Introduction to Lean

About LBS Partners

LBS Partners was founded in Limerick in 2002 to educate and assist companies in the development of operational excellence through Lean, Lean-Sigma & 6-Sigma.

We are a hands-on business improvement consulting firm with extensive Lean and management experience. Our customer base includes SMEs, Multinationals and Public sector clients in food, engineering, life sciences, services and software.

LBS Partners has a proven track record of delivering measurable and sustainable results to our clients through significant Lean transformations to hundreds of clients. Projects are typically delivering improvements in cost, cycle time, quality and customer service.

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Chapter 1 - Value

1.0 Introduction

1.1 What is Lean?

Enhancing value for the customer is the essence of "Lean". This means delivering what the customer needs, when it is required and at the best possible price.

Lean offers a structured methodology that maximises value for the customer through the elimination of waste from an organisation's activities. Lean examines the entire value stream. The value stream is described as the sum of all activities completed by an organisation to produce a product or to deliver a service.

The elimination of waste is a key underlying principle of Lean. It requires moving away from the traditional approaches to process improvement and instead focusing on the product or service provided to the end-customer. A culture of continuous improvement is key to any organisation's sustained success in the elimination of waste. Instilling this culture is done by considering three aspects of the business:

Purpose Process and People.

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An organisation's **Purpose** will be to thrive and grow. This will only be achieved by continuously providing value to its customers. Reviewing where the business is now versus where it needs to be is necessary; a gap analysis.

Having defined the organisations purpose, the next step is to define the **Processes** which will enable it to achieve its purpose, i.e. the steps which will maximise customer value most efficiently. Looking across the value stream; examine all process steps, see which add value and which don't. Eliminate all unnecessary steps if possible and if not look at how they can be streamlined.

People will be required to drive these processes. Consider what skills and training is required to enable them to perform the processes at the required level to enable customer satisfaction. Involve them in the improvement process; use their experience to drive day-to-day problem solving thus resulting in continuous improvement.

1.2 Benefits of Lean

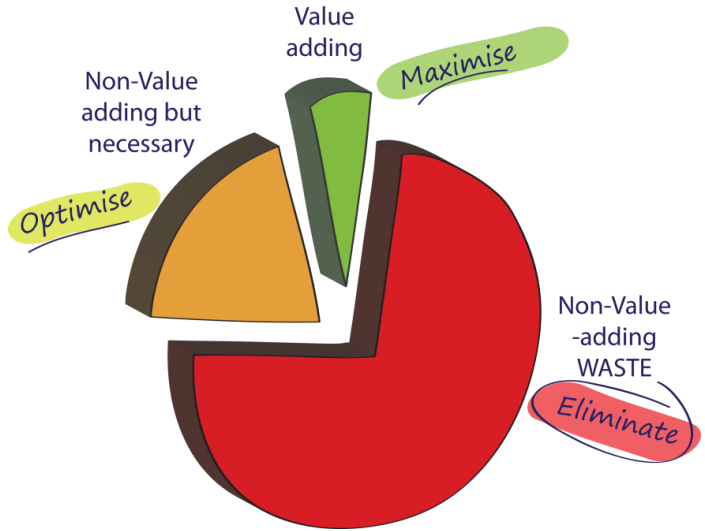Implementing Lean in an organisation typically results in the following benefits:

Figure 1   Benefits of Lean

1.2 Value

1.2.1 Customer Focus

Identification of value versus waste from the end customer's perspective is a key principle in Lean. Waste is defined as 'any activity which does not add value to the product or service provided for the customer'.

Figure 2   The Value Concept

The customer is the person who pays for the product or service. In relation to providing value to customers Lean considers the following:

- Would the customer pay for the activity?
- Was the product or service transformed or improved by the activity?
- Was it done "Right-First-Time"?

If the answer to any is "No", then value is not being added. This process of questioning must be continuously applied to ensure that all waste is made visible and the improvement opportunity is maximised.

First **identify**, then **eliminate** waste

1.2.2 Respect-for-People

In Lean, Respect-for-People is more than rudimentary political correctness and being respectful to your work colleagues. Respect-for-people means that expectations are clearly set and that everyone is equipped with the skills, tools and techniques to introduce and sustain a culture of continuous improvement.

It involves engaging people in the process of problem solving and challenging them to participate actively in fixing issues and longer-term process improvement.

A Lean transformation will demand problem solving on a daily basis, with both management and workforce co-operating to fix operational issues contributing to continuous improvement.

One of the specific wastes defined by Lean is "Skills" – not using or developing people's potential, expertise or experience to solve problems and improve processes.

Waste – Skills

Failing to utilize the skills and capabilities of everyone in the workforce.

Not listening to people, not fully utilising their knowledge not learning from past mistakes or not fixing issues.

Respect-for-people acknowledges this expertise, but it also challenges people to question old norms (we've always done it this way), gather facts on what's really happening and come up with creative solutions to resolve issues.

Management may not always be close enough to the job to effectively fix the issue: conversely team members may not be able to stand back far enough to understand the real problem and business context. A culture of mutual respect facilitates working together, management providing guidance and mentoring, team members providing the detailed knowledge necessary to root cause and fix problems.

1.2.3 Working to Customer Demand

Lean applies to all types of activity, including both manufacturing and service industries. A physical product is not required in order to apply Lean Thinking; any process can be improved by following the basic Lean Principles.

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In all cases it is important to understand that it is the customer that determines the value of the product or service and also the pace at which it must be delivered. This drives the concept of "Just-In-Time" which defines what is required and when it is required.

In essence, resources should only be consumed in direct response to customer demand; the organisation produces only what is needed to satisfy the customer.

Having a clear understanding of exactly what the customer wants and delivering just that eliminates wastes such as making too much or making it too soon (overproduction) or producing to too high a standard (overprocessing).

Chapter 2 – Lean Principles

2.1   PRINCIPLES

In Chapter 1, Lean was defined as a methodology which maximises value for the customer by eliminating waste from a company's activities.

In Chapter 2 Five Lean principles are identified to provide a path for the implementation of Lean Thinking and Continuous Improvement within an organisation.

These are stated as:
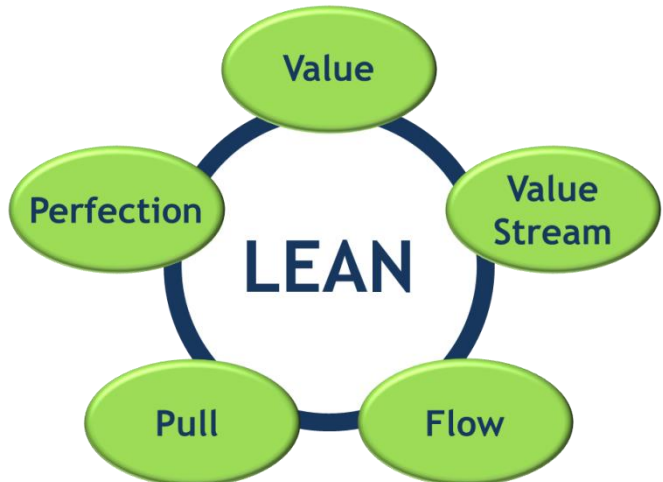
- Value
- Value Stream
- Flow
- Pull
- Perfection

Figure 3   The Lean Principles

2.2   VALUE

Value must always be defined from the end Customer's perspective. The customer pays for the product or service, so Lean Thinking considers the following questions to define value:

- Would the customer pay for the activity?
- Was the product or service transformed or improved in some fashion?
- Was the task or activity done "Right-First-Time"?

To help gain a clearer definition of the difference between Value and Waste, Lean defines waste under the following categories:

THE EIGHT WASTES   LBSPartners

TRANSPORT
The unnecessary movement of things, equipment, parts, tools or materials from one location to another.

OVERPRODUCTION
Making too much or too many, completing a task before it is needed. Making products that the customer hasn't ordered.

INVENTORY
Making more than is necessary to meet the customer demand, building up unnecessary stocks, between processes/process steps.

OVERPROCESSING
Duplicate or redundant operations, performing wasteful steps where they are not required. Typically is present because old norms are not questioned – "We've always done it this way".

MOTION
Unnecessary movement of people, walking to get things when they should be located closer to the point-of-use.

DEFECTS
Failing to produce a quality part the first time, generating rework or scrap. Not delivering the product or service "Right-First-Time".

