated so that our labour productive improves. So that is the basic target that we have to optimally utilize these resources. Now what is the basic definition of method study with this background.

That we need to properly utilize our resources to be productive and efficient let us see what do

we mean by method study. This definition already I think we have seen in our discussion on techniques used for work study in which we have seen method study and work measurement. In method study we have seen the definition. So again I am repeating method study is the systematic recording.

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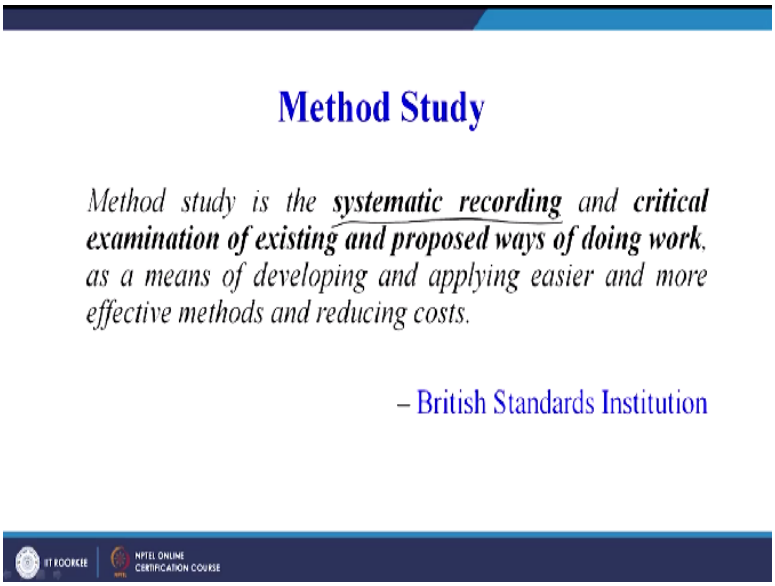

So it is a scientific technique in which we follow a proper procedure and we try to achieve the objective. So it is a systematic recording and critical examination we need to understand that. First of all, we have to see that this is the method, this is the sequence of operation. This is the sequence of body motions involved whatever is the current way of doing the job. So that is systematic recording.

Why do we need to systematically record? because we have to compare the current method with the advance or the new method or the developed method. So what we do in method study? To explain it to a layman currently there is particular way a person is maybe doing the task or doing the work. For example, a rickshaw puller is riding on a cycle rickshaw. So the cycle rickshaw puller is using his way of pulling the rickshaw.

Maybe in method study what we can do? We can see, observe, that how he is doing? Whether he is getting tired after cycling for maybe 2 kilometers or 3 kilometers with the particular load on the rickshaw how he is able to perform his job? Whether he is feeling tired after may be a

particular kilometers or when the load is more how is body motion changed. So all that can be analyzed now what can be proposed?

We can propose a proper posture which will help him to pull the maximum load that can be one thing another thing can be we can think of redesigning the cycle rickshaw in such a way that the load distribution is such that his effort is reduced. His effort cannot to zero because the effort zero in case of motor rickshaw also, auto rickshaw also he has to perform the task. He has to use the break some effort is required in the auto rickshaw also.

But in cycle rickshaw is more on part on the driver or the rickshaw puller so we can analyze the issue from the different perspectives. We can see his body motions. We can see his body posture. We can see his sitting. We can see or we can understand or record the design of the rickshaw and then we can see how the work can be changed? What alternatives can help us reduce the fatigue of the rickshaw puller? Just one simple example what is the target of method study?

So here systematically we have to record that what is the current method of doing the job and critical examination of existing and proposed ways of doing work? So it is important existing is our current method that we are doing the job already a cycle rickshaw puller is pulling the rickshaw so that is the current method and then what are the proposed ways that is the next stage. So we have to critically examine both that what is the current way?

What are the better things in the current way? What are the things that need improvement in the current method? Then we propose certain advancements and those advancements also we have to compare with the current method. We have to see how much cost will be added? How much effort will be reduced? How much weight will be reduced? We will see what are the different advantages of using the proposed method?

