Organizational Design Change and Transformation
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Module - 08
Lecture - 38
Technological Theories and Organizational Design

Welcome to lecture 3 of week 8. In the previous lecture we were discussing about you know different types of technology and how does it actually have relevance to organizational structure. And we also discussed about what are the principles of future organizational structure. In today's lecture what we are going to primarily discuss is we are going to discuss on theories on technologies and organizational and organizational design.

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And in today's lecture we are going to discuss about 3 important theories which are you know you know very important to understand with the respective technologies you know how this technology theories have been classified based on the type of work activities happen in the workplace. So, we are going to discuss 3 important theories. First theory is about a technical complexity how this technical complexities have been divided.

This theory has been proposed by Joan Woodward and we are going to discuss about next theory by Charles Perrow where he is going to talk about classification of technology based on routine and non-routine and complex task. If you remember that in the previous lecture also we discussed about routine and non routine type of a technologies.

When do we say some technology are routine technology and non-routine technologies where we are going to draw from you know Charles Perrow's theory or tasking about talking about how the task have been classified into routine and non-routine. Then we are going to discuss about theories of James Thompson where we are going to talk about the task interdependence based on the technology or a type of an organizations been you know workflow being considered we are going to see ok based on the type of organization functioning whether it is independent task independent or task interdependent. So, we are going to learn about all these 3 theories today.

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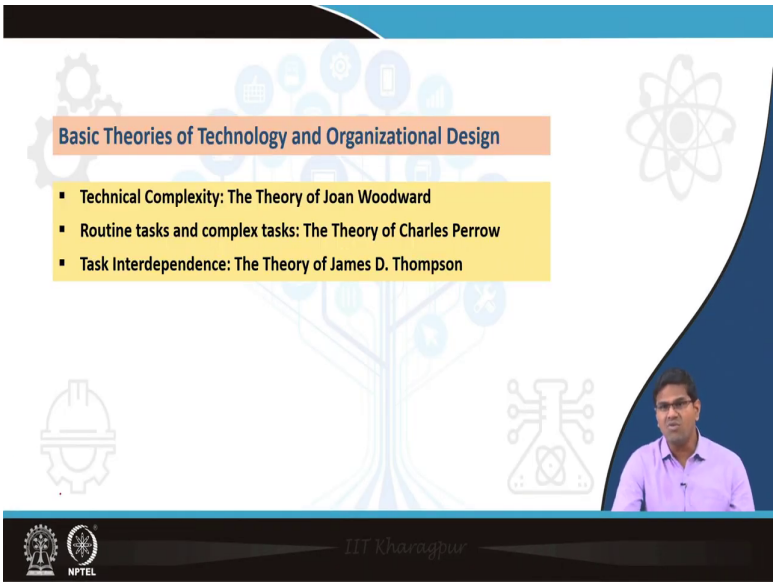

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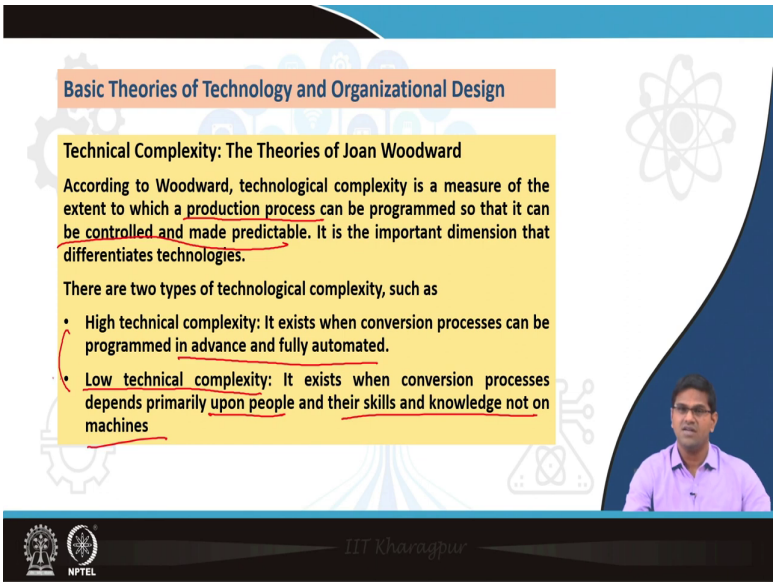

And let us start with the first theory which is going to talk about a technical complexity. So, this theory is proposed by Joan Woodward ok. What is he saying about this complexity technological complexity? So, the technological complexity is nothing but is a measure of the extent to which the production process we are again referring to the production process how this production can be programmed so that it can be controlled and made predictable.

Meaning that can we program it and make it more automotive can it make this production process happen on its own and it become more predictable. So, based on this technological complexity we will be able to classify this into you know high technical complexity and low technical complexity.

Now, let us try to understand what is this high technical complexity. So, high technical complexity exist in the production process when the conversion process can be programmed

in advance and fully automated. That is when we call it high technical complexity where when in well in advance you will be able to program it and make this production process automated.

So, that is a high technical complexity which is high technical complexity because you are trying to you know program it in well in advance and more of an automation. Now, comes low technical complexity when do we call it a low technical complexity when the production process.

In the conversion process depends primarily upon people not on a any computer assisted programs or computer assisted technology where it is primarily dependent upon people and their skills and knowledge not on machines. Where we say technical complexity is less because there is not much involvement of a technology whereas, it is only the you know involvement of people where if you look at high technical complexity.

And low technical complexity the major differentiation factor is that how much of technology has been used to produce or carry out my production process when there is less amount of technology been involved in the production process we call it low technical complexity when high level of technology is been involved in the production process.

For example, of an automations where you need lot of technology been involved in an automation process so, where we talk about high technical complexity.

