On Introduction to Industry 4.0 And Industrial Internet Of Things

Prof. Sudip Misra
Department of Computer Science and Engineering
Indian Institute of Technology, Kharagpur

Lecture - 08
Industry 4.0: Lean Production System

We need to understand the sustainability issue that we have discussed in the previous lecture. There are different ways in the development of the product, the manufacturing of a product, it can be done in different ways. One of the considerations for sustainable development of a product is to have the adoption of lean production system. So, lean and thin production process should be adopted.

Therefore, we need to have a cheaper product of higher quality developed in reduced time. And in the consideration of lean, and ensuring that there is reduced waste disposal to the environment. Reduction in wastes is the prime consideration in the lean manufacturing process or lean production process.

The concept of lean basically has its origin in Japan. The major global automotive manufacturer, Toyota, adopted their own production of their own vehicles, a manufacturing process, which was known as the Toyota Production System, TPS. So, it was done only for within their company for basically having the advantages at the outset.

This became popular globally, for adoption across different industries concerned about manufacturing of different products. It become very popular to ensure that at the end you have a product of high quality, produced in reduced time, and is produced with minimal wastes. Wastes of all kinds not just the tangible wastes, but wastage of time, wastage of human resources. So, improving profits having higher quality products, produced in reduced time with reduced waste of resources is what is the overall goal of sustainability. And lean production contributes to this overall issue of sustainability.

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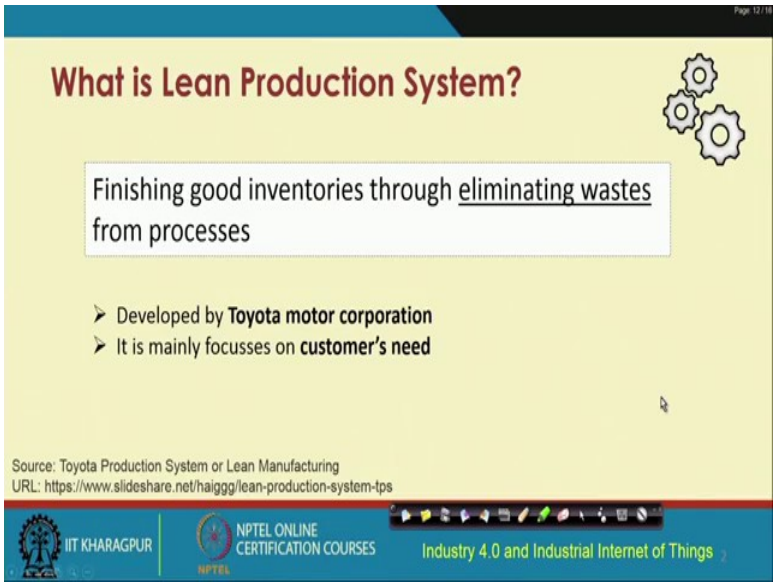

So, what is this lean production system? It is all about eliminating wastes from the processes, manufacturing processes in manufacturing industries for instance having higher quality products. So, it has its origin in the Toyota motor corporation company. This TPS or lean production system mainly focuses on addressing the customer's needs directly, which is key to this lean production process. Whatever the customer needs, eliminating the over usage of resources, use whatever resources are precisely required to eliminate all kinds of wastes, and finally produce a good which the customer basically would be satisfied in reduce time and having higher quality.

