

Work System Design
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Lecture – 15
Human Aspects of Work Study

Namaskar friends. Welcome to session 15 in our course. We are currently discussing the basic aspect of work study. We have already completed discussion in the first 2 weeks on the productivity and tried to understand the basic concept of productivity. The causes of low productivity, the factors affecting productivity, productivity improvement techniques then certain numerical problem related to productivity and case studies.

Related to improvement of productivity. In the current week our focus is primarily is to understand the basic concept of work study. We have already understood that what do we mean by work study? What are the various tools and techniques of work study? How to define method study? What do we mean by work measurement? and we can measure the time required for conducting or required for performing a particular task at a defined level of performance.

The focus primarily has been into just introduce the concept of method study and work method. Because we have 2 complete modules in work study. First one is related to method study there are different techniques that are used for method study and we will be focussing on each of these techniques with lot of examples and case study. Similarly, the second important module is the work measurement in which we will learn all the different techniques.

That are used for standardizing the time required for doing the work or the task. There are work measurement techniques like stop watch time study then there is standard data approach, predetermined motion, time systems are there. MTM, MTM1, MTM2. There are standard approaches to find out the time required for performing the task. So broadly our discussion will focus in two directions. First one is method study.

Second one is work measurement and we will study all this in detail. In today's session, the target primarily is to highlight the human aspects of work study. There is definitely going to be a

challenge when you are going to perform a work study analysis in any organization. Why? Because the workers are accustomed to a particular way, or particular sequence, a particular methodology, a particular procedure of doing the task.

A person joins may be in a particular educational institute, he is assigned may be 1 or 2 courses in the Autumn and Spring semester and suppose the faculty member is teaching the same courses over and over again, semester by semester. He gets satisfied with those courses. He gets accustomed to those courses. As soon as there is a change a new course is assigned to a faculty member immediately the faculty member will start to show a rebellious behaviour.

Or he may show his or her discontent. Similar is the case in industry also workers may be working for the last and near following a specific procedure of doing the work. And all of a sudden you start analyzing the work. You start trying to may be examine the work and propose a new work methodology or propose a new work plan immediately there will be an issue. So there is definitely going to be some kind of an issue.

When you are going to do your work study analysis. Or when you are going to perform you work study. So these are human factors which must be taken into account. Secondly, the important point is that when we are taking a decision the work has to be accomplished there are two ways of doing the work. First one can be manual. The second one can be with the help of machines. Now both of these have got their own advantages and limitations.

Where ever manual work can be done machine may have certain limitations. Where ever machine is successful human being or the manual task can have certain limitations. So we can compare that what are the areas where human being are more capable? What are the areas where machines are more capable? So today's session our target will be to focus on these two important points. And the title we have given is human aspect of work study.

Where we will see machine as a productive element, man as a productive element and try to see the pros and cons, advantages and limitations, challenges and issue when we put man as a productive element viz a viz machine as a productive element. But prior to going to that

discussion let us first try to systematically see that what are the issues when we start doing work study in any organization?

So quickly we will try to understand now human consideration in work study. Now work study will be a powerful management tool to improve productivity only if now the important point is only if? And this the question mark why? Because the previous sentence we have already, all of us agree that it is a powerful management tool to improve the productivity. Already two weeks of discussion we had on productivity.

So many case studies we have discussed I think all learners will agree that it is an important tool, work study is an important tool which can help us to improve the productivity of our operations of our organization. Only if now this is possible only if a good relationship is established between the managers, supervisors and the employees and I think I have already highlighted numerous times that it is the men.

Or the human work force or the human resource which leads to the success of the organization. So, human resource can be men, women or the staff that is working for the organization so we need to focus on the human resource effectively. We must focus on the human resource so that we are able to be profitable. So first point is very, very important that although our management practices, our work study is going to lead us to improve productivity.

But that is only possible if we focus on our human resource. So therefor due consideration must be given to everyone concerned as an individual and should see that no one will perceive a threat to his security and self-respect. So, we must properly give attention to each and every individual of the organization so that there is no threat to his security and self-respect.

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Human Consideration in Work Study

- Work Study will be a **powerful management tool** to improve productivity only if a good relationship is established between the **managers, supervisors and employees**.
- Due consideration should be given to everyone concerned as an individual, and should see that no one will perceive a threat to his security and self-respect.



