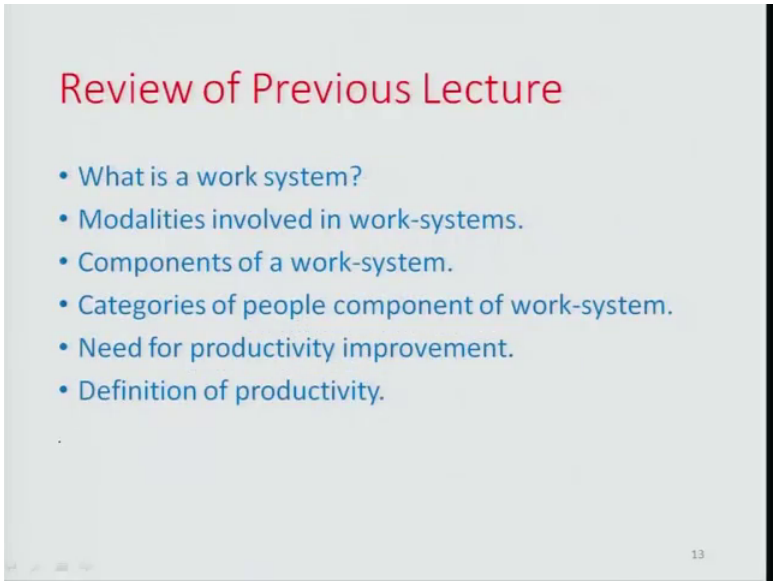
Applied Ergonomics
Prof. Shantanu Bhattacharya
Department of Mechanical Engineering
Indian Institute of Technology, Kanpur
Dr. Ankur Gupta
School of Mechanical Sciences
Indian Institute of Technology, Bhubaneswar

Module – 01
Lecture – 02

Hello and welcome to this supplied ergonomics lecture 2.

(Refer Slide Time: 00:22)

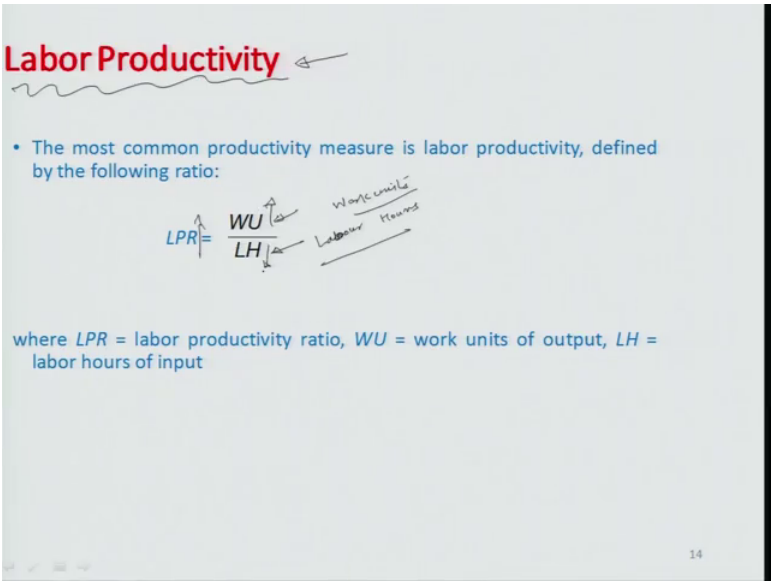


we will continuing on work systems and so on the basic things we discussed in the last lecture was that what was what is really the definition of a work system so on the modalities which are involved in such systems including you know work type or work measurement or even a management.

We talked about components of a work system and how, what are the basic stakeholders involved in defining such a system, we also discussed about how many categories of people are going to be there in a work system and then also what is the need for productivity improvement and definition of productivity which was mapped as really the output upon the input. And as we already discussed in great detail that as there is a bargaining need impose by growing population on work systems it is important that we keep on improving the efficacy of productivity so that you can give more benefits to the

people at a lower cost and that is again the whole purpose of organizing this in a and putting a systemic approach in studying such processes or such systems.