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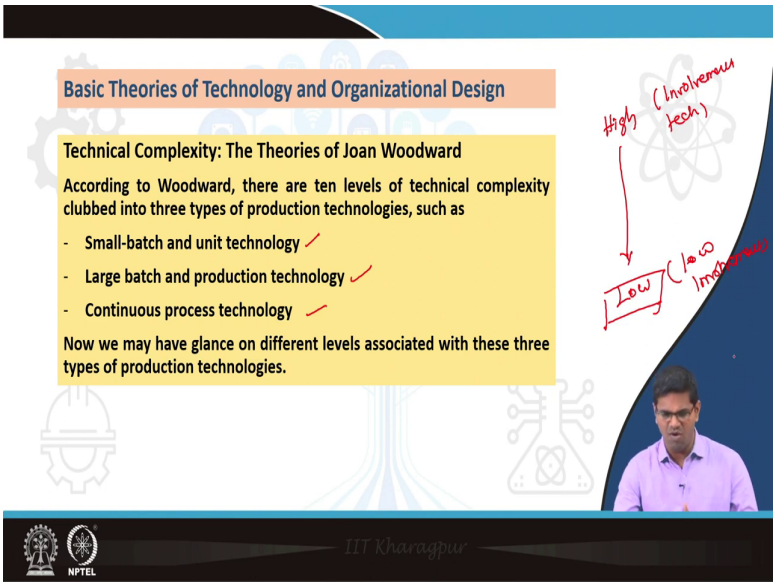

Now, let us try to understand further. So, this technical complexities are again further into ten levels of technical complexity, but what Woodward does is that he is try to you know capture this ten level of complexity into three type of production technologies ok. So, he said first is small batch and unit technology then large batch and production technology then continuous process technology.

So, this is how you know Woodward tries to say this technical complexity when he say technical complexity goes from high to low. So, what is high? There is more advanced programming and able to make an automations where if you look at high involvement of technology high involvement of technology where low involvement of technology.

Wherein in the low technical complexity where we say more of a people knowledge skills been used for the production process that is where they trying to understand how these

variations are coming. So, based on the high technical complexity he has classified based on this small batch and unit technology, large batch and production technology and continuous process technology.

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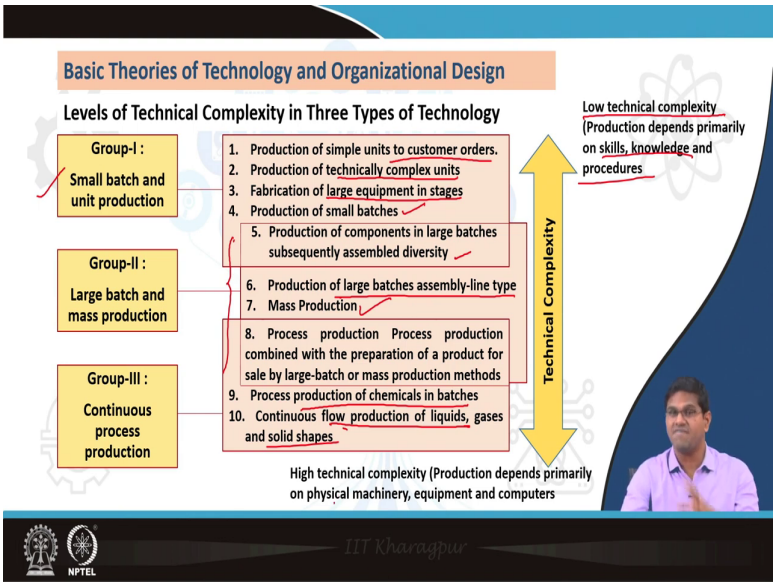

Now, let us look at from this you know flow diagram we will be able to understand that ok how this classifications are grouping has happened. So, group 1 primarily talking about small batch and unit production. Now, you see that there is an overlap in each of this group. When we say the classification there is one place where you see this overlap happens between group 1 to group 1.

Similarly, you will see some certain aspects where there is an overlap from group 2 to group 3. Now, let us try to understand on these first grouping where it is based on low level of

technical complexity whereas, depends primarily on people skill knowledge and procedures. So, now if you look at ok production of simple units to customer orders.

Now, you know simple units to be produced where you primarily do not automate, do not use technology and production of technically complex units sometimes you know you need people to be involved handmade you know we talk about your handmade product right. Where we are talking about you know highly people have been involved in producing and fabrication of large equipments in stages and production of small batches.

Now, we have look at this number 5 where it is having an overlap on group 1 to group 2 and moving from small unit to a large batch mass productions where production of components in large batches and subsequently assembled diversity. Now, if you look at on batch 2 where the large you know group 2 is large batch and production technology where the production of large batches assembly line type where you produce large batch of products are goods being produced.

And also mass production is also related to the group 2 where the technical complexity bit higher because you are talking about you know the flow of you know shop floor where there are setup you know subsequent activities are happening. And finally, you have a finished goods and then you are going for a mass production and using machines to produce a large volume of products.

And now if you look at you know point number 8 where we are seeing there is an overlap of between group 2 where the complexity is you know not high or rather low it is a middle level technical complexity. Now, to on a group 3 which is highly talking about high technical complexity because it involves more of you know prediction and programming and more of an automation.

Now, let us say process production combined with the preparation of a product for sale by large batch or mass production methods then process production of chemicals in batches and continuous flow production of you know liquids or. So, if you look at now continuous production of process where it is more of an automations and less people involvement you

know highly automated, you know inputs have been also designed automatically the input has been given the conversion process happens the finished goods products have been out.

So, where we are talking about high technical complexity. So, this is where we you know Woodward is talking about you know high technical complexity to low technical complexity and how we are talking about an organization based on a type of a complexity, technological complexity he classifies based on the complexity theory as of complexity talks about what is that involvement of technologies and the complexity associated with it.