WAITING
Delays between operations, because parts are missing. Work stopped: waiting for parts, waiting for machines, waiting for people.

SKILLS
Failing to utilize the skills and capabilities of everyone in the workforce. Not listening to people, not fully utilising their knowledge, not learning from past mistakes or not fixing issues.

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Figure 4   The Lean Wastes

Take a few minutes to apply the 8 wastes to your own workplace, you'll be surprised at how many you will be able to identify. Ideas for improvement result from this simple process of examining the activities carried out by the organisation.

2.3   VALUE STREAM

The value stream is defined as all the tasks completed to produce a product or provide a service. Some of these activities will add value for the customer some will not. The purpose of the value stream analysis is to identify the non-value adding activity and reduce or eliminate these activities.

This analysis involves documenting the current value stream of the organisation, understanding all the tasks required both for the physical product flow and also the flow of information between customers and suppliers.

Once the essential elements of the value stream have been clearly defined, they are analysed to separate those which actually add value from those that do not. The activities which do not add value are targeted for streamlining or elimination, serving as the springboard for continuous improvement.
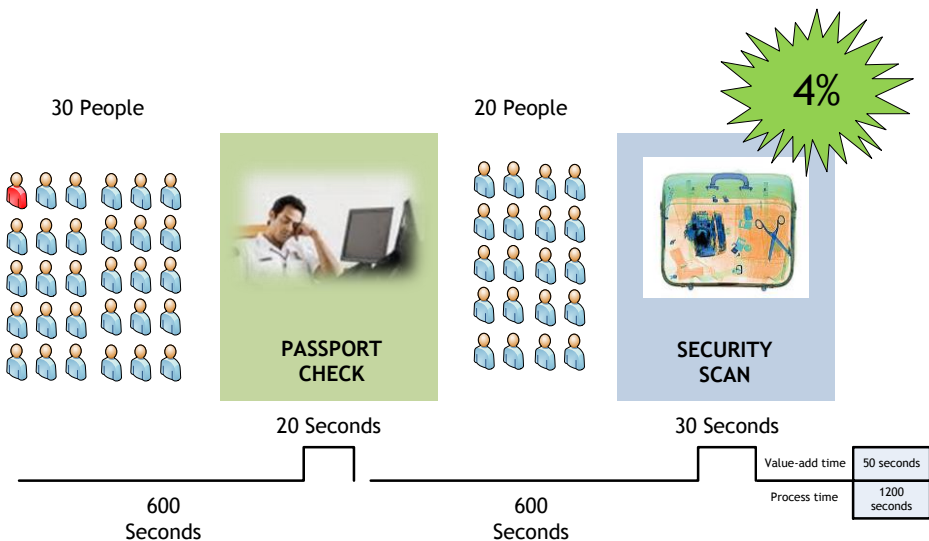

	Value-add time	50 seconds
	Process time	1200 seconds

Figure 5   Example of a Value Stream Map

In the example on the previous page, there are two process steps. A passport check which takes 20 seconds per person and a security scan which take 30 seconds per person. The value-add time for each customer is 50 seconds. Due to the queues each customer must wait while the previous person in the queue is processed.

Consider the final customer in the queue (in red in the graphic). He must wait while the previous 29 people go through the passport check and the other 20 people go through the security scan step.
For him, the total process time is 850 seconds (= 30 x 20 + 20 x 30) or 20 minutes.

The time where value is added for him is only 50 seconds, only 4% of the total time he spends in the value stream).

2.3.1   VALUE STREAM MAPPING

Value Stream Mapping is a visual tool used to illustrate how a process flow and information flow, transform a product as it moves through the value stream. It's purpose is to identify the sources of waste and drive action plans to eliminate them.

The Value Stream Map uses a standard "geography" or layout as illustrated on the next page.

The process steps from supplier to final customer along with the associated timeline are illustrated along the bottom of the diagram, running from left to right.

The flow of information from the customer back to the supplier is illustrated along the top of the chart, running from right to left.
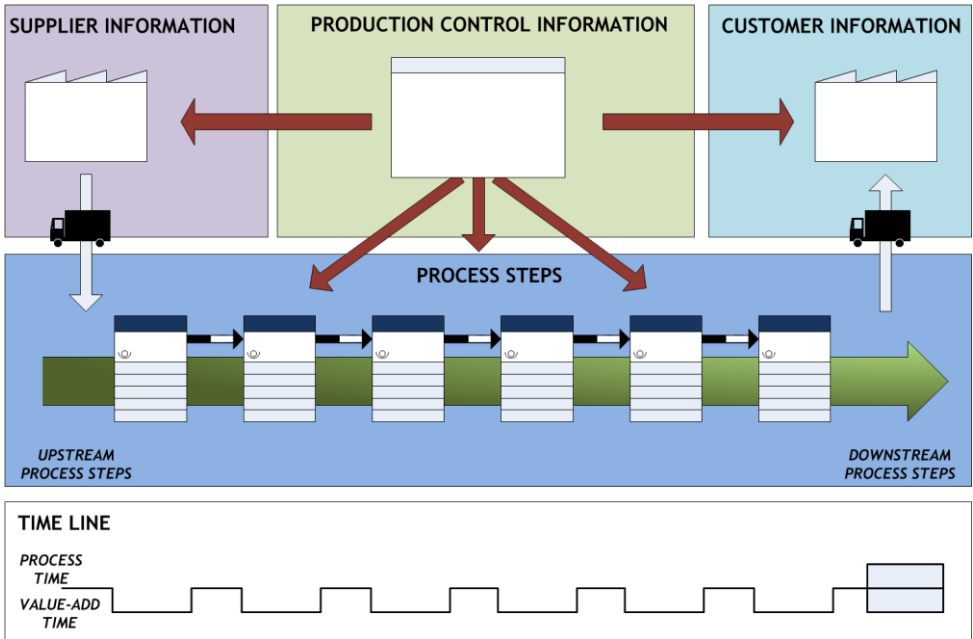
Figure 6   Value Stream Map Geography

The VSM shows both the process and information flow, tracking the material's progress from the raw material supplier to the end customer. It shows how the information flow is used to fulfill the customer's requirements.

In service terms, a VSM typically details the process steps and the flow of a report or file through these steps.

The timeline at the bottom of the chart compares the time where value is being added with the overall lead time to provide the product or service.

There are three Value Stream Map variants:

- **The Current State** (see overleaf for an example) or the current condition.
- **The Ideal State**, which represents the long term vision, and
- **The Future State** which represents an interim step toward the Ideal State, usually involving a series of improvements which are achieved within an agreed time period, through a defined action plan.
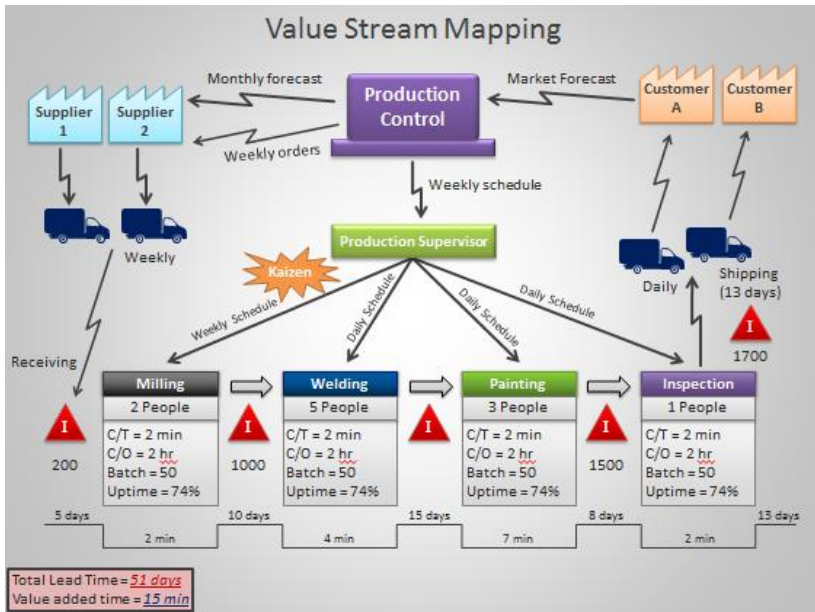
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Figure 7   Example of Current State Value Stream Map

2.4   FLOW

Flow describes a situation where each individual piece of work keeps moving i.e. being continuously worked on with no queues, waiting or rework. It is one of the concepts passed directly from Henry Ford to Toyota. Ford recognised that ideally, production should flow continuously all the way from raw material to the customer without interruption.

