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## Lean Management

### What is Lean Management?

Lean management, also known as lean manufacturing or lean production, is centred on creating “more value with less work”. It is a generic process management, originally derived from a Japanese methodology known as the Toyota Production System. Lean management involves a “production practice that considers the expenditure of resources for any goal other than the creation of value for the end customer to be wasteful, and thus a target for elimination”.

In his book entitled “The machine that changed the world”, James P. Womack mentioned that lean production is ‘lean’ as “it uses less of everything compared with mass production: half human effort in the factory, half the factory space, half the investment in tools, half the engineering hours to develop a new product in half the time. Lean production also requires far less than half of the needed inventory on site. The expected results are fewer defects, while producing a greater and ever growing variety of products”.

As such, lean organisations commonly apply a three-pronged approach that eliminates waste, ensures quality, and embraces employee involvement.



Source: Lean manufacturing. (2008, January 15). Retrieved November 5, 2009, from <http://www.albertacanada.com/productivity/lean/index.html>

## Lean Principles

The principles of lean involve a five-step thought process, which guides the implementation of lean techniques. While they are easy to remember, the principles are not always easy to achieve.

Lean manufacturing is underpinned by the following five principles;

1. Define value from the customer's perspective
2. Identify and map the value system
3. Reduce waste and improve flow
4. Pull from the customer
5. Pursue perfection



Source: Lean manufacturing. (2008, January 15). Retrieved November 5, 2009, from <http://www.albertacanada.com/productivity/lean/index.html>

### Define Value from the Customer's Perspective

Organisations should specify value from the standpoint of their end customer. A lean organisation places their focus on their product value to their consumers, identifies value added activities, and eliminates non-value added activities. The organisation should also be driven by consumer needs, without artificial boundaries such as minimum re-order points, quality control checks, clerical data entry, etc.

### Identify and Map the Value System

Lean organisations should identify all the activities, both material and information flows, in the value stream for each of their products or services. This process will be able to highlight all the bottlenecks, handoffs, lead-time, and where inventory lives, moves, and is used. With the pictorial view of the current processes in place from start to end and all the processes in

between, organisations should then identify the non-value adding activities that exist for elimination.

### **Reduce Waste and Improve Flow**

Waste are activities that are deemed to consume resources but do not create value to the product or services. Waste in the value stream should be eliminated. Only activities that are adding value for the customers and satisfying their needs should remain.

### **Pull from the Customer**

Information and material should be pulled based on the customers demand, rather than being based on arbitrary or pre-defined inventory levels.

### **Pursue Perfection**

Lean organisations should continue to repeat the process for a “cycle of continuous improvement”. They should continue specifying their value, identifying their value streams, remove waste and introduce flow and pull, until a state of perfection is achieved, in which perfect value is created with no waste.

### **Benefits of Lean**

Lean management have a positive impact on organisations. Through the process of implementing lean management, organisations would be able to find ways to achieve a number of benefits. The benefits of lean generally are; lower costs, higher quality and shorter lead times.

Other benefits of lean management include;

- creates a culture of continuous improvement
- improve flexibility in reacting to changes
- allows more strategic management focus
- decrease in manufacturing cycle times
- increases production capacity
- lead time reduction
- reduces obsolescence
- lower space/facility requirements
- eliminates waste
- empowers workers
- self-directed work teams

- experience higher profits
- lower overall costs
- minimises inventory and reduces inventory costs
- maximises flow
- meets customer requirements
- improve customer relationships
- improves partnerships with suppliers/vendors
- pulls from demand

Here are some typical savings and improvements results that organisations can see with the adoption of lean management.

<b>Reduce</b>	
<b>Manufacturing lead time</b>	50% to 90%
<b>Floor space requirements</b>	05% to 30%
<b>Work-in-Process</b>	60% to 80%
<b>Increase</b>	
<b>First-Pass Yields</b>	50% to 100%
<b>Throughput</b>	40% to 80%
<b>Productivity</b>	75% to 125%

Source: Benefits of lean. (n.d.) Retrieved November 5, 2009, from [http://www.mamtc.com/lean/intro\\_benefits.asp](http://www.mamtc.com/lean/intro_benefits.asp)

## The Effects of Lean Management on Work Force

The transformation of an organisation into a lean workplace would also generally have positive effects on the workers which will be empowered and involved in the process through the formation of work teams, training and the new responsibilities for multiple specialised tasks. Workers are also made responsible in ensuring the quality of product produced. They will also be responsible to immediately fix the problem when it occurs, or to halt the production line when deemed necessary to ensure that only quality product is produced. As such, empowered equipment operators are assigned primary responsibility for basic maintenance of machines since they are in the best position to identify malfunctions and problems. Workers will also become multi-skilled and able to perform many tasks, with adequate training for each of the positions.