So there can be a list of proposed method out of that we have to select we have to critically analyze and select may be one or two best methods which are giving us improvement as compared to the current method of doing the job or doing the work. This is as a means of developing an applying. Now what we must focus in our proposed method? What should be our,

you can say objective when we are trying to develop the new method.

Our objective must be the new method must be easier, more effective and they must be able to reduce the cost. So these are the 3 major objectives. There can be other objectives also but these are the major objectives with which we must try to propose the alternate method or the new methods or the noble method, creative method of doing the job. That they are easier, more effective and they must also be able to reduce the cost.

One thing is missing we can say they may be safer methods as compared to the current method. So I have already told there can be number of objectives with which a method study is taken into consideration or we start doing the method study. So this is a British standard institution definition of method study. A very, very crisp and very, very focused definition that what we need to do in method study so broadly to summarize in my own words.

We can say that there is a current method of doing the work we need to find out a better, improvised method of doing the work with an objective that the new method is easier, effective as well as cost effective. Now what is the concept of method study? The main purpose method study is to eliminate the unnecessary operations and to achieve the best method of performing the operation.

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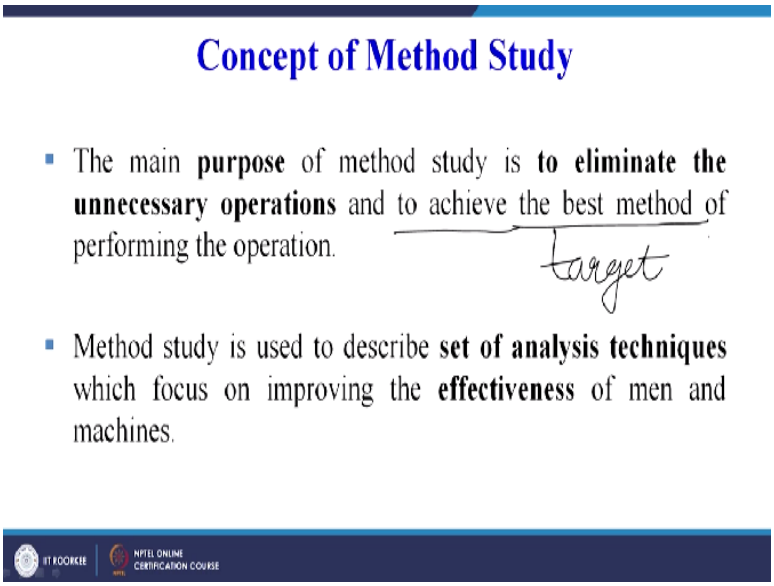

So, we can say to achieve the best method of performing the operation. This is our target with this target we perform our method study. So the main purpose is to eliminate the unnecessary operations. So how we will achieve our target? How we will find out or achieve the best method? One of the focus areas can be that we can try to eliminate the unnecessary motions in the current method of doing the work. Method study is used to describe a set of analysis techniques.

So our 4 weeks of discussion will focus on these analysis techniques like operation process chart flow, process chart van machine diagrams, different cyclograph, tono cyclograph, principles of motion economy. So we will focus on various analysis techniques which focus on improving the effectiveness of men and machine. So this we have already seen that there are various resources which are used in the manufacturing function or in the manufacturing system.

So, we will try to see that how effectively we can use these resources so that our overall organizational objective of being profitable is achieved. Now this is a concept of method study.

