

# An Introduction to Lean

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Lean is often referred to as Lean Operations, Lean Enterprise, Lean Manufacturing and the Toyota Production System amongst other things. It refers to a way of working that enables us to maximise customer satisfaction whilst utilising the least amount of resources. Lean Thinking was first introduced as a term in the bestselling book "The Machine that Changed the World" by Jim Womack and Dan Jones in the 1990's.

Put succinctly, Lean is the systematic approach to eliminating waste from processes so that every part of the process adds value to the customer. This may seem to be common sense but like many business excellence approaches, there is more to implementation than meets the eye. There are many forms of waste that are not apparent at first sight. Lean organisations are those that successfully identify wastes and eliminate them. Lean is called 'Lean' because it uses less capital, space, time, materials and people effort to deliver the highest quality and most economical products or services in the most responsive and flexible way.

Lean has, in recent years, taken manufacturing and service industries by storm in Europe and the USA. For decades Lean principles have been used by Toyota and other high volume manufacturers to great advantage and in more recent times it has been instrumental in improving customer satisfaction, service delivery and reduced operating costs in thousands of organisations world-wide. It has been applied in organisations of all sizes and has benefited both manufacturing and service industries as diverse as foundries and healthcare.

## **Why Should We Pursue Lean?**

Customer Expectations are continuously getting higher. It is taken for granted by all our Customers that when they buy something they get:

- Reliable Quality - Right first time every time
- Dependable Deliveries - On time deliveries to schedule and to promise.
- Strong Competitiveness - Continuous price reduction

Given that this is so, we need to manage our quality, delivery and cost to improve year on year. Lean approaches this by firstly dividing activities into the 'three divisions or work':

- Value Adding – Activities contributing directly to the achievement of customer requirements e.g. assembly of a wheel hub, a doctor treating a patient.
- Non Value Adding – Necessary but not contributing value for the customer e.g administrative and accounting activities.
- Waste – Activities that do not add value and are unnecessary e.g. moving parts to storage, patients waiting to see a doctor, bad quality.

The opportunities for improving performance all exist in the portion of our activities that is defined as waste. If we are not reducing waste and becoming leaner in the way we deliver our products and services the market price will eventually fall below our total costs and we go out of business. The waste that we manage every day is costly, hides opportunity for quality improvement and reduces our responsiveness and flexibility.

## **The 5 Stages to implementing Lean**

### **Stage 1 - Specify Value**

Value is defined by the customer. Targets are then defined to meet the customer requirements and translated into process targets to be achieved throughout the supply chain. Value is then made to flow through our processes to the customer. Examples of value, from the customer viewpoint, are: features, performance, cost, on-time delivery, convenience and ease of use.

## Stage 2 – Identify the Value Stream and Eliminate Waste

### The Value Stream

The value stream is collective activities that go together to turn raw material, information or ideas into a product or service in the hands of the customer. Identifying the value stream is done by carrying out an important stage in the implementation of Lean called 'Value Stream Mapping'. This graphically illustrates the flow of material, information, service delivery and product from suppliers to customers. From the value stream map we can identify which activities add value and those which do not. It is generally the case that value adding activities make up a small fraction of the total process time.

The start point in value stream mapping is to create a map of the existing process. This is referred to as the 'current state' or 'as-is' map. After applying lean principles to increase the proportion of value added activities and eliminate unnecessary waste we generate what is called the 'future state' or 'to-be' map. Ideally this will be a one piece flow, low lead-time process that provides products or services as the customer needs them and not earlier or later.

This 'Lean' state reduces inventory to minimal amounts, groups processes together, eliminates all unnecessary activities and maximises the effectiveness of equipment. The lack of clutter, inventory and other waste, gives maximum visibility to quality problems as they arise and therefore allows rapid and effective investigation of causes. Minimal inventory means no quarantine for large batches of unfinished and finished product when problems arise. It also reduces the amount of capital tied up in product that customers have yet to decide to buy.

### Eliminate Waste

Lean practitioners commonly refer to the 'Seven Wastes'. There are more than this but these seven make a good start:

#### The Seven Wastes

- **Over Production** - Making more than your customer wants.
- **Transportation** - Unnecessary movement of documents, products or process items between processes and departments etc.
- **Idle Time** - Non-productive waiting for parts, setting up a machine, documentation or information delays etc
- **Bad Quality** - Poor communication, defects, reworking, returned products, replacement product, dealing with customer complaints etc.
- **Inventory** – Finished stock, work in process, child parts, service documentation, patients waiting etc.
- **Process** – Unnecessary process steps, duplication, over-design, excess accuracy, excess reporting etc.
- **People Motion** – Unnecessary movement of people in the performance of tasks e.g. fetching tools, distributing reports, stretching to reach controls, attending meetings, moving inventory to storage.

### Stage 3 – Create Flow

The optimum rate for producing any customer product or service is at the rate the customer wants it i.e. if the customer buys one at a time we should provide one at a time. To get to this stage we must flow value through our processes to customers on demand without having large amounts of inventory. The elimination of all the barriers to flow that exist in the supply chain enables the flow of value without waste. Examples of barriers to achieving the flow are:

- Large batch sizes due to long process changeover times.
- Problems achieving target requirements.
- High levels of in-process inventory.
- Functional and departmental organisation structures.

