Production and Operation Management
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Lecture 03
Operations and Productivity

Welcome friends, this is the third session of this course on Production and Operations Management. In this particular session, we are going to discuss the role of productivity in operations management. And in our last two sessions, we discussed about what is the core idea of production management that is the value addition, we differentiated between value and non-value and then we also discussed some of the global changes that how India can take the advantage of operations management for improving its competitiveness. We discussed various factors including Chinese magic, the cost of input factors, and also discussed that how new low cost locations are developing.

Now, the whole idea is to develop a broader understanding of this subject, so that when we are discussing the functional level strategy, we can also discuss the business level and corporate level strategy from that functional level strategy. In this particular session, we are going to focus on productivity related issues, which are very much important rather which make core of our discussions of operations management. Now, when we have discussed the productivity, because all through operation management productivity will be discussed in different names.

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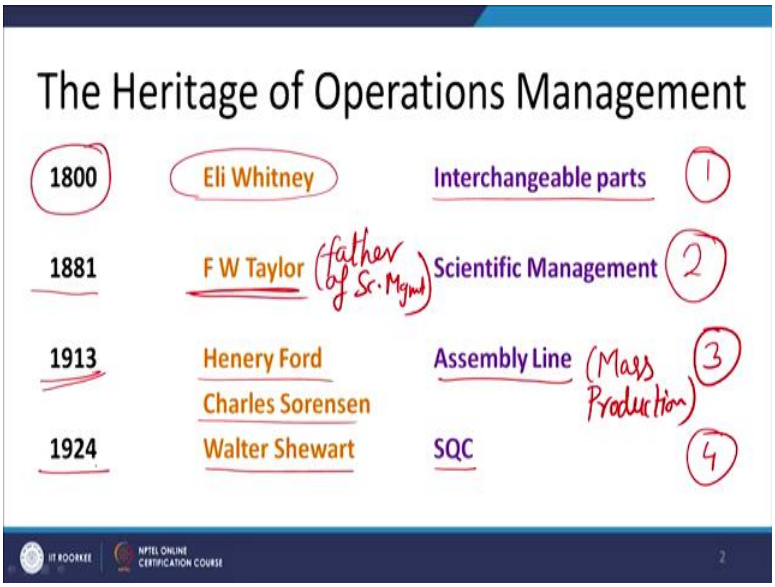

So, when we are going to start the discussion of productivity and operations management, it becomes my duty to give you a historical background of the operations management and

therefore in this slide, I have some very important milestones of operations management. And we are starting because operations were there since the civilization is there, but some of the important events in the development of operation management, I am starting with 1800.

And before this, there was no concept of interchangeable parts, you are making a pen for an example, what I am trying to say, you are making a pen and if this pen requires a refill, so you need to make a unique refill for this pen.

So, every product was highly customized and there was no concept of interchangeability. There was no... or you can also understand there was no concept of standardization. Take an example, you use bulbs and holders. Now, any bulb can be used in any holder that is the meaning of interchangeability.

Otherwise, you have a unique holder for a particular bulb but we all know that any bulb who can be used in any holder, this is the meaning of interchangeable parts. So, this is the beginning you can say the formal beginning of our operations management journey and this concept was given by Whitney.

So, he became one of the important contributor in the development of operations management and as a result, now we see that we never think of that, whether this part is going to fit in this particular product or not, because everything has become so standard, you can very easily use interchangeable parts. So, this is one very important milestone in the development of operations management.

The second important contribution came from FW Taylor, who is also known as father of scientific management. Taylor and some of the colleagues of Taylor, we will discuss about them, they gave the idea of scientific management, rather you can say they introduced science to the workplace and this happened somewhere around in the late part of 19 th century.

And Taylor's contributions are so important that even today like interchangeable parts have become the part of our life. Similarly, large number of contributions of Taylor are also part of our present day life also and we will discuss in detail about scientific management. So scientific management became the second important milestone in the development of operations management.

Then, third revolutionary concept in these line is from Henry Ford and Sorensen. Ford started the concept of mass production, the concept of assembly line is started from Ford company

and as a result of that, we got tremendous low cost of production. Before that, there was emphasis on low cost, but people were not able to get that low cost because of customization of the products, but Henry Ford started this concept of assembly line or you can say mass production and this mass production became third important step in the journey of this operations management. And we all give a lot of respect to Henry Ford for giving this concept of assembly line.

And then the role of Walter Shewart can also be very very important, because he gave the concept of statistical quality control, he gave the concept of sampling in quality control. Before that, we used to have 100 percent inspection, all finished products used to be inspected because we did not have the concept of sampling.

