Toyota Production System
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Lecture - 32
Overview of Lean Implementation

Welcome friends. So now we are moving into the 32nd session of Toyota Production System and in last few sessions we started discussions about lean culture that the essence of Toyota Production System is to convert your organization into a lean organization. And when we were talking of lean we discussed that it is more related to a mindset and the cultural aspect play a very important role.

There are organizations where we want to keep everything whether it is of use or not of use, but there are organizations which are trying to become more adaptable to the environment and these are lean organization and therefore we need to have a shift from that mindset where are storing everything then to become an organization where we stock or where we actually do not stock anything.

And therefore it is very, very important to develop that kind of culture in which you can enable thinking for the lean organization. So enabling environment, enabling ecosystem is very, very important for lean organizations. In this particular session we are going to discuss that how you are going to implement the concepts of lean because lean has to be implemented at various stages.

The simplest stage of lean implementation is at the operational level like we discussed about different types of waste if you remember in very first week of this course and waste of inventory which is a very visible waste that is something which is quantifiable also and you can actually measure whether you have reduced the inventory level whether your cycle inventory has reduced, whether your safety stock has reduced.

So these are that aspect of lean implementation which have some kind of quantifiable measures, but on the other hand the waste of over processing, waste of human capabilities. These are those waste which are very difficult to measure because waste of human capability. So there is no yardstick for that, that whether you are wasting the human capability or not

wasting the human capability.

You can only have a criteria based on the qualification, the degree qualification available with your employees and on the basis of that you can have some kind of you can say subjective, qualitative assessment whether human talent is wasted or not wasted. So point is that implementation of lean is possible at different stages in different way. So here in this particular session we are going to focus that what are those stages of lean implementation.
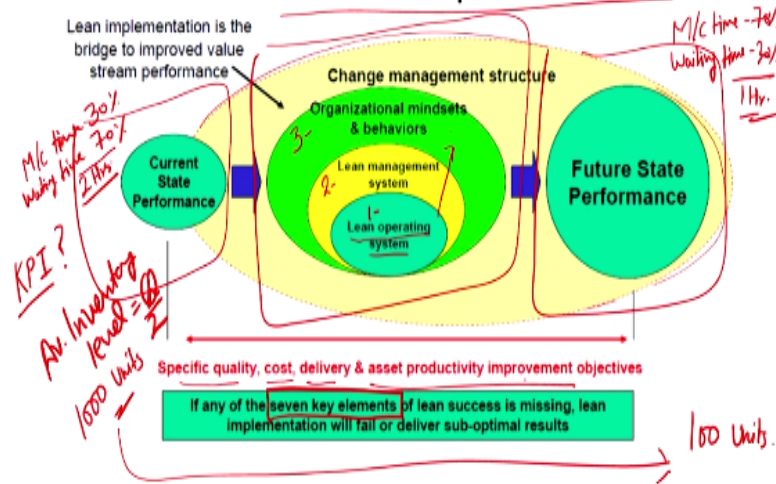
And how from operational level to strategic level you can implement the lean thinking in your organization. It is basically the promotion of lean thinking in the organization. In the next session also we discussed that these aspects are not only going to affect your organizational activity, but this is a way of thinking and those who are trained in this lean philosophy their personal life also get affected because of this.

They in their personal life will also not stock those things which are of less value. So they will only keep with them those things which are valuable, valuable means which are to be used and therefore their personal efficiency also increases. So that is the whole idea of lean thinking and in this session we are going to have the implementation part of lean thinking. We have understood the conceptual background so far.

But in this particular session we are going to discuss the implementation part of lean thinking. Now to have a clear view on lean thinking that how we are going to implement the lean concept in my organization.

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Overview of Lean Implementation

Lean implementation is the bridge to improved value stream performance

Change management structure

Organizational mindsets & behaviors

Lean management system

Lean operating system

Current State Performance

Future State Performance

Specific quality, cost, delivery & asset productivity improvement objectives

If any of the seven key elements of lean success is missing, lean implementation will fail or deliver sub-optimal results

So here you see the diagram which is divided into three parts. The input, the processing part and then this is the output part. So the input part is your current performance level. What is your current performance level with respect to quality, with respect to inventory, with respect to manpower utilization, with respect to waiting time, with respect to utilization of machines. So all these things are the input part the current performance level of your organization.