### Stage 4 – Create Pull

To ensure that we only provide the customer with the product or service that they require when they want it, we have to ensure that product is available on demand. This is not easy when we start to consider the complexities of colour, material, engine size, type of illness etc. that may apply.

In traditional manufacturing operations, products are produced in large quantities or batches according to a sales forecast. Here we 'push' product to the market and hope that our forecasts are correct for each colour, material, engine size etc. when customers choose not to buy the products we have made, we either discount them through sales promotions or retain them as capital tied up in unwanted product. Either way it is an expensive waste.

A 'Pull' system such as 'Kanban' (Japanese for 'Signal') is one where the signal to make a new product is triggered by a customer buying a product. In other words, the customer pulls the product through the facility. A good illustration of this is a supermarket. Here the shelves have a limited quantity of an item on display for the customer. Once an item is passed through the checkout, a signal is created to put more product on display to replace the one that is taken. The supermarket distribution network is geared up to only stock tins of beans when tins of beans are needed. In a 'Pull' system, we strive to remove all unnecessary inventory between our processes and effectively make product in batches of one. This is one piece flow. We only manufacture product to replace that which is taken from the end of the production line or from a defined limited stock. That way we avoid overproduction of unwanted items and reduce the cash tied up in inventory. We also avoid loss-making sales promotions to get rid of product that isn't selling to forecast.

Through one piece flow we expose and remedy quality and processing issues in real time and eliminate the expensive quarantine areas for large batches of 'suspect' material.

### **Stage 5 – Strive for Perfection**

Once we have introduced lean principles into our product and service delivery, we find that waste is easier to see. The removal of all the clutter and noise of unnecessary product, WIP and activity starts to reveal opportunities that were not evident before we made the changes. Reducing batch sizes and getting closer to the ideal of one piece flow as well as eliminating quality problems can be achieved simply because we can now see what is going on. By continuously reviewing what we do and why we do it, we create a continuous virtuous cycle of improvement which drives us towards perfection in the way our processes flow value into the hands of our customers.

### **Lean Tools and Methods**

The methods that are used to eliminate waste and clear a path for improvement are numerous and involve disciplines from several areas of process design and process improvement.

### **Lean Measures**

- Not Right First Time
- On-Time Delivery (to request and to promise)
- Lead Time
- Value Added Proportion
- Stock Turn
- Overall Equipment Effectiveness
- Floor Space Utilisation

## The Lean Tools

Value Stream Mapping	Identifies where value and waste exist in our total process.
Continuous Improvement	A methodology that continuously reviews and improves processes.
Pull (Kanban)	A system of work that only produces at the rate that customers consume.
Flow	Movement through the value stream without waste.
TPM (Total Productive Maintenance)	Routine and data driven planned maintenance.
Quality at Source	Ensuring quality of inputs is given and elimination of wasteful inspection.
Point of Use	All equipment and information is available at the location where it is needed.
Quick Changeover (SMED)	Process changeovers are rapid with a large proportion of activities carried out prior to and after changeover.
Standardised Work	Ensuring that things get done the same way by everyone every time.
Batch Reduction	Reducing batch sizes to as near to one as possible (one piece flow).
Teams	Use of teams to work on improvement activities.
5S	The method of clearing, cleaning and organising an area so that everything has its place and is clearly visible. Non essential items are removed.
Visual Management	A system that uses visual information for process management and information.
Plant Layout	Organising the parts of the value stream into an arrangement that maximises use of space, people, machines and materials.
Poka-Yoke	Mistake proofing of processes.

## Six Sigma and Variability Reduction

A major part of the lean approach to product and service delivery is process improvement through variability reduction. Whilst all the other lean tools clearly improve processes and reduce variability by removing the opportunities for defects and reducing the customer's exposure to bad quality, the process improvement tools and techniques brought to us by Shewhart and Deming, amongst many, form the backbone of the improvement methodology. The use of Six Sigma has become a worldwide standard for generating improvements through customer focus and variability reduction. Improvements in quality which in turn lead to operational and cost benefits are essential to the lean toolkit. Adopting the DMAIC (Define, Measure, Analyse, Improve, Control) or the PDSA (Plan, Do, Study, Act) cycle to manage and implement improvements is a given in most of the lean approaches to improvement. Training people in process improvement methods or as Six Sigma Black Belts and Green Belts is an integral part of the improvement process.

## Implementation

The Lean Thinking approach to managing a business can be complex and full of pitfalls. Many companies fail because they only want to apply it in parts or they have bad advice in either the planning, implementation or maintenance phases. Whilst some of the ideas seem straightforward, others are more complex and require management by experienced and well trained individuals. Lean thinking is essential in every business but like all change management programmes it requires good planning and the commitment of management to succeed.

For further information on Lean and other services provided by Thornley Group, [contact us](#) by phone or email.