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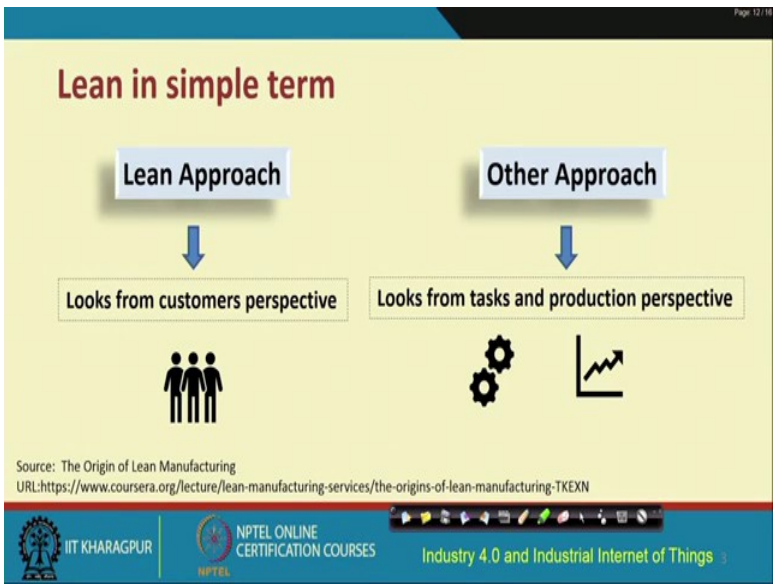

If you look at the comparison of lean approach versus other approaches, lean approach is basically look from the customers' perspective, whereas other approaches basically look from the task and production perspective. So, this fundamental difference between lean and the non-lean approaches.

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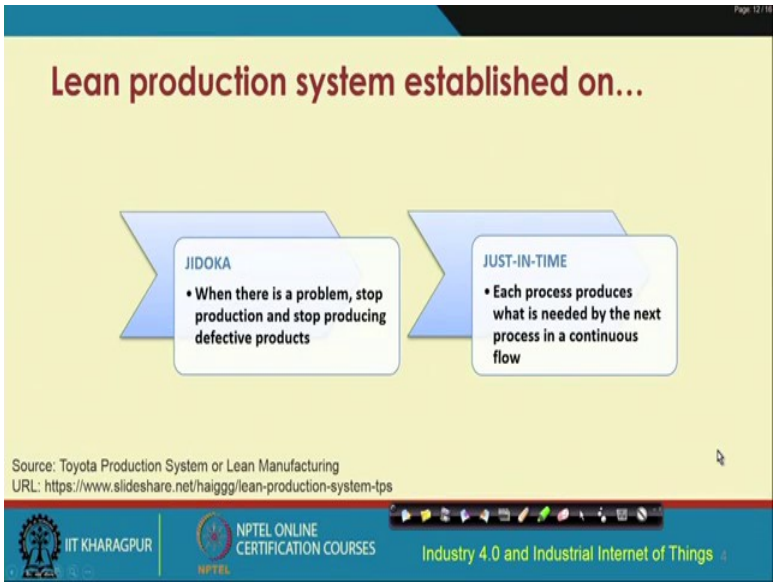

This lean production system has basically considerations of two different types of systems. One is the JIDOKA, which talks about that whenever there is a problem, problem of any kind with the machines, or in the process, or whatever be it. If there is a problem, stop the production, then and there, stop producing defective products in turn. So, this is this JIDOKA process.

And just-in-time basically talks about ensuring that each process produces whatever is exactly needed by the next process, in a continuous flow. JIT or just-in-time, is the short form, it is also known as popularly known as JIT. So, where each process produces what is needed by the next process in a continuous flow. There are different other components of this lean production process, such as the PPS, Toyota production system.

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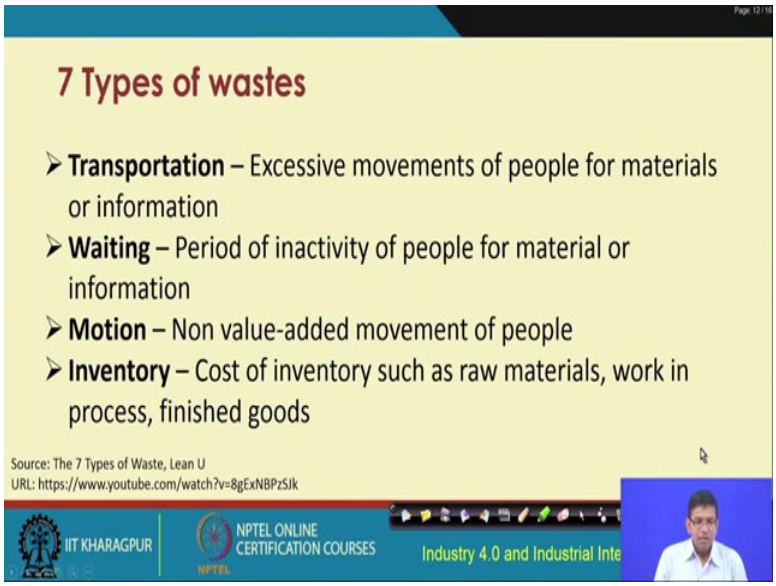

