**Toyota Production System**
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**Lecture – 26**
**Lean Vs Agile Manufacturing**

Welcome friends, and now we are entering into the sixth week of this course on Toyota protection system. In our various discussions, so far in last five weeks, we discussed in detail the philosophy of Toyota, the philosophy of Toyota production system which many authors also term as lean manufacturing. We discuss that whether we call it lean or we call it Toyota production system.

The idea was to eliminate waste and if you can understand the entire concept; the entire concept was looking about how to improve my organisation with respect to lowering the cost, with respect to improving the quality, with respect to on time delivery, so these were the major issues which Toyota production system was trying to address but we all know that and in our 2 sessions particularly, we discussed this aspect that lot of changes are happening in the environment.

And you cannot remain inward looking all detail, you also need to have a focus on what is happening around you and therefore, it is very, very important that with the Toyota production system with lean manufacturing, we also discuss the concept of agile manufacturing, if you have implemented lean, if you have implemented Toyota production system that next step is to go for an agile manufacturing.

So, in another words, you can say that lean is basically a prerequisite for going agile and when you have both lean and agile with you, then you became a power pack organisation and that is what we are going to discuss in this organisation that how lawn and agile are supporting each other and where from the theory point on view, from the academic's point of view, there is a difference between a lean and agile manufacturing, so that is the title of this session; lean and agile manufacturing.

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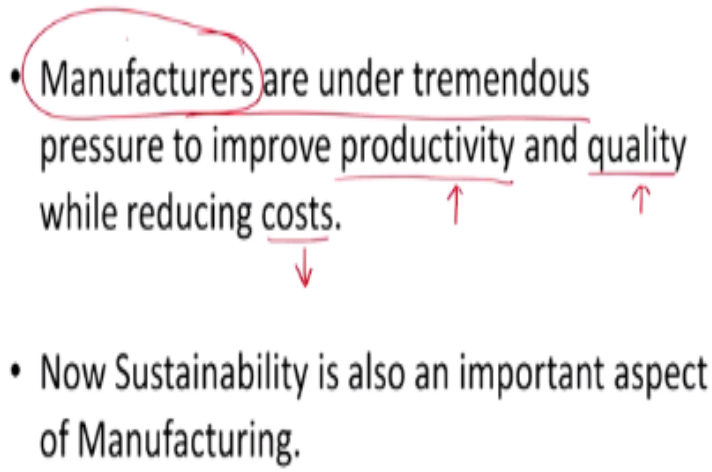


So far, in 20th century up to the 1990's you can say, the maximum manufacturers work under the pressure of improving the productivity that productivity should be high, quality should also be high and cost should be low, so that was the common thing across the organisations, whether you go to American or you go to Japanese or you come to Indian organisations, so these were the three important things for the manufacturers that how to improve the productivity, how to improve the quality.

And how you do these things by reducing the cost and that was the real challenge because the belief was that if you increase the productivity, if you increase the quality, then the cost will also increase but as a customer, we all know that we want good quality products and we do not want to pay more for that superior quality so therefore, the pressure was on manufacturer that how to achieve these conflicting objectives.

Superior quality lower cost, so these are the conflicting objectives and as a customer I want both of these together and over a period of time because of lot of changes are happening in our external environment and particularly, the physical environment, there is a business environment but there is a physical environment, the water, air, land all these things which are around us and without them, we cannot live.

And because of rapid industrialisation in some of the part of the world and without thinking for these kind of natural resources, we started exploiting them like anything and as a result of that we are now facing lot of difficulties with respect to environmental protection, we are having every year World Economic Forum's, we are having every year bigger conferences, each year the size of those conferences are increasing; number of those conferences are increasing which are focusing on environmental aspects of business.

So that is also becoming a very important trust area, a very important you can say a pressure area for the manufacturing people, so it is not only the internal issues of productivity, quality and cost but external issues like you should be environmental friendly organisation, how you are practices or not damaging the environment, so that is another important key area which has emerged. So, challenges for manufacturing people, challenges for business people are increasing day by day.