So that is one an important point we must take into account that the summery of this slide is that human resources are important and it must be given due importance. Now the relationship between work study and people there can be three different levels in any organization. One is the management then the supervisor and third are the workers.

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Relationship Between Work Study and People

- Work Study and the management
- Work Study and the supervisor
- Work Study and the workers



So we must be able to focus our attention on all these three levels of hierarchy in any organization. So work study and management definitely there will be silent features that must we taken into account. At worker's levels also there must be silent may be features or characteristics that must be addressed so work study needs to emphasize on each and every hierarchical level in the organizational set up of any organization.

And we will try to quickly see one by one that what is work study and management point of view? Now work study through the direct observation and analysis of a given situation will show up any sort coming in all activities affecting the productivity of the operations. Now when we will do work study we will definitely come up with sort coming. So that is the target of our activity that is the target of this work study activity, the target of the work study program.

Why the work study has to be done? We are analyzing the work to develop a new method, to develop a better method of doing the same task. So when we are doing any analysis we will like to find out what are the grey areas? What are the areas where time is being wasted? What are the areas where the human effort is being wasted and try to rectify those? try to come up with the new method which is more effective, more efficient, more time saving.

More safe as well as more economic. So we will try to find out the shortcomings. For example, ideal time due to lack of materials.

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Work Study and the Management

- Work study through the direct observation and analysis of a given situation will show up any short coming in all activities affecting productivity of operations . **For example:**
 - Idle time due to lack of materials**
 - Frequent breakdown of machine**
- Since no body likes to get exposed therefore Work Study analyst has to be very tactful in handling the people and it should be used with care.

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Maybe our supply of materials is not that regular or the demand raised by a particular section for the material is raised late or there is a miscommunication between two different departments maybe the actual shopfloor as well as the material management department there can be n numbers of reasons. But there is ideal time due to lack of material so that has to be taken care

off. Frequent breakdown of a machine that is may be some technological changes are required.

To keep the machine up and running. So these are two problem areas which will be identified after the work analysis. Since nobody likes to get exposed therefor work study analyst has to be very tactful in handling the people and it should be used with care. So when you pointing out the problems, the summery of this slide is that the management has to be very, very tactful very, very smart because they are going to pin point the problem areas.

And going to establish the accountability and responsibility of the people who are not able to deliver as per requirement. So, therefor they have to be very, very tactful, smart in establishing these problem areas as well as associating these problem areas setting up the accountability and responsibility of the employees. So because when you point at somebody there can be excuses and the buck may be passed from one person to another person to the other person.

So when you are applying work study you have to be very, very cautious. Then work study and the management again we are continuing our discussion on the same topic.

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Work Study and the Management

- Therefore, for Work Study analyst to be successful, support of top management is necessary.
- For this he should run appreciation **training programmes on Work Study** and inviting top bosses/CEO.

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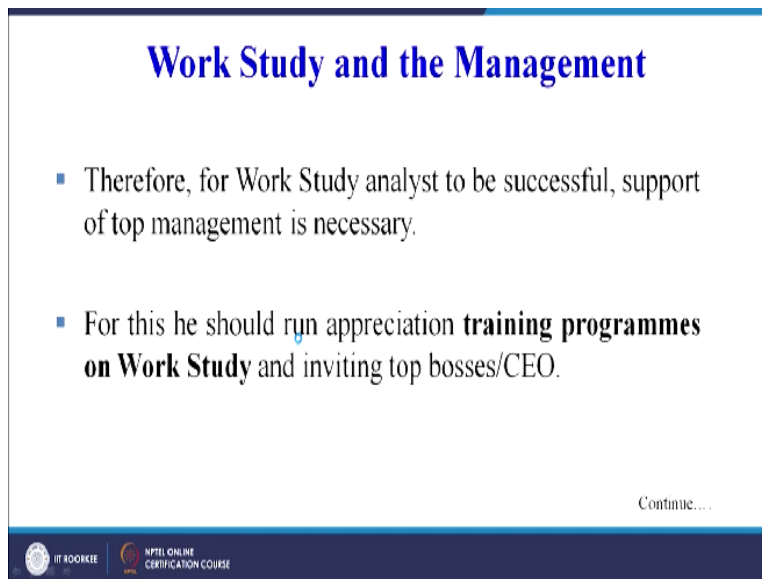


Therefor for work study analysist to be successful support of top management is necessary. Because work study is definitely going to pull the cat out of the box so that is may be just one analogy I have tried to draw it is directly going to point out at the problem areas within the

organization. So if it does not, work study team, work study analysts do not have the support of top management they may not be able to bring out the problem areas for the organization.