There are different types of wastes. And these wastes have to be minimized. So, these wastes are transportation wastes, which talks about excessive movement of people from materials or information. Transportation of different materials, transportation of information, in excess, that is not required. Second is the waiting, which is basically talking about the period of inactivity or people for material or information to arrive or to be able to use. It should not happen that the workers are waiting for something to arrive and the time gets wasted. So, this waiting has to be minimized.

Third form of waste is the motion, which is non value-added movement of people. Unnecessary movement of people from one point to another within the factory, outside the factory, across different locations of the same factory or organization, or between different organizations as the case may be. But whatever is required you should have only that kind of movement, non value-added movement should be reduced.

Inventory waste, which is the cost of inventory such as raw materials, work in progress, and finished goods. So, all of these things whatever inventory would be required should be used, and not unnecessary inventories should be used built up and procured.

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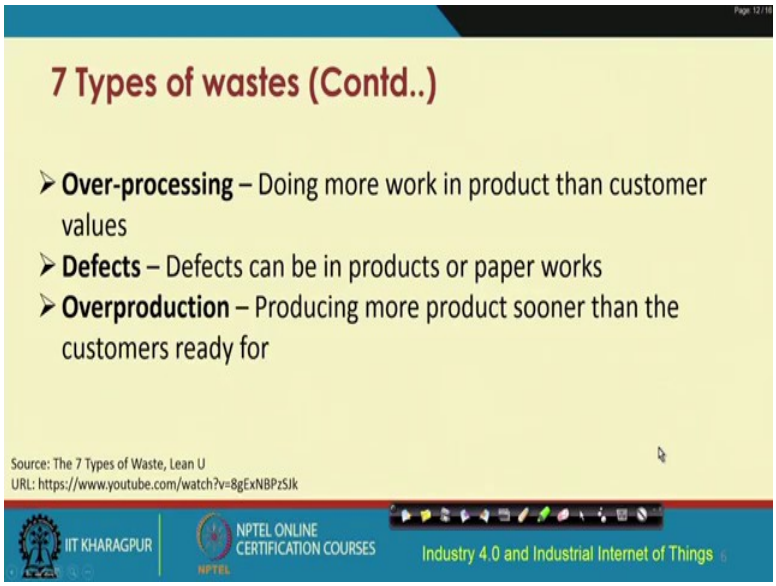

Over-processing - doing more work in the product, then whatever the customer finds value in. So, customer values, talks about what the customer needs precisely. And the production system should talk about only addressing the customers' needs. Producing exact product or the service that the customer needs, this is what has to be done. And over-processing doing more work for the product you know having different features, which customer will not need.

Defects can be in the product, in the service, in the process, or in the paper works. Defects of all kinds should be reduced. Overproduction - producing more product sooner than the customers' requirement, and that should be also reduced. So, these are the seven different forms of wastes.

