Work System Design
Dr. Inderdeep Singh
Department of Mechanical and Industrial Engineering
Indian Institute of Technology – Roorkee

Lecture - 34
Development and Selection of New Method

Namaskar friends. Welcome to session 34 of our course on Work System Design. What is the target for today's discussion is highlighted on the screen? You can see it is development and selection of a new method and the selection of a new method I have been talking continuously for the last may be 3 weeks in which we have been discussing the various techniques that are implied under method study.

So to summarize how to solve a problem using method study we have listed one procedure or one step by step approach to attack or to attempt a problem that we see under method study. So what is the problem? If we have to define a problem, we can summarize it in one sentence only to develop a better method of doing a particular operation or we can say to develop to be very specific to develop a better method of doing the casting operation or to develop a better method of doing the drilling operation or to develop a better method of serving customers in the bank.

We can say these are the statements and how to go about these statements or how to go about these problems what we need to do? We have seen that there is step by step by step by step by step procedure and if we follow that procedure very easily we will be able to develop a better method of doing the things. Now what are these step by step procedures? There can be theoretical steps.

But from practical point of view, what I personally believe is that these can be done in 4 stages or 4 broad focus areas. The first one is that we have to identify that which particular segment or which particular shop or which particular operation we need to study. So first is the identification stage. Suppose I enter into organization as a consultant and I have been hired as a work study analyst.

So if I enter into organization first thing that I would like to observe is that where I can put my efforts to improve or where I can put efforts to improve the methods of doing the work,

where I can improve the techniques, where I can improve the flow pattern, where I can improve the layout, where I can improve the Man machine interaction. So first thing what I believe is the identification.

So that depends on how knowledgeable a person is how much well versed the person is about the operations or the processes being done in the industry. What is his vision? How is his attitude? Can he perform critical thinking? Can he identify that yes this is the job or this is the process where I must focus my attention. The first thing broadly we can say is identification. The second is representation or records the facts.

Whatever we have identified that this is the particular area or this is a segment or this is the shop or this is the department where I want to focus my energy for improving the ways or means of doing the work then I need to record and for recording all of you know we have learned whatever we have been discussing till today is everything related to recording the type of work being done.

And for recording you know we can do operation process, chart flow process, chart flow diagram, man machine chart, 2 handed process chart, therbligs we can use, SIMO chart, string diagram. So any of the technique we can use depending upon our objective, depending upon the type of work being done, depending upon the results that we envisaged. So depending upon so many factors we will decide on the recording technique.

So 2 words first one is identification second one is recording and the third one which we have already covered in session number 33 critical examination. Once we record in the form of a diagram or a chart the current method of doing the work the third stage then is examining, the questioning technique. Question each and every thing related to the job as we have seen we can question the very purpose of doing the work.

Then the person who is responsible, the place, the means by which the job is being done or the technique being followed to do the work. To question everything, we have primary questions and secondary questions and these questions will help us to identify the problem also as well as to propose the alternatives also. So third thing is critical examination. So once we have done the critical examination.

And we have listed down the alternative possible with us then the last stage is there that is the installation and maintenance. So critical examination we can club into 2 examination and development or selection of a new method. So this is examining what we have already plotted or we have already put in the form of a diagram or what we have already represented in the form of a chart.

So examining that questioning the way we are doing the work, the people who are doing the work and then try listing down the alternatives, comparing the alternatives for technical feasibility, comparing the alternatives for economic feasibility then purposing or developing a new method. So this is the third stage that is we are trying to question or critically examine the method of doing the job.

And then we are trying to develop a new method. So examination, evaluation, and development we can say is the third main block for solving any problem using method study and the 4th one is whatever the best method we have developed, we have to install it and finally we have to maintain it, we have to ensure that each and every person is performing the work as per the standard of rating procedure which has been explained to him or her.

So broadly there are 4 main phases of developing a better method. The first one being I will just name the important points only the first one is identification of the work which we want to study. Second one is recording all the facts using the various graphical tools as applicable. Third one is critical examination and development of a new method and the 4th one is installation and implementation installation as well as the maintenance of the new method.

So in these 4 stages we have to work. So what we have covered till today. Till today we have covered the first 2 parts that we have to identify, that where we want to put our efforts we know now how to record. If a man is working on a machine and we want to see that for how much period of time or for how much time during an 8 hour shift he is busy and free. We know that we have to do this with a man machine chart.