So it is up to you that what are your KPIs key performance indicators. So this is you who need to decide that I want to check the performance of my organization on the basis of average inventory level. So what is my Q/2 that is the average inventory level in my organization. So if this becomes an important parameter for me. So let us say presently the average inventory level at my warehouse is 1,000 units.

So by implementing the lean concept maybe this average inventory level reduces to let us say 100 units. So that is how you will have a tremendous improvement from your current state to your future state. Similarly, the defects, similarly the waiting time let us say in the entire processing of product the machining time and waiting time two components are there. So out of that 30% is the machining time and the waiting time is the 70%.

By implementing the concepts of lean it is quite possible that you are able to reverse this ratio. Machining time becomes 70% and you are able to reduce waiting time tremendous and now out of total time only 30% of the time is the waiting time. Earlier it is taking 2 hours now it is taking only 1 hour because you have reduced the waiting time by applying the concept of lean.

So you have to decide that what key performance indicators are important for your organization, what is the current status of those and then we will see to have some kind of future status for those and concepts like benchmarking etcetera will help us to decide that what should be the future status. We have already discussed about different types of waste. So here we say that if any of the waste is left if any of the waste is not tackled properly that means you have a partial success in lean implementation.

So whether it is the waste of over production whether it is the waste related to defects whether it is waste related to over processing it is waste related to inventory all types of waste you need to handle and then you can say we have achieved success through lean implementation otherwise your success will be sub optimal. Now what is the processing part we discussed the input part, we discussed the output part.

Now let us discuss the processing part that how these outputs are achieved by lean implementation. Now here you see that we have a 3 level structure. Now in this 3 level structure the starting point is lean operating system. So at operational level you are going to implement lean first that is the first level of implementation of lean philosophy that is at the operational level.

The second level of implementation of lean is lean management. So everywhere in the organization so now you are moving from shop floor to other functional areas also whether it is your human resource management whether it is marketing management, whether is after sales services. So you are no longer limiting the implementation of lean to your operational level.

You are touching, you are including other areas also into this lean concept and then the most important thing is the organizational mindset and behavior. So you need to develop the final level of implementation when everything becomes in the auto mode and that is the organizational mindset and behavior also start falling under the lean category. People start thinking in that way that everywhere we need not to do any extra effort for lean.

Those who are non vegetarian and when they are shifting to vegetarian so they need to exert some kind of internal force that I am shifting from non vegetarian food to vegetarian food and

therefore there is a kind of some internal debate, internal resistance also and to move from that non vegetarian food to vegetarian food you have to overcome that resistance and then you will all the time eat vegetarian food.

But for a vegetarian it is a natural process there is no internal resistance, there is no debate and in a normal course whenever you eat something you eat only vegetarian food so it is a issue of mindset. So when you finally become a lean organization your mindset becomes of lean there is no separate effort required for converting your processes into lean processes. Whatever process, whatever business operation you are going to develop those processes, those operations, those implementation will be as per the lean concept.

So that is the ultimate level that everything becomes in the way of auto made that is the ultimate way of implementing the lean philosophy in the organization and for that purpose because we are not a lean organization initially this whole story which we are discussing this is applicable to those organizations which are primarily mass manufacturing organization which are not falling under the lean (()) (13:01).

So they are shifting their manufacturing philosophy from that mass manufacturing era to this continuous flow kind of era and therefore the yellow boundary this yellow boundary is about change management. So we need to have some kind of though we are discussing this particular session under operations management. If you see the structure of MBA program of any university this kind of course of Toyota Production System are under the heading of operation electives.

But it requires significant amount of human resource management also without proper change management structure you will not be able to change, you will not be able to address this mindset issues. So how to create that kind of mindset, that kind of you can say acceptance for a new philosophy. So these are the implementation stages from operation to management and then finally to your mindset and behavior.

So this gives you a very clear picture that how you are moving with respect to specific objectives of quality, cost, delivery, asset productivity, improvement etcetera. So these are those things which are in your primary performance level and you will like to see some significant improvement with respect to these things once you implement your lean

philosophy.

Three integrated system elements

1. Lean operating system
2. Lean management system
3. Organizational mindsets and behaviors

Next we see that as we just saw in that diagram when the processing is taking place the lean implementation is happening. So there are 3 integrated systems and these are lean operating, lean management and organizational mindset and behavior. So finally you can say that the first level of implementation is at the operational level. The second level of implementation is at the management level and third level of implementation is at the mindset level.