Lean aims to establish the environment where items are produced and moved from one processing step to the next, one piece at a time. This is referred to as "single-piece-flow" or "one-piece-flow".

Note that the unit of a "piece of work" can refer equally to information (an electronic file, a report or a document) as to a physical product.
Continuous flow is in direct contrast to batch processing where an operation produces more than one item at a time (a batch), in which the part in the batch must wait in a queue to be processed.

There are many reasons why batch production is used:

- There may be long setup times on a machine or a production line
- There may be large distances between process steps
- The processes themselves may not be efficient

There is a tendency to view batch production as an efficient way of making products. (If I'm doing one, I may as well do twenty).

The disadvantages of batch production are:

- Large amount of work in progress, [the batch must finish each process step before progressing to the next].
- Increased work in progress inventory between process steps.
- Long lead times – as a result of the time taken for the entire batch to finish all process steps
- Poor on-time delivery

If there are quality issues, many products may be affected before the problem is detected. The later the piece gets in a process, the more any problems will cost to rectify.

The benefit of continuous flow processing versus batch processing is illustrated overleaf.
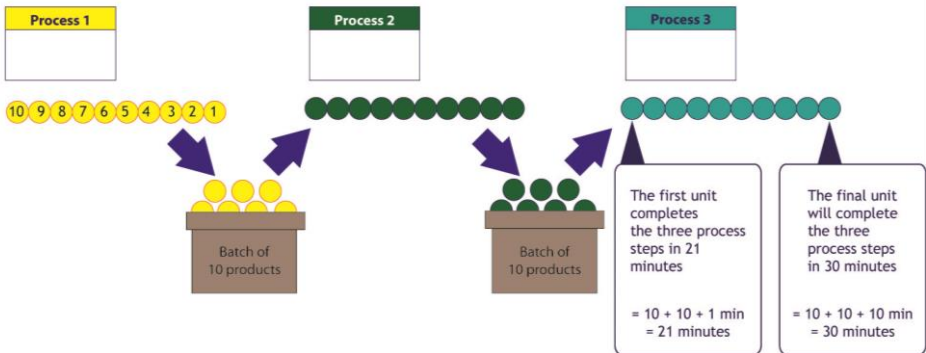
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Batch processing

A product is represented by a circle = ◯

Batch size = 10 units

Each product must complete three processes in sequence, each unit is processed in sequence one after the other

Each batch of product waits until the full batch is complete - this adds to overall lead time

The cycle time for each process = 1 minute, Each batch takes 10 minutes to be completed = 10 units x 1 minute each
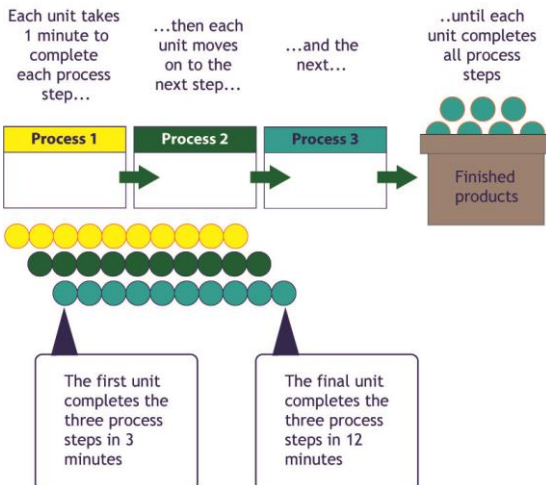
Process 1

10 9 8 7 6 5 4 3 2 1

Batch of 10 products

Process 2

Batch of 10 products

Process 3

The first unit completes the three process steps in 21 minutes

= 10 + 10 + 1 min
= 21 minutes

The final unit will complete the three process steps in 30 minutes

= 10 + 10 + 10 min
= 30 minutes

Single Piece Flow processing

1 product = ◯

One unit is processed at a time

The cycle time for each process = 1 minute

Each unit goes through the three process steps in sequence, one at a time

Each unit takes 1 minute to complete each process step...

...then each unit moves on to the next step...

...and the next...

..until each unit completes all process steps

Process 1   **Process 2**   **Process 3**   Finished products

The first unit completes the three process steps in 3 minutes

The final unit completes the three process steps in 12 minutes

The time for 10 units to complete the three process steps is reduced from the initial 30 minutes to 12 minutes i.e. a 60% reduction in the lead time.

The introduction of Single-piece-flow maximises the utilisation of resources, shortens lead times, and identifies problems in real-time, improving quality and communication between customer and supplier operations.

One of the aims of the Lean enterprise must be the reduction of batch sizes to reduce lead times improving delivery performance to the end customer.

2.5   PULL

Pull means providing only what the customer wants, when he wants it. The "Customer" can be within the organisation (internal) or the end-customer (external).

Pull means producing only what has been consumed by downstream activities instead of producing to a forecast, regardless of customer demand. "Downstream" refers to later process steps; "upstream" refers to earlier process steps.

The core idea is to get one process to make only what the next process needs, only when it needs it. Therefore, processes must be linked to each other – from the final customer back to the raw material supplier – in a smooth flow without delays that generates the shortest lead time, highest quality, and lowest cost.

Flow when you can;
Pull when you must

In summary:

- No one upstream should produce a product or service until the Customer downstream asks for it
- Each activity signals the next activity to begin (the 'back end' of the process pulls from 'front end')
- Pull needs to take place along the whole Value Stream and therefore requires a sharing of final Customer demand with all tiers of Suppliers
- Pull reduces time and waste

For example, the application of "Pull" includes the implementation of Kanban, defined as a material management and replenishment system which depends on visual controls to signal the production of a part or completion of a task. The essence of the Kanban system is that the downstream process is the customer and must pull from the upstream process, giving it the signal to produce more parts, controlling overproduction and inventory in the production area.

2.6   PERFECTION

The final Lean Principle dictates that continuous improvement is a never-ending journey. It doesn't stop once a specific improvement project has been completed. This is based on the fact that the ultimate objective is perfection - where every action and asset creates value for the end customer.

- Most of the activity completed by an organisation is waste!
- The more layers of waste you remove the more waste you can see!
- This is not a step change but a path which advances via a model of Continuous Improvement

Figure 8   The Continuous Improvement model

If an improvement is successfully completed, a new "current state" is the result. Once the changes resulting from this improvement have been "bedded-in" (standardisation has been completed) the process will be open to re-examination for further improvement.
This constant striving for Perfection is the foundation for "Continuous improvement".

Chapter 3 - Waste

3.1 INTRODUCTION

Lean Thinking examines all the activities performed by a company and divides them into two categories - those which add value and those that do not.

To help identify waste, Lean Thinking categorises it as follows:

Using the acronym "TIM WOODS" will make these headings easier to recall.

3.2   TRANSPORT

Transport is the unnecessary movement of product, raw material, or documents. Moving items unnecessarily increases the risk of damage or loss, adds time and adds cost without adding value. Poor layout of the floor/office/work area, batching and lack of flow all contribute to this waste.
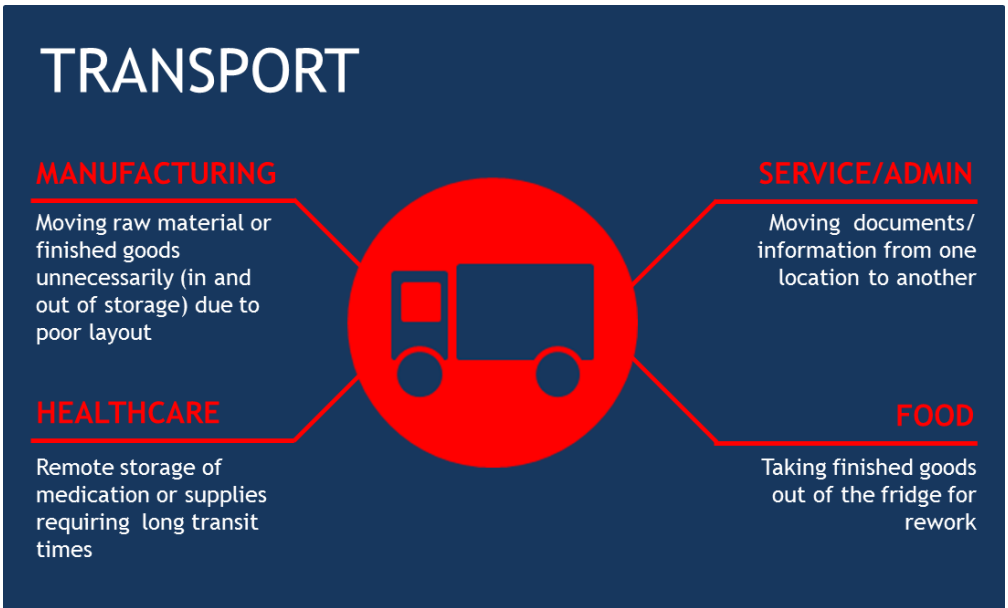

TRANSPORT

MANUFACTURING

Moving raw material or finished goods unnecessarily (in and out of storage) due to poor layout

SERVICE/ADMIN

Moving documents/ information from one location to another

HEALTHCARE

Remote storage of medication or supplies requiring long transit times

FOOD

Taking finished goods out of the fridge for rework

Figure 9   Examples of the waste of **TRANSPORT**

The aim is to reduce the overall "mileage" or footprint a product/service accumulates as it moves through an organisation, resulting in an increase in the proportion of value-adding activity.