Very easily we can go there, we can time his working, we can just see that for what time he is operating the machine, for what portion of time he is free and then draw a man machine chart and do the calculation accordingly. So now depending upon the application we can select that which graphical tool will be helpful to us. So first thing is identification, second is recoding

we already know.

While recording we have also seen that yes if we are able to record the things properly automatically we can see that where there is a scope of improvement and wherever there is a scope of improvement we have seen we have also shown the results also that the method can be improved in this manner. So we have directly seen the results. How to achieve those results?

How to make a process flow chart or operation process flow chart, how to make a man machine chart of a better method in between there is a box, in between there is a black box. So we have a current method of doing the job and for current method we plot it. We make a chart or a diagram as per requirement then we work on that. We do the critical examination, we ask numbers of questions and then try to develop a better method.

So then we plot the better method and then compare the 2 in terms of numbers of operations, numbers of inspections, numbers of transportations, delays and storages and then we show we are able to claim that the new method or the proposed method is better than the old method or the current method. So in between what we do in between we do the critical examination the questioning that we have already understood in the session number 33.

So now once we have done the questioning technique, we have asked the secondary question, we have a long list of alternatives which we feel can help us to develop a better method. So today's session is more theoretical in nature, but it will orient our thought process in such a way that we will be able to work on the alternatives which we have tried to list during our critical examination and out of the alternatives we will be able to develop and select the best method.

So there can be you can say 4, 5 alternatives available with us after the critical examination out of those we wish or we try or we want it is our objective to develop or to select the better method, so that is the target for today's discussion. So once again 4 words are important identification of the work area, recording of the facts, critical examinations, and development of the new method the last one being the installation as well as the maintenance of the new method.

So these are the 4 broad pillars on which the method study will always be successful. Now let us quickly read I think I have explained the gist, the summery, the synopsis of today's lecture. Now quickly we will try to see that how we can develop a better method. After we have critically analyzed the current method of doing the job.

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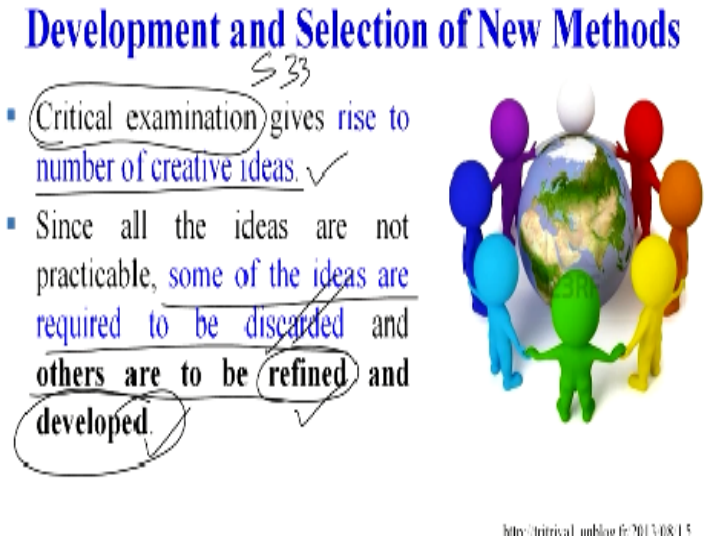

Now development and selection of new methods you can see. Critical examination which we have already seen in our session 33 gives rise to numbers of creative ideas and this we have seen with the help of examples also if you refer back to session number 33. You will see few examples that questions have led to numbers of alternatives and these alternatives you know we need to develop into a better method.

Since all the ideas are not practicable, some of the ideas are required to be discarded. So some of the ideas definitely we would like to discard or reject based on the technical feasibility, economic feasibility sometimes the ideas may be too much into the fancy word which is not practicable. So we will discard those ideas and the others are to be refined so the selected ideas have to be refined and developed.

So the summery of this slide is that after the critical examination that we have seen in session 33, we can list down a number of ideas out of those ideas few we need to discard and other we need to refine and develop. Approaches in the development of new methods now we have seen so many different examples also we have seen and moreover we are focusing on the similar examples only so that the subject becomes clear to you in totality.