So, the concept of sampling came from the work of Shewart and that happened in around 1924. So, as a result, this SQC and from SQC, you can see the whole journey of development of quality management, which is now either in the form of TQM, which is now available in the form of 6 Sigma or which is available now in the form of Kaizen, all these things they have their route in the work of Shewart, that is this sampling became a key component because, if sampling is possible, you can save lot of resources.

And that is again a very important elimination of non-value adding thing. So, Shewart's... journey is also very important because it created the whole path for development in the field of quality management. And then work of damming, work of Juran and many other quality gurus are also there.

But in that line, the Shewart was the first person who gave the concept of sampling in quality management. So, these four are very important milestones in the development of operation management. There are many other people who contributed in between, but just to limit to some very important people in the development of operation management, I highlighted these four important points.

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Now, here we like to give some more time on the development of scientific management, because somehow, Operation management is very close to scientific management. And people like FW Taylor, who is known as father of scientific management, and his close associates, particularly Gantt, Gilberth husband and wife Frank Gilberth, Lillian Gilberth who are very famous for their work in the field of time and motion study.

They all contributed in the development of scientific management, and their basic idea was that to systematically seek the best way to produce. Their underlying philosophy was that there is one best way to do a particular task. And systematically, we can identify that what is the best way to do a particular task.

So, once we identify a particular process, a particular way to do a task then we can train others also, we can train many employees to do work in that best way. And as a result, the productivity of the organization will go up. So, first important thing is to identify the best way of doing the task.

If I identify the best way of doing the task, then only I can train you to do the work in that best way. So, to systematically seek the best way to produce was the important contribution of these people. And as a result, even today we all know there is a system of SOP Standard Operating Process for each situation, particularly if you know about police or army or all these kinds of security forces. In these security forces we have system of SOP.

For each situation, there are well defined SOPs and what is SOP? SOP is nothing but the best way to do things in a particular situation. So, you can understand the concept came from

operations management, concept was given by FW Taylor, and how that concept is being used in variety of situations.

You take an example, that somewhere some fire has broken and how to handle that situation for that purpose also fire brigade go with a standard operating process, for all systems we follow SOPs and that SOP is nothing but the best way of handling a particular situation. So, that is the most important contribution of scientific management, and as I told we follow that system in large activities even today.

Now, the scientific management if we summarize, because if you go to the classes of principles of management, in those classes of principles of management, the scientific management is discussed in detail. So, we will not go into that detail of scientific management, but we will also discuss in very brief that what are the important contribution of scientific management which are relevant to operations manager.

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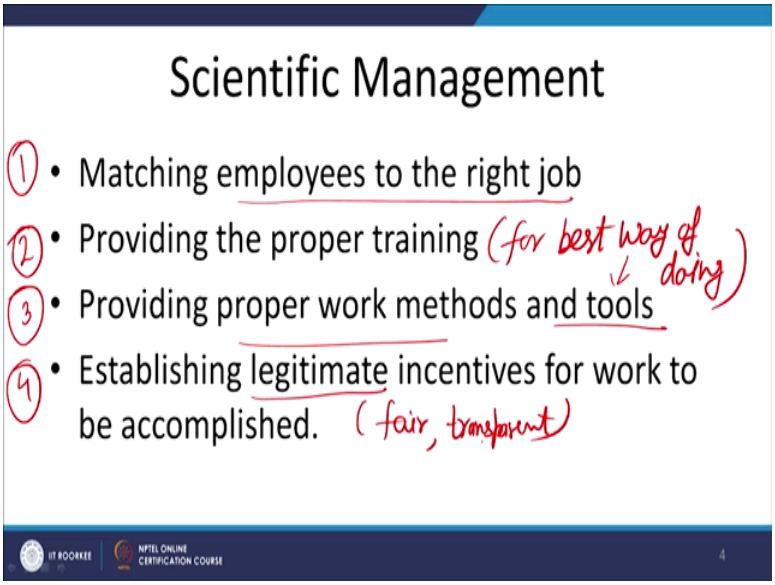

So, the first is matching employees to the right job. The matchmaking has to be perfect, if I am good in grinding and if you put me into the quality control, so neither quality control will be perfect nor that grinding operation will be perfect. I am a good purchase manager now, you kept me in the maintenance department, again the problem will be same.

