Lean Production and Agile Manufacturing

L-34

Contents

1) Lean Production
2) Agile Manufacturing
a) Market Forces and Agility
b) Reorganizing the Production System for Agility
c) Managing Relationships for Agility
d) Agility Versus Mass Production
3) Comparison of Lean and Agile

1)Lean Production

- Lean as doing more and more with less and less-less human effort, less equipment, less time, and less space while coming closer and closer to providing customers with exactly what they want
- Lean Production can be defined as an adaptation of mass production in which workers and work cells are made more flexible and efficient by adopting methods that reduce waste in all forms.

According to another author of The machine that Changed the world, lean production is based on four principles

(1) Minimize waste
(2) Perfect first-time quality
(3) Flexible production lines
(4) Continous improvement

Minimize Waste

Taiichi Ohno's list of waste forms can be listed as follows

(i) Production of defective parts

(ii) Production of more than the number of items needed

(iii) Unnecessary inventories

(iv) Unnecessary processing steps

(v) Unnecessary movement of people

(vi) Unnecessary transport of materials

(vii) Workers waiting

Comparison of Mass Production and Lean Production

TABLE 27.1 Comparison of Mass Production and Lean Production

Mass Production	*Lean Production*
Inventory buffers	Minimum waste
Just-in-case deliveries	Minimum inventory
	Just-in-time deliveries
Acceptable quality level (AQL)	Perfect first-time quality
Taylorism	Worker teams
Maximum efficiency	Worker involvement
	Flexible production systems
If it ain't broke, don't fix it	Continuous improvement

2) Agile Manufacturing

 Agile manufacturing is defined as

(1) An enterprise level manufacturing strategy of introducing new products into rapidly changing markets

(2) An organizational ability to thrive in a competitive environment characterized by continuous and sometimes unforeseen change

Manufacturing companies that are agile competitors tend to exhibit these principles or characteristics. The four principles are:

(i) Organize to Master Change

(ii) Leverage the Impact of People and Information

(iii) Cooperate to Enhance Competitiveness

(iv) Enrich the Customer

a) Market Forces and Agility

A number of market forces can be identified that are driving the evolution of agility and agile manufacturing in business. These forces include:

(i) Intensifying competition

(ii) Fragmentation of mass markets

(iii) Cooperative business relationships

(iv) Changing customer expectations

(v) Increasing societal pressures

b) Reorganizing the Production System for Agility

The changes in three basic areas

(i) Product Design:

a) Customizable
b) Upgradeable
c) Reconfigurable
d) Design modularity
e) Frequent model changes
f) Platforms for information and services

(ii) Marketing

A company design and marketing objectives must be closely linked.

a) Aggressive and proactive product marketing
b) Cannibalize successful products
c) Frequent new product introduction
d) Life cycle product support
e) Pricing by customer value
f) Effective niche market competitor

(iii) Production Operations

a) Be a cost-effective, low-volume producer
b) Be able to produce to customer order
c) Master mass customization
d) Use reconfigurable and reusable processes, tooling and resources
e) Bring customers closer to the production process
f) Integrate business procedures with production
g) Treat production as a system that extends from suppliers through to customers

C) Managing Relationships for Agility

The general policies and practices that promote cooperation in relationships and in general promote agility in an organization include the following:

(i) Management philosophy that promotes motivation and support among employees

(ii) Trust-based relationships

(iii) Empowered workforce

(iv) Shared responsibility for success or failure

(v) Pervasive entrepreneurial spirit

Enabling Technologies and Management Practices for Agile Manufacturing

TABLE 27.2 Enabling Technologies and Management Practices for Agile Manufacturing

Enabling technologies	Computer numerical control (Chapter 6*) Direct numerical control (Chapter 6) Robotics (Chapter 7) Programmable logic controllers (Chapter 8) Group technology and cellular manufacturing (Chapter 15) Flexible manufacturing systems (Chapter 16) CAD/CAM and CIM (Chapter 24) Rapid prototyping (Section 24.1) Computer-aided process planning (Section 25.2)
Enabling management practices	Concurrent engineering (Section 25.3) Manufacturing resource planning (Section 26.6) Just-in-time production systems (Section 26.7) Reduced setup and changeover times (Section 26.7.2) Shorter product development times to increase responsiveness and flexibility (Chapter 24) Production based on orders rather than forecasts Lean production (Section 27.1)

*Text chapter or section where this topic is discussed.

Contd.

There are two different types of relationships that should be distinguished in the context of agility

(i) Internal relationships:

Some of the important objectives are:

a) Make the work organization adaptive
b) Provide cross-functional training
c) Encourage rapid partnership formation
d) Provide effective electronic communications capability

(ii)Relationships between the company and other organizations:

a) To establish interactive, proactive relationships with customers
b) To provide rapid identification and certification of suppliers
c) To install effective electronic communications and commerce capability
d) To encourage rapid partnership formation for mutual commercial advantage

Virtual enterprise

It is defined as a temporary partnership of independent resources (personnel, assets and other resources) intended to exploit a temporary market opportunity.

- The potential benefits include:

(i) It may provide access to resources and technologies not available-in house

(ii) It may provide access to new markets and distribution channels

(iii) It may reduce product development time

(iv) It accelerates technology transfer

Virtual Enterprises: Guidelines and Problems

TABLE 27.3 Virtual Enterprises: Guidelines and Problems

Guidelines	• Marry well; choose the right partners for good reasons. • Play fair win; win opportunity for all concerned. • Put your best people into these relationships. • Define the objectives. • Build a common infrastructure.
Problems	• Legal issues-protection of intellectual property rights. • How to valuate each participant's contribution, so profits can be equitably shared. • Reluctance of companies to share proprietary information. • Loss of competitive advantage by sharing knowledge.

Valuing Knowledge

- It is that the people in an organization, their skills and knowledge and their ability to use information effectively and innovatively, are distinguishing characteristics of an agile competitor.

Some of the important objectives include:

(i) Open communication and information access

(ii) Openness to learning is pervasive in the organization

(iii) Learning and knowledge are basic attributes of an organization's ability to adapt to change

(iv) The organization provides and encourages continuous education and training for all employees

(v) There is effective management of competency inventory, meaning that the organization knows and capitalizes on the skills and knowledge of its employees.

d) Agility Versus Mass Production

TABLE 27.4 Comparison of Mass Production and Agile Manufacturing

Mass Production	*Agile Manufacturing*
Standardized products	Customized products
Long market life expected	Short market life expected
Produce to forecast	Produce to order
Low information content	High information content
Single time sales	Continuing relationship
Pricing by production cost	Pricing by customer value

3) Comparison of Lean and Agile

- Four Principles of Lean and Agile Manufacturing

TABLE 27.5 Four Principles of Lean Production and Agile Manufacturing

Lean Production	*Agile Manufacturing*
1. Minimize waste	1. Enrich the customer
2. Perfect first-time quality	2. Cooperate to enhance competitiveness
3. Flexible production lines	3. Organize to master change
4. Continuous improvement	4. Leverage the impact of people and information

Comparison of Lean Production and Agile Manufacturing Attributes

TABLE 27.6 Comparison of Lean Production and Agile Manufacturing Attributes

Lean Production	*Agile Manufacturing*
Enhancement of mass production	Break with mass production; emphasis on mass customization.
Flexible production for product variety	Greater flexibility for customized products
Focus on factory operations	Scope is enterprise wide
Emphasis on supplier management	Formation of virtual enterprises
Emphasis on efficient use of resources	Emphasis on thriving in environment marked by continuous unpredictable change
Relies on smooth production schedule	Acknowledges and attempts to be responsive to change.