For each type of slide, we can have a different example there are hundreds of examples available in different books in e-content, but our target is to take the same example so that we know that how a complete problem can be solved using a method study approach. So what can be the various approaches for developing a better method. This already we have seen in the critical examination in previous session.

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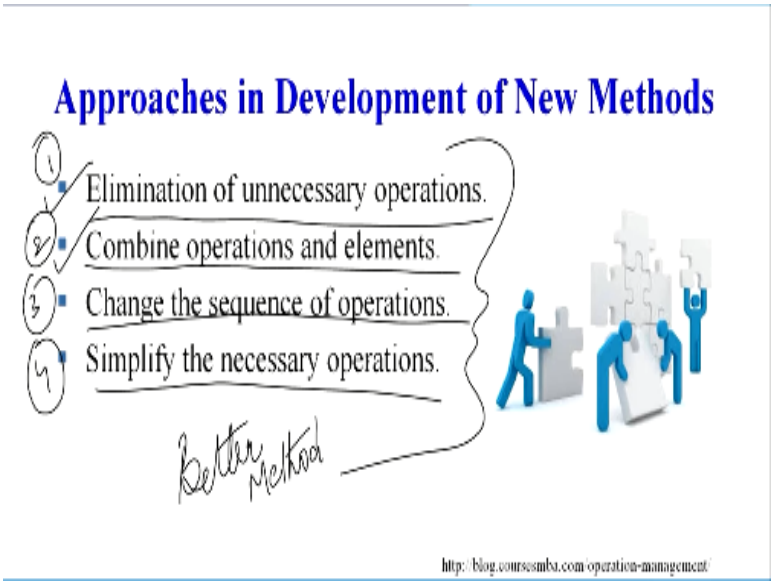

First one can be elimination of the unnecessary operations, but how we will come to know that which operations are unnecessary. We will come to know regarding these when we have recorded the facts properly using the specific recording technique or using the specific graphical tool or chart or a diagram. So first one is then once we have recorded the things properly we can very easily look at the unnecessary operation maybe that operation can be.

Redundant operation may not be required or it can be combined with another operation to save the effort and the time. Wherever possible we would like to combine the operations and elements. Already I have explained this, change the sequence of operations number 3. Simplify the necessary operations number 4. So if we focus on these 4 things very easily we will be able to develop a better method of doing the job.

And that is the targets of method study. So we can think that these can be the guidelines which will help us to differentiate among the alternatives that we have identified after the critical examination. Suppose we have 4 alternatives so we can work on each and every alternative and look for possible areas of improvements we can see that yes in alternative number 2 there is a possibility of eliminating these 2 operations.

There is a possibility of combining our operation with an inspection in alternative number 2. Similarly, we can critically look at the other alternatives also with these guidelines and then finally out of the 4 alternative we will be able to trace that this is the best alternative or we will be able to select that out of the 4 this one is going to give us the best result or at least the better results.

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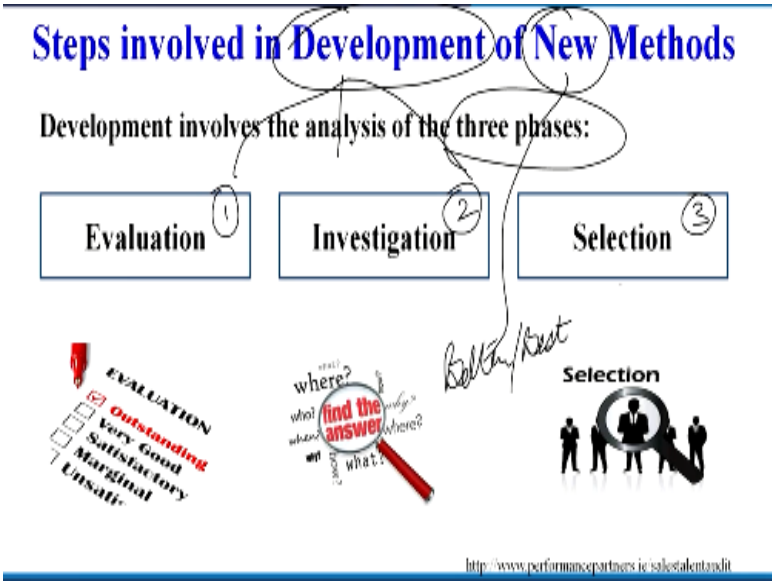

Now the steps involved in development of the new methods. So development involves analysis in the 3 phases. So what are these 3 phases? The first one is evaluation the second one is investigation and the third one is selection and overall we are trying to develop a new method and the new we can say it must be a better or a best method of doing the work. It must be better or best as compared to our current method of doing the work.

