Project and Production Management
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Lecture - 1
An Overview

Welcome to this course on project and production management!

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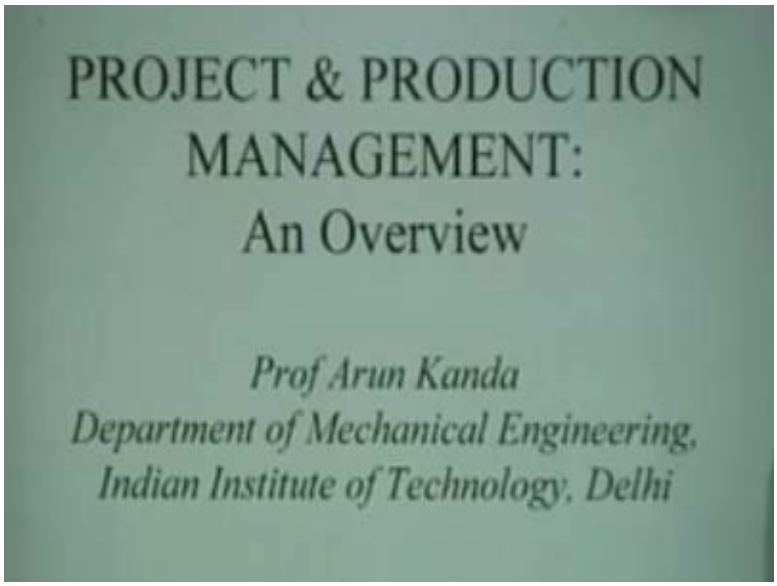

In this introductory lecture I shall try to give you an overview of the kinds of the problems that you face in projects and production management. The first thing that you have to realize is that there is a close relationship and also dissimilarity between the terms project and production. I think you are all familiar with notion of a project. Basically a project is something that converts an idea or design or a plan into some concrete entity.

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During the course of your undergraduate studies here at IIT Delhi I have done a number of mini projects and number of other projects. You find that they all fit into this definition and to take some other examples of projects, for instance construction of a factory is a project, construction of a new building or a new institute is also a project, construction of a new highway or a set of highways that our government is contemplating to connect the country with is also an example of projects. Construction of a prototype of a project or a prototype of a product is also essentially a project. These are all our examples of projects. We have on the contrary, examples of production of products like a factory producing cars or other kinds of service industries where different kinds of services are given. An example could be a hospital for instance or a post office and all these. What is the essential difference between a project and a production in the usual sense of the term?

Both of them involve some kind of conversion of raw materials into finished codes. But the difference is essentially in terms of the frequency with which we generally undertake the activities. For instance a project is supposed to be a onetime entity. You do it once. I have to build a factory, so I build a factory once. Maruthi udhyog builts it is factory just once and once the factory is built, car after car is being produced in the same factory. When it comes to repetitive activities it belongs to the domain of production and when it comes to producing the thing for the first time or doing it only once, it is a case of a project. However I think it would be interesting to see how projects and production are really related. Let us look at some examples. We were talking about the automobile factory, setting up the automobile factory is a project but producing the automobiles from the factory once setup is an example of production, building a house is a project, operating the household and living in the house is a production activity.

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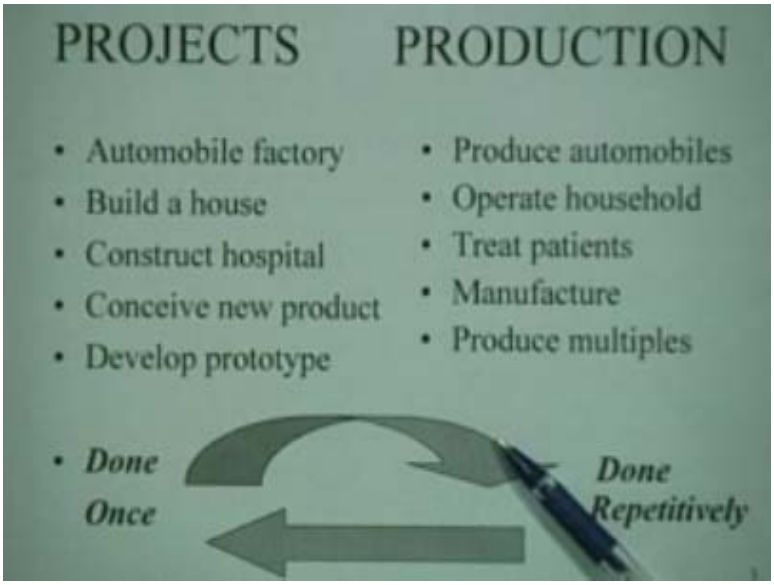

Constructing a hospital is a project, treating patients within the hospital and running in the hospital in the usual routine is actually production, conceiving a new product is a project and manufacturing the product and trying to get returns out of that particular product is the manufacture or the production activity. Similarly developing the prototype of a new product is a project. This could be developing a new product of any kind and then producing multiples or trying to commercialize it is the activity of production. So essentially a product is like going from one stage to another, taking from one current state in which you are to a more desirable state in which you are and generally this is done only once and once this has been done you read the benefit is of this particular activity and keep on repetitively producing or trying to make use of this particular activity from the project which has been setup in that sense of the term. This distinction between projects and production has to be is useful because the nature of the decisions involved in the projects and in production are totally different.