(Refer Slide Time: 01:26)



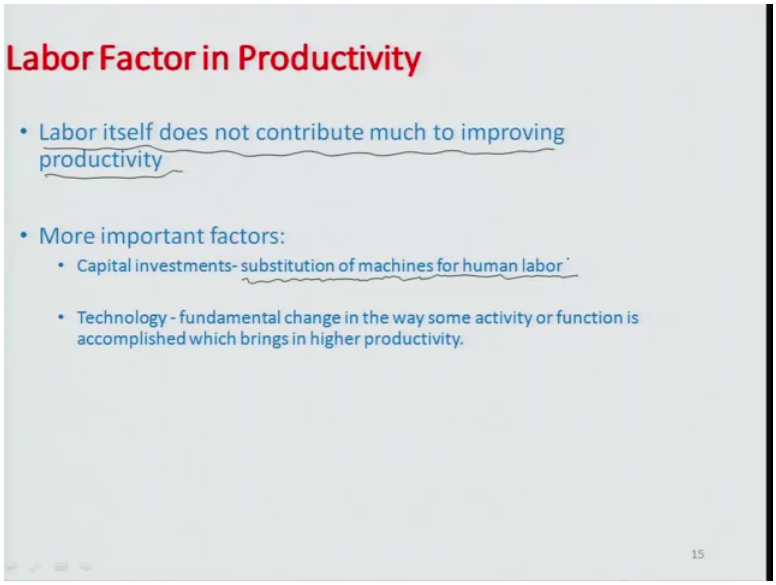
So, let us look at some more fundamental definitions associated with how you get productivity when we talk about productivity on a very very broad basis it is really about the output per the input, but output could be in terms of what you now of the different components which are associated with the system another very important components is the people component.

So, the output of any system with respect to what is the sort of input people component in the system could define very important term which is otherwise known as the labor productivity. In fact, a lot of work management which is involved in studying such systems is detailed about how to improve the task planning through technology or how to improve the task layout through, let us say simplifying processes in reducing waste or mudha as we commonly know from processes.

So, that the whole idea is that with minimum number of people we can do most of the work and so therefore, on a parametric basis it is important to monitor what is this term labour productivity which is really the sort of ratio between the work units which are going into producing a product or service or some other form of value added component which would give, which would contributes to the society and that divided by the labor hours which are needed for producing such work units.

So, the way that the productivity really can be improved is to either increase the work unit per unit the labor hour which is there in the system or reduced the labor hour in 1 work unit of the system and both ways we could sort of get a improvement in the total overall labor productivity. And there is where really the requirement of ergonomics comes into picture because if you look at the work and say that it is not being done in a proper manner and you give some other way of doing that work which is spending lesser time or you knows spending less effort and still be able to do this work in terms of an add which could be a technology improvement or something, you basically trying to attack the labor productivity and saying that how do increase it.

(Refer Slide Time: 03:58)



So, in that terms if I wanted to consider what really is responsible for improvement in the labor productivity, the labor itself will not be able to contribute really much to improve the productivity because there is only a finite amount of compression that person can have in terms of the density of work or task that he is performing.

So, beyond that you cannot take that aspect any further because after a while the efficacy of the work delivered, if I keep on compressing to an individual and by tasking him more and more the efficacy will come down and that would be at the behest of the quality or the compliance of what is being plan and that is not a good idea.

So, therefore, is always important that we do consider factors which are away from the labor in order to improve that productivity because of labor. So, then the question

becomes that what do you really do if you cannot improve the labor productivity beyond fix value and so some of the importance, more important factors which you need to addresses first example is that can I substitute some of the human effort through machine effort.