So these are the 3 level of implementation of lean and when you complete all these 3 levels you become a lean organization the implementation is complete no extra effort is required in implementing the lean concept in those organizations. When we talk of lean operating system the first level of implementing the lean concept is lean operating system.

Lean operating system
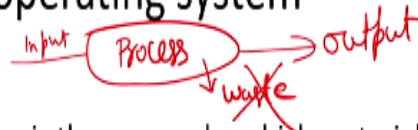
- An operating system is the process by which material, information, people and assets are organized and used to deliver value to customers
- For a manufacturer this includes equipment, processes, layout, inventory, facilities, planning and scheduling practices, manpower, etc.
- Application of lean technical tools improves operating system performance by reducing waste in processes

Now under lean operating system you see an operating system is the process by which all these inputs are organized and used to deliver value to customers. So the definition operating system we already know from the classes of operations management that there are certain inputs these inputs are arranged, organized and processed so that you can deliver some value to your customer.

So this is the process of arranging inputs, processing them and then finally delivering value to the customer. So for a manufacturer this includes equipment, process, layout, inventory, facilities, planning scheduling, practices, manpower. All these things are the part of your operating system all these things are the part of your operating system. Now application of lean technical tools improves operating system performance by reduced waste in the processes.

So whatever waste you are supposed to generate during the processing stage that can be minimized that can be eliminated by following the lean operating system because you have input. Processing rather operating processing and then output. So here chances of waste are there, lot of waste maybe generated. Waste maybe generated because poor layout so your products WIP need to travel unnecessarily.

You have lot of WIP also you have poor scheduling of machines. So because of poor scheduling lot of waiting is there. So all these things are generating different types of waste. So by following the concepts of lean you are able to minimize these waste you are able to eliminate these waste and obviously this waste will improve the competitiveness and with

respect to all these things you need not to do anything extra simply follow the principles of operations management.

Many a times we do these things just based on our instincts. So when you do these things without much rational without scientific backgrounds then probably you generate more waste. So if you are doing scheduling if you are developing a layout if you develop a layout which is based on cellular manufacturing which is based on right identification of part families you will have minimum transportation delays.

And therefore your competitiveness will increase. If you follow the proper inventory management policy whether it is P type of inventory management or Q type of inventory management. Whenever you follow a proper inventory policy you will have very low level of inventory without any kind of stoppage etcetera. When you have proper scheduling in your workplace you will have equal loading on machine.

And there will not be any excess Q in front of any machine. So all these things can be very easily handled if you just follow the available principles for these things. Many a times unfortunately if you go to shop floor you do not follow these principles, you do not even aware of these principles. Therefore, problem comes because we do based on our own experience, based on the culture of the organization which may be non scientific.

And therefore we generate huge amount of waste in our operational level. So these are the operational issue and most of the waste can be eliminated just be following the right process of doing that particular task. So that is the lean operating system.

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Lean operating system
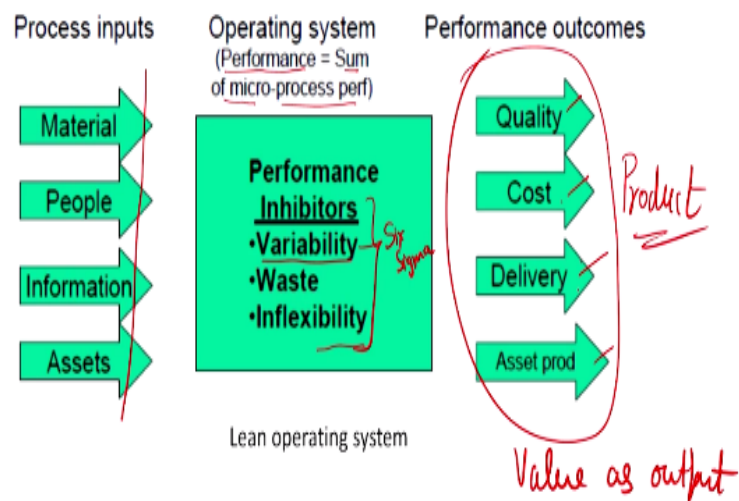
And this diagram will help you in understanding that how the lean operating system actually works. So these are input we all know material, man, information, equipments, machines all these are the process inputs and output is in the form of so there is one definition of output that is the product, but here we are looking output in terms of value that what value my system is producing.

So value is produced in terms of quality, in terms of lower cost in terms of faster delivery, in terms of better asset productivity. So these are the ways in which my system is producing value. So my system is (()) (21:09) products no doubt, my system will make some goods, my system will make some services, but I am more interested that whether these products are having some kind of value or not.