In real life when you are trying to manage a factory for instance, what really happens is that projects and production are intimately interwoven together. Projects for instance involve in starting the production and solving problems relating to operation maintenance housekeeping and subsequently marketing distribution quality and so on. So there could be projects of this nature, but the point really is even in a production environment if you join a routine production activity. As long as the production is smooth you are going on as per a following the usual norms of production. Whenever you typically face a problem the problem could be for instance they hear lot of customer complaints about the engine or about the fuel of Maruthi car, what would they have to do? They would have to initiate a project within the factory to look after those complaints and once that project is over the changes would be institutionalized within the production system. So it is with this understanding we would see that projects and packages are generally a mixed production in real life. It is more like the pulav which you eat. Rice and the peas intimately linked together and you eat both of them together. Similarly as a production engineer when you

join a company you would be doing routine production and you would also have opportunities to do different kinds of products projects in that sense. So I think this particular understanding has to be there. Now specifically in today's lecture, some of the issues that we are going to discuss are we have already talked about for instance the pervasiveness of projects and production. We know that organizing these days are becoming much more complex and as there is an increase in the complexity of organizations there are considerable problems in both managing projects and production.

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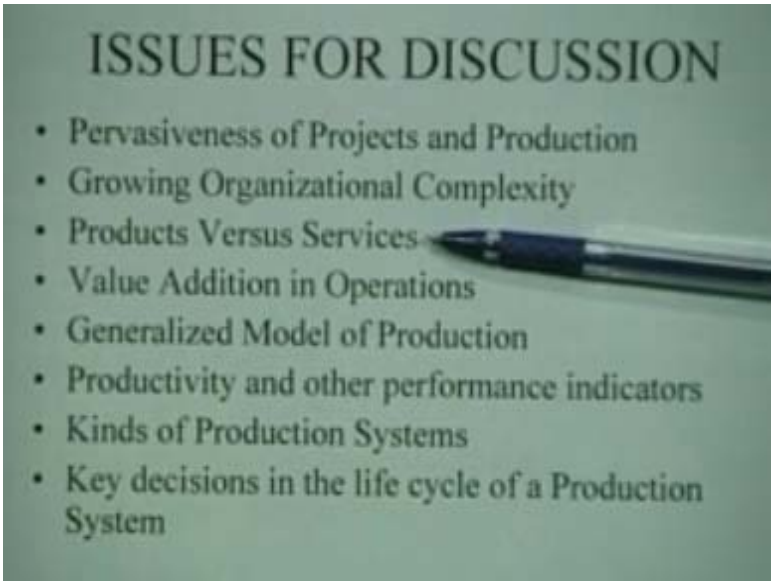

Another important thing to realize is the distinction between products and services. In fact this course could be called production planning and control. It could as well be called operations, planning and control. However when we use the term operations planning and control we are emphasizing the fact that we are talking not only about production of goods but also about production of services and since similar principles are applicable to the management of both kinds of activities we talk about all these things together and however when you are talking about services there are some special problems which you can talk about little later. Then we will talk about the issue of value addition which takes place in operations. The basic purpose of the production activity in a factory is to add value to the raw materials so that the final product fetches you more money as compared to what your raw materials were. Otherwise nobody would be in business. So production systems have to be designed specifically with this in mind and you have to look at how the process of value addition can take place and how it can be maximized or optimized to a large extent. This is one of the major problems of design of a production system. Then we will also talk about a generalized model of production to give you a basic idea about how a production really takes place and what are the major parameters involved in production because if a production manager has to manage his factory, he must be aware of what exactly he has to do. What is it? What are the controls and how can he controls the entire production system and then after this generalized model of production we will talk about performance indicators of a production system. Performance indicators are

important because they tell you the direction in which you are going and whether you are going in the right direction or not. So we talked about productivity. Total productivity and factor productivity and how the other performance measures can help us evaluate whether a particular production system is healthy or not. It is very much like saying that if you want to find out whether an individual is healthy you have a identified a number of performance parameters. You measure his temperature, you measure his blood pressure, and you measure his sugar count and so on and so forth. These are individual performance parameters and for a normal healthy human being you would expect them to live within certain limit are. Similarly in a production system you should know exactly what the kinds of performance parameters or indicators are and in what ranges they should live. Then we will briefly talk about some of the kinds of production systems that are there. You have various kinds of production systems, a kind of job shop batch manufacturing mass manufacture cellular manufacturing systems and so on. They have different characteristics.

So the job of a production manager is to may be choose the right kind of a system for a particular application and finally very important thing is the key decisions in the life cycle of production system. Any production system has a life cycle which means that you start from a certain stage of design of a system and you go on through the operation till finally the system has to be totally discarded. During these various stages different kinds of issues typically crop up. So we will talk about these issues. These are managerial issues. What does a manager have to do to run his production system efficiently at different stages of his life and we will talk about these. This basically gives you a summary of what we are going to be talking about in the remaining part of this particular lecture. It is best to begin with the aim of a production system. After all what is the objective of production? There are so many ways of looking at production but for our purposes it would be appropriate to say that the aim of production is to provide goods and services for mankind in the right quantities at the appropriate place at the desired time with the required quality and at a reasonable cost.