So, basically if I substituted machines for human labor also of course, there is the socialistic aspect here that they would be more unemployment on sort of you know that we need of increasing job generation. But you had a look at it from a standpoint of the overall profitability or productivity of a system when you do such decisions of investments and if supposing otherwise the available money is lying somewhere and not been utilized it is a better idea to get a utility out of a system without really worrying about the society in general. Obviously, the question of job creation in a society becomes a you know a sort of a post production aspect and if I wanted to considered as in a engineering domain more issues related to how to improvise may more mechanization it it is going to only improve my productivity from a, let us say profitability or value addition stand point.

So, I am using this connotation here in this scores particularly being donomics scores and the social factors like need for employmentory generation etcetera can separately treated outs so; obviously. So, if I do not do or if I am limited by improving productivity of labor one of the things could be to substitute more and more human labor by machines and the other of course, is technology which is a very important role to play; obviously, then we talk about information is the component in such work systems technology as you know has greatly influenced the information flow and.

In fact, that is one of the major reasons why today, today's systems are today's work systems are much more productive than what it used to be before information is had really setup and today you know in lean manufacturing systems for example, just by a click of a punch or a button you can get a information to all the way up to the vendor and where there is a sub assembly or a part being produced about how much more I need to produce per unit times.

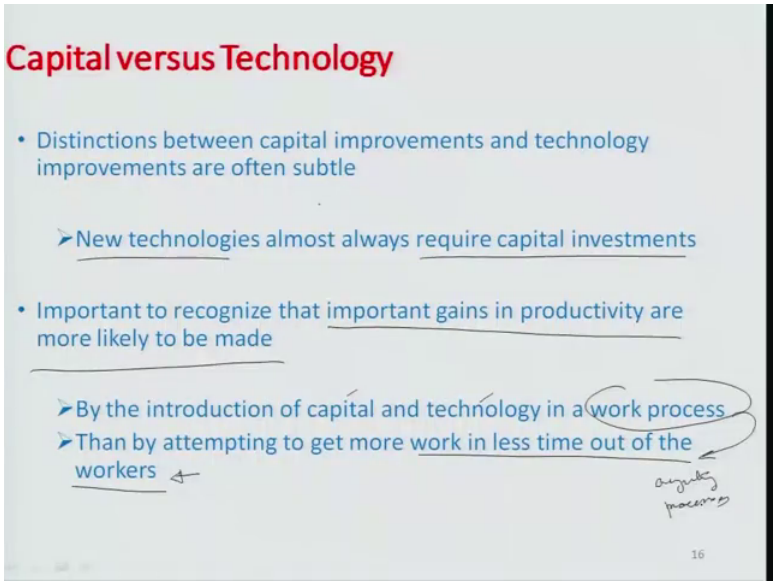
So, this is the kind of grading that is happened because of increased speed of information exchange and information technology. So, technology of course, is a very very important component which makes a paradigm shift in the way that productivity can be improved

and basically it is a fundamental change in the way some of the activities of functions is accomplished which brings in this higher productivity and technology also could be in terms of again infrastructure.

For example, today if I look at an automotive plant everything related to the way that an automated assembly line goes including the full proofing the various interlocks which are provided would actually only increase the overall safety labor the quality of the let us say the quality of the work in general or even the overall comfort of the concerned worker and technology definitely changes. Quite a bit of points which are in favor and points which would actually make the place of work much better, for the workforce and that way also some improvement productivity is realized.

So, rather than compressing the labor factor alone you have to work on technology and capital investments more. So, that you could make a much better work place in terms of efficient task implementation and carrying out things in timely manner.

(Refer Slide Time: 09:06)



So, if I wanted to sort of look at capital versus technology so; obviously, they cannot be thought of us 2 decreased pockets they happen almost with each other. New technology means new capital investment and vice versa and so therefore, the distinction between capital improvement and technology here often very very settle. So, almost always it is that new technology is would require higher capital investments.