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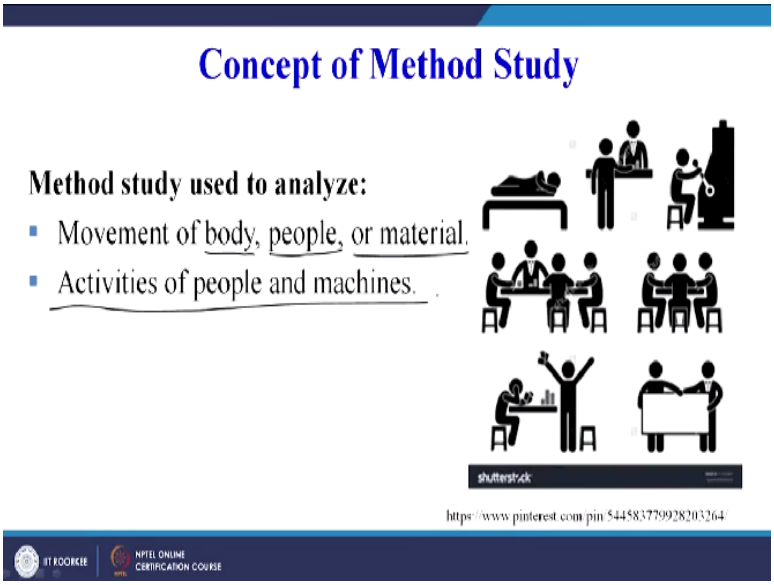

Method study is used to analyze movement of body, movement of people, movement of material. Activities of people and machines so this is our, you can say focus area. So, when we are going to start our method we have till now whatever we have discussed we have tried to understand what do we mean by method study? We have tried to understand that method study will lead to what type of targets or will leads to what types of benefits as we have seen.

The new methods will be that is the purpose with we are doing the method study. The new method will be as I think all of you have got the answer to my question. It will be easier. It will be more effective. It will be beneficial from cost point of view. It will reduce the effort of the worker. It will be safe for the worker. It will be safe for the organization. It will save cost. It will reduce the accidents. So, it will have number of benefits.

So how we can achieve all these benefits when we focus our attention on the body, the movement of the body of the worker already I have given two examples today. A man loading apples on the conveyer belt, his body motion we can analyze. We can analyze the people who are working the group of people working on the same task we can analyze the movement of the material also. How material is moving within the organization?

Activities of people and machine so this is one very good diagram which we have seen here if we just quickly roughly try to understand here 4 people are sitting. See the space occupied by 4 people and if we redesign the system less space is occupied and 4 people can still sit. So maybe you can try to optimize the space, optimize the layout within the organization. So similarly we can see this is a person while sitting operating this system.

Or this is a machine how we can better design the interface between the man and the machine. Maybe here he is operating the lever with his hand. His feet are free. So what we can do? We can design the system in such a way that his hands are free and he is able to manipulate the job or control the other control elements of the machine and the lever for setting up can be used up by his feet. So, we can divide the total work content of this worker among his four limbs.

Like when we are driving a motor cycle. We use our both hands as well as both feet also. So total content of driving the motor cycle is divide among the four limbs. So here also when we do the method study, when we see the motions of the worker, when we see the motion of the machine, when we try to analyze the person doing the task we can try to find out ways in which we can optimize the time, the effort, and the cost involved in the operation.

So similarly we can see that we can design the different work elements in such a way that we are able to save time, effort and money for the organization. So these are some examples which are given here. Two or three I have tried to explain others you can just look at these and find out that what we can do with these methods or what improvements can be done using these methods? Or the way the peoples are doing the work. Now what are the objectives of method study?

We need to understand all this I have already highlighted in the previous slide I have shown that we are trying to optimize the space required for proving sitting for 4 people. We are trying to optimize how a man and machine are interacting. We are trying to optimize the effort of the worker. We are trying to optimize the time required for the machine to perform the task. So we have seen that what are our targets? What are our objectives?

But this is a systematic list of what must be our objective when we are conducting the method study. It must be clear in our mind when we are analyzing the work that what is my objective for analyzing this work? So what I want to achieve? So first one is we try to conduct the method study with an objective that we are able to improve the processes and the procedures.