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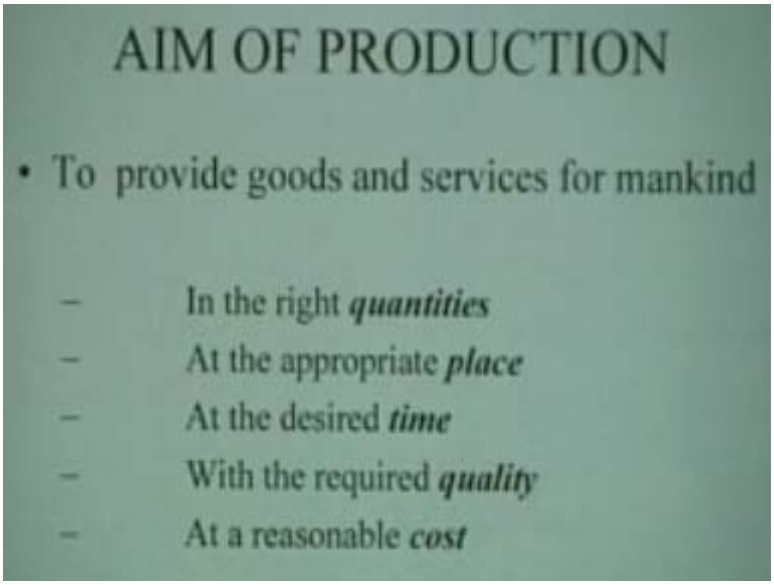

Whenever you are talking of a production system you are talking about getting right quantities at the right place at the right time and of the right quality and at the right cost the minimum possible cost. In order to achieve this let us see what exactly production manager would typically do? Let us first look at a nature of the production system. Basically you could say that a production system is could be a viewed at a very genuine level by saying that we have inputs in the system and these inputs will be provided to the black box here and these after the black box performs it is operations you would get certain outputs from the system.

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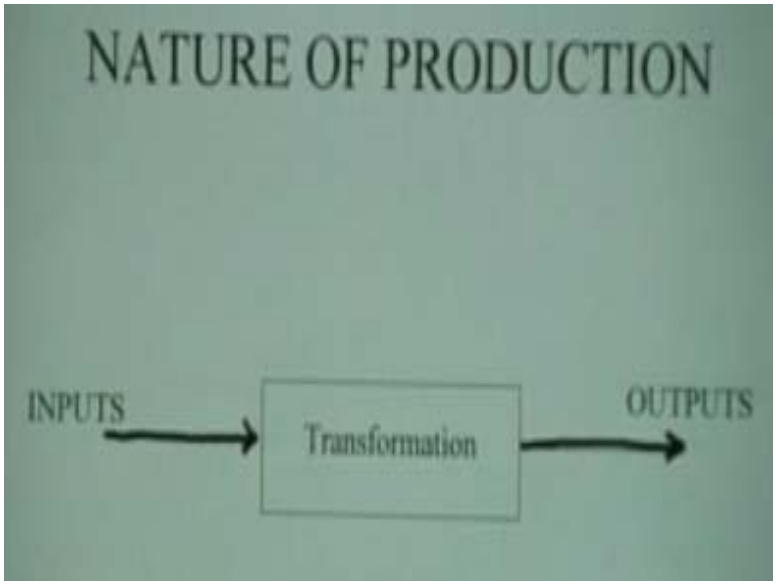

The simplest way of looking at production activity is to say that it is essentially an input output system in which you have a black box which carries out the relevant transformations that you need. However this is the most elementary way of looking at the production system. What we may now do is we might say for instance that we can categorize these inputs and outputs. For instance it is not a single input that you are dealing with a production system. There are a variety of inputs that you are dealing with. Typically these inputs are in the nature of man power, you have man power, no matter whether you are talking about manufacturing cars or whether you are talking about a textile factory or you are talking about anything, you will have to manage these kinds of inputs, manpower machines materials money information energy typically and many more inputs.

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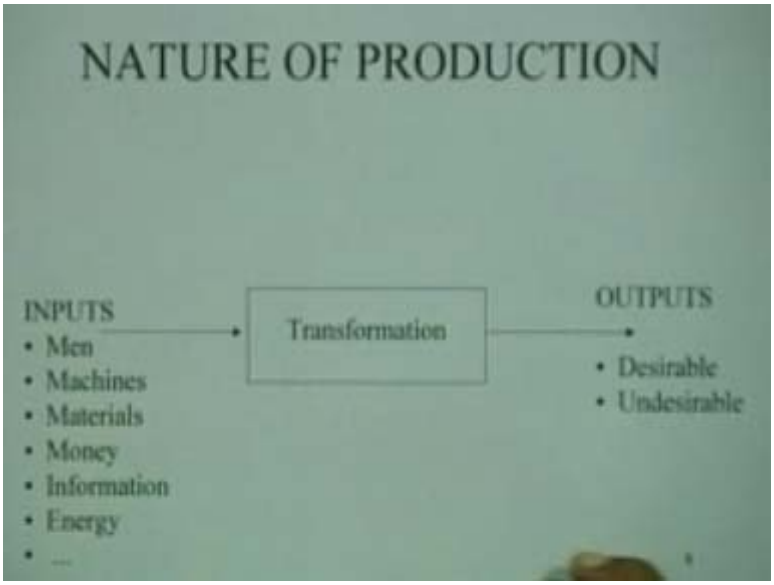

All these inputs would actually be utilized within the activity of transformation and you would typically get essentially two kinds of output from the system. One is the set of what we can call desirable outputs from the system. This is what you expect the system to give you. There would however always be undesirable outputs from the system like scrap fumes pollution etc. You never wanted them but they came because your technology was such, your raw materials were may be defective or whatever it was and things like that. So really speaking in this context we have to see that the objective of the whole exercise is to maximize the production of desirable goods by utilizing these inputs in some particular manner and that is exactly what we are trying to do. Notice these inputs are very important you know. For instance each of these inputs need to needs to a major academic discipline, managing men is you have a discipline called manpower development or human resource development as a whole discipline deals with this. Management of machines basically you can say machine management problems in that sense, materials management is another area, a complete area deals with management of this, management of money financial management, the whole discipline behind each of these individual information management information systems i.e., designing appropriate kinds of management, managing energy and so on. So, all these inputs are important. It the very fact that we have whole disciplines associated with each of these major inputs, it shows how important. We must therefore try to utilize them properly in getting your production from this particular system.

