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# Industry 4.0: Lean Production System

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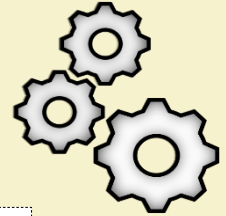
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# What is Lean Production System?



Finishing good inventories through eliminating wastes from processes

- Developed by **Toyota motor corporation**
- It is mainly focusses on **customer's need**

Source: Toyota Production System or Lean Manufacturing  
URL: <https://www.slideshare.net/haiggg/lean-production-system-tps>

# Lean in simple term

**Lean Approach**



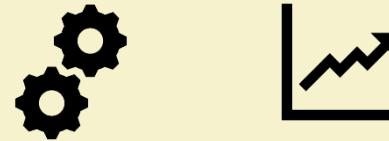
**Looks from customers perspective**



**Other Approach**



**Looks from tasks and production perspective**



Source: The Origin of Lean Manufacturing

URL: <https://www.coursera.org/lecture/lean-manufacturing-services/the-origins-of-lean-manufacturing-TKEXN>

# Lean production system established on...

## JIDOKA

- When there is a problem, stop production and stop producing defective products

## JUST-IN-TIME

- Each process produces what is needed by the next process in a continuous flow

Source: Toyota Production System or Lean Manufacturing  
URL: <https://www.slideshare.net/haiggg/lean-production-system-tps>

# 7 Types of wastes

- **Transportation** – Excessive movements of people for materials or information
- **Waiting** – Period of inactivity of people for material or information
- **Motion** – Non value-added movement of people
- **Inventory** – Cost of inventory such as raw materials, work in process, finished goods

Source: The 7 Types of Waste, Lean U

URL: <https://www.youtube.com/watch?v=8gExNBPzSJk>

# 7 Types of wastes (Contd..)

- **Over-processing** – Doing more work in product than customer values
- **Defects** – Defects can be in products or paper works
- **Overproduction** – Producing more product sooner than the customers ready for

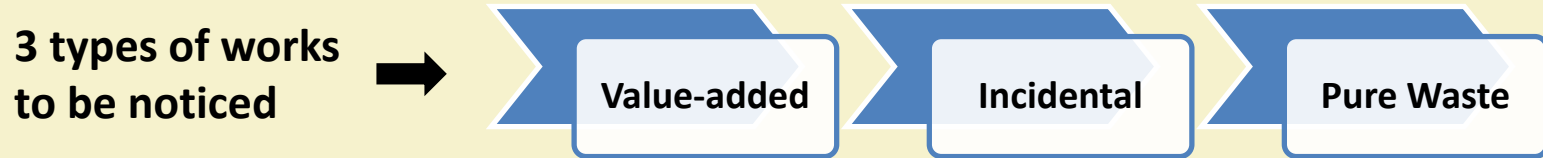
Source: The 7 Types of Waste, Lean U

URL: <https://www.youtube.com/watch?v=8gExNBPzSJk>

# Value streams in Lean

Value streams - All the actions required for a product from order to delivery

It can be done by simply walking through the lifecycle of the product



Source: Lean U - Value Streams

URL: <https://www.youtube.com/watch?v=U985dxED7e4>

# 5 steps of walk in value streams

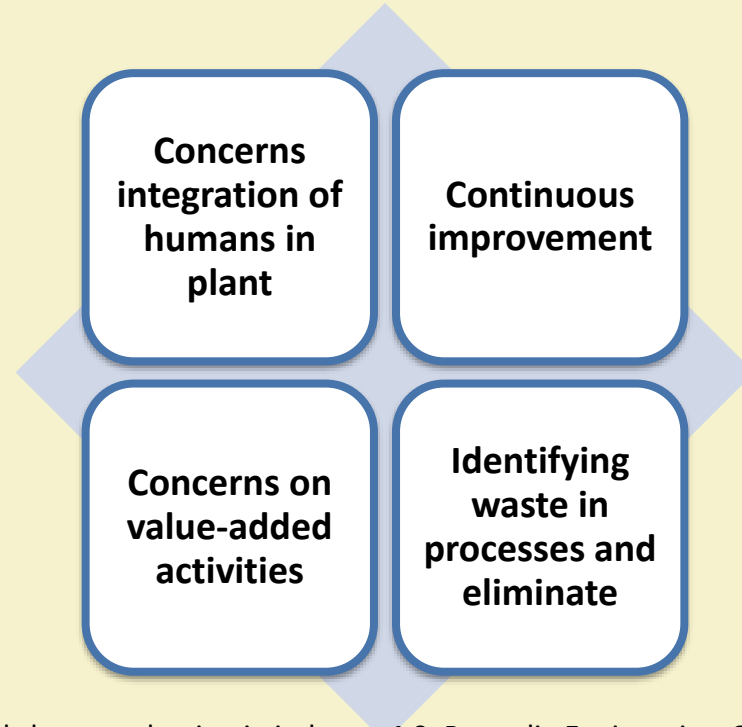
- Focus on single value stream
- Build a leadership team
- Schedule date and time
- Walk it – Discuss value, walk together, list and prioritize ideas
- Schedule follow up

Source: Lean U - Walking a Value Stream

URL: <https://www.youtube.com/watch?v=P3v5EI6EEog>



# Lean production in Industry 4.0



Source: Mrugalska B, Wyrwicka MK. Towards lean production in industry 4.0. Procedia Engineering. 2017 Jan 1;182:466-73.