3.3 INVENTORY

Inventory is an accumulation of finished product, raw material or partially completed product throughout the value stream. In a service/administration environment it can be an accumulation of physical documents or electronic files, over and above what is required to satisfy the customer's requirements.

Holding excess stock represents a cost to the company, with no benefit to the customer. The waste of inventory results from poor design of the elements of the value stream, resulting in overproduction and imbalances in work flows.
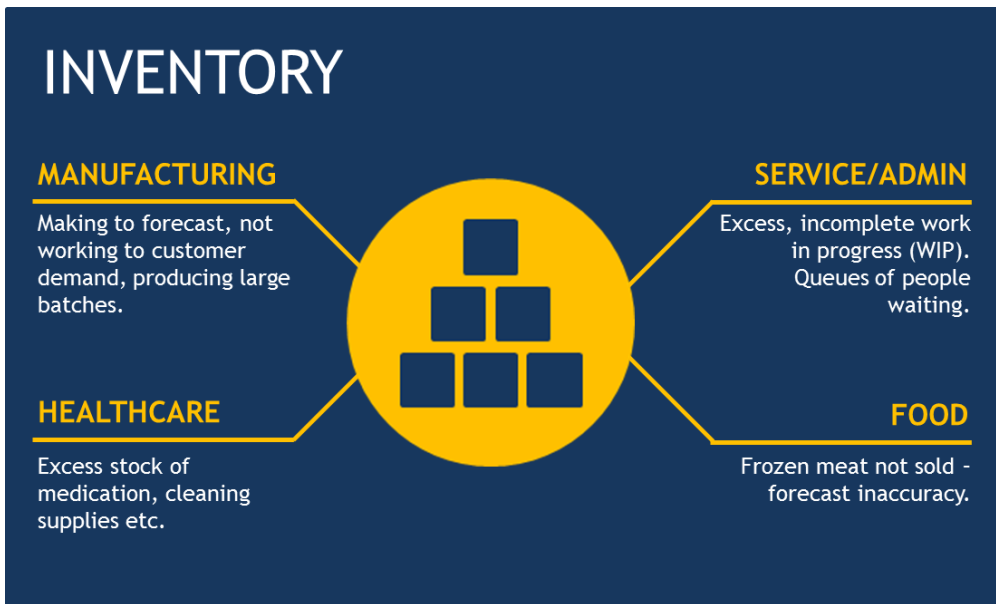

INVENTORY

MANUFACTURING
Making to forecast, not working to customer demand, producing large batches.

SERVICE/ADMIN
Excess, incomplete work in progress (WIP). Queues of people waiting.

HEALTHCARE
Excess stock of medication, cleaning supplies etc.

FOOD
Frozen meat not sold – forecast inaccuracy.

Figure 10   Examples of the waste of **INVENTORY**

Inventory should be systematically reduced as holding stock hides problems in processes; reducing stock exposes issues and forces organisations to resolve them.

3.4   MOTION

This waste is similar to the waste of Transport, but refers to the time wasted by individuals moving around when they don't need to, to collect parts or search for something they need to complete the job e.g. tools or equipment.

MOTION

MANUFACTURING
Handling of information, walking, manually accessing files, securing sign-off, searching for people or things.

SERVICE/ADMIN
Handling of information, walking, manually accessing files, securing sign-off, searching for people or things.

HEALTHCARE
Searching for information, people, medication or equipment

FOOD
Handling meat more than once, walking, work-area layout. Searching for packaging.
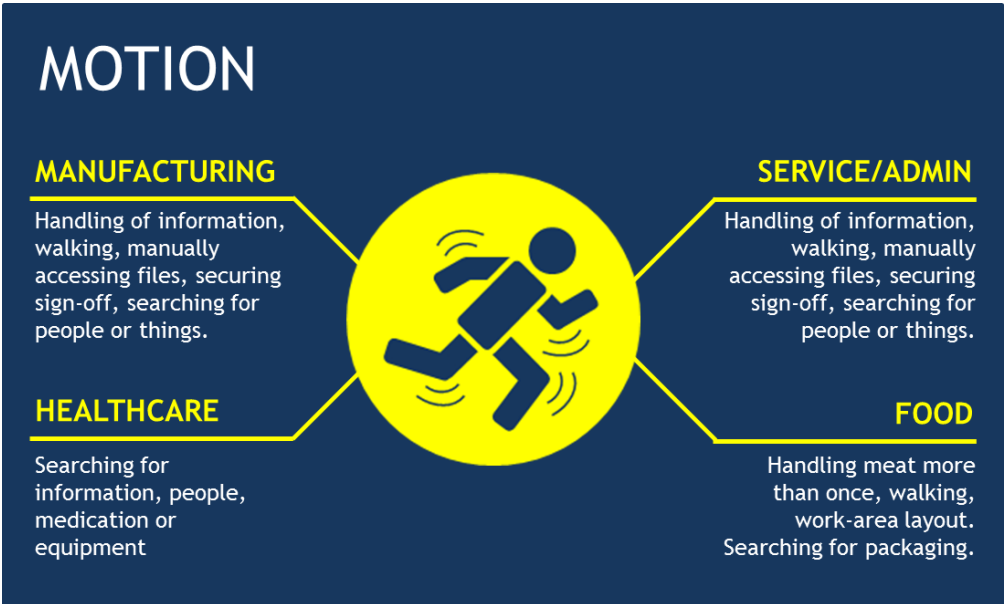
Figure 11   Examples of the waste of **MOTION**

Waste will be reduced by the implementation of a workplace organisation (6S) programme to re-organise the workplace ensuring processes are located closer to each other, that material delivery areas are at the point of use and tools and equipment are close to hand.

The result of implementing such a programme will reduce the distance travelled by the person, saving time and even "wear-and-tear" on the employee in the long term.

3.5 WAITING

Waiting refers to the time an item spends between process steps, when no work is being performed and therefore no value added. For example, in manufacturing environments if batch production is practiced, individual products will wait between process steps while the remainder of the batch is processed.

WAITING

MANUFACTURING
Waiting for an operation to finish a batch before the next batch can be processed. Machine downtime.

HEALTHCARE
Waiting for appointments, results of tests, medical reports

SERVICE/ADMIN
Waiting for work from the upstream step. System downtime or poor response time.

FOOD
During changeovers, when machinery is stopped

Figure 12   Examples of the waste of **WAITING**

The ideal is to produce a single piece at a time, also referred to as 'Single-Piece-Flow'. This may not always be practicable, but the goal is to reduce batch size to reduce changeover time and waiting for parts between operations.

This equally applies to operations where the output is not a physical item. Work should be scheduled in sufficiently small increments to allow the unit of work (e.g. a file, a report) to flow smoothly through the individual process steps to be delivered in a timely fashion.