We are gradually adding an element in the manufacturing scenario and trying to generalize our model. They started with a simple input output model but now we have characterized the input, we have characterized the outputs and the other element, we have added at this particular diagram is the notion of feedback. This is something extremely important in any production system and namely in all cases what happens really is that feedback is taken from your customers primarily from your customers or other people you encounter on the way that means distributors retailers customers all these kind of

people and they probably give you some kind of feedback on your product on the packaging on the performance of the product and so on and when this information comes the impact of this information on the manufacturing shop would be in terms of suitably modifying your inputs choosing better materials choosing better packaging for packing your parts and things like that. This feedback is something important because it tends to keep on constantly improving the production system in that sense and so we have here these kinds of things about the nature of the production system.

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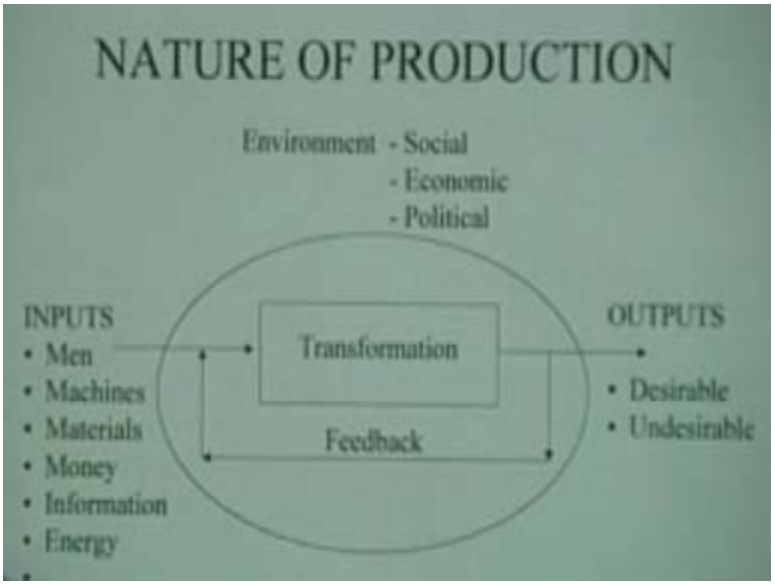

We now superimpose, you find that there is this circular element which has been posted here on top of this model and this particular envelope actually shows the environment and the environment has different components. It is the social environment that you could be talking about. It could be the economic environment you could be talking about or it could be the political environment you could be talking about and the important thing to note here is that the entire production system is as it were floating in an environment and this environment lends a very lends both a dynamic flavor and an element of uncertainty to it. So the whole thing becomes dynamicis moving. Today the government says something on prices of a certain type of raw material okay so you are happy. Tomorrow the government says something else about the prices of a different kind of raw material and you are sad, as a manufacturer in that sense, so this will constantly keep on happening.

Similarly there could be a lot of social pressure. Social pressure could affect the performance of the system. Social pressure could be for instance, yesterday you must have read the news about coca cola and pepsi cola being unfit for drinking because of pesticides harmful pesticides and other kinds of chemicals which are there in the product. Now that has led to a social pressure. Housewives our prime minister, not only the prime minister but also our health minister Sushma swaraj has issued a statement that no household should drink these products things of this kind. What has happened really is

that a social pressure can affect considerably lot of things. In this case it will affect the demand for the product and therefore the management of this production system is pretty tricky in the sense that you want the production manager to look after these various factors. This is very much like a pepsi giving a statement today saying that number one cse is not equipped or it does not have the appropriate license to such tests. You will find these kinds of things; legal battles would also be a part of the production system when these environmental factors impinge upon performance of the production system in that sense, there could be a lot of political interferences which could lead to the performance of the product and system. I mean a certain politician may be interested in promoting some particular product or some particular manufacturer and therefore he would try to influence the government to bring out legislation to that effect and this would have again the effect of basically influencing the performance of the product and system. Now this model we can call as a generalized model of the production system because if nothing else tries to at least tell us about how the what kinds of pressures and poles what kinds of situations the project manager and the production manager will have to face to run his organization. See you can see all the major functions here. He has to manage his inputs that mean he has to do proper vendor rating, proper vendor development and get individual projects for his factory.

He has to make sure that these are actually transformed properly within the factory so there are problems of managing the factory within the factory that this particular box which we haven't talked about yet. There is a constant change being brought about by the feedback. It is basically you can say jocularly that a management of a production system is not an easy task. It is not an easy because it is dynamic also and uncertain also. So it is like riding a horse to some extent. A horse is moving up and down as you go, a galloping horse, so there is an element of dynamism there you know you are dynamically moving there and there is also a risk that if your terrain is bed you could probably fall down and injure your legs or whatever. That is the element of uncertainty which is there and another thing that comes out is that a strategy which is followed today, might not necessarily work out after two years or five years. Why because these factors would have changed other factors would have changed and so on. So you cannot really program your operations for this particular production system in that context. So I think this would give you some idea. This we can call a generalized model of a production system of how the problems of management of a production system are no longer trivial problems because you have to manage so many things. Let us now talk about what happens within the box. That is the area of the black box which is transformed. What happens within the area of transformation? Important thing that happens there is value addition. That is the important thing that happens. It does not matter whether you have a machine from Sweden and another machine from Holland and another machine from Ludhiana all juxtapose. The purpose of that system which is designed is actually to add value to the products. That is the whole thing. So basically operations are the process of changing inputs into outputs and thereby adding value to some entity. This constitutes the primary function of virtually every organization.