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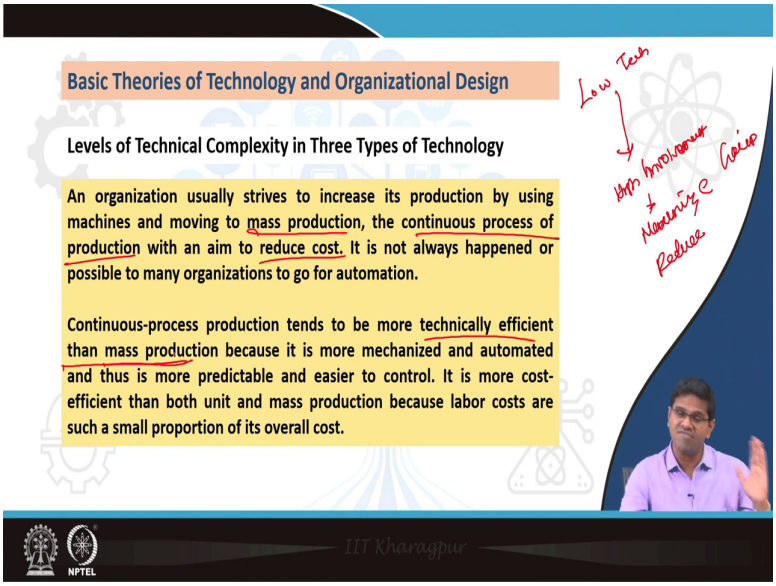

Now, so if you look at now this three you know technical complexity we are talking about organization generally uses this you know kind of you know technologies that we increase its production by using either a mass production or a continuous process of productions to reduce cost.

Because you know organizations are moving away from low technical complexity; low technical complexity meaning you know less involvement of technology to high you know involvement of technology because they know that you know organizations are able to reduce cost and maximize gain.

So, organizations are trying to go for maximizing gain and reducing cost. So, where I can go for mass production or a continuous mass production you know it is not always happened to possible for you know many organization go for an automations and continuous process production tends to be more technically efficient than mass production. Because where if you look at you know the complexity level in a mass production it is at the mid level.

Whereas, in a continuous process production is a high complexity you know obviously, it will be technically more efficient than mass production because, it is more mechanized and automated thus it is more predictable and easier to control; because you know you are it is become more predictable and you have more control over you know where we are talking about you know analytics been effectively used where you are going to know ok.

When the potential breakdown is going to happen how do you know address those concerns, when you go for you know predictive maintenance of the machinery and also I am I am using those demands understanding the demands and based on the mass production happens.

So, this high level of complex technology which is more efficient than the mass production and it is more predictable and of course, have more efficient you know applications for a organizations.

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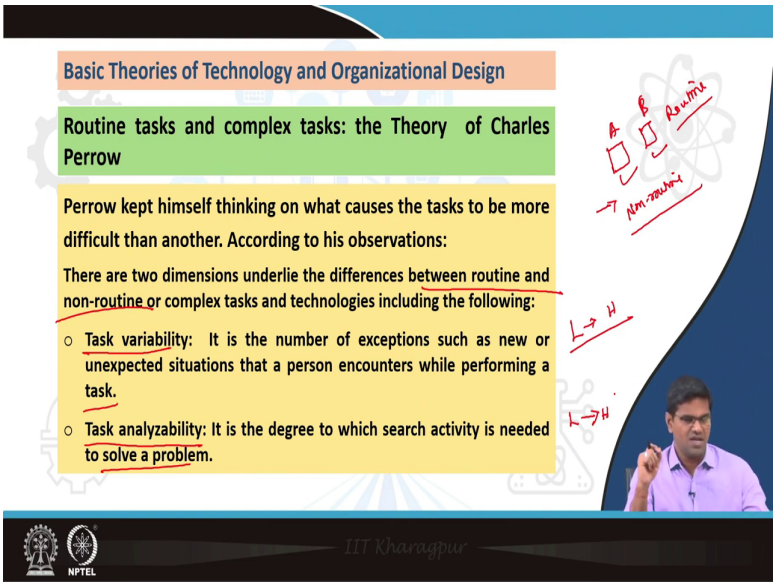

Now, this is on a theorem complexity. Now we are going to the next theory wherein we are going to talk about the routine task and a complex task ok. So, this theory is proposed by Charles Perrow. So, where this Perrow was keep thinking about you know what makes or what causes the task to be more difficult than the other. So, what makes a certain task are difficult than the other task.

So, how do we understand ok there are two task A and B and why let us say you know why task A is much difficult than B? What are this what causes this A to be you know people to perceived or finding a difficult to carry out this task A than B? So, he has trying to understood this differences from two perspectives.

So, he says one is task variability and also the using to understand this is whether it is a routine and non-routine. There are two dimensions underlie the difference between you know

routine and non-routine. So, now routine task are not much difficult non-routine task are difficult.

So, now he says ok task A may be attributed as non-routine in this example and task B is routine task ok. Now, to understand this routine and non-routine task. So, he is trying to understand you know from two perspectives one is a task variability and task analyzability.

If you remember in the previous lecture as well I was very briefly talking about what is this task variability. So, the task variability is that it is a number of exceptions such as you know new or an unexpected situations that will a person will encounter while performing a task. Let us say you are doing a task. What is the number of you know exceptions meaning that new or unexpected situations you will encounter during a task.

So, it can be again low to high ok, L is low and high. So, then now comes task analyzability. Task analyzability degree to which the search activity is needed to solve a problem means you know you need a certain the search activity to solve a particular problem it is again low to high ok.

Now, these are the under the two specific parameters one can you know label task as routine task or a complex task.