Will not be able to define new methods of doing the job. Therefore the top management support is very, very important and also for this he must run appreciation training programs on work study and inviting top bosses and CEO's or CFO's or CTO's.

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Work Study and the Management

- Therefore, for Work Study analyst to be successful, support of top management is necessary.
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So, top management support is mandatory for the success of work study that is the summary of the last two slides. Now, let us come to the training programs also. Now, we can maybe the top management can think of organizing or I must not say can think they must, they will organize programs if they want to be successful in their business or if they want to be successful organization. Now what are the various types of training programs that can be developed?

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Work Study and the Management

Training programmes example:



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So one can be very important that is personality development, then soft skills program can be run for the employees. Product branding programs, study of behaviour fourth. Team building fifth then types of behaviour can be studied for the employees. So, different training programs can be conducted for the workers so that they feel associated with the organization. So management has a key role. Now first thing is there are two important points here.

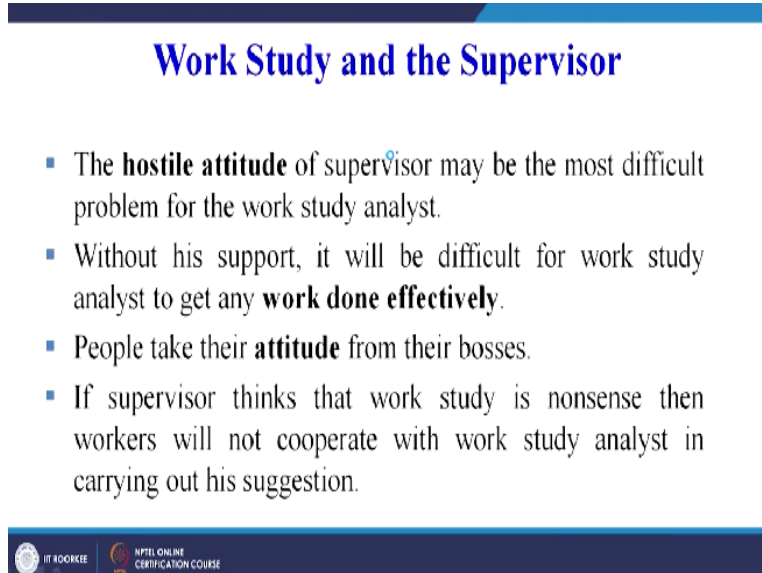
Point number one is the management must support the time study, not the time study only the work study which includes both the methods and the time study for the work measurement. So the top management must support that is number 1 and the second point is that they must not only help the work study analyst to point out at the problem areas but must also try to rectify these problem areas with the help of certain programs.

So the behavioural aspect of work study is very, very important in connection or in context of the top management. Top management has to ensure that the sequence of operations, the methods of operations, the way of doing the work is improved. There is team which is able to point out at the flows or at the problem areas. The team is fully supported, fully backed by the top management and when the problem areas are identified.

The top management helps the employees to improve themselves by conducting time to time or may be sequential training programs. Then coming on to the second important link between the

top management and the worker that is the roles of the supervisors. The hostile attitude of supervisor may be the most difficult problem for the work study analyst.

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The slide features a blue header with the title "Work Study and the Supervisor" in white. Below the title, there are four bullet points in black text. At the bottom of the slide, there is a dark blue footer containing two logos: "IIT ROORKEE" on the left and "NPTEL ONLINE CERTIFICATION COURSE" on the right.

Work Study and the Supervisor

- The **hostile attitude** of supervisor may be the most difficult problem for the work study analyst.
- Without his support, it will be difficult for work study analyst to get any **work done effectively**.
- People take their **attitude** from their bosses.
- If supervisor thinks that work study is nonsense then workers will not cooperate with work study analyst in carrying out his suggestion.

So now we come to the middle level where the supervisor is coming into picture without the support of the supervisor it will be difficult for the work study analyst to get work done effectively. People take their attitude from their bosses take their attitude from their bosses. So if the supervisor is noncooperative, the workers will also be noncooperative. If supervisor thinks that work study is nonsense, then workers will not cooperate.