So the steps involved are very clearly depicted here, the evaluation, the investigation and selection. What we need to evaluate? We need to evaluate the alternatives which we have developed, which we have listed after the critical examination using the questioning techniques of the current method of doing the job. For example, if a person is performing a particular task we can ask the questions like the purpose of the task.

Why this task is being performed, why Mr. X is performing it, when he is performing it at what locations, where the task is being performed, what are the means or what is the technique he is following for performing the task. So with these questions we can ask for the secondary questions that is the task really necessary, what else can be done to avoid this task.

Similarly, for persons also why only he is performing this task.

Why there cannot be other person or a maybe a group of person from among whom we can choose that who is the best person to perform this task. So these types of alternative, this type of question or these types of questioning techniques will help us to list down the alternatives. So those alternatives we need to evaluate and once we evaluate them we may be required to investigate.

We need to compare that which one can gives us the better results and once we have investigated then we have to select the best methods which is giving the best results. Evaluation now 3 stages are there. Evaluation, investigation and selection.

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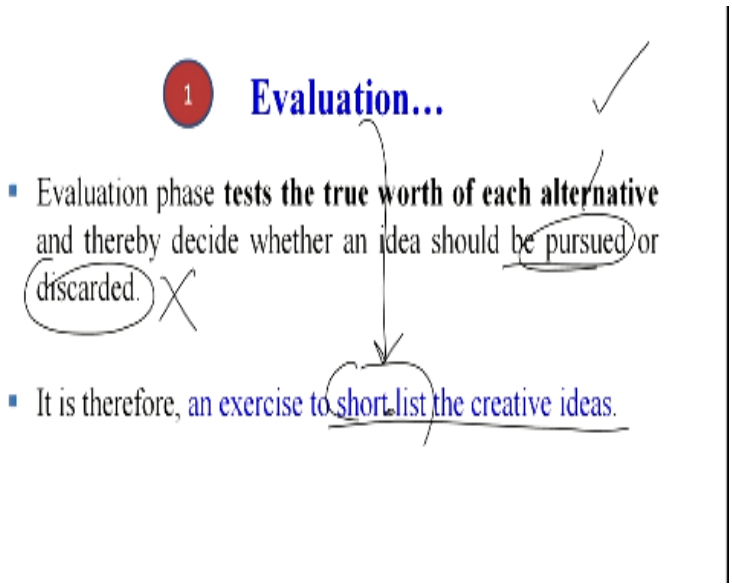

Now in evaluation phase it test the true worth of each alternative and thereby decide whether an idea should be pursued or discarded. As we have already seen that after the critical examination we may have a long list of ideas or alternatives some of them we have to discard the other one we have to refine and develop. So here also again some ideas have to be discarded and some ideas have to be pursed further.

It is therefore an exercise to shortlist the creative ideas. So we can say evaluation is a process of short listing the ideas or the creative ideas which have been developed after the critical examination of the current method.

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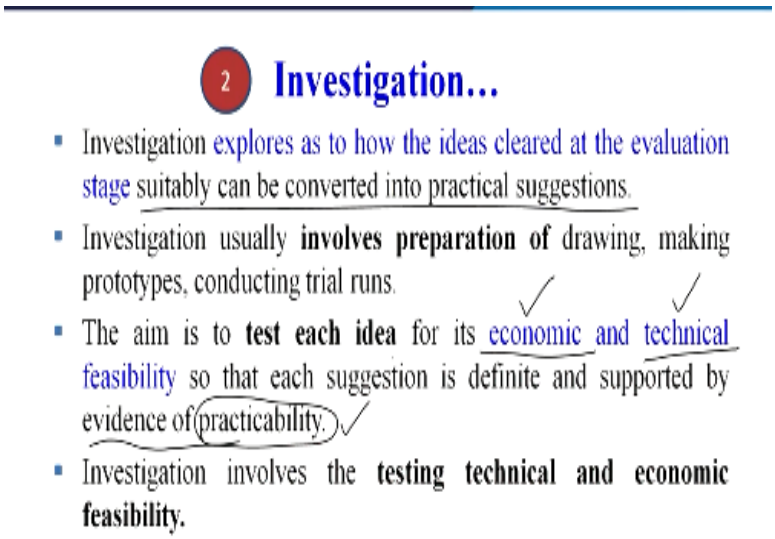