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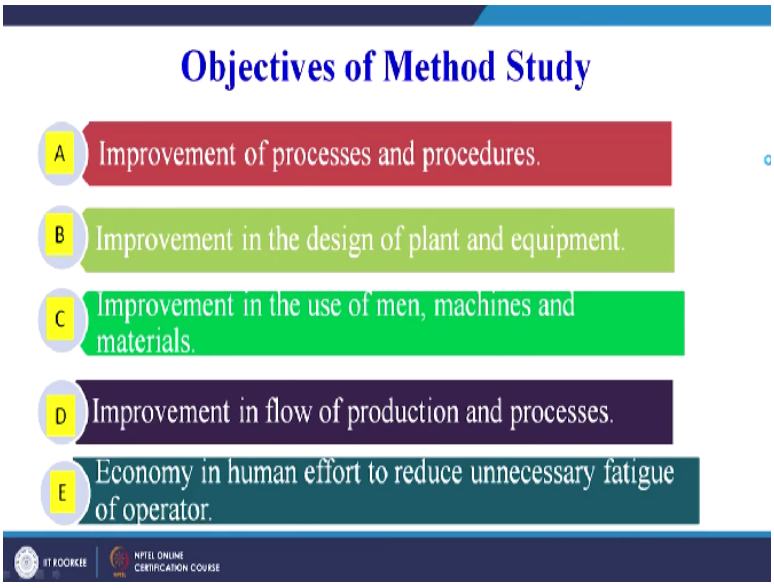

So there is a procedure as we have seen in one of our previous sessions the process or the procedure for doing the investment casting process. So they have a 7 steps involved there. So, we can focus on those 7 steps and try to do improvement in the process and the procedure. Just one

example that is one thing, second is improvement in the design of plant and equipment. As I have already told 4 people are having their lunch together.

So the design of the table can be modified in such a way that the space is optimally utilized. Similarly, the layout of the machines in any organization can be redesigned in order to insure better utilization of space. So improvement in the design of plant and equipment many times there are so many examples. We would like to design our machines in such a way that they provide us safe working conditions for our workers.

The machine will not be switched off until the worker is maybe 3 feet away the machine that type of machines can be developed. Because they will reduce the risk of accidents and the compensation or the insurance amount the company need to pay on account this accident will also we reduced. So, improvement in the designs of plants and equipment, improvement in the use of men, machines and material that we have already seen.

Improvement in flow of production and processes. The sequence of operations can be optimized. We need to analyze the work with this object that we have to improve the flow of production and process. Economy in human effort to reduce unnecessary fatigue of the worker. So we can say that broad focus is on the operations that we do on the shop floor. And what is there on the shop floor? Majorly there are three things one is the plant and equipment.

Another is the material handling system. And third is the person or the labor which is performing the task. So all our objective if you list them properly and if you try to understand them and may be bring them into one sentence only so the major objective of all these 5 points is that we need to optimize the design of plant and equipment as well as the material handling system so that the worker is able to perform his task in the most safe.

Easier and less fatigued manner or may be with minimum fatigue he is able to perform his task in a safe and cost effective manner. So may be three things we need to improvise we need to improvise the design of plant and equipment. We need to improvise the sequence of operations. We need to optimize the third thing that is the material handling system and we need to optimize

the efforts of the worker who is performing the task.

And with that target we enter the shop floor and start analyzing the way the work is being done and try to improvise on the way the work is being done to suggest the better methods of doing the work. So method study analyst should have this is from the person who is going to perform the method study. Objectives we already we know but a method study analyst must have. He must have the desire and determination to produce the result.