With work analyst in carrying out his suggestions. So we have seen the top management support, training programs conducted by the top management that is the role of the top management in ensuring that the success of the work study team is ensured. From supervisor point of view this slide is a negative slide it is showing all the negative things related to the role of the supervisor in the work study analyst.

But as a work study analyst, as an engineer we have to impress on him that how we can conduct this program what are the benefits if this program is conducted and if you remember in this week only we have seen that what are the advantages of work study. So we need to impress upon the supervisors that this study is conducted. It is not only beneficial for the workers it is also beneficial for the supervisors also.

It is beneficial for the top management. It is beneficial for the organization. It is beneficial for the state. It is beneficial for the country. So, we need to impress upon the supervisors the importance of the work study program and the advantages of the work study program. The relationship between the management and the workers has to be reasonably good for the success of work study.

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Work Study and the Workers

- The **relationship** between management and workers has to be reasonably good for success of work study.
- Workers should have **confidence on management** sincerity towards them.
- This can be achieved by **sound personnel policy** of management, good working conditions and right attitude toward them.



So, I think I have highlighted that supervisor is the key man so we must be able to impress upon him the advantages. Then coming on to the workers the relationship between the management and the workers has to be reasonably good for success of work study. Workers should have confidence on management sincerity towards them. So the worker must feel that the management is sincere about the concerns of the workers.

They want the upliftment of the workers. They want their workers to be happy. There is no conflict of interest between the workers and the management. So the management as we have seen in the previous discussion today that must insure that the worker has proper training time, time to time training, workers are kept in good moral. They are having good motivation that is the role of the management.

And if the management is able to keep the workers in good stead, definitely the workers will feel

empowered. They will feel happy. They will enjoy doing their work and that will lead to the productivity or higher productivity of the organization. Now how they can achieve this thing, the management. This can be achieved by sound personal policies. Sound means worker friendly policy a good personal policy an excellent personal policy.

The HR policies of the management or the HR policies of the organization must be addressing all the concerns of the workers working for the organization. So, if all the concerns are taken care of the worker will be more than happy to contribute to the success of the organization. So sound personal policy of management then the second thing is good working conditions must be ensured.

Now good working condition means we will see that when we are designing a work system for a worker we must take care of his safety. We must take care of his may be physical capability. We must take care of the environment that we are providing to the worker. Now for example a worker is doing a very may be intricate task may be he is fixing up the gears in the wrist watches. Now it requires lot of concentration.

So if we are able to provide environment where there is no noise, there is no sound then there is adequate lighting, illumination in the room or the work place is very, very good. The worker will also feel may be comfortable while doing his task. So the management must ensure that the workers are feeling comfortable while performing their task. The management has a sound or a good or an excellent personal policy then the right attitude towards the workers.

So, the management must have may be not happy is not the right word. I must say may be feeling of belongingness must be developed inculcated among the workers. So that is the role that is you can say one of the core responsibilities of the management to make their workers feel comfortable, to make their worker feel important, to make their workers feel empowered. So from the workers point of view there are few things that must be taken into account.

If they want to realize the full potential of the work study program. Because what we are going to do in work study? We are going to have a team which is going to understand which is going to

record the way the work is being done. They are going to examine the way the work is being done. They are going to develop a new method of doing the work. The new method has to be the benefits have to be measured then this method has to be installed.

And when the method will be installed who has to follow this method? The workers have to follow this method. The management has to ensure a strict compliance of the method which has been developed. So the management the supervisors, the workers are the key elements for the success of any work study program. So, it cannot be done solely based on the machines in many cases only if the workers are not involved in the whole manufacturing process.

Maybe the human elements in work study can be slightly ignored. But in most of the companies we see that lot of human being are involved. Lot of workers are involved starting from the worker level to the supervisory level to the management level to the strategic management level. So always there is a human intervention in the way the company operate and when the humans are working we have to consider the effect of human behaviour.