And these things we need to answer, therefore this particular session highlights that how on one side, lean helps you becoming internal oriented and Agile helps you becoming external oriented and then the combination of both will help us in achieving the objectives of sustainability.

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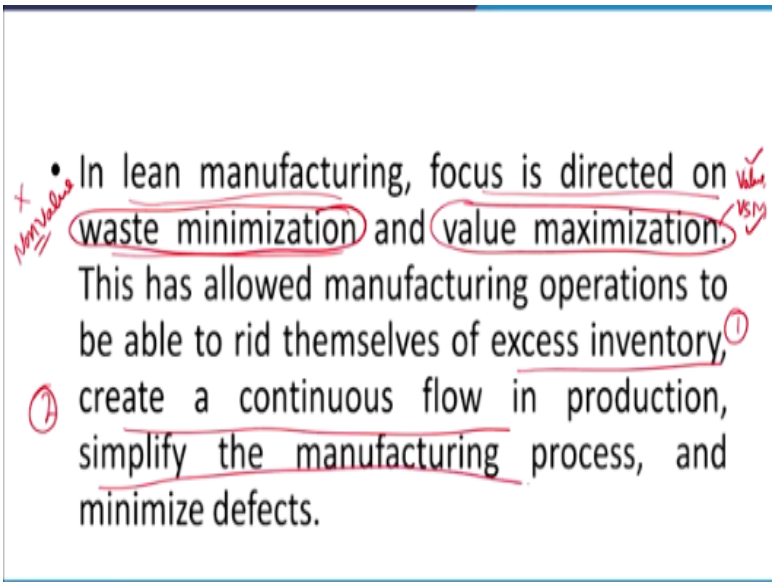


Now, when I say that what is lean because, we already had our previous session in fifth week solely devoted on lean manufacturing, so, just take a quick recap of that. In lean manufacturing, focus is directed on waste minimisation because our focus is on how to improve the productivity,

how to reduce the cost, so therefore, we feel that by waste minimisation and value maximisation, these two things are important; minimising the waste, maximising the value.

And therefore, if you remember when we were discussing the concept of the lean manufacturing, we discuss some key issues like value and value stream mapping, so these 2 important things we discussed that we want and waste is non-value, so we want to eliminate non value and we want to promote value, the set of activities which are transforming my input into output, so those are value things.

But in doing that we do many things which are not contributing, those are non-value things, so the whole idea of lean is based on this particular concept that we need to eliminate waste and we need to maximise the value adding activities. This has allowed manufacturing operations to be able to rid themselves of excess inventory, now you see the list of waste (()) (08:31), which we have discussed that by following the concept of elimination of waste.

And by following the concept of adding value to your organisation, what actually we achieve, so you are able to remove excess inventory, you are able to create continuous flow in production, so one thing is this, second is continuous flow is again and again emphasised because when you have continuous flow, you are able to surface out the problem, your problems will be immediately visible.

Otherwise, if you have unevenness in your production system, then the problems will many a time will be hidden inside those spikes so, the continuous flow will help you in identifying the problems and then you simplify the manufacturing process, do not have very complicated complex manufacturing system and finally, because of that you will be able to achieve minimum defects that is the superior quality.

So, if you have this lean manufacturing or say Toyota production system, you are able to achieve all these things or you can say that you will eliminate (()) (09:49) from your business process.

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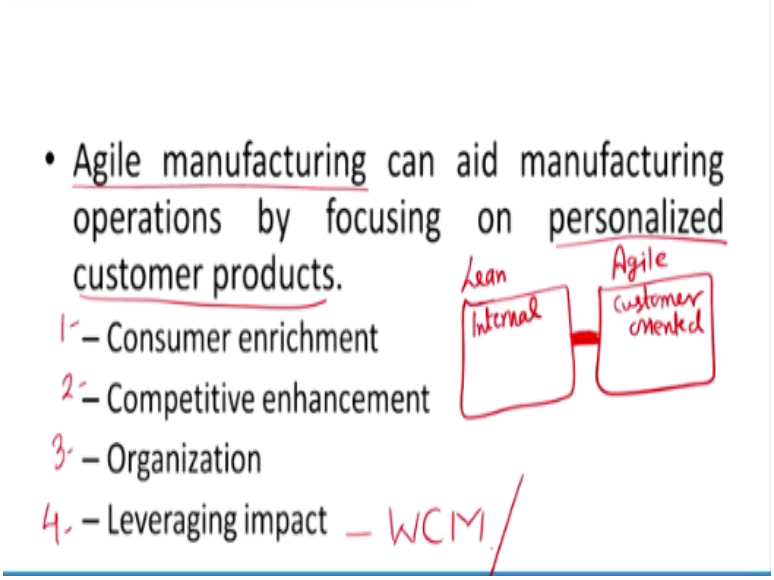