# Impacts of Lean production system

Through the elimination of waste in processes, it provides best quality, lowest cost, shortest lead time



Source: Lean Production System - TPS

URL: <https://www.slideshare.net/haiggg/lean-production-system-tps>



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# Implementation of Lean implies

Implementation of lean → implementation of full manufacturing system

- It does not only focus on lean tools
- In addition it focuses on four main areas such as business requirements, operation improvement, people management, performance governance


Source: The lean manufacturing system; Coursera

URL: <https://www.coursera.org/lecture/lean-manufacturing-services/the-lean-manufacturing-system-mqbGU>

# Implementation of Lean implies (Contd...)

## 1. Business Requirements

- Set right objectives
- Clear about strategy
- Clear about contributions



**Business  
Requirement**

Source: The lean manufacturing system; Coursera

URL: <https://www.coursera.org/lecture/lean-manufacturing-services/the-lean-manufacturing-system-mqbGU>

# Implementation of Lean implies (Contd...)

## 2. Performance Management

- Refers to people management
- Should have clear **KPI (Key Performance Indicator)** structure
- Top-down management
- Key topics to be covered-  
**Productivity, Quality, Costs, Delivery, Safety**



Source: The lean manufacturing system; Coursera

URL: <https://www.coursera.org/lecture/lean-manufacturing-services/the-lean-manufacturing-system-mqbGU>

# Implementation of Lean implies (Contd...)

## 3. Operation Improvement

- Company should have clear knowledge about all tools of toolbox
- Should not have massive toolbox with unnecessary tools



Source: The lean manufacturing system; Coursera

URL: <https://www.coursera.org/lecture/lean-manufacturing-services/the-lean-manufacturing-system-mqbGU>

# Implementation of Lean implies (Contd...)

## 4. People Engagement

- Develop right capabilities
- Should follow **Learn, Do, Teach**
  - Learn** – Clear knowledge about tools
  - Do** – Perform all tools
  - Teach** – Move into role of teacher to teach about tools



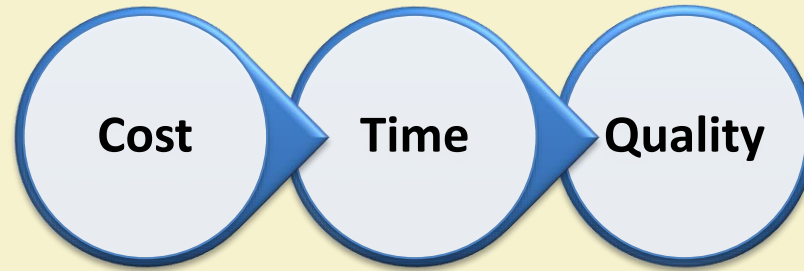
**People  
Engagement**

Source: The lean manufacturing system; Coursera

URL: <https://www.coursera.org/lecture/lean-manufacturing-services/the-lean-manufacturing-system-mqbGU>

# Why company should decide to implement lean?

Company should implement lean motivated by three drivers;  
**Cost, Time, Quality**



This leads to company's continuous improvement

Source: How Lean delivers impact in manufacturing; Coursera

URL: <https://www.coursera.org/lecture/lean-manufacturing-services/how-lean-delivers-impact-in-manufacturing-S32fw?authMode=signup>



# References

[1] Source: Toyota Production System or Lean Manufacturing

URL: <https://www.slideshare.net/haiggg/lean-production-system-tps>

[2] Source: The Origin of Lean Manufacturing

URL: <https://www.coursera.org/lecture/lean-manufacturing-services/the-origins-of-lean-manufacturing-TKEXN>

[3] Source: The 7 Types of Waste, Lean U

URL: <https://www.youtube.com/watch?v=8gExNBPzSJk>

[4] Source: Lean U - Value Streams

URL: <https://www.youtube.com/watch?v=U985dxED7e4>

[5] Source: Lean U - Walking a Value Stream

URL: <https://www.youtube.com/watch?v=P3v5EI6EEog>

# References (Contd..)

[6] Source: Mrugalska B, Wyrwicka MK. Towards lean production in industry 4.0. Procedia Engineering. 2017 Jan 1;182:466-73

[7] Source: Lean Production System - TPS

URL: <https://www.slideshare.net/haiggg/lean-production-system-tps>

[8] Source: The lean manufacturing system; Coursera

URL: <https://www.coursera.org/lecture/lean-manufacturing-services/the-lean-manufacturing-system-mqbGU>

# Thank You!!