So, where to keep the right person that matchmaking is very important, if you keep right player at the right position in the field, you know that who is a good slip player, slip fielder, who is good at gully, who is good at covers and accordingly captain sets the field in the playground. So, it is very important that you know the strength of your all employees and

according to their strength, you use them at different locations. So, matching people to the right job, that is one thing.

Second is providing the proper training. Now, providing proper training for best way of doing things. What best way people are following, according to that if you are doing the work, then you can get the best output. So, first you identify, systematically seek best way to produce and then train your employees so that they all can be following the similar way.

The third is providing proper work methods and tools, the role of tools is very important. If you have appropriate tools, then your output will be very much different, but if you do not have tools, then certainly there are going to be difficulty. So, the workmanship is directly dependent on the tools.

If you have good tools, you will produce good output. If you do not have good tools, your output will also be of low quality. So, proper work method and proper tools are very important. So, which is very much similar to the best way of doing things. And then fourth is establish the proper incentives for work to be accomplished.

You also need to have a proper system of remuneration, how are you going to give incentives to your employees, what type of salary system you are going to have. So, having a legitimate that means, a fair transparent and which is respectable, so that all your employees must have a feeling of positive motivation with that kind of remuneration that is also very important. So, these are the four key takeaways of scientific management.

And why I am saying that important takeaways, because these four principles, these four you can say final jest of scientific management are applicable in today's scenario also. So, that is one very important thing, which is going to be there in all of our discussions. If I see the journey of operations management, I can divide the entire journey into three important phases.

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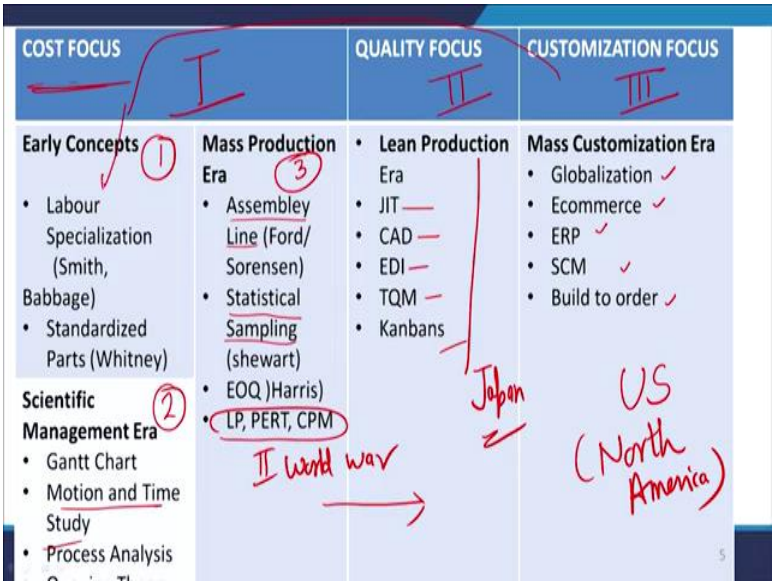

The first phase was focusing on cost, this is the first phase. The second phase focuses on quality, and third phase focuses on customization. So, initially the first concept, the very first concept where we used to have labour specialization and people like Adam Smith and Babbage, they gave the concept of division of work according to specialization. And then people like Eli Whitney, in 1800 they gave the concept of standardized parts or interchangeable parts. So, these were the early concepts and the focus was cost, how to have low cost.

The second came the concepts of scientific management and where people gave the concepts of Gantt chart, so how to monitor the performance over a period of time. Gillberths, they gave the concept of time and motion study. Then came the concepts of process analysis, then keep the concept of queueing theory.

So, all these concepts came during the period of scientific management era. Then after that, because in that period, Henry Ford also came into picture and Henry Ford started the era of mass production. So, we got the concept of assembly line, we also got the concept of statistical sampling, which was given by Shewart and we also had the concept of economic order quantity, which was given by Harris. And after that, the Second World War gave us concepts of linear programming per CPM which are used for project management. So, all these things happened but focus was cost, how to minimize the cost.

After second world war we moved to this era, and this era is basically Japan dominated era where the focus started on JIT, Computer Aided Manufacturing, Electronic Data Interchange,

Total Quality Management, Kanbans, Kaizen, all these things came into picture and the focus became on value, non-value, value non-value.

So, how to minimize the waste in your organization that became a very important concept during this period of quality focus. And after that, when marketing became a very important phenomena in the world. So, again we moved to the west and US particularly or you can say in general North America, it became the reason of third focus that is the customization focus.