Then investigation explores as to how the ideas cleared at the evaluation stage. Suitably can we convert it into practical suggestions. So we are in investigation. Our focus primarily is on those ideas which have passed the first stage of evaluation. Now for these ideas we need to further refine them, we need to further develop them. Investigation usually involves preparation of drawing, making prototypes, conducting trials runs.

So maybe we have 3 ideas we may like to investigate all 3, we may do some trial runs or it is regarding development of a fixture or a tool or kind of assistive device the prototype can be made and tested on the workers who are actually performing the task. The aim is to test each idea for its economic as I have already highlighted economic and technical feasibility. So that each suggestion is definite and supported by evidence of practicality.

We have to see that whatever ideas we are going to propose for doing the work must be practicable. Moreover, it must be able to pass the economic as well as the technical feasibility test. It may not be so costly for the company to implement that they discard the ideas at a later stage. So we have to ensure that its economical and technical feasibility is also in the practical range.

Investigation involves testing, technical and economic feasibility which I already I have explained.

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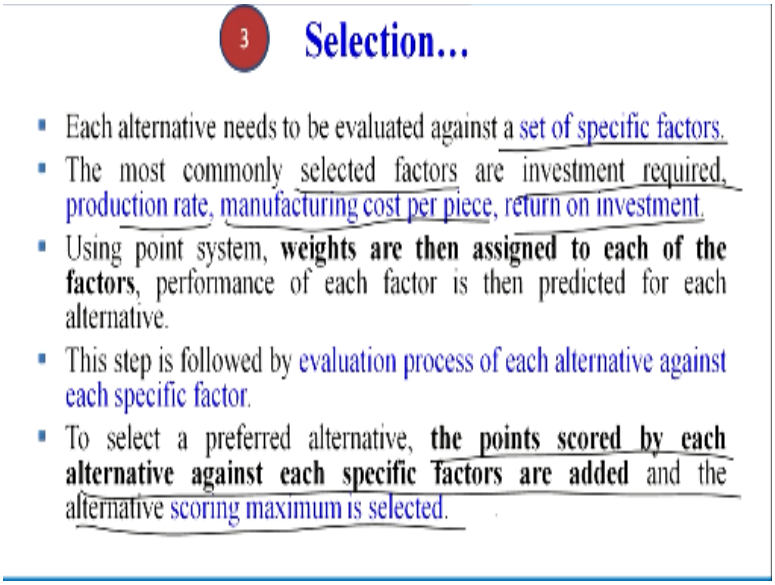

And the final stage is selection. Each alternative needs to be evaluated against a set of specific factors. The most commonly selected factors are investment required, production rate, manufacturing cost per piece, return on investment. So we will see that suppose we spend Rs. X what are going to be return on our investment, in how many years we are going to achieve breakeven.

For example, currently the method of doing our work is manual, but during the critical examination techniques or during the questioning technique there is an alternative that is coming to our mind that 50% of the work can be automated. Now we feel that yes if we automate the work our productivity will improve. Our overall profits will increase. So therefore let us evaluate this alternative that we can at least automate 50% of our work.

But for that you require investment in terms of automatic machines that you need to procure. So that type of during the selection that we have to check that whether the additional money that we are putting into our industry whether it is going to give us the return in due course of time or not. So at selection stage, we have to see the points mentioned are very, very valid that how it will reduce the manufacturing cost.

Because if the labor less labor is required machine is used. We have to take into account the depreciation of the machine, the maintenance cost of the machine, the operating cost of the machine and therefore we have to calculate that if the work is done manually what is the manufacturing cost. If we improvise the methods by putting automatic machines what is going to be the cost per piece.

And thereby it will help us to decide that whether we must go for automation or whether the manual work or the manual operations are giving us the desired results. So the most commonly selected factors are given here that what is the investment required, production rate if we automate as per my example. Manufacturing cost per piece, return on investment. So these are the important factors to be taken into account.