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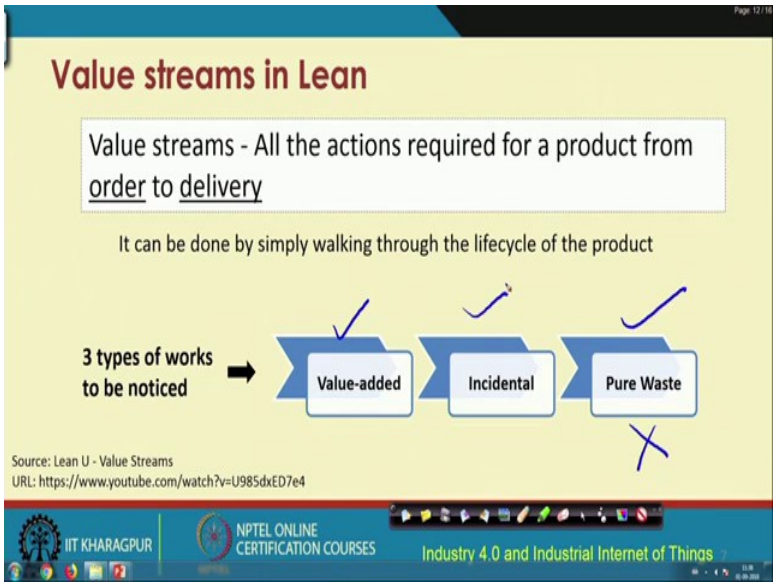

The overall lean system talks about this value streams. So, value streams are all the actions that are required for a product from order by the customer to the delivery of the product to the customer. And it is not just the product, it could be the service as well. So, starting from the ordering of the product or the service to the delivery of the product, the service is what the value stream basically talks about.

There are three types of works. One is value added; second is incidental, and pure waste. These are the different, which is very much desirable value added to the value stream, then pure waste is not desirable.

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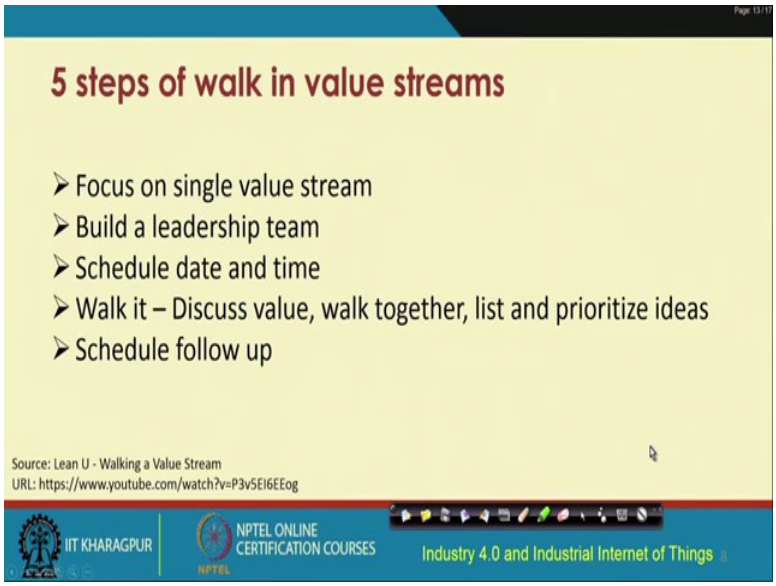

There are five steps of walk in the value streams. Focusing on a single value stream is very much desirable in building a leadership team. Scheduling the date and time properly for each, and everything whatever the customer needs. Walking it, that means, discuss the value, value in terms of the customer requirements, precise customer requirements, discussing the value of those walking together with all stakeholders, with the customer, listing, prioritizing ideas, and doing everything together what is desirable in terms of offering the value to the customer. Schedule follow up is the last one. These are the five steps of work in the value streams.