And value I am seeing in superior quality, in lower cost in faster delivery, in better asset productivity and how these things are done. So the definition of value let us say these are value as output. This is important to understand that I am producing value as output from my system. So it is a very important thing we are discussing right now and the operating system is the performance= sum of micro processes performance.

That there are large number of small, small activities which are taking place here in between and the sum total of that is actually the performance of my operating system. So each small activity, each micro activity is important to define the performance of my system. Many a time you feel that this is a very small activity how it is going to effect the performance of the whole system.

So you consider many things insignificant where you do not focus your attention, but it is not correct because all those small activities put together sigma of them is actually defining the performance of your system. So you need to consider all those micro activities in giving output for these system these value as output is made of those micro processes. Now what are the challenges, what are the limitations, what are the barriers, impediments in better performance.

One is variability, lot of variability is there with respect to process inputs, you will not have same type of material coming all the time. You are in a cold rolling plant and you have set a particular amount of pressure for the rollers, but the input material which is coming that sheet will have different level of thickness. So different level of thickness and if you are keeping the same pressure will produce different output thickness also and that is not desirable.

That will bring low quality. So the quality as a value if you are seeing so the variability in the input material is a challenge which you need to solve so that you can achieve quality as a value in your output otherwise if you have too much of rejection your cost will go up. So you have to see that how you have a better system where you can check your variability and we have discussed like six sigma helps us in limiting the variability.

How we can minimize those variations that is possible six sigma type of concepts then waste. We generate lot of waste during the process. We discussed the example that in a machining process 30% time is actual machining and 70% time is either waiting or changeover in the processes. So if you have too much of waste it is going to affect the cost. So if you are able to reduce the waste you will be able to achieve the value of low cost.

Then inflexibility we do not have those systems which are highly agile. So we are having bulky systems which are difficult to change as per the requirement of the customer and therefore these inflexible systems will create low value with respect to delivery. So if you are having a flexible system you will have a value given for the delivery. So different type of performance inhibitors are responsible for different type of values.

So if you are able to control variability you will be generating value of quality that is the purpose of six sigma only. If you are able to reduce waste, you will be able to generate value

of low cost. If you are able to reduce the issue related to inflexibility you will be able to generate value of faster deliveries. So we see that lean operating system is very important for getting the value as our output.

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Lean Management System

- (i) **Daily Management Systems (DMS)** are used to build organizational discipline, drive focus on performance and create "new habits"
- DMS is applied at the work group (micro- process) level, and has several key elements:
- (a) *Primary visual display* (andons)
- (b) *Shift start up meetings (and daily accountability process)*
- (c) *Lean daily control system (metrics and leader standard work)*
- (d) *Work group action sheets*

Then the second important element of this system of lean implementation is lean management system. Now in this lean management system what it (()) (26:46). A lean management system is the set of formal systems, structures and accountabilities needed to manage and improve lean processes day-to-day. A lean management system ultimately lead to lean culture, the employee involvement, problem solving and process improvement focus essential for lean success.

The meaning is that this lean management system is responsible for developing that ecosystem in the organization which is going to help us in developing the lean culture and therefore you will be able to implement lean at the operational level. So the responsibility of lean management system is now wider it is creating that kind of environment in which lean can be implemented.

So it is easier to act your way into new ways of thinking then it is to think your way into new ways of acting. So this is from Toyota and it is therefore very important that your management must support the idea of lean thinking, your management must support the implementation of lean and therefore it is creating the more formal processes, structure and other kind of responsibilities fixing so that you can have a formal implementation of lean.

So in this lean management system what all is included. So like daily management system DMS are important thing under the lean management system and it is used to build organizational discipline, drive focus on performance and create new habits because as we just discussed and we will discuss further also that it is all about mindset. So when I am talking of mindset.

So therefore the daily practice is very important because I have to learn, I have to inculcate new habits. I am moving away from the habit of savings rather I am only keeping that much with me which is to be used today. In India there is a culture of small saving and many of us feel pride in that small saving and to some extent those small savings are very essentially, but if somebody says you that do not save you spent whatever you have.

And do not think for tomorrow whatever you have please use it for today's comfort so this is a new type of mindset and therefore you need to do this practice on a regular basis whether it is correct or incorrect that is a different debate, but the point is that under lean management system you need to develop various new habits. So therefore this daily management system is important.