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You must not lose sight of this fact and basically how we add value to the organization depends upon the structure the type of management system that is going on. So we should be careful about that particular thing. Then we could be looking at this value addition s, so we recognize the fact that value has to be added but the question is how does this value addition take place? What are the typical things which happen in the black box so that value addition can take place? Well conventionally they say that basically four types of things happen in the factory. The first thing that is going on is altering something. What is it that you are altering? You are altering the physical product. So all machining operation, all welding operation everything that you do in manufacturing for instance is basically concerned with altering the shape of a particular product. So it could be not just the shape. It could be altering the physical properties, altering the molecular structure so that we have more strength and things of this nature. So altering means that you are carrying out essentially these operations whether you are doing metal cutting or you are doing metal forming or you are grinding or you are doing heat treatment or you are doing Those are the basic physical alterations which take place within the factory. Then alteration could also be sense work. I would leave that for you for the time being to imagine what kind of sensual transformations could be brought about in an input output system and the alteration could also be psychological to bring about a psychological transformation within the individual.

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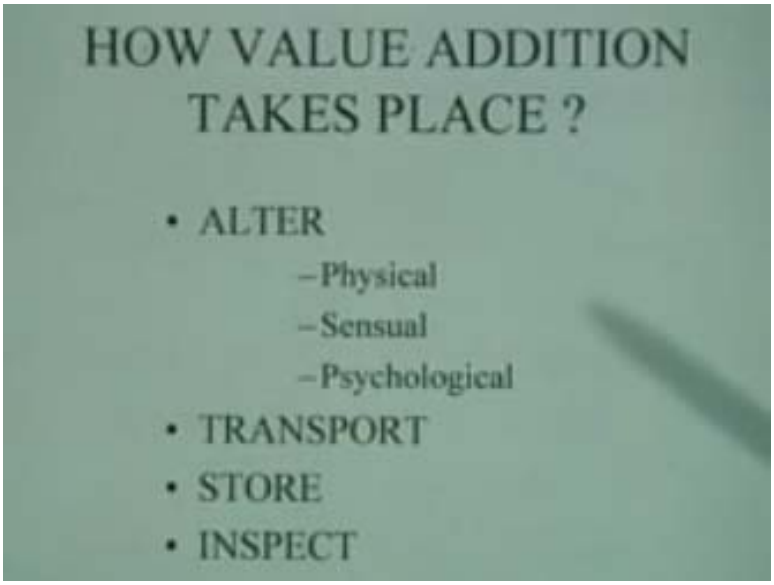

A typical example is you take a book, book is a production system. You read it, you are in the transformation box. What happens to you? It transforms you psychologically in that sense if the book is powerful, if the book is all trash, it transforms you in another way that could be another possibility but it does transform you. There is a psychological transformation and all. The other activity which is fundamental to all manufacturing is transportation. This could be transportation or raw materials within the factory or it could be transportation of finished goods from the factory finished goods store to where to your retailers and the final customers or it could be transportation of raw materials from your vendor sides to the factory.

Essentially transportation is a very important exercise. If you are not able to transport properly you are not able to actually improve the value. Some raw material lying in a mine is valued at something but the moment it becomes in a factory producing iron ore iron, say then it becomes useful there. The utility of the raw material changes after it is transported. So transportation is something which ensures that you bring the material to the right place and the value increases as a consequence. When we talk about storage how are we increasing the value by storage? In the context of a factory if you produce something and let us say you are not able to sell something immediately in that particular month. You would typically have an inventory of finished goods and you will utilize it. This inventory may be in the next period or the next period when the demand becomes normal or something of that kind. An inspection is a typically very important aspect when you are talking about addition of value because this is the stage where you are checking whether what you have produced is as per your specifications or not and that is basically what quality is all about. So you have to talk about these. Essentially speaking when we are talking about value addition within the factory, we are essentially talking about the various things which have to be improved in terms of the value addition. Here is a now a look at the kinds of transformations which might take place within the input output box. So we have said that there could be physical transformation as happening in

manufacturing. I think this is obvious because we have already given examples of how basically you start with steel sheets and convert it into a car. Ultimately you are changing shapes, right and in location kinds of transformation. What you are doing is, in transportation what is happening is the kind of transformation involved is you are changing the state of the material from location A to location B. So, essentially transportation is nothing but a locational transformation. When you are doing retailing purpose, retail shops stocks items of different kinds, what is that they are doing? It is the kind of transformation, what it is doing is merely exchange. In warehousing the kind of exchange that you are doing is basically storage. You are storing that means when you are talking about the whole operation of any warehousing company, what it does is it stores a material at time one and produces the same material at time two. That is what happens to your wheat. You get wheat, it is stored one year ago and you get it in the next year. So that is the kind of transformation which goes in warehousing. Although a warehouse does not have any complicated machines or those kinds of operations involved it is performing this kind of transformation. Hospitals, the kind of transformation which goes on within a hospital is physiological. You go to a hospital with a broken leg and come with a leg which is hopefully working or you go with broken knees and come with new knees like many people including our prime minister for instance, so it is a physiological transformation and then in reading in the transformation is essentially attitudinal.