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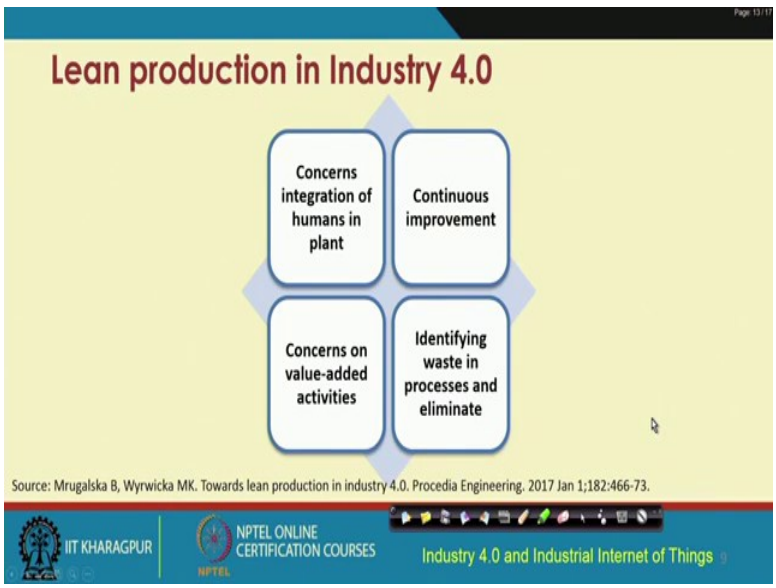

In the context of Industry 4.0, lean production is paramount; it is something very important. This lean production talks about four different considerations. Concerns about the integration of humans in the plant, continuous input improvement, value added activities, identifying waste in the processes, and eliminating them, as soon as possible, in an environment friendly manner.

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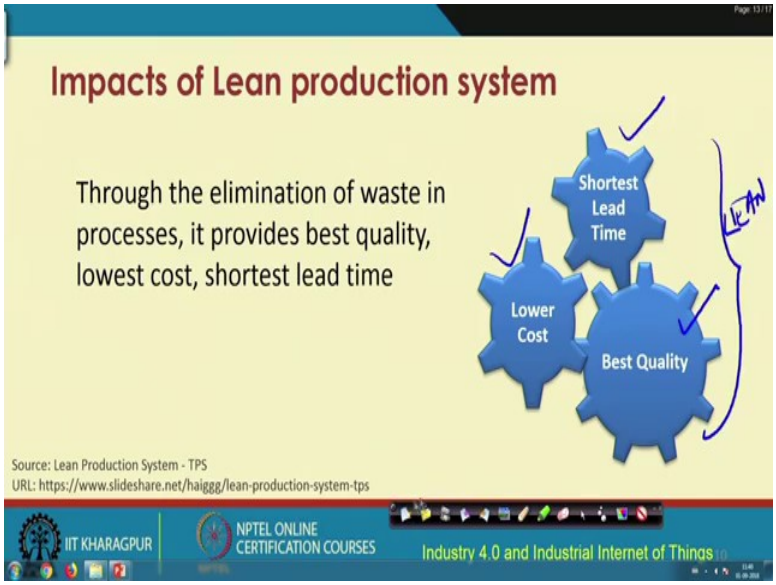

The impact of lean production system in terms of offering what is going to happen if you adopt this lean production system. You are going to have products of best quality, produced in lower cost, and with shortest time of production. These are the three different impacts of production using lean.

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Implementation of lean leads to the implementation of the full manufacturing system. It does not focus on just the adoption of the lean tools, but also it focuses on different other areas such as business requirements, operation improvement, operation of everything, operation of the machinery, operation of the product being developed, operation of the processes. So, overall production process, production operations of the overall production process, people management, and performance governance.

