

# Unit 49: Lean Manufacturing

<b>Unit code</b>	<b>L/615/1517</b>
<b>Unit level</b>	<b>5</b>
<b>Credit value</b>	<b>15</b>

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## Introduction

Lean manufacturing is a systematic approach to minimising waste in a manufacturing system, by focusing on the activities that add the most value through the eyes of the customer. The basis of lean manufacturing originated in the car industry and was developed by Toyota in Japan. Lean is now used extensively worldwide, in all types and size of organisation, to improve international competitiveness. It is therefore crucial for manufacturing engineers to be able to design and operate manufacturing systems that employ lean successfully

The aim of this unit is to introduce students to the principles and processes of lean manufacturing, so that they can become an effective and committed practitioner of lean in whatever industry sector they are employed in. To do this, the unit will explore the tools and techniques that are applied by organisations practicing lean. The students will consider both the benefits and challenges of using lean manufacturing, and become sufficiently knowledgeable about the most important process tools and techniques to be able to operate and use them.

Among the topics included in this unit are: scoping and defining lean manufacturing, the benefits and challenges of adopting Lean, The Toyota Production System (TPS), common tools and techniques associated with lean manufacturing and process improvement, and the most appropriate improvement tool(s) to tackle a problem.

On successful completion of this unit students will be able to explain the common principles of lean manufacturing, compare the Toyota Production System with the now more widely adopted generic approaches to lean manufacturing, utilise a range of the process improvement tools used within lean manufacturing, and demonstrate effective communication skills in order to lead the process of continuous improvement across an organisation.

## **Learning Outcomes**

By the end of this unit students will be able to:

1. Examine the common principles of lean manufacturing and how the implementation of a lean production system contributes to business success.
2. Evaluate the Toyota Production System against the now more widely adopted generic approaches to lean manufacturing.
3. Specify a range of the process improvement tools used within lean manufacturing.
4. Demonstrate effective communication skills in order to lead the process of continuous improvement across an organisation.

## Essential Content

### LO1 **Examine the common principles of lean manufacturing and how the implementation of a lean production system contributes to business success**

*Scoping and defining lean manufacturing:*

The common principles of lean manufacturing philosophy

Origins of lean

Defining lean and its importance to the customer

Identifying and eliminating material and process waste that adds no value from the customer's perspective

*Benefits and challenges of adopting lean:*

Why an organisation would consider adopting a lean philosophy

Productivity, quality, customer satisfaction, delivery performance

The benefits of a lean organisation to the customer, the employees, and the shareholders

Outline the benefits of lean in terms of cost, quality, delivery, customer satisfaction, management complexity and cost to serve

Challenges of implementation: change management, managing expectation, empowerment, motivation, 'burning platform', investment, supply chain

### LO2 **Evaluate the Toyota Production System against the now more widely adopted generic approaches to lean manufacturing**

*Toyota Production System:*

Research the Toyota Production System (TPS) and identify the fundamental elements of the TPS and the motivation behind creating the TPS

Compare TPS with the recognised theory and production systems publicised by other global manufacturers: how do they differ and how they are similar?

How the common principles are now being adopted outside manufacturing

**LO3 Specify a range of the process improvement tools used within lean manufacturing**

*Common tools and techniques associated with lean manufacturing and process improvement:*

Seven Wastes, continuous flow, kanban (pull System), just-in-time (JIT), lean simulation activities, value stream mapping, Poke Yoke, 5 Whys (Root Cause Analysis), Total Preventive Maintenance

Plan-do-check-act (PDCA), Single Minute Exchange of Die (SMED), A3 Reporting, Visual Management

*Selecting the most appropriate improvement tool to tackle a problem:*

Tools for improving quality and delivery

**LO4 Demonstrate effective communication skills in order to lead the process of continuous improvement across an organisation**

*Communication:*

Facilitate a small group in the application and use of one of the lean tools (e.g. 5 Whys technique, A3 Report)

Identify factors that influence engagement within a group, facilitation skills and change management

## Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
<b>LO1</b> Examine the common principles of lean manufacturing and how the implementation of a lean production system contributes to business success		<b>D1</b> Critically evaluate the advantages and disadvantages of implementing a lean production system
<b>P1</b> Examine how lean manufacturing principles can improve business performance	<b>M1</b> Analyse the benefits of adopting lean manufacturing  <b>M2</b> Analyse the key challenges encountered when implementing lean manufacturing	
<b>LO2</b> Evaluate the Toyota Production System against the now more widely adopted generic approaches to lean manufacturing		<b>D2</b> Critically evaluate the Toyota Production System in comparison to a researched alternative, determining the elements that are critical in making the approach successful
<b>P2</b> Distinguish the principles of the Toyota Production System  <b>P3</b> Research alternative lean production system approaches  <b>P4</b> Examine the origins of lean and specify its early applications	<b>M3</b> Critically analyse alternative examples of lean production systems to determine the common principles, with reference to the Toyota Production System	

Pass	Merit	Distinction
<b>LO3</b> Specify a range of the process improvement tools used within lean manufacturing		<b>D3</b> Make a supported and justified recommendation for a lean tool to be applied in addressing a specified process improvement
<b>P5</b> Specify which tools are commonly associated with lean manufacturing and determine what context they would be applied in	<b>M4</b> Evaluate how the most common lean tools can be applied to eliminate waste in a manufacturing process	
<b>LO4</b> Demonstrate effective communication skills in order to lead the process of continuous improvement across an organisation		<b>D4</b> Critically evaluate the importance of the skills required to successfully deploy change in an organisation
<b>P6</b> Demonstrate and deliver a communication approach that can be taken to manage change in an organisation	<b>M5</b> Evaluate the impact of this communication approach, including an evaluation of impact on employees and personal effectiveness	

## Recommended Resources

### Textbooks

BICHENO, J. and HOLWEG, M. (2009) *The Lean Toolbox*. 4th Ed. PICSIE Books.

LIKER, J. and MEIER, D. (2006) *The Toyota Way Fieldbook*. McGraw-Hill.

WOMACK, J., JONES, D. and ROOS, D. (1990) *The Machine That Changed the World*. Free Press.

### Links

This unit links to the following related units:

*Unit 48: Manufacturing Systems Engineering*

*Unit 50: Advanced Manufacturing Technology*

*Unit 51: Sustainability*