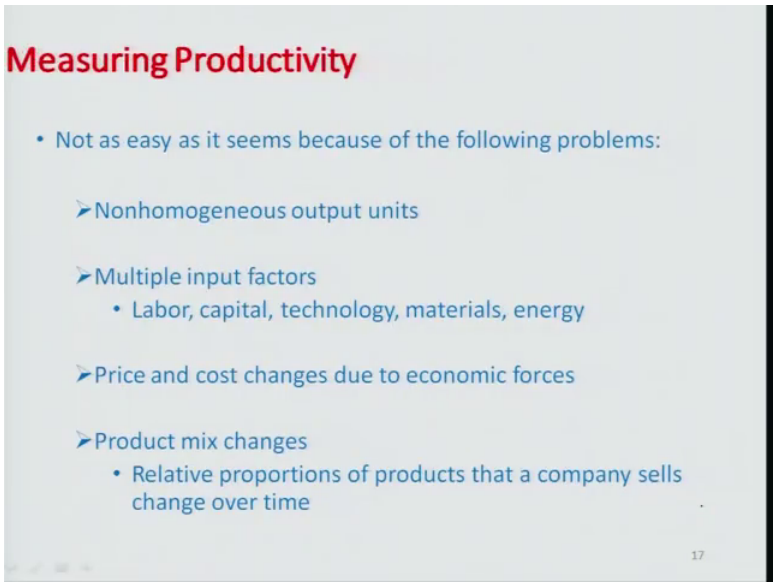
So, it is really important to recognize that important games in productivity are more likely to be made by first of all introducing capital and more and more technology in the work place and then also by attempting to get more work in less time out of the workers and these are sort of augmenting processes for point number 2 to happen. Also you have to understand that with technology there is a marked change in the overall comfort level associated with carrying out at task or an operation. Let me give an example for example, let say we talk about the coolant filling of an automotive in a workstation, which is done manually which of is a process where coolant filling is done automatically.

So, there are now day's machines which are available which you can engage along with the assembly line and there is a movement of a coolant gun in a carriage which is overhead along with the vehicle up to the extent the coolant filling happens and it is time balanced in a manner. So, that its between limited zones and its confined to 1 or maybe more than 1 workstations, but what is really happening here is that if there was a person who was opening the lead every time, checking the vacuuming on the system whether everything is vacuum proof and then trying to fill the coolant along with moving with the vehicle as the assembly line goes on its definitely a very hard task and it also very very un productive.

So, at times you are yourself fitness to such change when such a machine which does auto vacuuming and auto filling at a pressure is installed which actually, the only purpose now left with the work is just engage and disengage the machine and the machine carries out a task on a timed manner in a manner. So, that it can do in every vehicle and so this actually is good because now there is no scope of the concerned work force or workman to somehow meet an accident or let us say get along with the vehicle on the top of the assembly line riding the vehicle from one station to another. And so therefore, you are putting in a safe zone at the same time improving is quality of life and you could actually enable him to carry out some more tasks.

So, that his productivity or his value addition to the system could improve and he could remove some of the unsaid practices that he was earlier carrying while he was moving along with the vehicle to do this vacuuming and filling operation himself. So, this is what technology does really you know. So, you have to understand that technology in a way is also important in terms of how to get more work done in less time in different systems like I just said or given example.

(Refer Slide Time: 12:23)



So, having said that it is important now to measure or start measuring productivity and obviously, is not a very easy task as one can recall because again productivity is dependent on the number of output units you always know that your output is really not very homogeneous. There is also multiple input factors which are involved in a work system for example, labor capital, technology material these are all energy these are all input factors and their cost do vary in a competitive environment in a particular economic zone with sudden forces.

So, from time to time place to place there is; obviously, a marked difference in the way that input factors are coasted and therefore, with this along with coupled with the fact that the product mix also changes based on the demand of the market, today the customer may want to have a certain line of product. Tomorrow he may just make it also lead and try for doing something else some other market may propels being some other part on the world which wants the whole product.

So, therefore, the product mix also keeps on changing and therefore, because of this dynamism associated with the work system is very hard to measure productivity, but still there are certain gages or mattress which are used to do that and probably the next lecturer will cover how to measure the productivity and move ahead with things like productivity index etcetera which do from a year to year make you know the production system towards more efficiency.

Thank you very much.