Now, when we come to agile manufacturing; in the agile manufacturing, the concept is that you are becoming external oriented and you actually focus on personalised customer products so, now this is very, very interesting, now why it is interesting? Your lean and this is agile; in lean, you are looking to the internal environment that is how to eliminate waste from your entire business processes.

And in the agile, you become that more and more customisation is required and each customer may require some kind of an unique product, particularly it is more applicable in service organisations but now it is you see that in our manufacturing organisations also, the degree of customisation is continuously increasing and therefore, mass manufacturing is reducing and batch manufacturing is increasing.

And in that particular sense that agile is a customer oriented so, this is one fundamental, you can say difference between 2 approaches; lean and agile and when you have both on them that actually going to help that you are going to fulfil the customer requirement with minimum cost, you are going to fulfil customer's specific requirements best of the quality, so both these things are possible which will help you as a supplement to each other.

And when I am talking of agile manufacturing or agile environment, there are 4 important things which contribute to the agile manufacturing. The first is customer enrichment that what value

you are adding to the customer then, the competitive enhancement; you need to create new benchmarks, you need to create better competitive environment, positive competitive environment. Toyota company developed a new philosophy of manufacturing; the Toyota way.

Now, this Toyota way enhance the competitiveness of automobile industry, not only automobile industry but 2 other industries also, so this competition enhancement is possible when you have development of new theories, new skills, new capabilities and that we discussed that the ultimate objective of a learning organisation is that how do we teach our employees to learn, not just to adopt but to learn, so that is competitive enhancement.

Third is creating an organisation which is able to understand the customer's requirement, the requirement of your partners and be able to transfer that information to your related, relevant departments, so developing the that kind of system, that kind of ecosystem in your company that is the part of the organisation because without having proper systems however, customer friendly you are but you do not have systems, you will not be able to deliver the required output to the customer.

So, having a proper system within your organisation which is gel with the; so there has to be a very strong, you can say link required between agile and lean, so whatever information because agile means you are customer oriented, lean means you are more product oriented, you are more process oriented so, your processes and the understanding of market they had to have a kind of gelling.

And then fourth is leveraging impact; you should be able to leverage the impact that how all these 3 things; the enriched customer, the competitive enhancement and a suitable organisation, so you should be able to take maximum benefit, you should become the world class organisation; WCM, you should be in list of fortune 500, you should be one of the most innovative company, so whatever type of index are available, you should be standing in the top positions of those index.

So that is how we understand the four basic principles of agile business processes, now let us discuss them one by one in some more detail.

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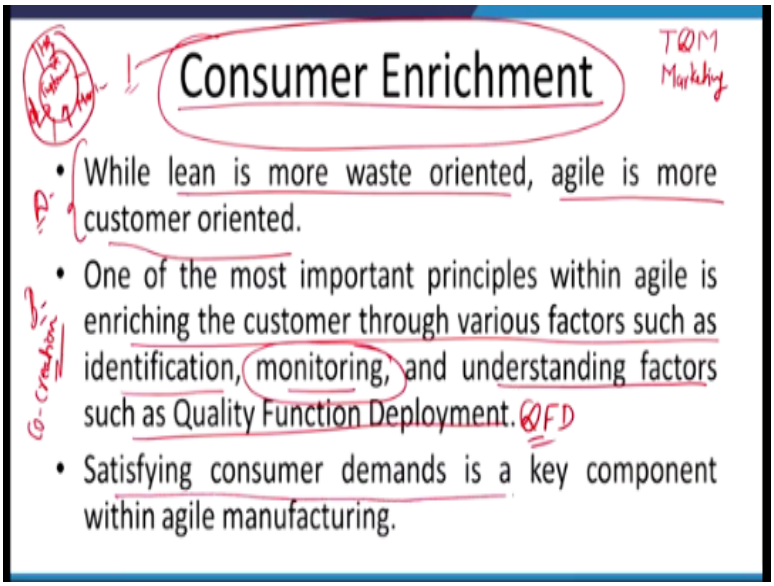