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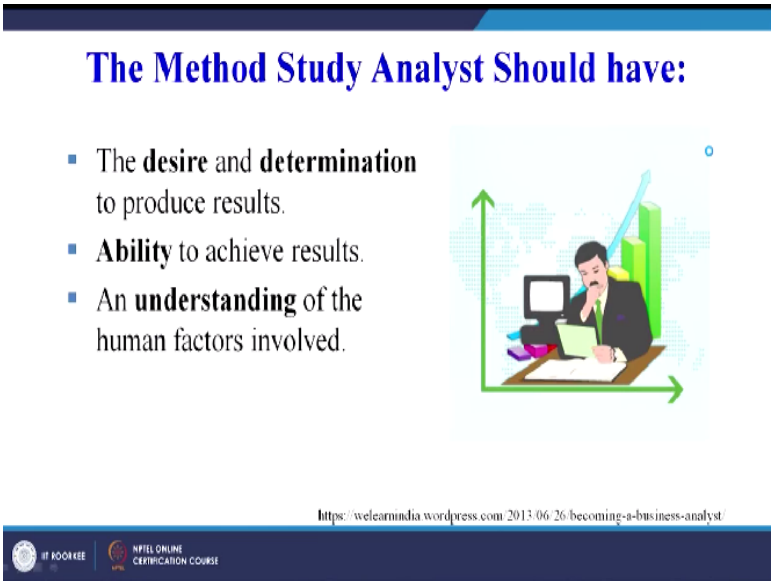

Ability to achieve results and an understanding of the human factors involved. So this is may be standard approach for any good person who wants to achieve maybe the results. He can focus on the way the work is being done with human factors in mind which we have already discussed in session number 15. So person must have basic information about the human factors. He must have understanding about the technical details also.

That how the work is being done. He must have understood about the technologies and how technology can help in optimizing the way the work is being done. So if he is we can say experienced person of that area definitely he or she will be able to produce the results. Now scope of method study

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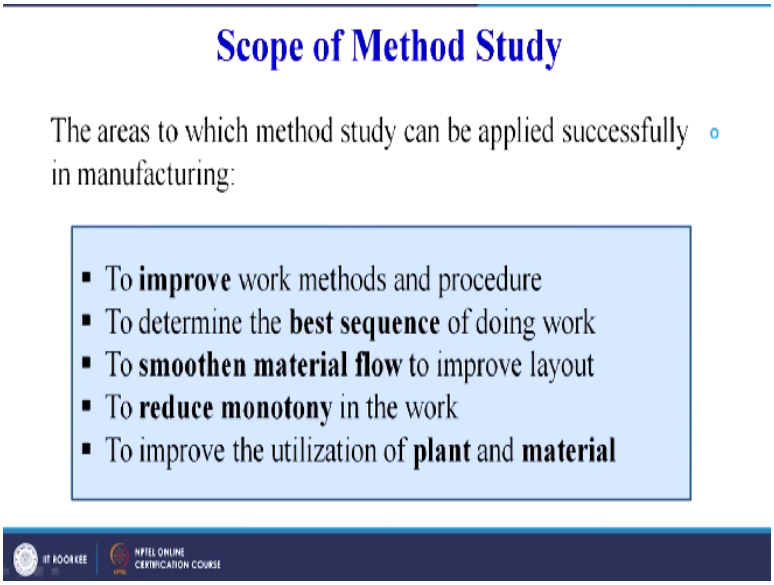

I think it is again a repetition. Quickly I will read it for you. The areas to which method study can be applied successfully in manufacturing. So this is specific to manufacturing sector only to improve the work methods and procedure already we have seen. I have already highlighted this during our discussion on the objectives of method study. So the focus is to improve the work method and procedure to determine the best sequence of doing the work.

To smoothen the material flow to improve the layout. To reduce monotony in the work. Already in last session I have told that if the worker is repetitively doing the same job he may feel bored. So we need to focus on concept like job rotation and job enrichment and to improve the utilization of plant and material. So this is the broad scope of method study. Method study scope lies in improving the work methods through process and operation analysis.

Such as this is again may be why we are emphasizing again and again because at the end of this session I think the objectives, the scope of method study must be clear to all the learners. So what we need to do in improving the work method? We need to focus on manufacturing operations and their sequence materials, tools and gauges. Layout of physical facilities and work station design. Movement of men and materials.