And here Globalization kind of forces, Ecommerce, Enterprise Resource Planning, Supply Chain Management, Build to order these types of concepts started coming into picture and as a result, when Ecommerce and globalization came into existence, all of a sudden all of a sudden your customer became empowered and he started asking a product which is uniquely designed for that customer.

And now you can think of that we are going back, if I minus this cost focus, we are going to this labour specialization era, where in that period labour was designing or labour was developing a product for your unique requirement. But now what is going to happen, machine is going to develop, machine is going to produce a product for your unique requirements.

So, labour is replaced by machine, but that concept of assembly line, concept of mass production, that concept of interchangeability that all will go away, if we are going for more and more customization. So, this proves that the whole working is in a circular fashion that we have completed the cycle and now again we are going back to that individual specialization era, so probably time will tell more about this. So, this completes our discussion about the history of operations management that how we have moved from cost focus to customization focus.

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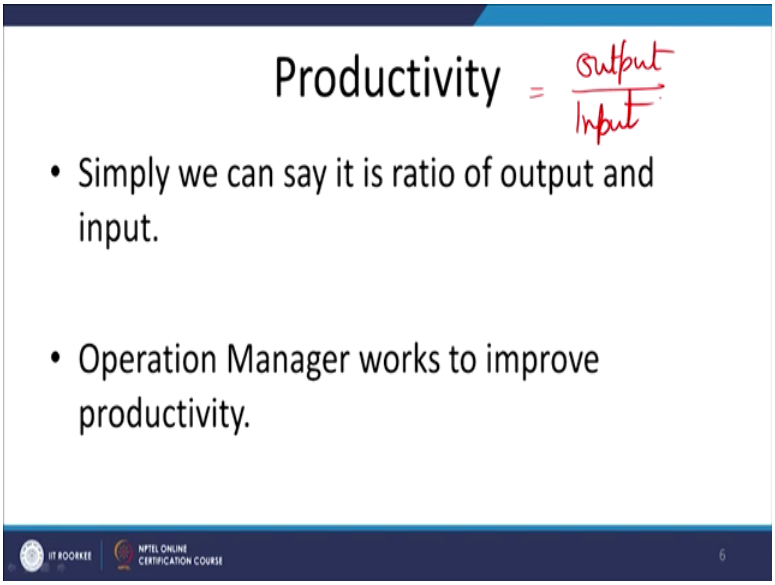

Now, another important concept which we need to discuss in this particular session that is about productivity. Now, productivity as we know is the ratio of output and input, this is the ratio of product, this is the meaning of productivity. And for operations manager improving productivity, increasing productivity is a very-very important task. It is a very important challenge also you can say.

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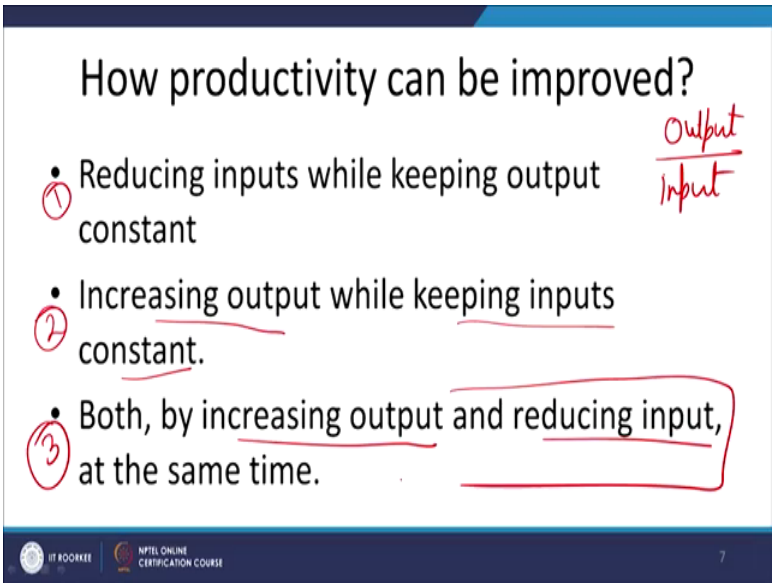

Now, if I ask you how to improve the productivity, so you will say these two answers, the first answer you will say that because it is output divided by input so one answer you will say that I can reduce the value of denominator and by increasing the value of by reducing the value of denominator, and if my numerator remains constant productivity increases, that is the first way.

The second way is, I can increase my output, I can increase my output while keeping inputs constant. My same input is now producing more output that is a way of increasing the productivity. And third is I may increase output and reduce input simultaneously. I am reducing input and increasing output both these things simultaneously and that can also increase the productivity.