Now, the first is consumer enrichment; now, consumer enrichment is a subject, a topic which we discussed in various initiatives, you must have heard about TQM, in TQM also, we talk of customer delight, we go to the class of marketing, in that also customer satisfaction, we have subjects like CRM, which talks of how you are adding value to the customer so, customer is because it is a marketing area so, you can understand that the customer is always in the centre of various activities.

And whether you are HR, whether you are marketing, whether you are operation, all these functional areas are actually supporting the customer so the discussion of customers cannot be avoided in any functional area of the management. So, first point is consumer enrichment, now what does it mean; that lean philosophy is more waste oriented that how to minimise the waste how to eliminate the waste, while agile is more customer oriented.

So, as we just discussed this is a difference of between two approaches that lean eliminates the waste and agile is more external oriented, it is focusing on your consumer, so that is one very, very important thing we need to understand that many times people are not able to explain the difference between lean and agile and therefore, this particular line is very useful. The second

important point with respect consumer enrichment is one of the most important principles within agile is enriching the customer through various factors such as identification, monitoring and understanding factors such as QFD.

So, customers many a times are not able to explain that what are my requirements, if you are a marketer, you come to me, you ask what is your expectation with respect to a particular product, I will give you answer in lot of linguistic variables and I will not be able to give any specific, you can say, dimension or any specific figure for my expectation. I will say that it should be comfortable, if you are designing a chair, I will say it should be comfortable, I can sit for long duration maybe 3 hours, 4 hours without fatigue.

Now, how do you quantify this comfortable, I cannot say that the thickness of foam in chair should be 3 inches, hardly any customer can give this kind of a specification that I want 3 inch thickness of foam or I want this quality of foam, I will simply say that it should be comfortable so, as a marketer, as a company representative, I should be able to convert these linguistic variables comfortable into some kind of product specification.

And that is done with the help of QFD; quality function deployment, where customers requirements which are very subjective, which are very qualitative in nature, which are based on linguistic terms, these are converted into some kind of numerical values, some kind of a specific values that is being done with the help of QFD and then, it is also possible that over a period of time, my requirements may change.

So, therefore I should be able to have that system where you can continuously monitor my changes and accordingly, you can come up with new products so, therefore the constant involvement of customer into your organisation is very, very necessary for new product development and now it is a new term is coming that is known as co-creation which helps in developing the products with the help of customer.

Customers are involved from the designer stage of the product and we discuss the concept of concrete engineering in our lean week but we can go what a step ahead in that concrete

engineering, we included a very cross functional team from the organisation but we can also include the customer who is actually the user of that product, then it becomes a co-creation activity.

Normally, co-creation we discuss in marketing classes but actually co-creation is an extension of our concrete engineering where we have also included the customer and customer will only be able to conclude some kind of inputs customer can provide, when our customer is enriched, when you are creating that kind of enabling environment in which customer can contribute something, so that is one very important aspect of the agile manufacturing.

Now, the finally we can understand that the satisfied consumer demand is a key component for the agile manufacturing because the whole idea of agile is to fulfil the customer demand to become customer oriented from the operation's point of view, many of us believe that the operation is inward activity, many of us say that if you go to a service organisation suppose, let us say you go to a bank, so they have a front desk and a back office.

And normally, it is considered that people who are at the front desk, they are representing the marketing department of the organisation and people who are in the back office, they are from the operation profile but it is very important to understand that even those who are in the back office, those who are in the operation activities, they also should have some kind of customer orientation and that is what is agile concept is that unless until those people have the customer orientation they are creating some kind of enrichment into the customer.