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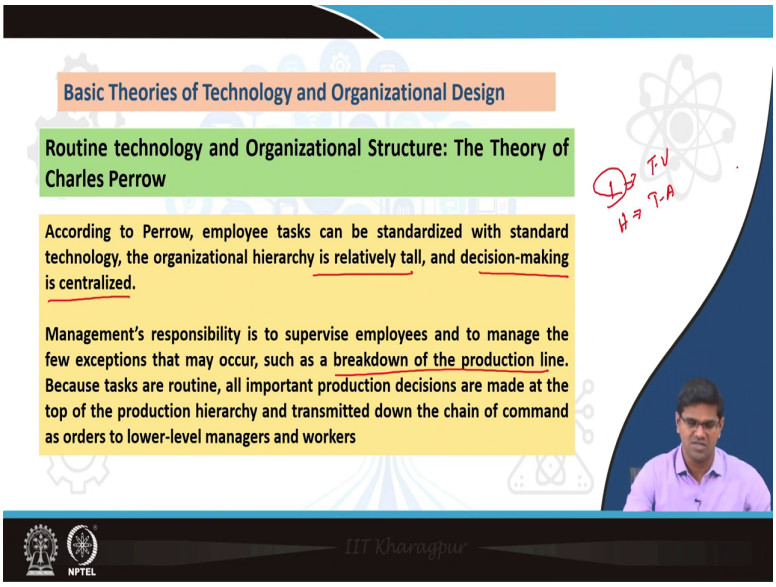

Let us try to understand when this when do we call a routine technology and when we let us say in a routine tasks. So, according to Perrow so, employee task can be you know let this routine task. So, when we are talking about a routine task which are you know high task variability and then you know low high low task variability and high task analyzability.

So, the routine task are low in task variability high in task analyzability ok. So, now low in task analyzability means is the repetitive task the routine task where implies task can be standardized with a standard technology. So, organizational you know at you know hierarchy relatively tall decision making is centralized because if you look at this type of a task which are very repetitive you know there is no unexpected situations you will encounter.

Because very clearly defined task in this process what happened highly standardized procedures are clearly defined this is what happening in this type of you know organization

where more routine task are there. So, what type of a structure they will have it will be a relatively a tall structure there are various level and you know decision making is always centralized because the variations or variability is very less right at the at the each of the task.

So, you can always keep the decision making at the centralized decision making rather than you know decentralized you do not need to you know make the decision making happen at a various level because the variability is very less it is very predictable we know this is what the task of it is very clearly defined. So, you know routine task is really high on an organization where the structure are relatively a tall and the you know decision making is centralized and it is more of a standardized.

So, here what is the response of the management? Generally the management's responsibility in this type of a task are to supervise employees to manage maybe very unlikely that we will see an exemptions or you will get an exemption it may be very rare occasions. So, how do you manage those few exemptions may occur let us say for example, breakdown of the production line it may not happen every day maybe once in a while it might happen.

So, here your role is to just to supervise employees and manage those exemptions you know how do you handle when there is a breakdown in a production line because the tasks are more routine all important productions are made at the top of the production hierarchy and transmitted down the chain of command as to lower order level managers and the workers.

So, you know routine task where it is more of standardized and decision making is centralized and structure is tall.

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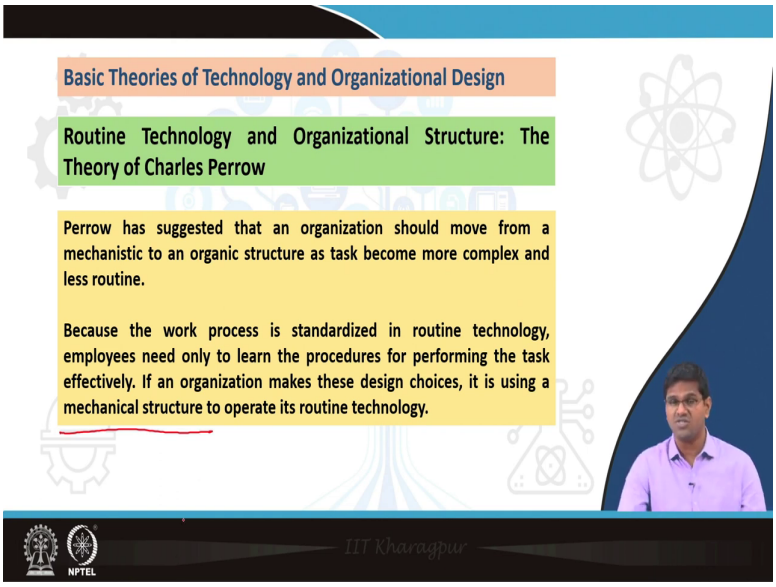

Now, so now, in this routine technologies the Perrow also suggested that organization should you know move from when you are moving from routine to non-routine you know you have to move from more of a you know mechanics to an you know organic structure because task become more complex and less routine than you need to move from more bureaucratic structure to a more you know organic structure flexible organizational design.

Because when workers standardized in routine technologies you know employee only to learn the procedure of doing the task effectively whereas, when this complexity is increasing and the task become non-routine you know it you need to be very flexible. So, in a routine technologies going with the mechanized structure is you know is you know well taken because the technology or the task are highly standardized and in not much variations the variability is less and you can able to manage.

So, you can go for a mechanical structure whereas, this complexity or routine you know non routine task you need to move from mechanical structure to an organic structure, ok.