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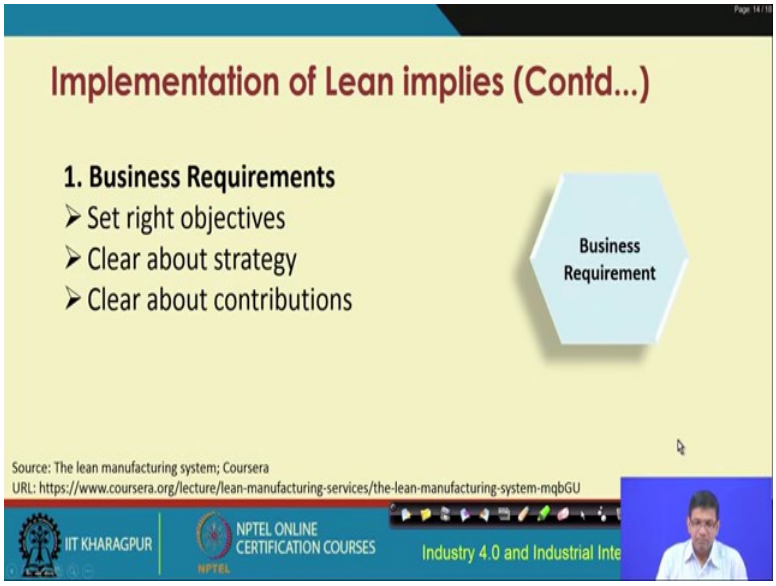

So, implementation of lean has different requirements. First is the business requirements, which talks about setting the right objectives. Clearing the strategy completely from a business point of view; business strategy should be clarified.

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Second, the performance management dimension in terms of lean implementation. Here, we are talking about people management, use of different KPIs to assess. KPIs means key performance indicators, so use of these different KPIs to assess the performance in the production process. Consideration of top-down management and we are talking about the use of KPIs to measure the performance in terms of productivity, quality of the goods and products, cost of delivery, cost of production, delivery time, and safety. These are the different performance attributes or the KPIs that have to be considered from a performance management viewpoint, in the lean production system.

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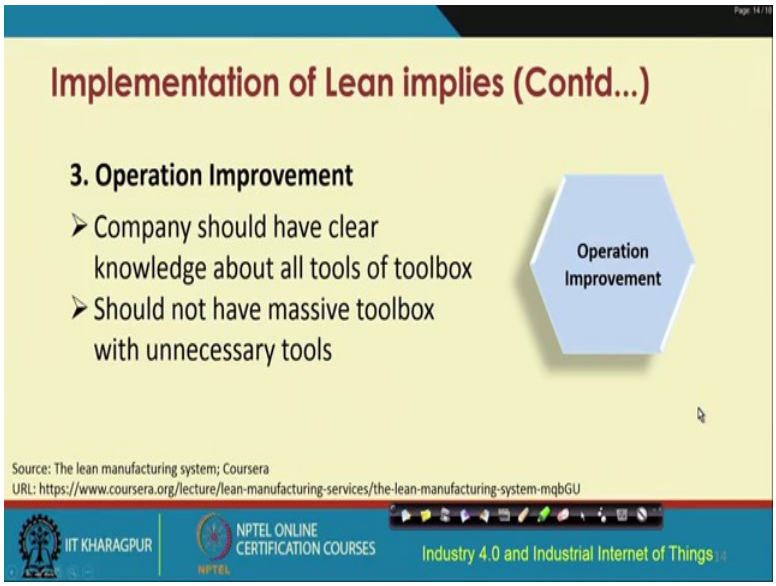

Operation improvement should have clear knowledge about all tools of the toolbox, and should not have massive toolbox with unnecessary tools. Then minimize the wastage in terms of all different resources, and overall improve the operations.

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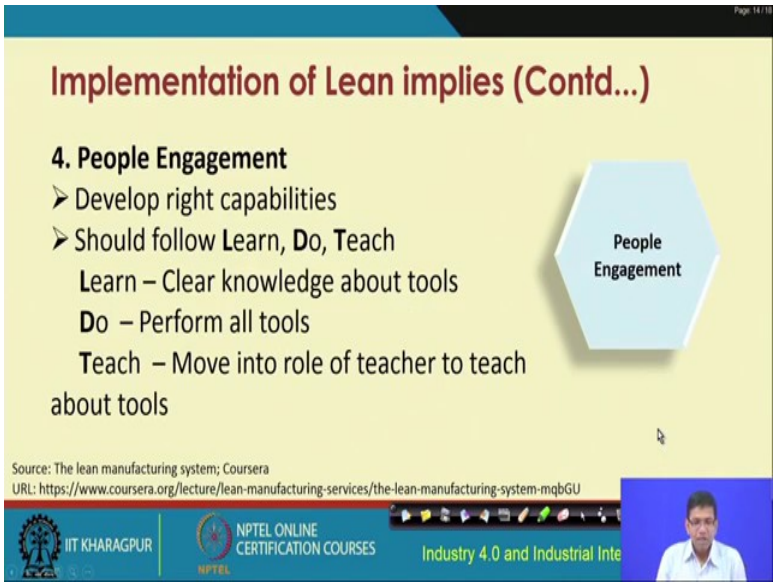