This is the third is a difficult one, it is a difficult one, but if I want to list that in how many different ways productivity can be improved so these three are important ways through which productivity can be increased, you increase the numerator keeping the denominator constant, you reduce the denominator but keeping the numerator constant or you increase numerator and decrease denominator simultaneously. So, these are the three ways in which productivity can be improved.

Now, it is not always in your hand that which particular strategy or productivity increase you are going to adopt. Now, you see what is happening with respect to productivity across the globe.

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So, I took this data from OECD site and India is not a member of OECD you know. So, some of the data with respect to India is not available. But what I want to show you that for some of the developed countries like Australia, Germany, Japan, Norway, USA, you see the GDP per hour of worked 59 US dollar, 72.2 US dollar, 46 83 that is the highest in the world for Norway.

That type of and unfortunately for India and China, both these are not the members of OECD, so this GDP per hour work is not available. Now, you see another important data, GDP per person employed, this will give you a better idea.

Now, you see this data for countries like USA 1, 25,318 US dollar that is the GDP per person employed. And in case of India it is 18,142 I kept these two figures very close. India and China, China 29,780 US dollar, India is 18,142 US dollar. So, you see where are we standing, vis-a-vis other countries which are much more productive than us.

So, this data is giving you the productivity point of view, I am because if you see the population, so there will be large number of people who are unemployed also so that data may be misleading. But this data gives you the idea that those who are working, how much they are contributing to their GDP. And that type of data shows that the productivity of people for like USA, that is 1, 25,300 US dollar one person is contributing and in India it is 18,000.

So, you can say that it is 10 times more 10 times more US people or 10 times more productive than the Indian people. And this type of statistics give you a full reason that we need to work very hard on productivity kind of issues.

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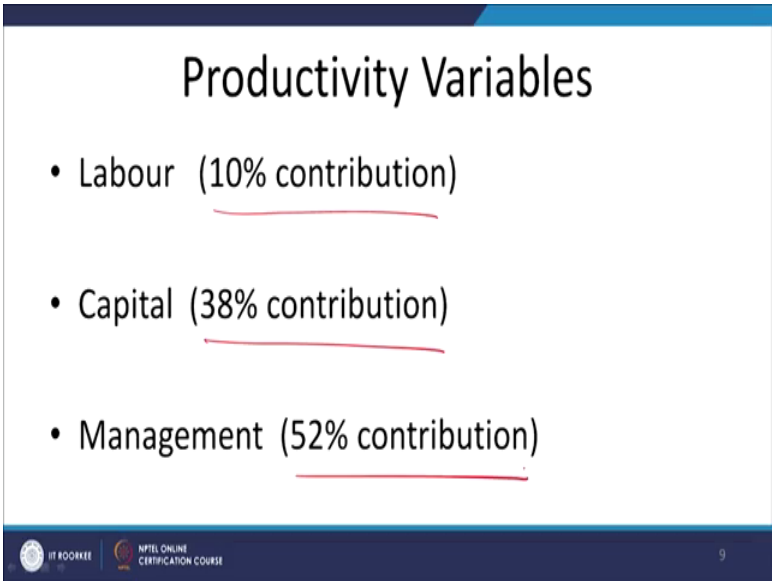

Now, three important variables are there for productivity, labour, capital and management. This data is from the US economic systems that in their country, labour contributes about 10 percent for the productivity, capital contributes around 38 percent in the productivity, while management contributes 52 percent in the productivity improvement.

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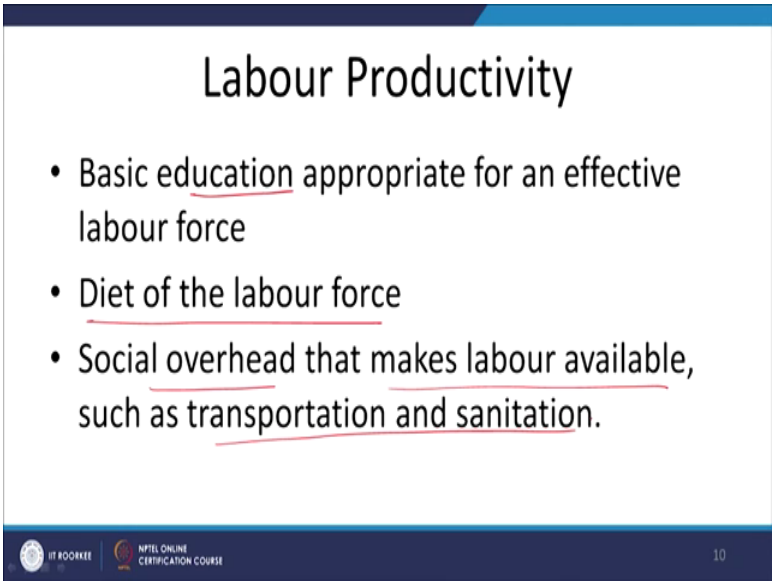

Now, labour productivity is very much affected by proper basic education which is very much important, the nutritious values given to the labour force and the social overhead that makes labour available such as transportation and sanitation etc. So, when you consider all these things, your labour productivity improves.