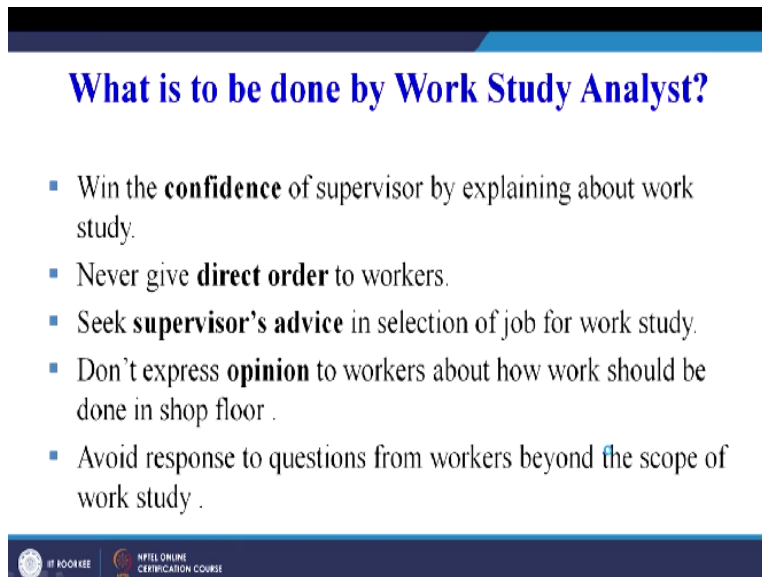
On the decision making process and in this case also whenever we propose a new way of doing the work how the different hierarchical levels in the organizational setup are going to perceive that change this is very, very important that we have tried to understand in the last 15, 20 minutes. That work study has a separate one to one relationship with management. Work study has a relationship with supervisors also.

Work study program has a relationship with the workers also and if this relationship is congenial if it is good, it is friendly. Management also likes work study program. Supervisor also feel's important with the work study program. Workers also want to be part of the work study program automatically it will ensure of the work study program. It will ensure the success of the work study program.

Now what is to be done by work study, analyst this is just maybe one guideline because the work study analyst has to be in touch with the top management, with the supervisors, with the workers also. So what he must do? Win the confidence of supervisor by explaining about the

work study.

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What is to be done by Work Study Analyst?

- Win the **confidence** of supervisor by explaining about work study.
- Never give **direct order** to workers.
- Seek **supervisor's advice** in selection of job for work study.
- Don't express **opinion** to workers about how work should be done in shop floor .
- Avoid response to questions from workers beyond the scope of work study .

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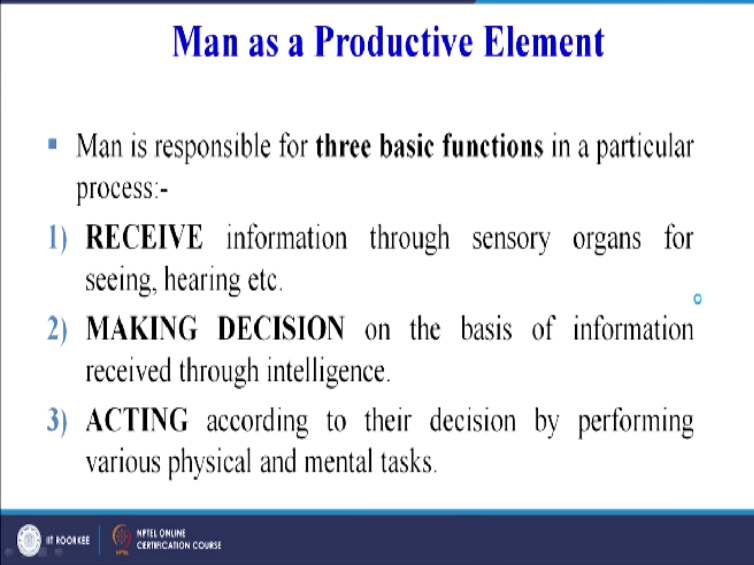
So the first thing he has to win the confidence of the supervisor who is the key man in any work study program. Never give direct order to the worker that is one good practice. Seek supervisor's advice in selection of job for work study. Which means that you involve the supervisor in the decision making process. Give importance to the supervisor, empower him. So if the supervisor feels empowered he feels that I am a part of the work study program.

He will definitely support the analysis. He will definitely give valuable inputs because he is the first hand man who is seeing actually how the work is being done day in and day out. So that is very, very important. If supervisor becomes the part of the work study team it is definitely going to add to the success of the program. do not express opinion to workers about how work should be done on the shop floor.

As a work study analystist you must analyze the work, do the critical examination of the work but do not pass any judgments on the shop floor which is a good habit for any work study analystist. Avoid response to questions from workers beyond the scope of work study because it may create an element of doubt in the minds of the workers. So therefore the time study analysis must be very, very focused regarding the objective, aim of the work study program at hand.