And the over\all work environment. So again there are 3 things coming in pictures. The plant, equipment, or the machine and processes that are being used in the manufacturing sector. The

material handling system which is being used as well as the work environment that we are providing to the workers. So overall object remains same that we need to focus on the manufacturing processes.

The sequence of operations being followed the way the material is being handled within the organization or the work handling machines and equipment or work handling systems as well as the overall environment that is being provided. That how the people who are the main stake holders in the overall manufacturing activity how they are performing their task? If we are able to focus on all these issues, we will definitely be able to come up with better methods of doing the work.

So these are the method study tools which we will focus in our discussion in the next weeks.

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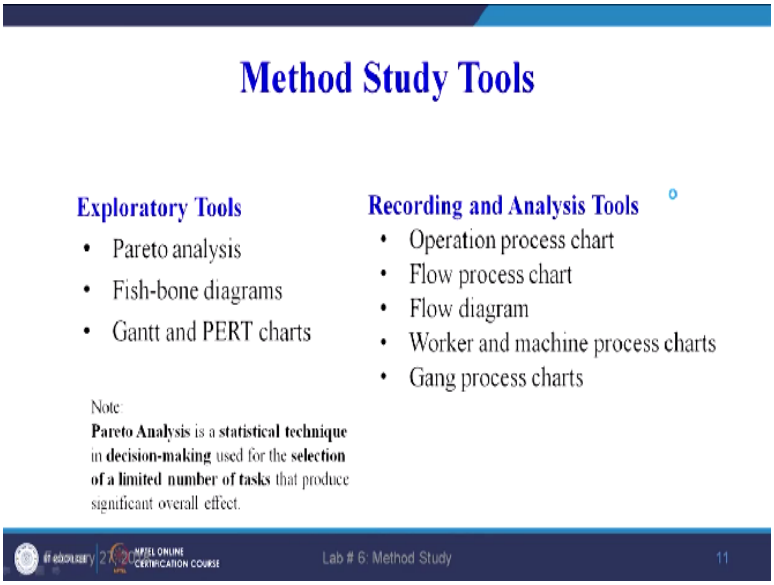

So there are exploratory tools like Pareto analysis, Fish-bone diagrams, Gantt and PERT charts and then there are recordings so Gantt and PERT charts may help us to establish the sequence of operations and how we can optimally utilize what work can be done simultaneously all that can be understood with the help of Gantt and PERT charts. Then Fish-bone diagrams can be cause and effect type of diagrams which can help us to take decisions related to optimal utilization of men and material.

Then recording and analysis techniques are very, very specific to method study. So we will study operation process chart, Flow process chart, Flow diagrams, Worker and machine process chart or Man machine chart and Gang process chart. We will further see string diagrams; we will see (()) (33:36). We will see principles of motion economy so we will understand different techniques or different tools which can help us to improvise, to improve the way the work can be done in an organization.

Now let us see the application of method study. When we apply the method study it will lead to improved design of plant and layout.

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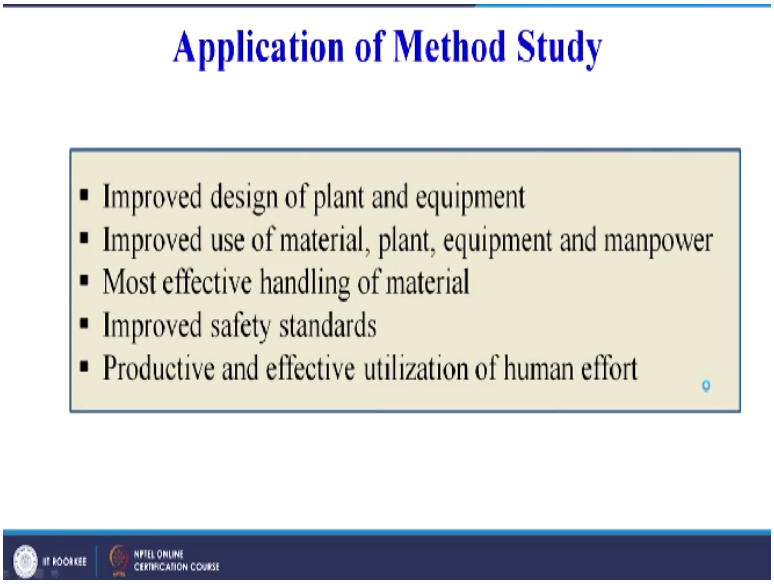