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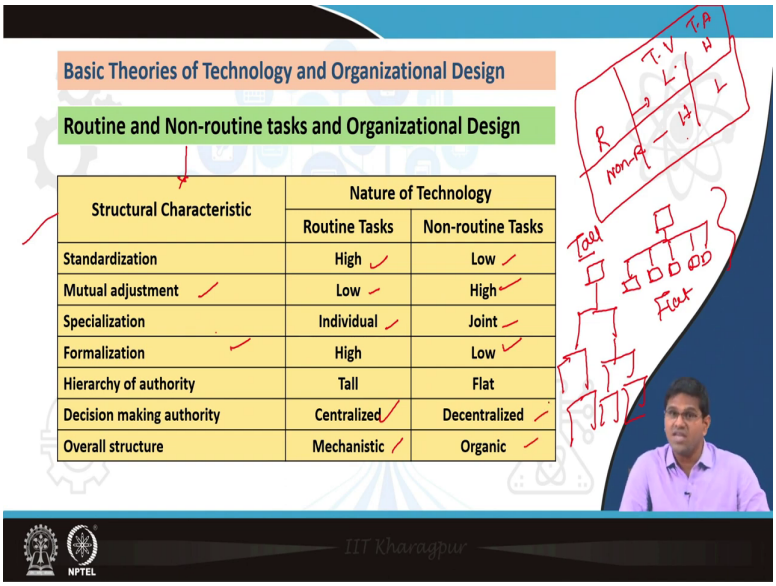

Let us try to look at you know comparing this routine task to non-routine task. Let us say routine and non-routine where you talk about you know task variability is low, ok task variability is low ok here task variability is high and task analyzability is high and here it is low this is the major difference that happens in a routine and non-routine task ok.

Now, if you look at so, when the variability is really high. So, now we look at some of the structural characteristics and when your technology is routine and non-routine what type of a differences you should do in an organizational design. Now, you see the application of technology on organizational structure.

Now, you will be able to understand and appreciate, why are we in discussing about technology, why are we even concerned about when you are talking about a structure and technology. So, now technology will determine or impose on an organization what type of a structure you should hold.

Let us say when your technology is more of a routine task the standardization should be really high as this is less variability and you have to standardization should be high. When the non-routine task standardization should be less because there is high variability you will say unexpected situations, uncertain, unpredictable situations comes more often do not standardize keep it low.

Then mutual adjustment should be low because it is already defined set of activities there is not much disruptions not no variations we keep it less. Whereas, you know when a non-routine task you should keep it high. Then specialization to be individual whereas, here it is a joint case.

Formalization should be really high because it is already a defined task there is no differences you know keep more formalizations whereas, you know non-routine task you should keep it low. Hierarchy of authority keep it tall because you know decision making to be centralized again and you follow a mechanistic structure whereas, in a non-routine task you try to keep the structure relatively less.

Let us say tall is like you know how many layers let us say here is the box comes ok this ok this ok. Now, you see there are various levels this is kind of tall structure. When we talk about a flat structure we are talking about ok more of this. Let us say my levels are relatively less so, flat structure when going for a flat structure. So, when you are non-routine task go for a flat structure and you know decentralize the decision making.

So, allow people at each level to make decisions whereas, in a non-routine task you know keep you centralized and keep your overall structure more organic in a non-routine task, ok.

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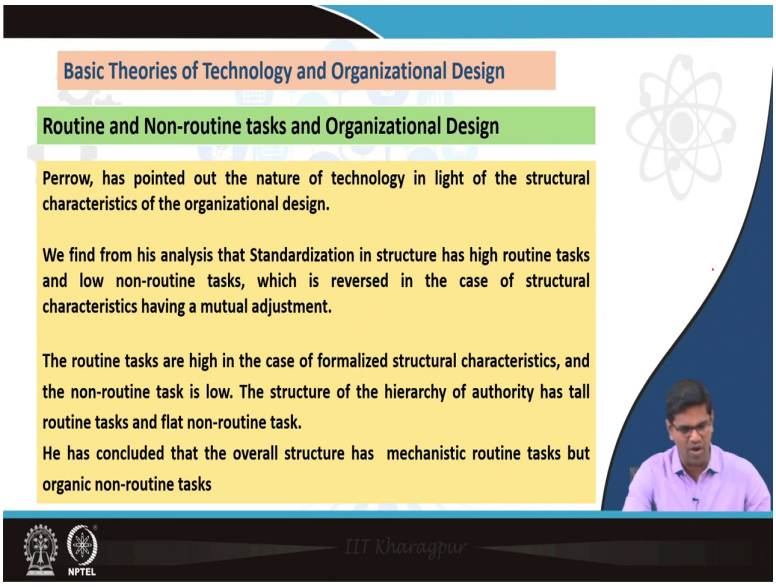

That is what I we have been explaining so far.

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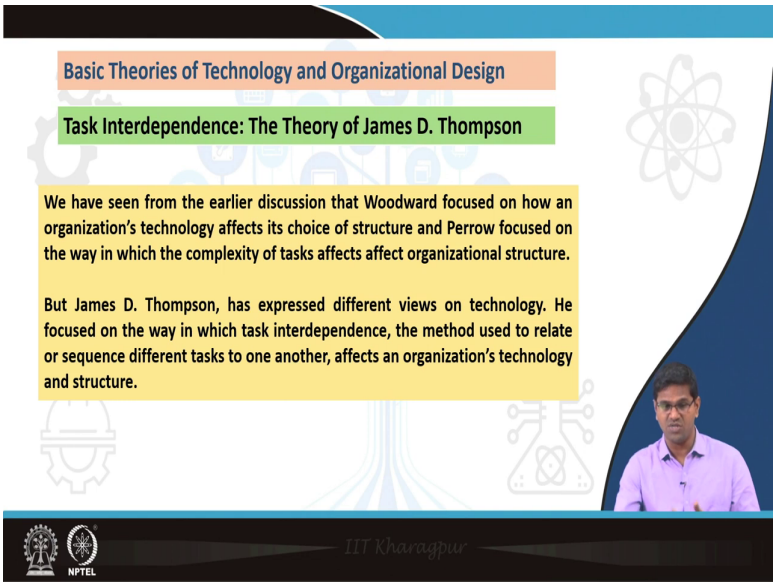

So, now what I will do is I am going to discuss about the third theory which first we talked about technical complexity, second we talked about based on you know task you know whether it is a routine task or a non-routine task classifying the nature of technologies and we have to see you know how this will have an impact on structure.