Unnecessary should not get involved in other question and answer sessions. Now quickly we will try to differentiate between man as a productive element and a machine as a productive element. Now man as a productive element we can see that man is responsible for three basic functions.

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Man as a Productive Element

- Man is responsible for **three basic functions** in a particular process:-
 - 1) **RECEIVE** information through sensory organs for seeing, hearing etc.
 - 2) **MAKING DECISION** on the basis of information received through intelligence.
 - 3) **ACTING** according to their decision by performing various physical and mental tasks.

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What are these three basic functions? First is receiving the information through sensory organs for seeing and hearing. Making decision on the bases of information received and acting according to their decision by performing various physical and mental tasks. Now let us take an example. Suppose I get a intimation from the watch if I look at the watch or the teaching assistance shows me a play card showing 25 minutes are over.

So this is one information which I will receive by seeing at the play card I have taken this information. Receiving of the information has been done then making a decision now I have to see that I have 5 minutes or 6 minutes left. I have to cover this topic. I have to take a decision that how I must conduct myself so that my topic is covered within the stipulated time of 30 minutes then I will start my action.

I will try to emphasize on the most important parts and try to finish the things within the next 5 to 6 minutes. So that means that as a man as a productive element I eyes will received the information. I will make certain decisions based on that information and then I will act accordingly. Similarly, a man working on the shop floor will also receive some information it can

be in the form of a drawing.

He will look at the drawing that four holes have to make in this plate. So that is the receipt of the information then he will take a decision that which drill I must use. What is the speed and feed combination that I must use and then after that selection he will act? He will put the plate on the drilling machine, fix the size of the drill and start the operation and that is coming under the action state.

Now these are three basic functions that the man usually do on any shop floor or in any decision making process. Now let us see that as a man what are the advantages as a productive element? So if a man is given a task what are the advantages? We can see the first thing is the flexibility in working.

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Advantages of Man as a Productive Element

- A Flexibility in working
- B Intelligence in working
- C Can adapt to the working environment and changing conditions easily
- D Can design various tools and machines and methods to reduce the work content
- E Man is an innovator

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First thing is the flexibility. Second is he intelligence in working that is in case of any problem a man can quickly react and take a decision that how to save the situation? How to prevent the situation? But a machine may not be able to take a decision as quickly as a human being can take. Then can adapt to the working environment and changing conditions easily. Now suppose there is a may be a temperature is going beyond a particular level the machine will stop.

But a man can take a decision that he can open a window so that the temperature comes to the

normal condition. So person can use his judgment as per the condition and can adapt to the working environment can changing conditions easily. So we can say man is more adaptable as compared to machines. Can design various tools and machines and methods to reduce the work content so we have already seen what do we mean by work content?

So a man can design various tools and techniques to reduce the work content and all in all man is an innovator. So man is an innovator he can innovate as per requirement but a machine cannot innovate. So these are the advantages if we use a man as a productive element if we assign task to a man these are the advantages that we can derive. But there are certain flip sides also.

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Disadvantages of Man as a Productive Element

- A** Cannot apply huge amounts of physical force and pressure
- B** Cannot use muscular power with fixed intensity and high accuracy
- C** Cannot perform simple repetitive movements rapidly and accurately
- D** Cannot respond rapidly to frequently changing control signals
- E** Cannot function satisfactorily in working environment in which conditions go beyond natural limits

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First thing is cannot apply huge amount of physical force and pressure. Machines can do that machine can apply as much force and pressure as possible. We can do that but that is one may be flip side of man. Second is cannot use muscular power with fixed intensity and high accuracy. Now suppose I am asked to speak for 5 hours at a stretch. May be for the first hour I will be speaking quite loudly may be at the end of fifth hour my voice may be feeble.

It may not be that loud so a man cannot apply muscular force with the same intensity and accuracy for a long period of time. Cannot perform simple repetitive movements rapidly and accurately. If you start uttering the word may be I tell you that you utter it 1 million times. You may be after 1000, few 1000 times you may not be able to speak it that correctly. So that is

simple repetitive movement that is the movement of the lips.