## The Relationship of Waste to Profit

	<b>Waste Factor</b>	<b>Relationship to Profit</b>
<b>Customer Focus</b>	Zero customer dissatisfaction.	Customer input and feedback assures quality. Customer satisfaction supports sales.
<b>Leadership</b>	Zero misalignment.	Direction and support for development improves cost, quality and speed.
<b>Lean Organisation</b>	Zero bureaucracy.	Team-based operations reduce overhead by eliminating bureaucracy and ensuring information flow and cooperation.
<b>Partnering</b>	Zero stakeholder dissatisfaction.	Flexible relationships with suppliers, distributors and society improve quality, cost, and speed.
<b>Information Architecture</b>	Zero lost information.	Knowledge required for operations is accurate and timely, thus improving quality, cost, and speed.
<b>Culture of Improvement</b>	Zero wasted creativity.	Employee participation in eliminating operations waste improves cost, quality, and speed.
<b>Lean Production</b>	Zero non-value-added work.	Total employee involvement and aggressive waste elimination promote speedier operations and eradicate inventories.
<b>Lean Equipment Management</b>	Zero failures, zero defects.	Longer equipment life and design improvements reduce costs. Meticulous maintenance and equipment improvements increase quality. Absolute availability and efficiency increase speed.
<b>Lean Engineering</b>	Zero lost opportunity.	Early resolutions of design problems with customers and suppliers significantly reduce costs, while improving quality and cycle time.

Source: Benefits of lean. (n.d.) Retrieved November 5, 2009, from [http://www.mamtc.com/lean/intro\\_benefits.asp](http://www.mamtc.com/lean/intro_benefits.asp)

## Seven Wastes to Eliminate

The elimination of waste is the goal of lean management. For organisations who are adopting lean management, there are seven types of waste that should be eliminated, which hopefully would lead to an increase in profits and efficiency.

Waste can be activities or resources that do not add value to the customers. The seven types of wastes are;

1. Over production
2. Unnecessary stock
3. Inefficient transportation
4. Unnecessary motion
5. Waiting time
6. Rejects and defects
7. Inappropriate processing



Source: Lean manufacturing. (2008, January 15). Retrieved November 5, 2009, from <http://www.albertacanada.com/productivity/lean/index.html>

## **Over production**

Over production includes producing more, sooner and faster than required by the next process. It leads to the production of unnecessary products, which are wasting material, resources and personnel. Lean organisations would need to ensure that overproduction, redundant or early production is avoided and eliminated.

## **Unnecessary stock**

Unnecessary stock is not only a waste, but also creates waste. Hence, it is necessary for lean organisation to manage their inventory well, and prevent the holding or purchasing of unnecessary raw materials, performance of unnecessary work-in-progress, or the production and storage of unnecessary product.

## **Inefficient transportation**

Inefficient transportation may add to cost but creates no value to the product and end customers. Thus, organisations should streamline their transportation of materials or products, which can result in the reduction of multiple handling of materials, delays in material handling and avoid unnecessary handling.

## **Unnecessary motion**

Poor planning and organisational layout often cause motion waste. An example of unnecessary motion is the walk that is undertaken by the personnel to pick up store parts. Storing the parts closer to where they are actually used could eliminate such unnecessary trips and unproductive actions and motions.

## **Waiting time**

Waiting for products, personnel or parts all result in wasted time. The operator or machine idle time does not add value to the product. Hence, lean organisations should ensure that unnecessary waiting times are reduced to increase efficiency and achieve a smoother production process.

## **Rejects and defects**

Lean organisations should also strive to reduce or eliminate the production of defective units. Errors in the production process should be identified during the lean analysis and will greatly help

to eliminate the production of defective units that cannot be used or sold and avoid reworking and repairing.

## Inappropriate processing

Lean organisations need to eliminate doing more work than necessary. Organisations should strive to reduce or stop over-processing by eliminating unnecessary steps or work elements that do not add value to the work or product.

<i>The 7 wastes</i>	<i>Some questions to ask</i>
<b><i>Over production</i></b>	Can the operation produce to order rather than produce for inventory?
<b><i>Unnecessary stock</i></b>	IS inventory needed just in case or can we operate without it?
<b><i>Inefficient transportation</i></b>	Can the process be configured to move product to the next operations (rather than having people do the moving?)
<b><i>Unnecessary motion</i></b>	What aids, such as fixtures, new equipment, or special tools, could speed up the process?
<b><i>Waiting times</i></b>	Can some tasks be done in parallel rather than in series?
<b><i>Rejects and defects</i></b>	Where can mistake proofing be used to eliminated or reduce defects, errors and avoid reworks?
<b><i>Inappropriate processing</i></b>	Can some tasks be combined or eliminated?