The other dimension of a lean production is basically people engagement. And as this name says it basically to ensure that people, the constant stakeholders are all engaged, and follow these different objectives learn, do, teach. Learn means having clear knowledge about the tools; do means perform, all the tools you know act with all the

tools that are available, and teach into the role of a teacher about these different tools. So, engaging all these peoples in these three different directions is also very important.

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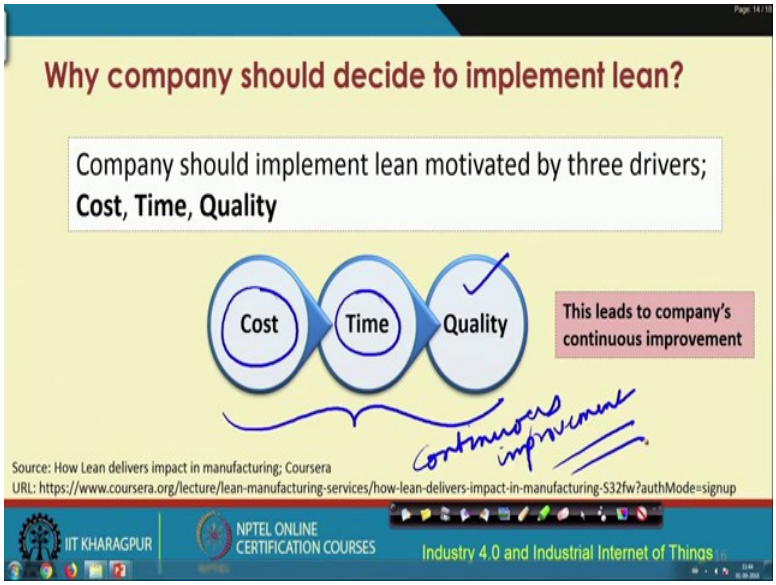

This is basically we have been talking from the starting. So, basically to reduce the cost, the time of production, and to improve the quality, would be the contributors to the overall continuous improvement, continuous improvement, in the manufacturing process.

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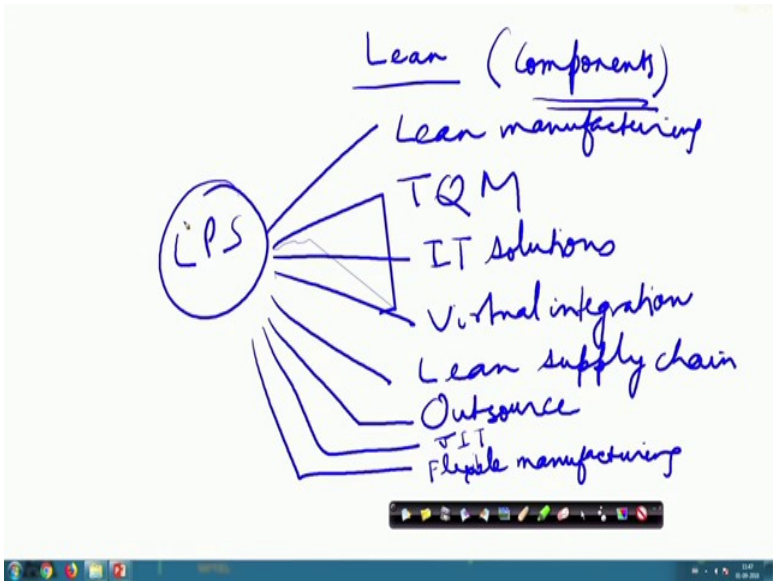

So, let us now look at it from another direction, holistically, what lean is all about. If we are talking about the lean production system, it is required to have these different

components of the lean production system, lean manufacturing, adopting lean manufacturing methods, ensuring total quality management, and adoption of it solutions to improve the overall production, reduce time, improve upon everything, virtual integration of different machinery, and have a lean supply chain.