Then, only they are able to see whether my system is producing waste or not producing waste, if we this diagram, here first comes lean that you are eliminating the waste and the second step is you are now going for the customer orientation but the ultimate idea of both these things is that we need to have a competitive organisation, how to create a competitive organisation and for that purpose, your customer friendliness, your customer orientation is very, very important.

And finally, the identification of value adding activities and non-value adding activities also need to be done from the eyes of customer so, from customer what a customer wants, what a customer

does not want and accordingly, you will see that this is a value adding activity and this is a non-value adding activity, therefore agile concept can also contribute in in your effective lean system, it is not only from lean to agile.

When you have agile organisation so, what are the requirements of agile on the basis of that you can suggest the team involved in lean systems that these are value adding and these are non-value adding activities. If for example that how things may change in our manufacturing strategy, we discuss the concept of order winners and qualifiers, so order winners and qualifiers keep changing over time.

Sometime customers may like product because of quality, tomorrow customer may like product because of low cost, now when this change is happening that so far, I am focusing everything to improve the quality because that is the order winner and by internal processes, I have created in such a way that I am producing superior quality and that is as per the customer expectation but the role of agile manufacturing will come that if the customers are now moving from quality to low cost, so they need to immediately tell their internal team that is the lean team that now we need to adjust our systems, we need to see that how we can provide products with low cost.

So that is how the combination of lean and agile is very, very useful for becoming a customer oriented organisation as well as keeping the minimum waste in your organisation so, satisfying consumer demands is a key component within the agile systems so, that is the first important, you can say dimension of agile manufacturing.

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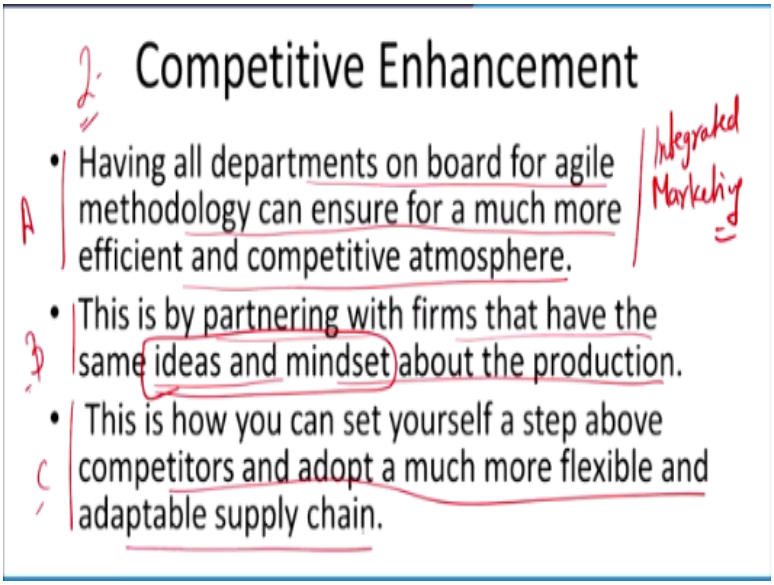


The second important is competitive enhancements; competitive enhancements are having all departments on board for agile methodology can ensure for a much more efficient and competitive atmosphere, so you need to create that environment that all your departments have same understanding, if you go for concepts like integrated marketing where all departments they have a similar kind of understanding.

And when you have similar kind of understanding, it creates a very suitable conducive environment for the implementation of a new philosophy, so that is one important thing. Second is; this is by partnering with firms that have the same ideas and mind set about the production. In Toyota production system, the third been was around people and partners and here also, we are talking of that people and partner.

We need to identify out of large number of vendor's who are around us that those vendors having similar kind of ideas and mind set, if I am ready to make products in multiplication of one, I expect my vendors also to provide me components in multiplication of one but if I am ready to make in multiplication of one, but my vendor says I cannot give you in multiplication of one, I can only give you in multiplication of 100, so I will be getting unnecessarily huge wasteful inventory.