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When you are reading? It is your attitude which changes and in entertainment the transformation is essentially informational. I mean an entertainment industry is for instance you go to a cinema theatre, you go in as unentertained man and when you come out you are entertained man hopefully depending upon the kind of movie you see or whatever in that sense, so that is the kind of transformation which is trying out there. I think these are the variety of transformations that we can talk about. Now we have seen the basic model of a production system and seen the various entities involved within the

production system. Let us now try to define some gross measures of performance of a production system. Commonly used measures are production; you say for instance that my plant can produce three hundred cars per month. So that is your output. So you can measure the total production in terms of output per unit time. That is how you measure production or you can measure productivity in terms of output to input ratio because total output doesn't give you an idea of how much you actually put in to get those cars. It is better to talk about output per unit input in a given time. This is what we call productivity, then you might talk about efficiency. Now efficiency will be defined as actual performance to target performance. You might say for instance if an actual ideal operator is supposed to produce fifty nine pieces a day and that is what we expect from him and if he produces only fifty. Then fifty divided by fifty nine could be taken as a measure of the efficiency of the operator. So notice that intrinsic in the definition of efficiency is the notion of the target value and the target value could be defined subjectively. That is an important thing.

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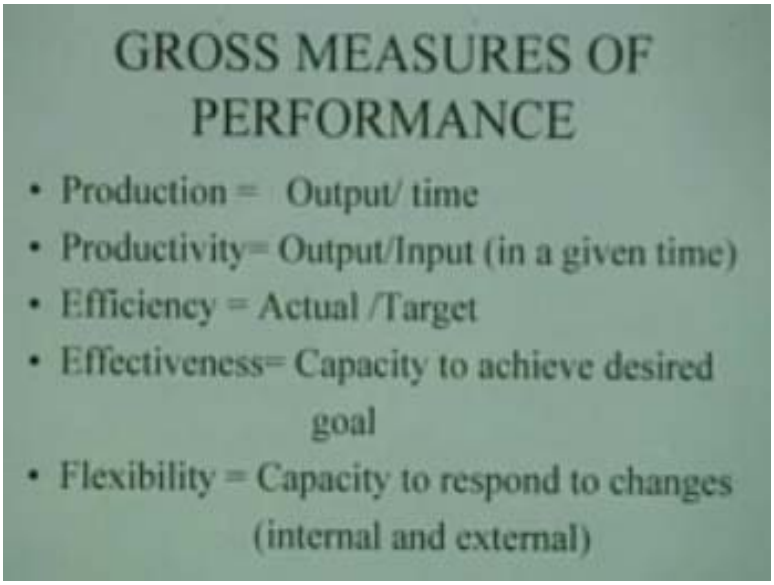

What do you mean by effectiveness and how does it compare with efficiency? Basically we find effectiveness as the capacity to achieve a desired goal. Can you give me an instance for instance where we might have a poor effectiveness but high efficiency or vice versa? You see what can possibly happen is that take one of the programs. The government has had so many programs. You know Garibi hatao was the program for instance the objective of which was to remove poverty. A lot of money was spent in terms of initiating a number of projects for various things. Now if you review this project after let us say five ten years what would you feel? It is job of removing poverty from the country. We can clearly say that the effectiveness of these procedures was not high was not good. On the contrary in a particular procedure, in a particular problem the government may have decided certain types of procedures like give every month five thousand rupees to such and such people. What could have happened is in this entire thing is the government could have executed this particular aspect very methodically over

the five years. It had to distribute let us say five thousand rupees every year. The efficiency of operation of the person or the bureaucrat who is disbursing this money is very good because he has been this money and it has been going to whatever use. But the overall effectiveness of the project is not good so really speaking it is important. Normally we would take effectiveness to be a major criteria and efficiency to be lower level criteria. The major difference between efficiency and effectiveness is based on the relevancy of the target. For example if you are producing hundred percent literacy but overall time of the targets uses relevancy and the program is efficient but is not effective. It doesn't achieve your goal. What you are saying is very true because what can happen is 1. How do we define efficiency? It is actually divided by target in that sense. One thing could be that the target itself is slipping. So there could be a problem with the definition of efficiency. So similarly in terms of effectiveness you have to actually effectiveness has to be measured with reference to the achievement of the overall goal of the organization. You very right in that sense and finally another important measure of performance is flexibility and basically flexibility means capacity to respond to changes, changes both internal and external. If you are flexible then you can respond to changes and these days flexibility is a very important requirement. Why is it an important requirement today? It is a dynamic world.

What does that mean? It means for instance that you have a customer today who wants certain kind of output from you, maybe tomorrow he wants double the output from you and maybe he wants a different kind of output from you. Unless you are able to respond to these changes you would not be able to survive. So flexibility is a key thing and that is one reason these days there is a lot of emphasis on flexible manufacturing. Flexible manufacturing should be able to produce what the customer wants using the same kinds of materials by organizing your production machines and work force appropriately. If you can develop this then you remain healthy. To give you an example for instance, even in from the realm of health if you want to remain healthy, you do yoga. What is yoga? The purpose of yoga is essentially to maintain this kind of flexibility in your limbs and so on. Even in the human context for instance flexibility is a very important aspect and if you are not flexible if you cannot bend then you break and when you break you are through. So some similar concept actually applies within this context of flexible manufacturing systems. Apart from looking at those measures of performance of a production system let us try to look at some of the economic measures of performance and when we talk about these economic measures of performance we can talk about investment. This is a major economic measure of performance, the initial investment and the phased investment that you have to make for setting up a factory or buying a machine or whatever the profit that you get from your venture both gross and net after taxes profit, the revenue, the turnover.