You are uttering the same words again and again may be after 1000 times, 2000 times you may start faltering. So the man cannot do the repetitive where as a machine you give the task for 1 week, 2 weeks, 5 weeks may be 2 months it can do the same repetitive task again and again. Then what is the other limitation of man? Can't respond rapidly to frequently changing control signals so if there are control signals are changing too frequently.

It becomes sometime difficult for a man. Suppose may be if I am in an interview three people are continuously asking questions may be I am trying to answer a question. There is a new question that is asked so I may not be audible to adapt to these types of change in the control signals. So that is one limitation of man. Then cannot function satisfactory in working environment in which conditions go beyond the natural limits.

So may if the temperature is 70 degrees celsius so it may be it may not be possible or on the other side the temperature is subzero temperature. May be beyond the natural limits when the environmental conditions will go it becomes difficult for man to operate. But the machines can be designed to operate in these types of conditions. So whatever are the advantages of man that will become the disadvantages of the machine.

And whatever are the disadvantages of man as a productive element that will become the advantages or the areas where the machines can be used so quickly now let us summarize. Advantages of machine as the productive element. Where machines are more applicable? Can we use to apply huge amount of force with fixed intensity and accuracy which is a limitation of man as a productive element.

But it is an advantage in case of machines, can perform repetitive movements without fatigue. So the machine can do the same task again and again n number of times. Can we use for doing the complex calculations rapidly and accurately? computers do such nice calculations for us which it's sometime becomes difficult for human being to accomplish. Can perform various tasks simultaneously which is very, very difficult for human beings.

But not at all difficult for the machines. Can function in conditions which are beyond the natural limits, machines can be designed to work in difficult environmental conditions. Then what are the disadvantages of machines? Natural these are the advantages of man as the productive elements. So disadvantages of machine as the productive element are.

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Disadvantages of Machine as a Productive Element

- A Machines are less flexible and have a fixed area of expertise
- B Machines do not have intelligence and cannot respond in accordance with the environment
- C Can survive only in standardized condition otherwise it leads to wear and tear of machine
- D Machines cannot adapt to changing conditions
- E Machine is not an innovator

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Machines are less flexible and have fixed area of expertise. Man is flexible he can be taken from one particular job and put to the task in the other job. But machines are less flexible as compared to human being. Machines do not have intelligence and cannot respond in accordance with the environment. But I slightly disagree with this these days with the advent of artificial intelligence tools, machines are also being developed which are very, very intelligent.

But not as intelligent as human beings. Can survive only in standardized condition otherwise it leads to wear and tear of the machines. So whatever are the conditions for which the machines have been designed they can operate reliably and successfully in those conditions only. If you take them beyond those conditions wear and tiers will lead to the failure of the machine elements. So that is one limitation of the machines.

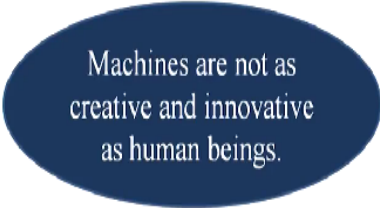
Machines cannot adapt to changing conditions easily. Whereas human being can do that and machine is not an innovator so machine can do the task for which it has been trained, for which it

has been designed. But it cannot adapt to so many changing environment, cannot take decisions that quickly and that creatively as a human being can. So machine is not an innovator. So in the end we can conclude that in today's session we have tried to cover two important aspects.

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Conclusions

- Advantages and disadvantages of man and machine as a productive element help us to decide the sequence of various operations in the production system. ◦



Machines are not as creative and innovative as human beings.



That how is work study related to the human behaviour that is management, supervisor and workers. What are the issues to be taken into account then what are the good habits that any time study or work study analysis must practice in order to run a successful work study program? And finally we have seen that in case of work study both the worker and a machine can be used as the productive elements and what are the relative advantages and disadvantages of using machines.

And men as the productive element. So advantages and disadvantages of man and machine as a productive element help us to decide the sequence of various operations in their production system. In summery we can say it will help us to decide that what work must be done by machine and where man will more successful. So machines are not as creative and innovative as human beings. So we cannot undermine the importance of human resource.

For any organization and human resource is definitely going to help in the success of the organization as well as in the successful implementation of any work study program. So with this we conclude the third week of our discussion and in this week our focus was to understand the basic aspects and very concepts of work study. In next week our focus will primarily be to learn

the various tools and techniques that are employed for conducting a successful work study program. Thank you.