Improved use of material plant and equipment and man power. Because now we have design our plant and equipment in such a way that it is helping us to perform our task in a better manner. Most effective handling of materials. Safety will improve productive and effective utilization of human effort. So we can see our focus area in method study is what we have already discussed. Now if we focus on all those issues this will be lead to the improvisation after the application of method study. Now what are the advantages?

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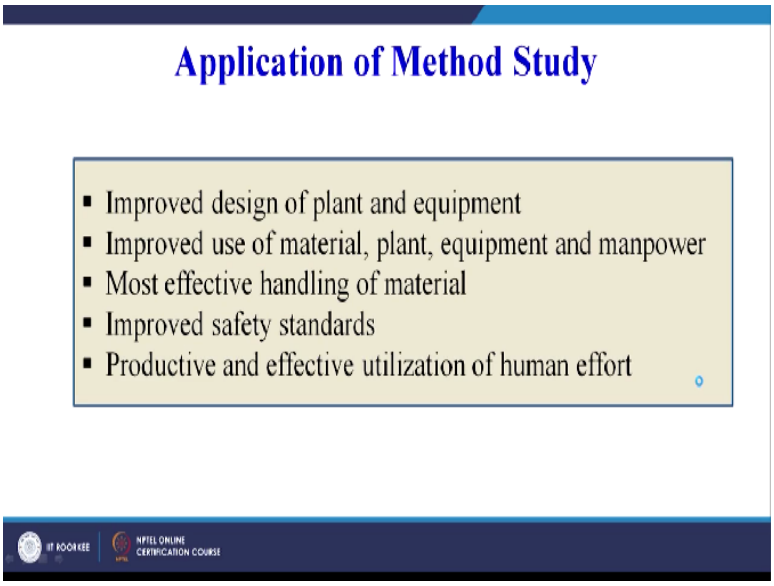

Work simplification. Work will become easier. Improved working method. Better product quality because now we are performing the task in the much better manner so it will translate into the product quality also. Improved work place layout as we have seen in one of the examples in the diagram that the space utilization can be improved following method study. Improved equipment design, better working conditions.

So advantages are numerous so I do not see any disadvantage of performing the method study. Only disadvantage that I can foresee is that human effort will be involved. We may need some time to hire specialized consultants who can come over to our company for performing the method study or we need to train our own employes, our own engineers, our own managers in this specialized area so that they can identify the areas of improvement.

They can identify certain segments of the work that here the improvisation can be done. Here the improvement can be done. So, if they are able to identify then they can follow all these techniques that are listed here to find out better methods of doing the job and also in addition the technological advancements happening every day, every now and then can help us if the company keeps themselves abreast with the latest technological advances.

They can definitely adopt this advances and put them into use and try to improve the way they are conducting their work or the way they are performing their work. So this is an overall

phenomenon or it is a universal technique which is not only related to the shop floor applications only. It is related to this recording studio also. It is also related to the office work also. It is related to the way the banks conduct their business.

How the bank employes perform their task? It is related to how may be our army men defend our boarders. So everywhere wherever the work is being done there can certainly be a better method of doing the work. So this will help us to analyze the work. The way the work is being done. The sequence of the various operations in the work (()) (37:04) and try to optimize that with the objectives which we have already seen.

And will lead to the advantages which are already listed on the screen. So with this we conclude today's discussion and in the next session our target will be to understand the various techniques that we follow in method study. So for the next 4 weeks now our target will be to understand the concept of method study in much more detail with examples and case studies. Thank you.