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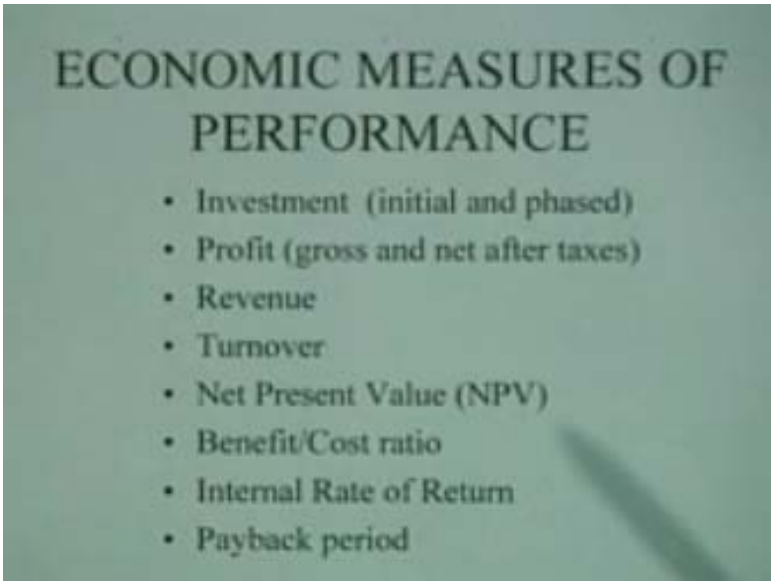

The net present value, the benefit to cost ratio, the internal rate of return and the payback period and I am quite sure that you are familiar with many of these financial terms and how to perform these computations for a given set of cash flows for a given thing. What we are simply trying to say is that since the economic performance of the production system is important. Basically this economic performance is measured in terms of these various parameters and they become important to finally identify whether the proposal that we are talking about or the actual production system is sound on financial front or not. Let us now look at some of the major challenges in production. What are some of the major challenges in production? One of the key challenges that are facing modern manufacturing is competition. Central and this competition mean essentially that there are now more producers and the customers have become more demanding. Both the things have happened. Customer has become more demanding. He wants better quality, better delivery time and lower costs like that and we can afford to do this because now there are more producers. So these are the two major things which have happened here as far as the competition is concerned and what are the various ways that manufacturers can adopt to deal with this situation? They can deal with this this particular challenge on in a variety of ways. They can deal with it by controlling the price by bringing down the price. That is one of the things but obviously there is a limit to which price can be brought down. The question really is that you should be able to find out the level to which you can reduce the price and if there are let us say take an example. There are a number of manufacturers. Everyone says I cannot bring down the price because they might be buying their materials from the same sources and things. For one particular manufacturer would still be able to give you the lower price. How would he arrange this? He would arrange this simply by managing his own costs appropriately. If you can organize your own costs, make your internal system more efficient, then you can offer a better price to the customer. So this is how you can look after your price. Of course quality is another aspect where you are giving essentially what the customer is asking for another thing which is happening is that lead times have reduced.

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I mean they have reduced considerably to give you an example from personal experience. For instance the boeing about 6-7 years ago was that if an airlines placed an order for an aircraft with boeing, they will not typically take about two and a half to three years to process that order. That is to make the aircraft. Each aircraft would have to be uniquely made you know for the customers. Now the situation is that they have brought this lead time down from two half three years to something like 1 year 2-3 months. Their target was to bring it to within less than a year for the manufacturer of an aircraft. This is again an application of this kind of pressure which is there where lead times are reduced and you know in the manufacture of aircraft there are not many suppliers. Generally there are only two suppliers in the world. There is another thing there is happening is that the customer can want greater variety. You have to organize your production again more flexible essentially and another thing that the manufacturer has to do is to provide customer satisfaction. How does a manufacturer provide customer satisfaction? What can he do to provide customer satisfaction?

One thing that he can do is to provide quality that the customer does not have complaints but the second thing he can also do is to provide good after sale service. It should not happen as sometimes happen in many of our Indian products. If you buy something and second day the electrical system goes out of order and you have no means of contacting the original manufacturer although you might even have a warranty with him. Really speaking customer satisfaction would involve that the customer should be able to contact and should be able to get his job done from the manufacturer as early as possible and hopefully they should be it should be so organized that need for this should not arise, that is another thing. So customer satisfaction is really important. Do not think that increasing the quality will also increase the price, high quality at a low price. What our friend is saying here is that he would not increase in quality would lead to an increase in price. It may and it may not but not in the long run, what may happen for instance is that when you are providing quality that means you have probably given him some. You have

provided some kind of quality. The additional costs are generally much more than offset by the increased demand for that product that is what he is saying. In fact when Crosby said quality is free, this is what he means i.e., that is by providing quality you have actually increased your sales to such an extent as it is that you have more than recovered the cost of that particular product. That is the idea and that is what you should do. You should try to enhance your market in that sense of the term. So these are some of the major challenges and you will find that most of the research in production management actually hinges on how to deal with this or how to deal with this or how to deal with this or how to deal with this or how to deal with this. Essentially these are the issues which we talk about in this. Another major development which has taken place in the context of production systems is that originally the focus was only on transformation process and the input output from the transformation process. It is now being recognized that the transformation process is not operating in isolation. There are a large number of vendors who are actually supplying materials to these. So they are actually also like the limbs of the manufacturing organization and similarly there could be a number of warehouses where you are stocking these items and from these warehouses you would be shipping your product to different retailers from where the customer is actually taking the product. So the idea has been that if you want to make the system more efficient rather than looking at the manufacturing process it is elf you should look at this entire chain.