3.6   OVERPRODUCTION

This waste is directly related to the waste of Inventory which is as a result of not responding to customer demand. Continuing to produce what is not required leads to an accumulation of stock between process steps and at the end of the process. Overproduction occurs when production runs ahead of demand; items are produced in greater volume than required, sooner than required or faster than required.
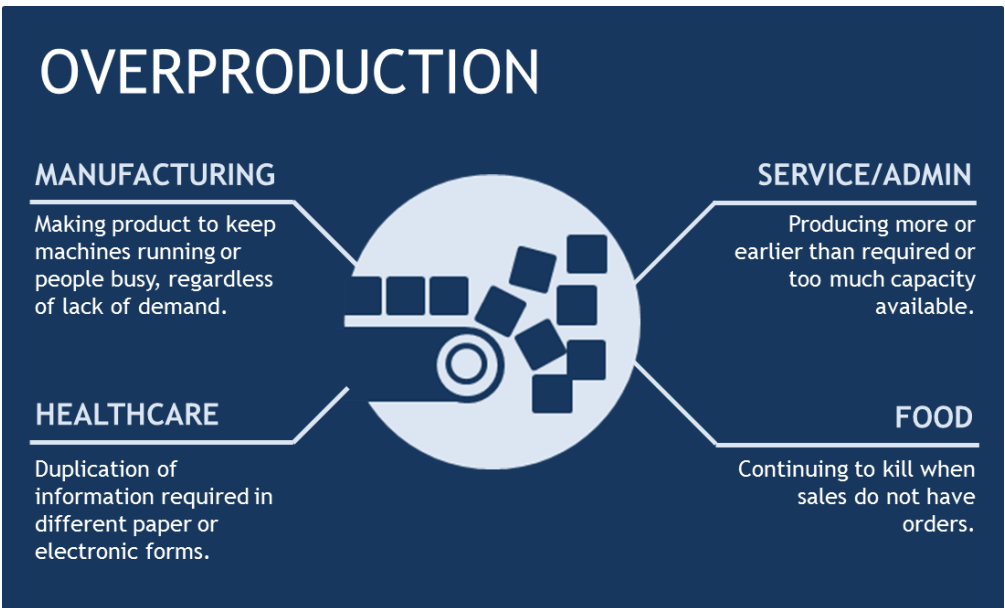

OVERPRODUCTION

MANUFACTURING
Making product to keep machines running or people busy, regardless of lack of demand.

SERVICE/ADMIN
Producing more or earlier than required or too much capacity available.

HEALTHCARE
Duplication of information required in different paper or electronic forms.

FOOD
Continuing to kill when sales do not have orders.

Figure 13   Examples of the waste of **OVERPRODUCTION**

The remedy is to work to customer demand, improve flow through individual process steps to produce only what the customer needs when he needs it. It is also preferable that the 'load' on production be as consistent as possible to allow resources to be better planned thus minimising overtime costs.

3.7 OVERPROCESSING

This waste applies when more work is done than is required to meet customer expectations, performing wasteful steps that may not be required.
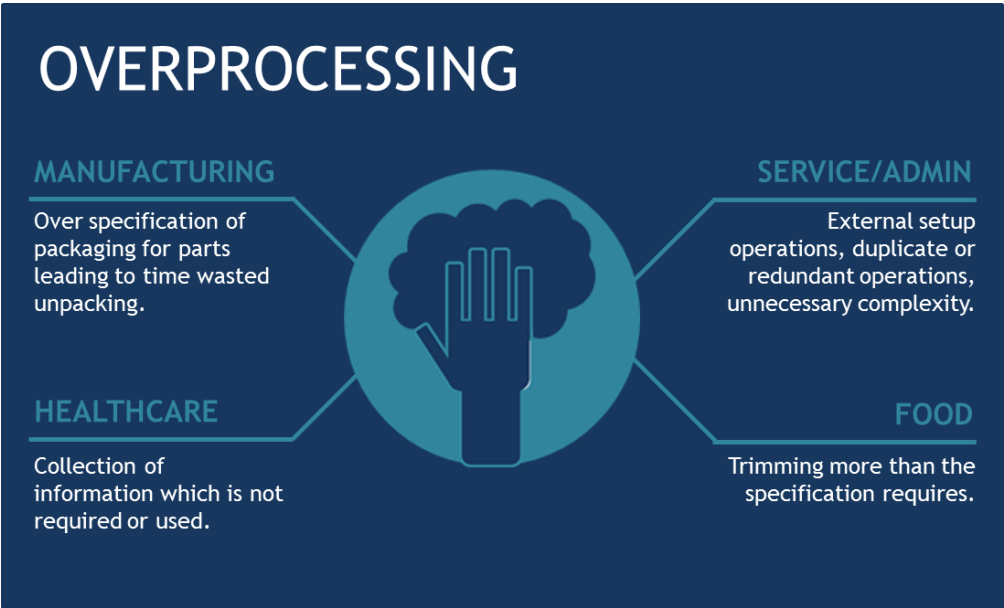

Figure 14   Examples of the waste of **OVERPROCESSING**

Overprocessing is eliminated by a thorough understanding of what exactly is required to fulfill the customer's needs and simplifying and standardising processes to deliver these expectations.

3.8   DEFECTS

One of the easier wastes to understand as this relates to not doing the job "Right-First-Time".

A defect is the result of an error; it is a deviation from the product specification which leads to customer dissatisfaction. In a service environment, it could be data input errors, a report incorrectly filled out, an error in billing etc.

Production defects lead to the cost of reworking. Reworking leads to a double handling of product which add costs and also exposes the product to further risk of damage.
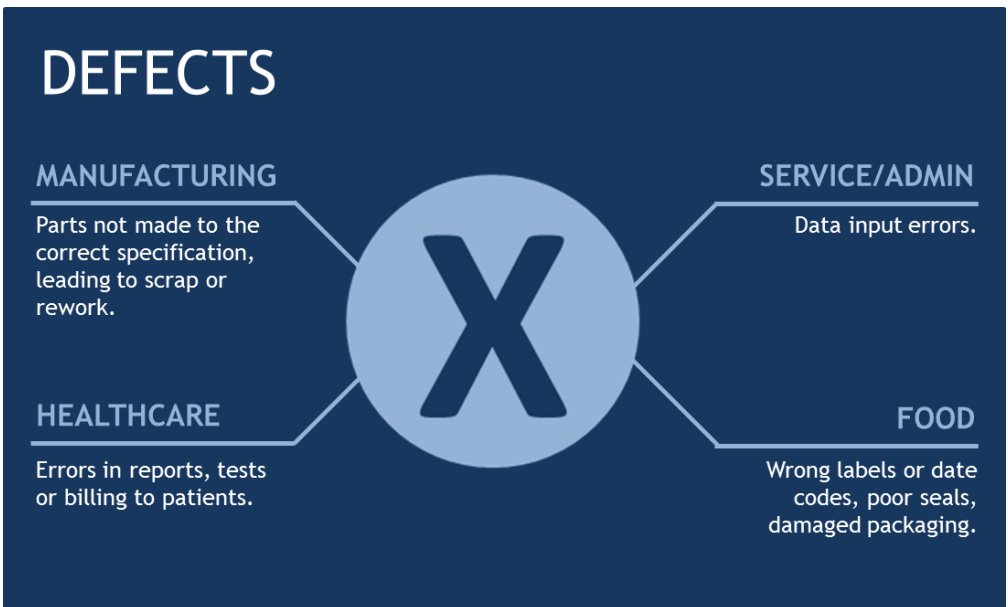
Figure 15   Examples of the waste of **DEFECTS**

Defects can be reduced by ensuring that all work steps are highly specified with no ambiguity. All the required tools and equipment are present and in good working order (achieved through a workplace organisation programme). Instructions are clear, concise and photographs should be used as much as possible. Personnel must be trained in all aspects of the job.

It is vital that each person in the company be responsible and accountable for the quality of their work and that they subscribe to the concept of doing the job "Right-First-Time". Ultimately, the customer would not pay for inspection to be performed; the job should be done once and correctly, with each employee taking responsibility for his or her work.

A concept called "Error-proofing" is employed to reduce as much as possible the occurrence of defects. Error-proofing is a structured process which seeks to prevent errors through robust product and process design, to eliminate or immediately detect defects as they occur. It ensures that defects are never passed to the next operation, as the further a defect progresses "downstream" the more it will cost to remedy.

3.9   SKILLS

This waste describes the situation where management functions within a company don't fully utilise employee's skillsets, the experience which people bring to their jobs, or develop over time in the performance of their jobs. It relates back to the "Respect-For-People" described in Chapter 1 of this book.

The core of the Lean Production System is the relentless elimination of waste, however the culture of continuous improvement depends on all team members contributing ideas for possible improvement, also being in a position to implement and sustain such improvements once introduced.