Now, here we are going to talk about task interdependence. So, this theory has been proposed by James you know Thomson. So, we have seen in the earlier discussions you know Woodward focused on how organization technology affects its choice of structure and Perrow also talked about you know based on a non-routine and routine task how does it actually impact the organizational structure.

Now, Thomson actually expressed a different views on technologies. You know he focused in which the task are either dependent or independent to each other. So, this each method related

to whether the type of set of task that you have carry out. You know every organization will have its various type of task to be carried out to achieve an organizational goal.

Now, how this task are interrelated to each other? Whether are they interdependent or they independent to each other. So, that will actually you know affect the kind of an organization technology and the structure you are going through. That is where the Thomson actually proposing.

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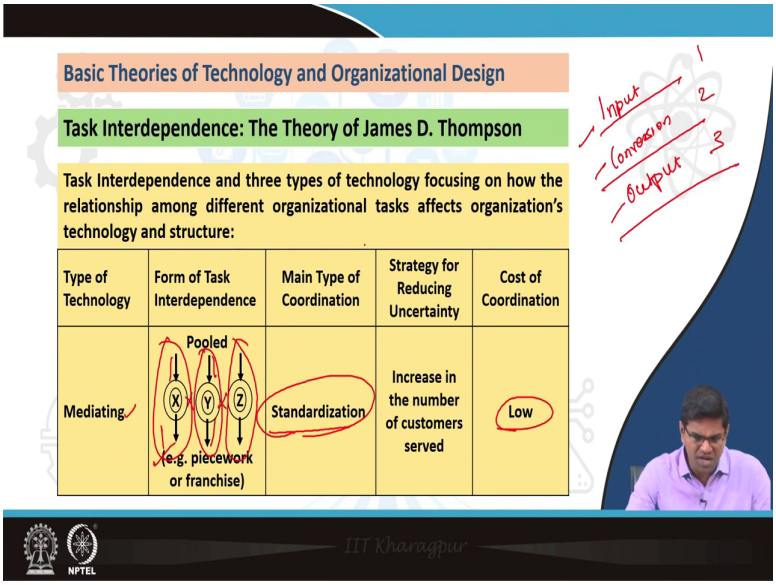

Let us try to look at you know he is talking about you know three different type of technology. First type of technology is a mediating technology. So, here tasks interdependence and there are three type of technology focusing on how relationship among different technology organizational task affect organizational technology and a structure ok.

So, now the three different technology first is a mediating type of technology. Now, if you look at form of task if you look at here its pooled you see there are input let us say call it input conversion and output. You know we keep that as in our framework. So, that you will be able to understand input, conversion and output ok. Now, let us say these are three set of activities. Now, in this mediating let us say input is one activity conversion is another activity and output is another task. Let us call it 1, 2, 3.

Now, in this form of mediating type of technologies where let us say each of I am just saying you know to the better understanding. So, each of this in you know task are independent to each other. Let us say this is a you know when this type of a task where each task are independent not dependent to each other.

Let us say this comes here and you produce you finish and you come here. Now, if you look at there is no relationship between X and Y and Z there is no connection between these three set of task where it is all independent to each other each of them are independent there is no relationship to each ok.

Now, what type of a coordination you are go for more standardization. So, strategy for reducing uncertainty where you know increase the number of customers being served because you are reaching each of the type of activity and coordination is less because why coordination is low the reason is that because here this activities are independent in nature there is no interdependence between these activities.

So, independent so, coordination is relatively less and what you have to do? And you have to more of a standardize go for more standardization.

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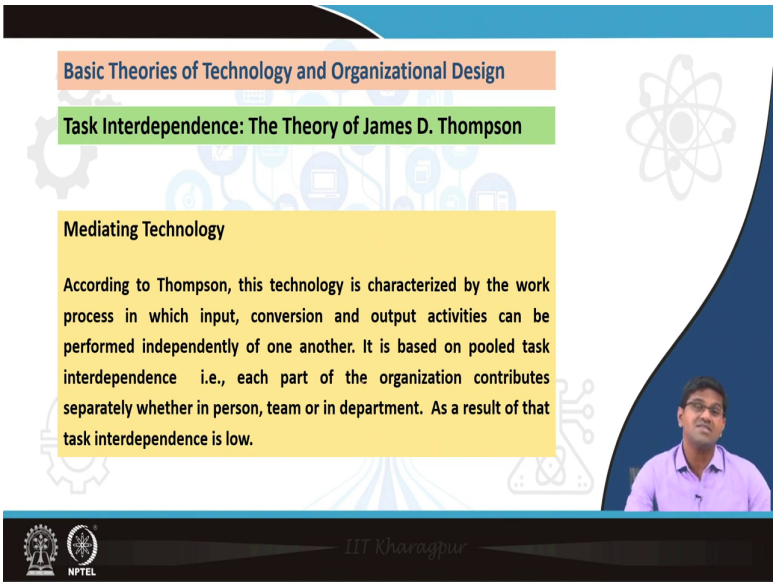

So, in this mediating type of a technologies so, what Thompson says this technology is characterized by the work process in which input conversion and output activities can performed independently of one another ok. So, as I was explaining earlier that keep this input conversion output independently and all these activities are independently done.

So, each of this part contributes separately whether in person or department so, there is where the interdependence is relatively low. Now, this second type of technology first is the mediating technology second type of technology is a long linked technology.