Source: The seven wastes. (2004). Retrieved November 5, 2009, from [http://www.qualitytrainingportal.com/resources/lean\\_manufacturing/form\\_44a\\_app1.htm](http://www.qualitytrainingportal.com/resources/lean_manufacturing/form_44a_app1.htm)



## Implementing Lean Management in the Organisation

### Managing in a Lean Organisation

Implementing lean management may be a challenging task to the management. Employees may show resistance and fear, which should be addressed in the initial stage. To overcome the resistance and fear, management should emphasise to their employees that lean management is a strategy for growth, and not just another cost-cutting exercise.

Successful lean implementations should lead to higher revenue growth. As such, organisation would in turn “further expand into new markets and stimulate even more business growth and other benefits”. Organisations should note that lean implementations that strictly look upon lean as a cost-cutting exercise are typically not sustainable.

During a lean transformation, change management and good communication are two critical factors that should be monitored closely by the management. Employees may become resistant to change for fear of losing their jobs. As such, to ensure a successful implementation of lean, management should;

- announce that jobs may change, but that growth is the goal
- announce that employees would not lose their jobs through continuous improvement
- ensure lean advocates work to motivate employees participation in the implementation of lean
- ensure that management and lean advocates remains energetic and optimistic in promoting lean management within the organisation
- lean advocates should be open-minded to opportunities, possibilities and ideas
- ensure the involvement of employees from all areas and levels of the organisation to eliminate waste and identify true value adding activities
- reduce fear by educating employees so that they understand the benefits and activities of lean implementation
- use lean to get the organisation back into competitive shape

## Lean Training

Lean training is essential in ensuring that lean implementation progresses effectively. Training would also equip employees with the necessary knowledge on lean management. It provides the tools needed to understand how lean production can be driven by customer needs, rather than by traditional forecasting, helps to identify waste and how waste can be eliminated, and shows how managers and workers can work together to optimise processes and practices.

The benefits of lean training include;

- able to maximise organisation gains by properly applying lean production concepts
- obtain measurable gains and return on your lean investment
- reduce employee training times
- reduce lean training costs within the organisation

It is crucial that the best and suitable type of lean training is chosen to meet the needs of the organisation. The training should include information on the following;

- business process value stream mapping so that organisation can create effective blueprints for applying tools and targeting events
- developing end-to-pull delivery systems
- developing lean lines and cells
- developing lean strategies
- lean accounting and how to switch from a batch methodology to a flow methodology
- lean policy management
- lean warehousing methods, analysis and implementation
- making materials flow effectively through the production process
- maximising knowledge about products and customer needs
- methods for identifying and defusing conflicts within the organisation
- methods for training the company's personnel
- mistake proofing lean processes
- optimising product development processes
- setting up lean implementation teams
- standardising work
- supporting lean within the organisation

## Lean Tools and Methodologies

<i>Tool</i>	<i>About the Tool</i>
<b>5 S</b>	A methodology for organising, cleaning, developing, and sustaining a productive work environment. Improved safety, ownership of workspace, improved productivity and improved maintenance is some of the benefits of 5S program.
<b>Error Proofing</b>	Error Proofing is a structured approach to ensure quality and error free manufacturing environment. Error proofing assures that defects will never be passed to next operation.
<b>Current Reality Trees</b>	Is a problem-analysis tool, aids to examine cause and effect logic behind our current situation.
<b>Conflict Resolution Diagram</b>	Is used to resolve hidden conflicts that usually perpetuate chronic problems.
<b>Future Reality Diagram</b>	Is a sufficiency based logic structure designed to reveal how changes to the status quo would affect reality - specifically to produce desired effects.
<b>Inventory Turnover Rate</b>	The number of times an inventory cycles or turns over during the year. A frequently used method to compute inventory turnover is to divide average inventory level into annual cost of sales.
<b>JIT</b>	A philosophy of manufacturing based on planned elimination of all waste and continuous improvement of productivity. It encompasses the successful execution of all manufacturing activities required to produce a final product.
<b>Kaizen</b>	The Japanese term for improvement; continuing improvement involving everyone - managers and workers. In manufacturing kaizen relates to finding and eliminating waste in machinery, labour or production methods.
<b>Kanban</b>	Kanban is a simple parts-movement system that depends on cards and boxes/containers to take parts from one workstation to another on a production line. The essence of the Kanban concept is that a supplier or the warehouse should only deliver components to the production line as and when they are needed, so that there is no storage in the production area.
<b>Lean Metric</b>	Lean metrics allow companies to measure, evaluate and respond to their performance in a balanced way, without sacrificing the quality to meet quantity objectives, or increasing inventory levels to achieve machine efficiencies. The type of the lean metric depends on the organisation and can be of following categories; Financial performance, behavioural performance and core process performance.