When we are developing or selecting a new method. During development there are 3 stages evaluation, then the second one was investigation the third one is selection. Using point system weights are then assigned to each of the factors. Performance of each factor is then predicted for each alternative. This step is followed by evaluation process of each alternative against each specific factor.

To select a preferred alternative, the point scored by each alternative against each specific factor are added and the alternative scoring the maximum is selected. So sometimes we can make a matrix, we can have the alternative in the columns and we can have the factors in the rows and then the scores can be assigned, weights can also be assigned. The weights can be multiplied with the score then summed up.

And the alternative who score the maximum can be selected because it is satisfying most of the factors. So this is a standard approach which maybe is beyond the scope of our discussion, but we can use this factor rating approach to select that which alternative is going to give us the better results. So the main part is that when we are developing a better method of doing the task.

We have to focus on 3 important things that is the evaluation, the investigation and the selection of the ideas which have come out from the critical examination of the current method of doing the job. In session 33, we have already understood the questioning technique which will lead to number of alternatives and for development we can use this step-by-step approach for segregating, scrutinizing the ideas.

And therefore it will lead to the better or the best alternative being selected to be implemented in the industry.

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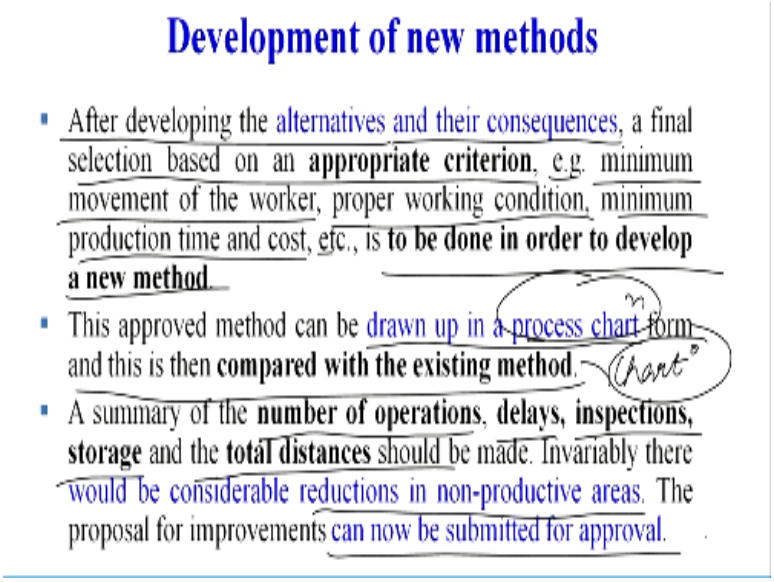

Now development of new methods slightly theoretical it is there on the screen be very busy slide for all of you. So I will try to explain it point-by-point. After developing the alternatives, we have already now scrutinize all the alternatives after developing the alternatives and their consequences may be we now know that if we invest this much of money this is our investment what will be the ROI.

How much manufacturing cost per piece will reduce? how our production rate will increase? So all that data we have now after developing the alternatives and their consequences. A final selection based on the appropriate criteria. For example, now this can be additional criteria, minimum movement of the workers, proper working conditions, minimum production time and cost etcetera is to be done in order to develop the new method.

Now depending upon the type of work being done we can have different criteria for example the previous one. My example was quite apt that you are trying to develop a better method, we are comparing the manufacturing cost per piece, the production rate, the return on investment, the initial investment. So it can be the example can be supposed you want to automate the things.

So when you want to automate the things you want to do the things automatically all these factors will be in stage 3. Now suppose the other example can be you are working manually and for manual work you can see that we can have the criteria like minimum movement of the workers, proper working conditions so that the worker feels comfortable while doing task.

Minimum production time and cost can be the criteria for final selection of the method which has to be implemented in the industry. This approved method can be drawn up in a process chart and this is then compared with the existing method. So we have a chart for the existing method which we can say old and we have a process chart for the new method and this old and the new process chart can be compared.

And this can be compared as I have been highlighting it number of times, the summary of the number of operations delays, inspections, storage and the total distances must be made. Invariably there would be considerable reduction in the non-productive areas, the proposal for improvement can now be submitted for the approval. So we can see that developing a better method is also a scientific technique.

It is based on logic; it is not just based on intuition. So we can mathematically do the calculation and find out that how much we have achieved that how much better is the new or the proposed method as compared to the old method.