So that is not going to create my competitive enhancements, then the third is; this is how you can set yourself a step above competitors and adopt a much more flexible and adaptable supply chain, when you have this competitive enhancements means, you are not limiting your competitiveness to yourself but your entire supply chain, this is OEM, this is you and this is your vendor, this is your retailer, so you are creating that system which is supply chain wide.

And therefore, you are able to enhance the competitiveness your entire partners, it is not limiting to you but it is of entire supply chain, so that enhancement of competitiveness of your entire supply chain, they are able to respond quickly to the changing requirements of the customer that is very, very important aspect of agile that if customer is changing its requirement, my entire supply chain should be able to respond to those change in needs.

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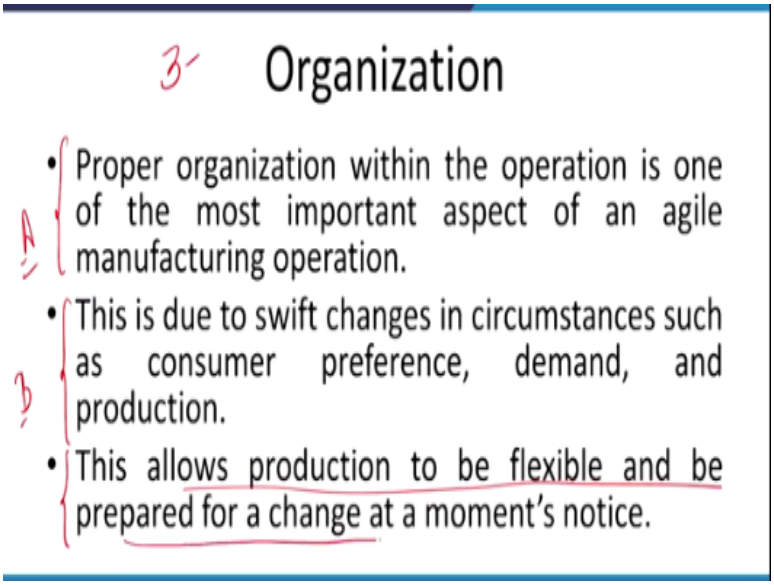


The third important issue or the aspect of the agile manufacturing is the organisation, now in the organisation, the proper organisation within the operation is one of the most important aspect of any agile manufacturing activity that how you have arranged your internal processes within the operation domain that is obviously very important and it does not require any kind of elaboration also.

Then, the second important thing, this is due to shift changes in circumstances such as consumer preferences, demand and production activity. Today, you want a different type of product,

tomorrow you say that customer is expecting these additional features so, like in case of India when we are procuring rafale aircrafts, so initially the specifications were different and now, the specifications are changing may be, tomorrow there will be some further change in the specifications of air crafts.

So that all is only be able to fulfil, when you have your internal systems that how can you address the changing needs of your customer and it is happening like anything that customer's requirements are changing day by day and the first product of supply and the last product of supply in the same lot may also get changed, so that is depending that how much robust organisational system, you have to respond to those changes.

Then, third is; this allows production to be flexible and be prepared for change at a moment's notice, when you have this kind of organisation so, we will be discussing separately the concept of flexible manufacturing system but you can say that if you are an agile organisation, it is going to help you in flexible manufacturing systems that you can adjust your manufacturing as per the requirement of customer.

And as we mentioned here that this change is possible within a moment's notice, you just send an email to a customer, even to your vendor and your vendor has to change the specifications, so that is how you need to have a robust system's internal systems which can take care all these changes without much, you can say complications.