If required as much as possible to outsource some parts of the product or the components, as the case, may be if it is cheaper and can be done faster by some experts, who have more expertise in developing those components. And just-in-time is the another one that I have already mentioned before adopting just-in-time concepts, and having flexible manufacturing. These are the different components of the lean production process, lean production system.

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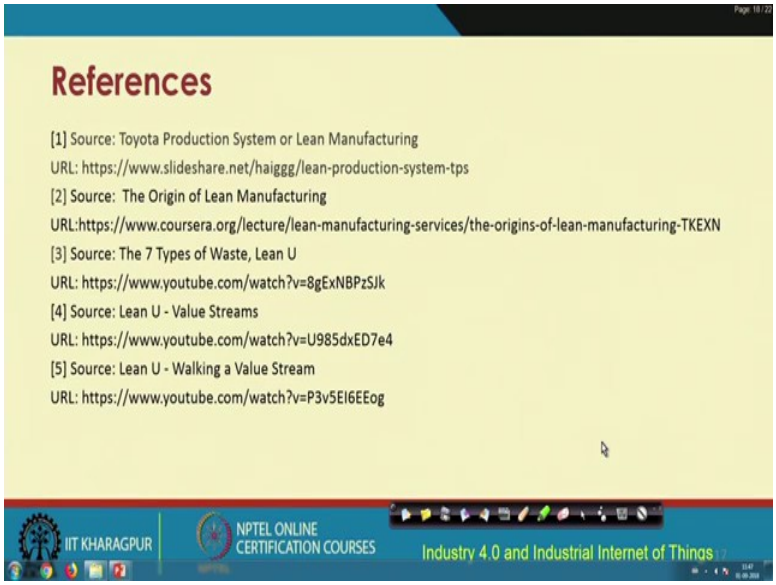

So, here are the references that you could go through in order to have further understanding about whatever we have covered with respect to lean production system, lean production process, and lean manufacturing.

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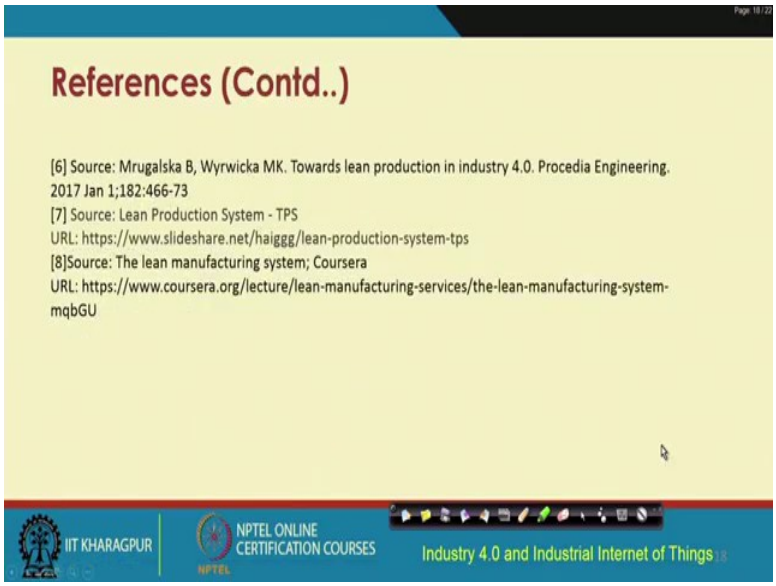

Thank you.