SKILLS

MANUFACTURING
Failing to utilise the skills or capabilities of all the workforce.

SERVICE/ADMIN
Failing to utilise the skills or capabilities of all the workforce.

HEALTHCARE
Failing to utilise the skills or capabilities of all the workforce.

FOOD
Failing to utilise the skills or capabilities of all the workforce.

Figure 16   Examples of the waste of **SKILLS**

Respect-for-people acknowledges their expertise, and challenges them to question old ways, gather real-time data and design creative solutions to resolve issues.

Chapter 4 – The Lean Business System

4.1   House of Lean – House of Quality

The primary objective of Lean is to clearly understand what the end Customer values and drive the organisation to maximise its value to the customers and satisfy their expectations.

The House of Lean is a framework is used to illustrate how the Lean system is directed at the sole aim of meeting the customer's expected standards.
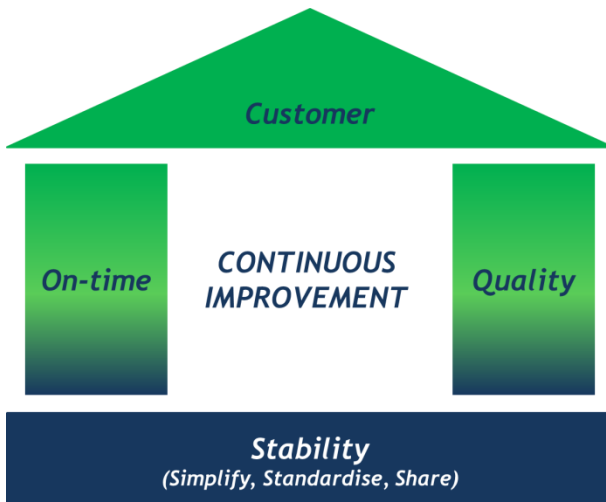
All activity is driven toward the goal of customer satisfaction, symbolised as the roof of the house of quality

In any organisation, the initial focus will be on simplifying and standardising processes. Improvement is not possible until you have a clear understanding of how well the needs of your customers are presently being met.

However, Lean is more than a set of tools & techniques, it is a new way of thinking, a new mindset. It challenges people to look at what they are doing with "fresh eyes", to see what they can do to remove waste from their daily tasks, and in the process simplifying their jobs.

Once the stabilisation has been instituted, improvement is achieved through the use of a suite of Lean tools and techniques in the areas of meeting deadlines (Just-In-Time) and quality targets (Built-In-Quality).

In simple terms:

- Understand the customer requirements and how they're presently being met (or are not being met)
- Identify which aspects of the business most need improvement
- Develop the people and the processes required
- Implement improvements and measure their impact on the business

4.2 The Lean Business System

As Lean is more than just a set of tools and techniques, successful implementation of a Lean transformation demands a change in the culture within the organisation.

A culture can be defined as:
"the ideas, customs, and social behaviour of a particular people or society".

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Any Lean Implementation will involve cultural change to move to a situation where waste is constantly being identified and consequently reduced or removed from processes. Certain characteristics support the introduction of Lean to an organisation:

- **Safety** – a primary consideration at all times
- **Standards** – set a standard and work to it to provide a consistent, quality output and work to this standard until a better standard is developed
- **Leadership** – Management must lead by example in the introduction of Lean
- **Partnership** - in terms of empowering employees to identify and solve problems, and enabling them to work successfully in teams

The Lean Business System encourages organisations to think in terms of three aspects of the business when undertaking a Lean Transformation, the Purpose, People and Process.

In chapter 1, it was stated that what the organisation sets out to do, the purpose, will obviously be to thrive and grow, but this will only happen by continuously providing value to the customer.

This is done by reviewing how the business is performing currently versus where is should be [current state v future state; a gap analysis. People will be required to drive these processes, consider what skills and training will they require to operate the processes at the required level to keep the customer satisfied.

Look across the value stream; examine all process steps to see which add value and which don't, then define the Lean processes which will achieve it, i.e. those which will maximise customer value most efficiently.

The Lean Business System recognises four specific cornerstones which are necessary to enable the necessary learning within the organisation.

- Management System
- Skills & Competence
- Standard process
- Coaching

These cornerstones are enablers which facilitate the successful adoption of Lean.

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Once the stabilisation phase is complete and it is understood where the "gaps" between current and desired performance exist, plans can be put in place to educate the workforce so that they are capable of delivering and sustaining improvement. This step is vital to the successful implementation of improvement projects.

Management will need to adapt a leadership role, they must drive the adoption of Lean, leading by example and not just paying "lip service". It will also be necessary to appoint lean champions within the organisation who will act as coaches, assisting people involved in projects to successfully implement improvement.
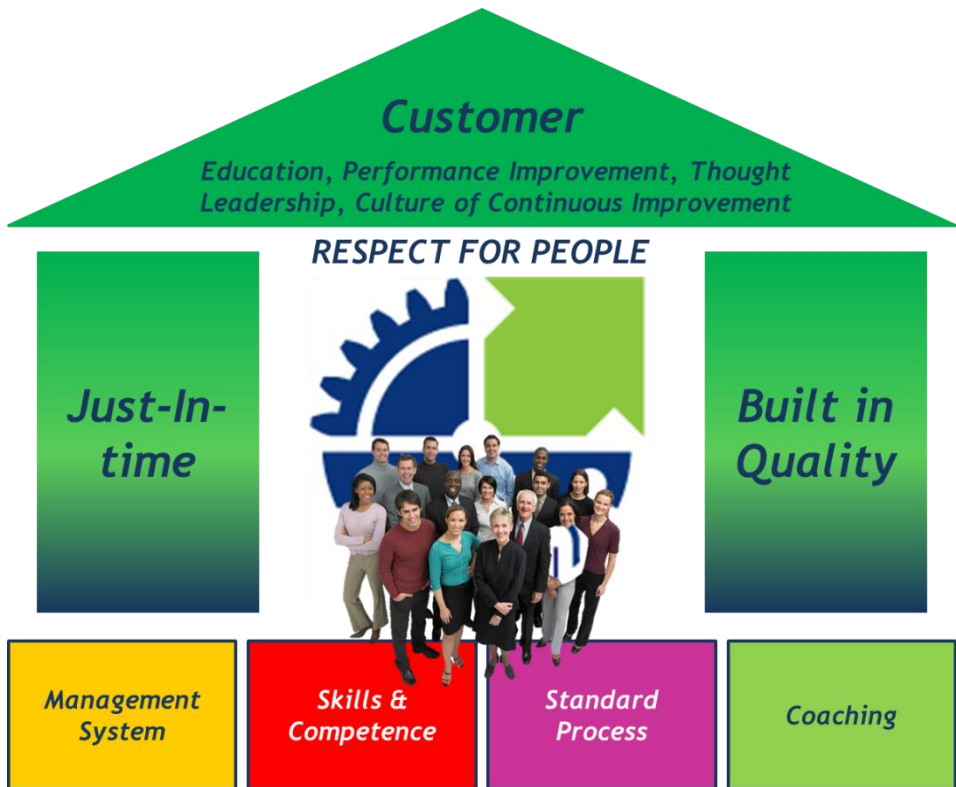
Chapter 5 – Respect for People

5.1   Introduction

One of the central tenets of Lean Thinking is Respect-for-People, based on the original concept of "respect-for-humanity", with is central to the Toyota Production System.

Respect-for-people in the Lean sense goes beyond rudimentary politeness or political correctness; it is more than just assigning work to people and trusting them to complete the allocated tasks. It involves engaging people in the process of problem solving and challenging them to participate actively in fixing issues and longer term process improvement.

Respect-for-people is also about ensuring that expectations are clearly set and that people are equipped with the skills, tools and techniques to introduce and sustain a culture of continuous improvement. Indeed it has been called the foundation for continuous improvement

Introduction to Lean

5.2   Respect-for-People

In the Lean context we consider Respect-for-People under the following headings:

- Respect
- Environment
- Stability
- Development
- Problem Solving
- Teamwork

5.2.1   Respect

One of the specific wastes defined by Lean is "Skills" – not using or developing a person's potential, expertise or experience to solve problems and improve processes.

Respect-for-people ensures that a person's full capability is realized to benefit both themselves and the organisation.

Respect-for-people not only acknowledges that people have developed this expertise, but on a daily basis also challenges people to use their knowledge and experience to gather facts on what's really happening where the work is done, identify where issues are occurring and working to solve them as a team.