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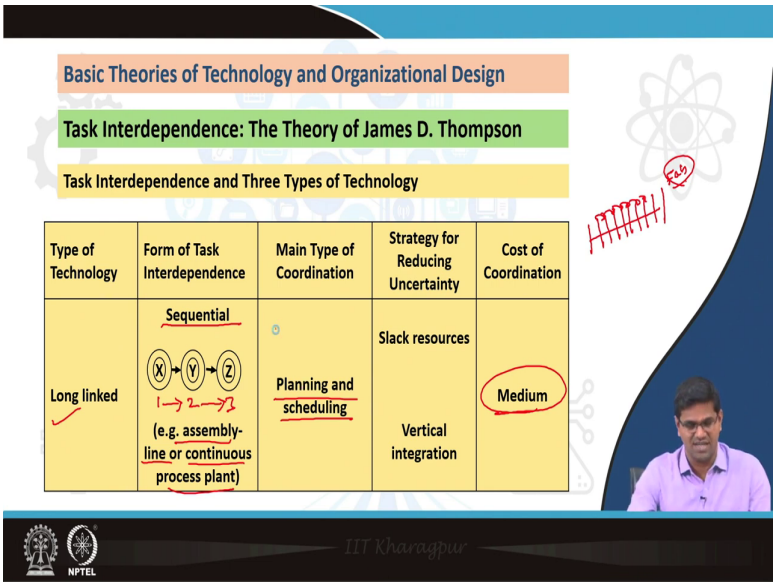

Now, in this if you look at this form of task interdependence here is a sequential right 1, 2, 3, 1, effects 2, 2, effects 3. Generally this type of a sequential task interdependence are mostly seen in assembly line or a continuous process plant because let us say in an assembly line is generally starts from here E and C here. So, there are set of activities each of these activities are dependent on one another this will impact this this will impact this it goes on and on and then comes the finished goods ok.

So, now here what type of a coordination is required here you should have more planning and scheduling you required ok how this activities to be planned what are this you know coordination what are the scheduling exercises should do. Now, so, reducing uncertainty slack resources vertical integration now coordination require is medium it is a long linked where you see there is you know one task effects the other task ok.

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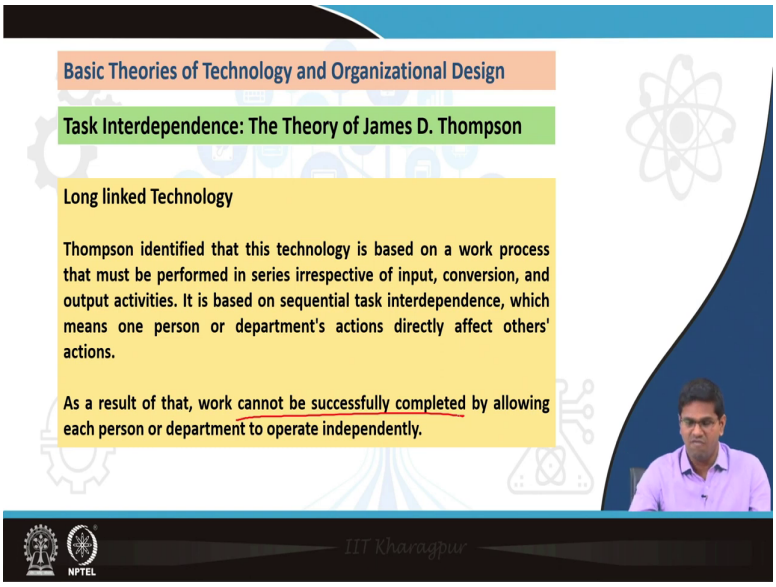

So, now here what is very important to understand you know in this case work cannot be successfully completed by allowing each of the person operate independently. Why? The reason is one affects the other and other effects the next one. So, here it is very sequential. So, you cannot let each one of them work independently then you cannot achieve the work output.

So, he says ok there is a long linked you know type of a technology.

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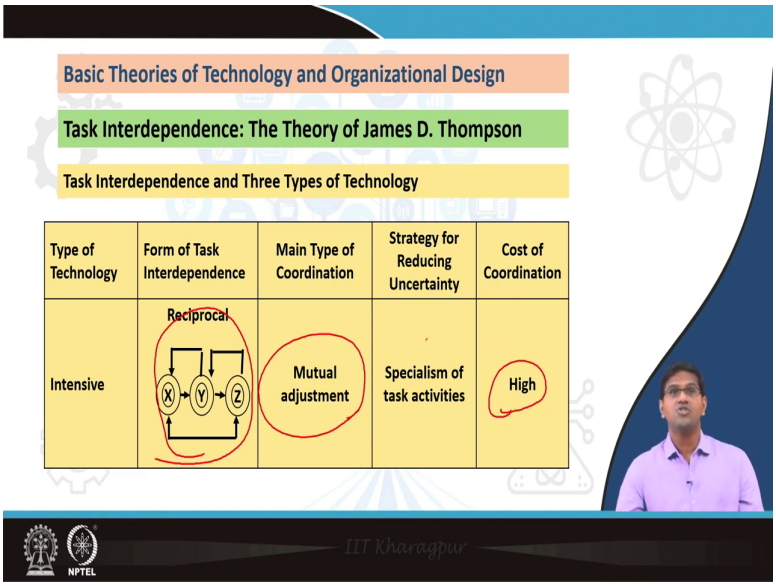

Now, comes the intensive technology where it is you know interlinked you know all the process are linked to each other. So, previously we see it is a sequential right where x was independent to Y and Z, but y is dependent on X and Z was dependent on both X and Y. Whereas, in this case you see it is all of interdependence you know reciprocal, reciprocal influence on each other where X is also the dependent on Z Z is also dependent on X and similarly is the case is Y as well as the you know Z.