So DMS is applied at the work group and has several key elements and what are those key elements of this daily management system. The first is primary visual displays so you have andans where you are continuously displaying your performance levels. So that the entire team is aware where are we heading so that is one important aspect that is the primary visual display.

The second is shift start up meeting and daily accountability process. You may be aware that in most of the Japanese organization whenever there is a shift change, whenever executive come morning for the work they have a very quick 3, 4, 5-minute meeting and that is known as shift start up meeting and the purpose is that just to review what is to be done, what are the priorities of the day.

So this is also a type of management concept that they are having quick meetings and these quick meetings are actually helping in assigning the accountability also. Then another third important element of this DMS is lean daily control system. So you have on day-to-day basis you have visual displays, but on day-to-day basis you also try to see whether we are moving

into the right direction or not into the right direction.

So that it is easier to take corrective actions. If you do not know whether we are heading into the right direction and let us say end of the month we meet. So it is too late to do any kind of corrective action. So this daily basis they follow a control system which is actually acting as a feedback and they have work group action sheets. So different work groups are there and what action they have to be taken their sheets are prepared.

And these information are shared in their daily shift starting meetings. So that is about the lean management system.

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Four implementation strategies

1. Implement by value stream and deploy in generational waves.
2. Target specific measurable business objectives
3. Define in advance how to "cash the check"
4. Support with robust change management structure

Now the implementation strategies are implement the lean system by value stream and deploy the generational waves that means it is not one-time activity. It has to go from one generation to another generation. So it has to deploy in your generational waves that how you are transferring this knowledge from one generation to another generation. So that is one very important implementation strategy that it has to be the philosophy of the organization.

Then as we already discussed we need to discuss, we need to identify those KPIs initially which are directly measurable the inventory level, the defect level. These are waiting time; these are directly measurable performance indicators. So you need to target them first because these give motivation to your team members that yes by doing these new thing we are able to reduce these particular things or we are able to increase these particular indicators.

Define in advance how to cash the check. So these are implementation activities, but how these implementation activities can be converted into some kind of profit activities. So that also you need to understand in the beginning that whatever I am going to do. How I am going to convert those things into some kind of positive revenue stream for my organization and support with robust change management structure.

We already discussed in the first diagram that yellow boundaries that all these things require a very strong robust change management program in your organization. We particularly if I talk only from the context of India so we are influenced by European and American system of manufacturing. Now when I am talking of this Toyota way of manufacturing so it requires a significant change management program.

So therefore our all these implementation activities need to be properly supported by change management activities. So you have to organize your value stream then you need to target specific improvement objectives we discussed.

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3. Define in advance how to "cash the check"

- Successful lean implementation will improve operational performance by increasing capacity
- Performance improvement will not flow to the bottom line unless something changes, e.g. people leave, sales increase, overtime decreases, work is insourced, etc.
- People immediately "see" the improvement opportunity and will question how it will be realized by the business

Then define in advance how to cash the check.

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4. Change management structure

- Changing an organization, with lean implementation or any other initiative, is different than managing one
- Change related activities must be separated from day to day management activities and focused on intensely to succeed
- An Executive Steering Team or leadership team must plan the implementation, then meet regularly to:
- *Review progress against the plan*
- *Address barriers to achieving plan objectives*

And then you have a change management structure. So these 4 strategies you need to follow one after another we may have a detailed discussion on these 4 strategies in our next session.

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Summary

Successful lean implementation can dramatically improve business performance.
- To succeed, lean must be viewed as a business system that extends beyond manufacturing.
- A lean system focuses on improving and sustaining micro-process performance, to improve organizational performance
- A successful lean manufacturing system must have three integrated elements:
  i.   Operating system
  ii. Management system
  iii. Organizational mindsets & behaviors

So here we are concluding our session with this summary that we need to be seen that lean is a business and it is beyond shop floor, it is much more than shop floor or operational activity. So therefore you can have a wider perspective when we are implementing the lean. So this is one important thing that lean cannot be restricted only to your manufacturing or shop floor activities rather it is extended to entire business processes.

A lean system focuses on improving and sustaining all your micro process performance because the overall performance of your system is sum total of these micro process performance. So no micro performance is insignificant. You need to focus on all your micro

performances. A successful lean manufacturing system must have these 3 integrated elements the operating system, the management system and mindset and behavioral aspects.

So these 3 things are important for implementing the lean concept in your organization. So with this we come to end of this session. Thank you very much.