Respect must be mutual between management and employees, avoiding a "them" and "us" situation, realising the need to work together to ensure success.

5.2.2 Environment

A fundamental requirement for a Lean organisation is the provision of a safe working environment for all employees.

In short, employees should have all the tools, equipment, furniture, other hardware, software etc, they need to get the job done. In addition all equipment should also be in working order and ready for use.

Conversely anything not required should be removed from the workplace, removing clutter and improving safety and productivity.

The best way to achieve this environment is to complete a 6S/Workplace Organisation programme, to firstly understand what is needed and not. To organise what is required in the best manner to enhance safety, productivity and cleanliness. However, it should be noted that though the company provides the workplace and equipment, there is a responsibility on employees to maintain and sustain the workplace organisation programme.

5.2.3 Stability

To paraphrase one of the leading thinkers in Lean, Taiichi Ohno, without a standard there can be no improvement. Before improvement can be made there needs to be an understanding of how things are currently done.

As part of the workplace organisation programme mentioned in the last section, the current process should be reviewed and improved before the workplace is laid out to support it.

When you think about it, one way to respect employees is the provision of standard processes, working with them to define and implement the best way to do the job. Standard processes are supported through workplace organisation and visual workplace, making it easy to see what needs to be done and then doing it.

Visual workplace follows on from the basic workplace organisation programme ensuring clear communication and facilitating performance monitoring. To monitor performance, a set of Key Performance Indicators (KPIs) are defined, these metrics are then monitored on a daily basis to ensure that the organisation's goals are met.

5.2.4 Development

Following on from the standardisation work completed on the processes and workplace, people should be trained in all aspects of the work. The work requirement should be clear and unambiguous. Expectations should be clearly set in terms of activity and performance levels required.

Management should recognise the need to invest in people; facilitating growth and learning. Fully harnessing their capability and creativity brings this competency to problem solving. A fundamental requirement in people development is the cultivation of problem solving skills, enabling individuals to identify and solve day-to-day issues.

From the employee's perspective, the result of this investment by management should be increased job security and improved morale.

5.2.5 Problem Solving

So far we've looked at the best way to do things and the best workplace/layout to support it. What do you do when there's a problem? How do you understand what the problem is, identify the root cause and put a permanent fix in place to ensure it does not reoccur?

In short, how do you transition from a culture of fire-fighting to problem solving, where issues are identified and fixed in a structured fashion?

It has already been stated that challenge is part of respect-for-people. Management will not always be close enough to the detail of the work being done to fix a problem. Meanwhile, employees may not be immediately prepared to question their own work and how they are doing it, to be in a position to successfully resolve issues. Employees are challenged

We've also said that mutual respect is required for success. Employees are challenged to collect facts about what is actually happening, management provide coaching to get to the root cause. Together they review the options to resolve the problem and agree on how success in its resolution will be measured and the best action to take.

5.2.6   Teamwork

Employees should realize that they too are stakeholders in the continued success of the company, not just management, and go above and beyond just "doing the job". They need to move away from the "silo mentality", only thinking of their job or their department, and work with everyone else in the organisation to meet customer requirements.

Leadership is generally used in the context of management, however it should be realised that everyone will assume a leadership role at some stage. By this it is meant that, for example, if there is a problem on the floor, employees can lead positively or negatively, positively by taking a constructive approach and taking personal responsibility for their attitude to the job.

5.3   Summary

At first glance, some of the topics listed above may seem to be unrelated to the concept of respect-for-people; however one could argue that a safe working environment, standardised processes and structured problem solving are essential to the success of the Lean organisation.

Letting people work in a poorly laid out environment with a lack of communication on the expectations, demonstrates a basic lack of respect for employees, sustaining the creation of "heroes", people who work "all the hours God gives" to get the job done.

The principles which underpin Lean are based on the principle of respect; originally referred to as respect-for-humanity.

It was recognised that great benefit could be gained by harnessing the skills, knowledge and experience of people who actually perform the work. It was acknowledged that they would have valuable ideas on how their work and consequently overall operations could be improved.

Respect-for-people promotes a sense of inclusiveness, by involving people in the process of daily problem solving and challenging them to participate actively in fixing issues and driving longer term process improvement.

Respect-for-people is about ensuring that expectations are clearly set and that people are equipped with the skills, tools and techniques to introduce and sustain a culture of continuous improvement.

Chapter 6 – Cornerstones of the Lean Business System

6.1 Introduction

As stated previously the Lean Business System identifies four cornerstones on which the successful implementation of a Lean Transformation depends:

- Leadership
- Education
- Standardisation
- Coaching

Lean Business Systems have systemised these initiatives in the framework illustrated below. Each Lean implementation demands a specific plan to match the specified initiatives with the needs of the individual organisation.

Figure 17   The Cornerstones of the Lean
                   Business System

Business Results [Leadership] – The principles underlying Business Results, the systems which are used to produce these results, key measures (Key Performance Indicators – KPI's) used and how they are utilised to manage a business's success.

Cultural Enablers to Lean [Education] – The principles, processes and techniques required to introduce and sustain a Lean culture within a company

Continuous Process Improvement [Standardisation] – The principles of Continuous Improvement (CI), the systems used to introduce CI and the techniques and practices employed in it's implementation.

Consistent Lean Culture [Coaching] – The principles of a Consistent Lean culture, the processes which are used in the development of a consistent Lean culture and the tools and techniques required.

6.2   Leadership (Business Results)

The Oxford English Dictionary defines leadership as:

"The action of leading a group of people or an organization, or the ability to do this"

Lean initiatives will not be successful without the support of Management, they need a clear understanding of what implementing Lean will demand from them in terms of time and support. Management will need to provide leadership to introduce Lean and more importantly sustain the implementation.

The goal of management development is the achievement of improved performance from the organisation i.e. superior business results, in terms of productivity, profitability and competitiveness.

The starting point is an assessment of the current state of the business, an understanding of the strategy for the business and a gap analysis between the present state and the desired state. Once the difference is understood a plan can be put in place to bridge the gap between current and future state.

The main tools used are:

- **Hoshin planning (Policy Deployment)** – is used to further a clear understanding at all levels of the organisation of its goals, to ensure everyone is aligned and working to achieve the stated goals. The process of understanding the goals and setting specific targets must be been completed first.
- **Value Stream Mapping** – a primary evaluation tool which examines all the activities carried on by the organisation and compares value add time to production lead time. The purpose of completing a value stream map is to highlight specific areas where waste is generated and identify improvement projects to address these wastes.
- **Leader Standard Work** – Applies the concept of standard work to the role of management/leaders. Is all about sustainability and accountability built into the practice of daily, weekly and monthly checks of the operating condition of the workplace.

Management will also need to develop skills as Lean Mentors within the organisation to provide guidance to their co-workers in the successful implementation of specific improvement projects

6.3   Education

Employees at all levels in the organisation will need to have at least a basic grounding in Lean Principles and a clear understanding of the Lean Wastes.

These varying requirements will need to accommodated in the training and education programmes in Lean.
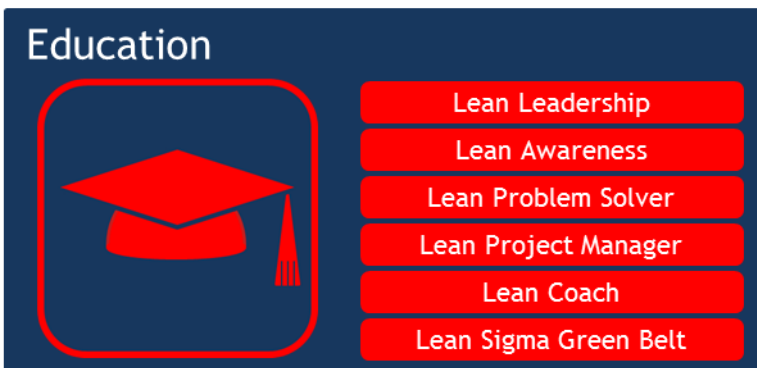
Introduction to Lean

The main specific programmes involved here are:

- **Lean Leadership** - The Lean transformation of any business begins with the senior management team establishing awareness within the organisation and providing direction and leadership. The success of the transformation ultimately depends on the ongoing vision and support of the business leaders. To achieve this, management must be equipped with an intimate grasp of the fundamental concepts of Lean and a clear understanding of how to approach the Lean transformation.