So, where it is you know the type of a coordination mutual adjustment is required and the cost of coordination should be high because you required more coordination because you will see the reciprocal relationship is being exhibited in this type of a technology ok.

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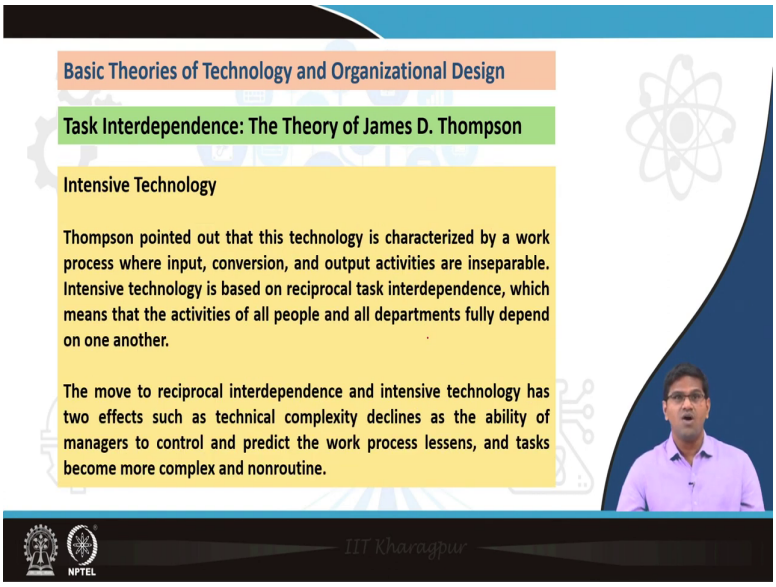

So, now so, what we are looking at you know this intensive technology has two effects because talks complexity declines as the ability of manager to control and predict their work process lessons. And now this is an intensive technology where we are talking about all these processes are you know reciprocally connected and coordination required is higher ok.

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So, in this lecture so, we are coming to an end of this lectures what did we learn about you know we are try to understand more on theories of you know technologies where we started from understanding from technical complexity going from high technical complexity to you know low technical.

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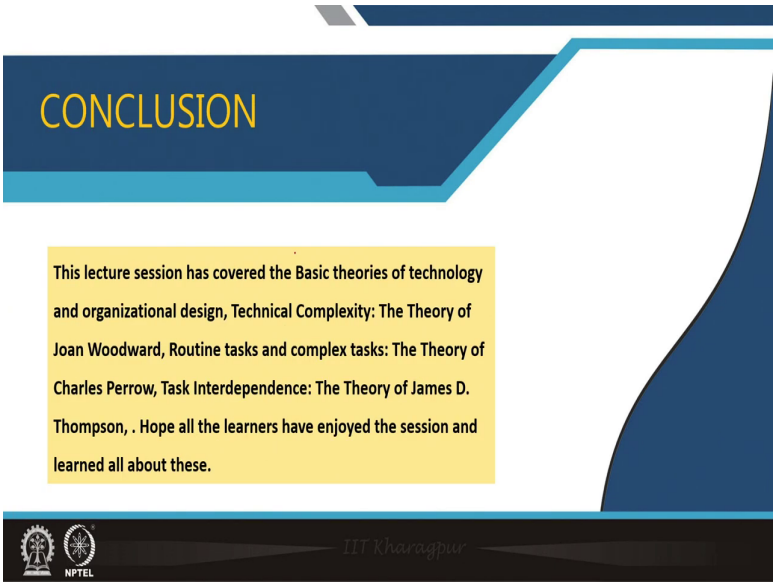

So, first being high to low technical complexity is the first theory.

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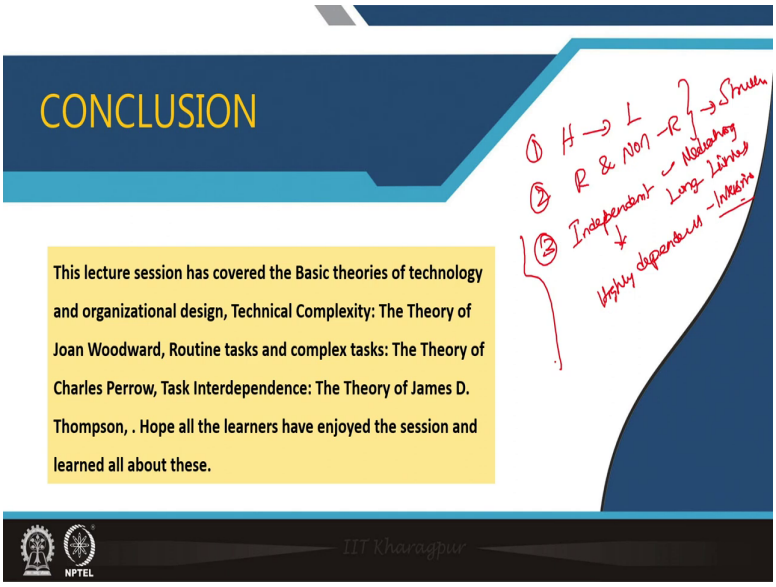

Then second theory talked about routine and non-routine technology how does this impact the structure and design right obviously, the structure. Then third one talked about a typed of technologies based on you know the interdependence of the task right so, interdependence of the task moving from you know independent right independent to highly dependent ok highly dependent.

Now, if it is a highly dependent where you are talk about mediating then comes long length right then we also learned intensive. So, now this gives the basis of how based on the type of technology the series tells ok is the what type of technology he used and how does it actually related to a structure.

So, this theories gives you more basis to understand how do you look at based on the type of technology you have been using in an organization how it is going to be related to the

structure. So, we are going to look at the challenges and complexities in the subsequent lecture. So, looking forward to see you all in the next lecture.

Thank you.