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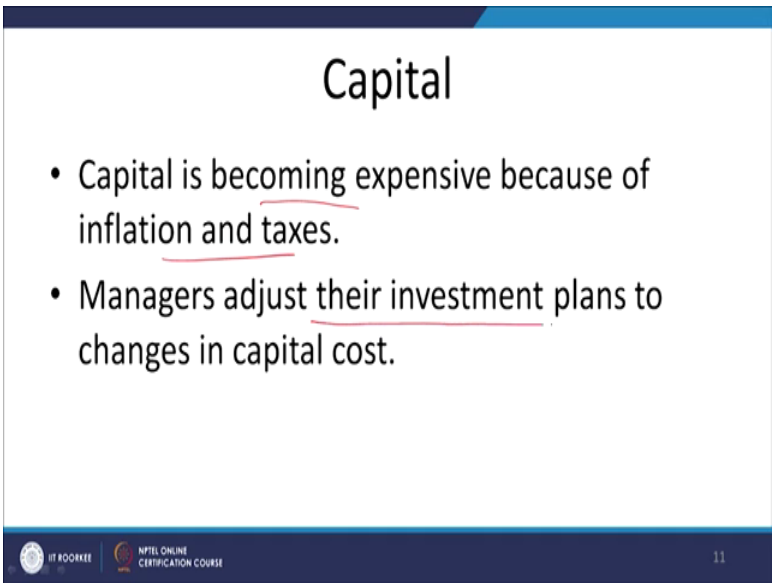

Second important thing is capital, now capital is becoming expensive because of inflation and more and more taxes you are putting on it and therefore, one of the very important role of manager is to adjust their investment plan so that you can keep the cost of capital within the limits. And third important variable of productivity is management.

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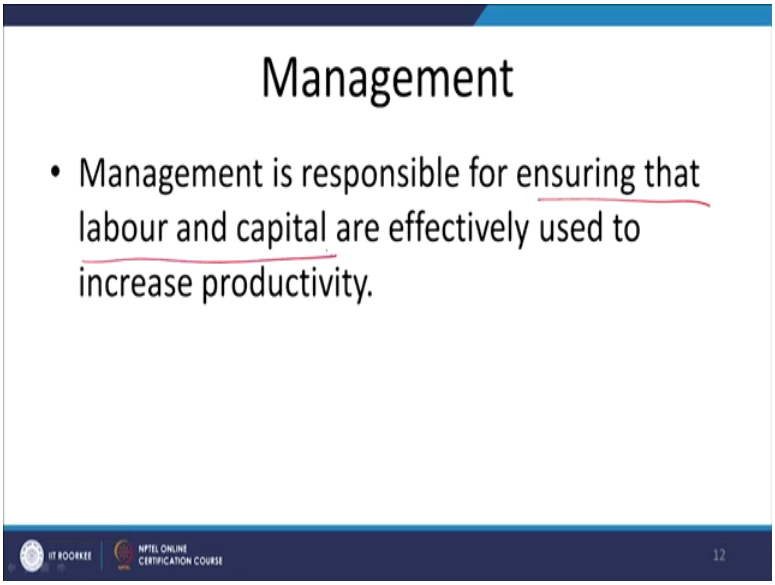

Now, management is responsible for proper use of labour and capital. As scientific management discussed that, who is best for which job, so similarly ensuring proper use of labour and capital, effective use of labour and capital increases the productivity. So, therefore 50 percent or rather more than 50 percent role in improvement of the productivity is of the management.

If management knows how to employ your people, how to invest the capital properly, the productivity gains will be much higher. So, with this we now come to end of this session that we have productivity as a very very important challenge for India. And three important variables we discussed labour, capital and management.

And collectively, we need to take the best advantage of available resources, how to use those resources to increase the output. And if we are able to do that, our productivity is going to increase. So, with this, we come to end of this session. Thank you very much.