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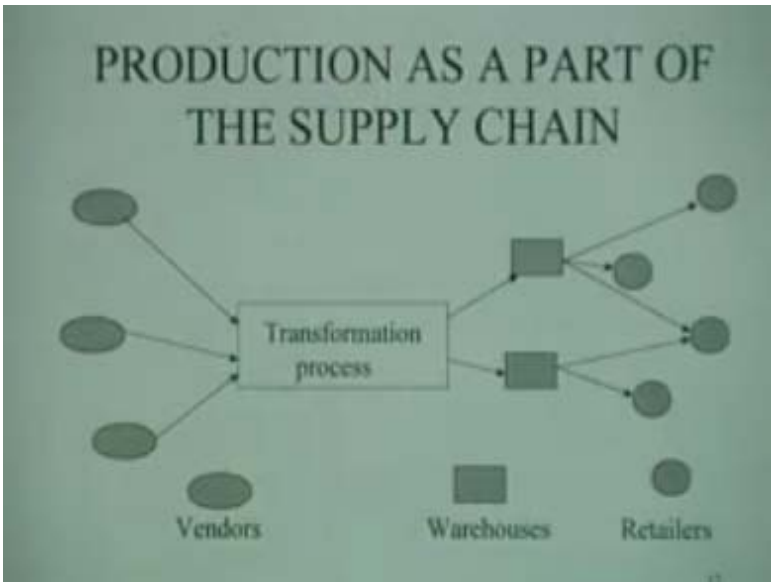

They call it the supply chain, so this is been the reason why there is such a lot of emphasis today on supply chain management because why it is important is that if there is a blockage somewhere in any of these systems it will lead to the failure of the whole system. It is like saying that whether you have a blockage in the heart or blockage in the brain or a blockage somewhere else in your system it can lead to a total catastrophe and this is what is really happening. This is what has prompted researchers to basically look at the supply chain and the basic idea here is that by looking at the supply chain you are you will try to identify the bottleneck operations and try to improve the bottlenecks and

then try to run the system as a whole. We were talking about the difference between production organizations and service organizations, production versus service systems, so here are some of the features of service organizations which make the management of service organizations more complicated. These features of service organizations are that there is greater customer participation. This is very important aspect, for instance by customer participation I mean that if you go to a hospital with a broken leg you are a part of the operations. You have to go to the drilling machine, you have to go to the doctor, you have to do flow within the organization but if I am the buyer of a maruthi car I do not have to go to the maruthi factory and flow with where the gear box is being made and how the engine is being assembled and things like that, just get the car. Because of that there are when you are planning service organizations you have to make sure that to plan for customers who are participating in the process, another important thing is that the services cannot be inventory. Service capacity time is also time perishable. If you miss the time you miss it. In a doctor's clinic, if he is waiting idle he cannot prepare some hypothetical patients like when inventory is in a car and do with that operation, the customer here will govern the location and generally these things are labour intensive or they are intangible nature of service.

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That means this kind of service that is provided to different patients who would vary from patient to patient. This does not happen. One maruthi eight hundred does not receive a different treatment from another maruthi 800. Whereas a person with a fracture in the leg receives a different treatment from a person who is has fracture in the arm in that sense, and so broadly speaking the whole process of operations management can be defined as the performance of managerial activities in selecting designing operating controlling updating production systems.

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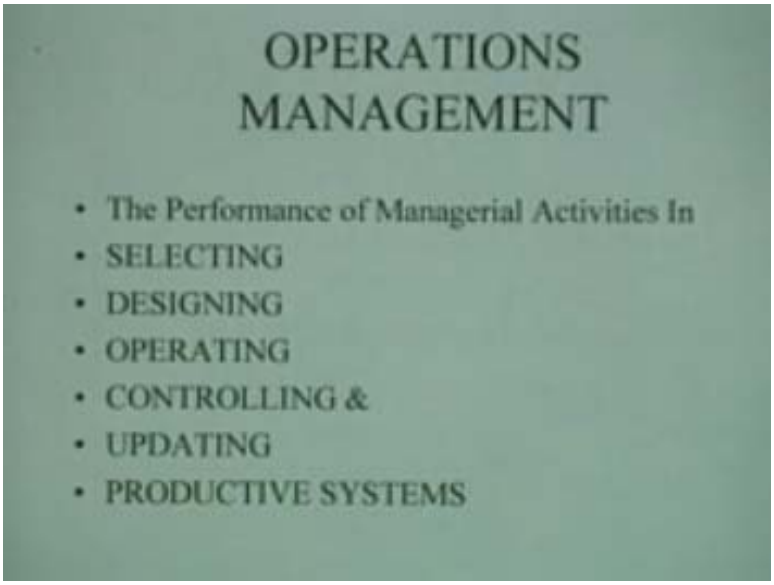

This could be taken as a formal definition of operations management. I think with this we would like to conclude while quickly summarized what we have tried to do in today's lecture. In this particular lecture we have tried to look at the distinction between projects and production systems essentially and then we have looked at a generalized model of a production system and we have looked at the various aspects of a production system and tried to define the role of operations management. In the next lecture we shall be concentrating on the life cycle of a production system, that means we will try to talk about the major problems of design and operation which occur in production system and what kind of managerial decisions are involved in that context.