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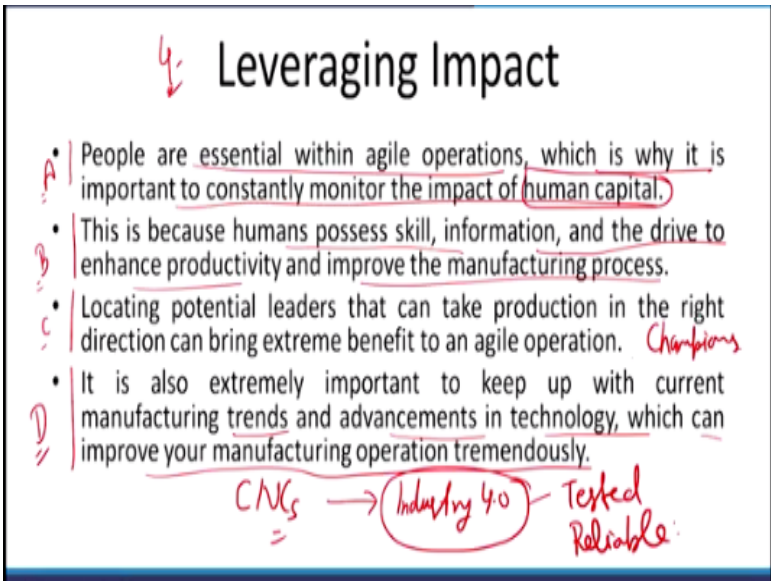


And then finally, leveraging impact; that how to leverage, how to benefit out of all these changes and in that there is first thing that people are essential within agile operation, which is why it is important to constantly monitor the impact of human capital, because it is a mind-set again that we need to continuously respond to the changing requirements of the customer so, if you are having this kind of agile system in your organisation and you are continuously asking your employees to change your way of doing things, so that you can fulfil the customer's requirement. It is a not easy for a human being to adjust again and again on a very short notice for new things.

So, certainly there is a concept which is coming nowadays in our human resource management classes, management of change so, when we are talking of agile organisations, these are impacting the human capital so, you are therefore requested that you need to continuously monitor that how these things are impacting your human capital. There are people who love challenges and they always are interested in doing new things rather they feel bore, if they do something on a regular basis.

But there are another people; another set of people who are slow learners and when they are in the agile environment, they make more mistakes because every time on a very fast basis, they have to learn new things and that may put their morale slightly down, so different type of people get affected because of agile activities differently. The second is this is because human possesses

a skill, information and the drive to enhance productivity and improve the manufacturing process.

So, on the positive side, we take this assumption that human beings are ready for improvement and if they are ready for improvement, they love to get new skills, they have a drive to enhance productivity so, they will be positively affected but they may be negatively affected also. The, another thing is locating potential leaders that can take production in the right direction can bring extreme benefit to an agile operation.

In our Toyota production system also, we discussed that we need to have champions and here also we talk of champions, without champions; champions who are coming from the team itself, they will be helping us in implementing this concept of agile if you invite some consultant from outside and that consultant gives you some kind of lecture, some kind of workshop that is not going to be effective that is just a ritual (()) (35:27).

The true implementation of agile is only possible when you identify some champions from the team's, from your shop floor and they will actually tell other people that what is the right way for implementation of agile manufacturing and finally, for leveraging the impact, it is also extremely important to keep up with current manufacturing trends and advancements in technology which can improve your manufacturing operations tremendously.

So, on one side we are talking of customer but at the same time, you also need to see that what new technologies are coming. For an example like we were talking or using CNC's in our manufacturing setup since long but now, industry 4.0 is coming, where we have cyber physical systems in our manufacturing systems and these cyber physical systems are supposed to be more efficient, you can control these systems remotely.

And you will be having a much comfortable and a repetitive performance from these cyber physical systems, so whether to implement these kind of advanced technologies or not that is also a very important thing that can you implement which can leverage the organisation or not,

so if I see from the Toyota point of view, so we need to only use this industry 4.0 where it is tested, when it is reliable.

And I should not use this just for the sake of having something new in my organisation, if I feel that I can actually leverage, I will have a positive impact by implementing industry 4.0, then only I should go for these kind of new technology adoption otherwise, if impact is not there; if positive impact is not there, I should be restrained for using these new technologies. So, these are the 4 important aspects we discussed that how consumer enrichment that how competitive enhancement, how organisation and how our ability to leverage impact or some total of agile operations in my organisation.

So, with the help of lean first and then by becoming customer oriented, you can create a really, deadly combination which can take your organisation to the higher level of success. Thank you very much.