<b>Tool</b>	<b>About the Tool</b>
<b>LPI</b>	<p>Lean Performance Indicator is a consistent method to measure lean implementation effectiveness.</p> <p>A Key Core Value Metric for Motivating Performance and Rewarding Team Performance Through the PIP Plus Incentive Program.</p> <p>Indicator: Real Time Performance, Continuous Improvement Implementation, Lean Sustainment, Waste Elimination and Profitability.</p> <p>Goal: An LPI Monthly Goal of 100 - Equates to 116.3% Value-Added Output Performance at Level C Lean Performance.</p> <p>Formula: Value Added Sales (Total Sales Minus Raw Materials, Sub-Contracting and Components) divided by Shop Rate Per Hour ( ) Divided by Number of Hourly Shop Floor Personnel Divided by 2.</p>
<b>One-piece Flow</b>	<p>One-piece flow or continuous flow processing is a concept means that items are processed and moved directly from one processing step to the next, one piece at a time. One-piece flow helps to maximum utilisation of resources, shorten lead times, identify problems and communication between operations.</p>
<b>Overall Equipment Effectiveness</b>	<p>Measures the availability, performance efficiency, and quality rate of equipment - it is especially important to calculate OEE for the constrained operations.</p>
<b>Prerequisite Tree</b>	<p>Is a logical structure designed to identify all obstacles and the responses needed to overcome them in realising an objective? It identifies minimum necessary conditions without which the objective cannot be met.</p>
<b>Process Route Table</b>	<p>Shows what machines and equipment are needed for processing a component or assembly. These tables aid in creating ordinary lines and grouping work pieces into work cells.</p>
<b>Quick Changeover</b>	<p>Quick changeover is a technique to analyse and reduce resources needed for equipment setup, including exchange of tools and dies. Single Minute Exchange of Dies (SMED) is an approach to reduce output and quality losses due to changeovers.</p>
<b>Standard Rate or Work</b>	<p>The length of time that should be required to set up a given machine or operation and run one part, assembly, batch, or end product through that operation. This time is used in determining machine requirements and labour requirements.</p>

<b><i>Tool</i></b>	<b><i>About the Tool</i></b>
<b><i>Takt Time</i></b>	The time required between completions of successive units of end product. Tact time is used to pace lines in the production environments.
<b><i>Theory of Constraints</i></b>	A management philosophy that can be viewed as three separate but interrelated areas - logistics, performance measurement, and logical thinking. TOC focuses the organisations scarce resources on improving the performance of the true constraint, and therefore the bottom line of the organisation.
<b><i>Total Productive Maintenance</i></b>	Total Productive Maintenance (TPM) is a maintenance program concept, which brings maintenance into focus in order to minimise downtimes and maximise equipment usage. The goal of TPM is to avoid emergency repairs and keep unscheduled maintenance to a minimum.
<b><i>Toyota Production System</i></b>	The Toyota production system is a technology of comprehensive production management. The basic idea of this system is to maintain a continuous flow of products in factories in order to flexibly adapt to demand changes. The realisation of such production flow is called Just-in-time production, which means producing only necessary units in a necessary quantity at a necessary time. As a result, the excess inventories and the excess work force will be naturally diminished, thereby achieving the purposes of increased productivity and cost reduction.
<b><i>Transition Tree</i></b>	Is a cause and effect logic tree designed to provide step-by-step progress from initiation to completion of a course of action or change? It is an implementation tool.
<b><i>Value added to Non-value added Lead time ratio</i></b>	Provides insight on how many value added activities are performed compared to non-value added activities, using time as a unit of measure.
<b><i>Value Stream Mapping</i></b>	Value stream mapping is a graphical tool that helps you to see and understand the flow of the material and information as a product makes its way through the value stream. It ties together lean concepts and techniques.
<b><i>Value Stream Costing</i></b>	Value Stream Costing methodology simplifies the accounting process to give everyone real information in a basic understandable format. By isolating all fixed costs along with direct labour we can easily apply manufacturing resources as a value per square footage utilised by a particular cell or value stream. This methodology of factoring gives a true picture of cellular consumption to value-added throughput for each value stream company wide. Now you can easily focus improvement kaizen events where actual problems exist for faster calculated benefits and sustainability.

<i>Tool</i>	<i>About the Tool</i>
<b>Visual Management</b>	Is a set of techniques that makes operation standards visible so that workers can follow them more easily? These techniques expose waste so that it can be prevented and eliminated.
<b>Workflow Diagram</b>	Shows the movement of material, identifying areas of waste. Aids teams to plan future improvements, such as one piece flow and work cells.

Source: Glossary of lean tools. (n.d.). Retrieved November 5, 2009, from [http://www.shopwerkssoftware.com/lean\\_glossary.aspx](http://www.shopwerkssoftware.com/lean_glossary.aspx)

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Articles may be delivered to clients, upon request.

Books are available at the Lee Kong Chian Reference Library.

## Recommended Readings

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