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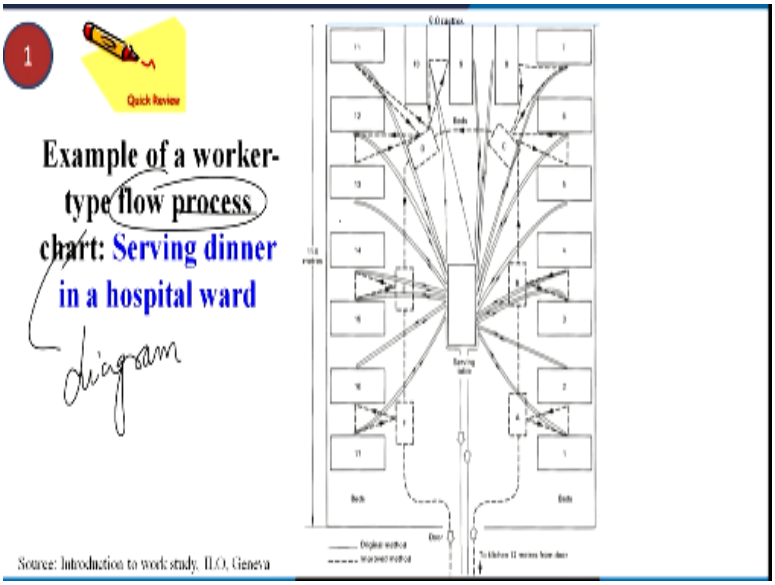

Now this is again the example that we have taken number of times we have taken this example. This is the flow process not the chart. This is again I am correcting this is a flow process diagram we can see all the flow diagram of a nurse serving the patients in the hospital ward. So this how we can improve all of you know the results of this.

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Develop The New Method

- It will be seen from the **broken line in the diagram** (representing the revised path of movement of the nurse when provided with a trolley) and **from the flow process chart** that the final solution involves the nurse serving and carrying two plates at a time (which also saves a small amount of serving time).

But for this problem we have to develop the new methods it will be seen from the broken line in the diagram representing the revised path of the movement of the nurse when provided with a trolley and from the flow process chart that the final solution involves nurse serving and carrying 2 plates at a time which also save the small amount of the serving time also. So the dotted portion all of you if you are looking at this lecture independently.

This is the backward journey for the nurse, this is the onward journey for the nurse and this is the direction in which the nurse is serving the food using our trolley. Whereas initially there was a central table where the food was kept and it was served to all the 17 patients on 17 beds. So it leads to lot of savings.

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Develop The New Method

- The result, as will be seen from the process chart, is a reduction of over 54 per cent in the total distance walked in serving and clearing away the dinners.

- What is important here in this very simple example is **not the reduction in cost** (which is very small) but the fact that the nurse's fatigue (resulting from the considerable distance which she had to walk within the ward and while carrying the loaded tray to and from the kitchen) is lessened.

The result as will be seen from the process chart either reduction of 54% in the total distance

walked, 54% is the improvement, 54% less distance he has to walk. What is important here in this very simple example is not the reduction in cost which is very small, but the fact that the nurse is fatigue. Now why she will get fatigue resulting from the considerable distance which she had to walk within the ward and while carrying the loaded tray to and fro the kitchen is lessened.

So the nurses fatigue or the worker's effort is lessened by developing a new or a better method of doing the job. So here we can see how we were able to find out that there can be a better method which we have already seen in the previous session that when we asked lot of question that why this central table is located, why there cannot be a better method, why there cannot be a movable trolley which can serve the food to the beds.

How we can reduce the movement of the motion or the movement of the nurse who is serving the food, how the distances can be minimized. So all these questions let us to the development of a better method. So questioning techniques gave us some alternatives those alternative is further refined some of the ideas may be discarded and then they are developed into better method and is explained with the help of an example the better methods give us maybe savings not only in terms of cost.

But also in terms of the effort which is reduced for the worker and similar type of example already we have seen during the course of our sessions. That if we are able to develop a better method of doing the job it is going to show us lot of valuable results. So with this I conclude this session of Development and Selection of a Better or a New Method. In the last session for this week, we will focus on the last aspect of method study that is the installation and maintenance of the new method which is developed in today's session. Thank you.