- **Lean Awareness** - At the heart of a successful lean transformation lies a culture of inclusion, people engagement and empowerment throughout the work environment. The most effective method of engagement is fully supported participation in the improvement efforts and within improvement teams. The most effective starting point for this engagement is specific awareness training for identified Kaizen Team members.

- **Lean Problem Solver** - Problem solving is one of the keys to successful Lean implementation. Lean is all about problem solving, and in the context of continuous improvement it is a never-ending process. Lean thinking describes a scientific method for problem solving, starting with a clear statement of a problem, following through to its resolution via a process of measurement, analysis, implementation and evaluation of the solution.

- **Lean Project Manager** - To successfully manage projects which deliver demonstrable improvement in key business measures, managers and team members need both the ability to effectively manage these projects and lead cross-functional teams. A successful Lean Project Manager should be able to combine the philosophies of Lean Thinking with the discipline of Project Management and the concepts of teams and team performance in implementing improvement projects.

- **Lean Coach** – To successfully implement and sustain a Lean transformation (of any size) within a company, a team of Lean experts are required equipped with the skills to support management and staff, drive continuous improvement and produce a consistent approach to processes within the company.

- **Lean Sigma Green Belt** - An element of waste in processes derives from variations in the inputs to and outputs from the process This results in defects and adversely impacts quality and other business performance areas. Six Sigma, with its formal structure and tool set, has long been recognised as a powerful, customer-focused methodology to attack this variation.

  Increasingly the key elements of these approaches are being combined. Together as Lean Sigma – the marriage of process improvement with system thinking – the fusion is proving to be more powerful than the individual parts. With Lean thinking guiding the way and driving optimisation at the system level, and Six Sigma driving excellence at the process level, a holistic solution to business competitiveness driving exceptional customer experience and business performance can be envisaged.

The net result of the education programme is the empowerment of employees at all levels to be in a position to support the execution of Lean within the organisation. All employees will need to have the basic understanding of Lean. While some will need to take more pro-active problem solving or project manager roles to promote change. Supervisors and Managers will need to adopt coaching and mentoring roles.

## 6.4 Standardisation (Continuous Process Improvement)

Standardisation is achieved primarily through the use of the following Lean tools & techniques:

- **6S & Visual Management** – organise the workplace in the most efficient, safe and clean way, utilise visual techniques to make targets and performance visible.

- **Standard Work** – the best use of people, material and equipment to maximise value-add and minimise waste.

- **PIT (Performance, Issues, Targets)** - a process of monitoring Performance, Issues and Targets to ensure goals are met consistently.

- **OEE (Overall Equipment Effectiveness)** - a key performance measurement which examines the availability and performance of machines or equipment and combines this with the quality of the parts produced. OEE measures the efficiency of the equipment; it does not measure the productivity of the operator
- **Flow/Kanban** – review and improve the physical and information flow of people, products and information.
- **Kaizen** – the structured implementation of specific business improvement projects.
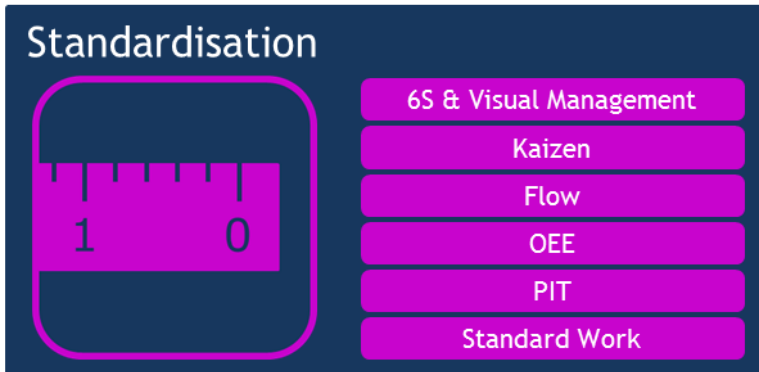
Standardisation establishes the baseline for performance, it's goal is to eliminate variations in work methods and produce a predictable, quality output from the process.

Elements of the standardisation process such as 6S and Workplace Organisation set the seeds for the continuous improvement process. The process of identifying problems commences here, leading to successive incremental changes for the better.

Once the baseline has been set and is consistently achieved, this improvement effort expands through a process of audit, problem identification and problem solving.

The drive toward standardisation is supported through people development, achieved through training, education and coaching.

6.5   Coaching

This initiative focuses on the development and maintenance of a Consistent Lean Enterprise Culture within the organisation.

It encompasses such disciplines and methodologies as:

- **DMAIC** – a problem solving and process improvement technique associated with the Six Sigma discipline known as DMAIC (Define, Measure, Analyse, Improve, and Control).

  a) **DEFINE** – clearly state what the problem is to be addressed
  b) **MEASURE** – describe the issue with data – collect information about what is actually happening at the workplace
  c) **ANALYSE** – review the data collected, brainstorm and evaluate suitable corrective actions and agree on the action to be taken
  d) **IMPROVE** – implement the solution
  e) **CONTROL** – monitor the improvement and ensure the gain is sustained

- **A3** – a standard format for problem-solving, proposals, plans, and status reviews, used to manage projects which involve a process of mentoring and coaching between a project sponsor and project manager.

- **HELP CHAIN** – is a routine for interaction to solve a problem when it arises, starting with the production operator and involving the immediate leaders up to the heads of all support areas, eliminating instabilities in the process

- **KATA** - A "Kata" is a training exercise in martial arts that is performed over and over to build muscle memory. In the Lean context, it refers to the fact that new improvement routines are practiced over and over again to develop a new habit, leading to cultural change.

  Kata provides the context for the application of Lean tools; without it you will not achieve continuous improvement.

- **MENTORING** – Where a manager or supervisor guides a subordinate in implementing a project, providing support and encouragement, giving constructive feedback and developing them in the process. Thus ensuring that the mentee learns and is developed in the process.

- **TEAMS & TEAMWORK** – The inclusive nature of Lean is facilitated by the establishment of cross-functional teams with the appropriate skills and knowledge to drive change through the implementation of specific projects.

A consistent Lean Culture necessitates a consistent approach to problem solving and project management to ensure projects are successfully implemented and the gains made are sustained. It involves enabling people to work in cross-functional teams and develop new, improved habits to support the culture of continuous improvement.

Chapter 7 – Stability

7.1   Introduction

Stability in Lean terms means setting a baseline for current performance. The goal is to eliminate variations in work methods and produce a predictable, quality output from the process. Variations are eliminated through the identification and resolution of day-to-day issues and standardisation of processes.

Once the baseline has been set and is consistently achieved, the continuous improvement effort is sustained through a process of audit, problem identifcation and problem solving.
Stability is achieved by firstly reviewing what is currently done, and where possible simplifying what is done by removing process steps, or streamlining steps where they cannot be removed. New processes are standardised and expectations are communicated to all stakeholders (information sharing).

Stability

Simplify

Standardise

Share

The main tools used to promote stability are:

- 6S/Workplace Organisation
- Visual Management
- Standard Work
- Levelled production

7.2   6S – Workplace Organisation

The 6S Process is a series of steps and procedures which are used to arrange work areas in the best manner to enhance performance, safety and cleanliness. It represents the first step toward establishing a workplace standard and provides a basis for all process improvement activity.

Implementing 6S helps focus on the causes of and the elimination of waste and sets standards for storage, housekeeping and visual communication.

What are the 6 "S's"?

1. Sort
2. Set-In-Order
3. Shine
4. Standardise
5. Sustain
6. Safety

7.2.1   **Sort**

In the SORT step, all items that are not needed for the current operation are removed from the workplace. Leave only the bare essentials – if in doubt take it out.

The benefits of implementing SORT include reduced frustration because parts and equipment are easier to find and less time is wasted looking for tools and materials. Also it becomes obvious where space can be freed up by removing the clutter and unnecessary "stuff".

Once SORT step has been completed there should be no clutter in the workplace as all tools, materials and equipment which are not needed have been removed. In addition there should be a clear understanding of what is needed to do the job, summarised in a list of what is required to set up the work correctly.

7.2.2   Set-In-Order

A list of what is needed in the workplace, in terms of tools, equipment, furniture, documents, files etc. is an output from the "SORT" step. The next step, the "SET-IN-ORDER" takes this list and organises the items on the list in the best way. As the old saying goes "A place for everything and everything in its place."

SET-IN-ORDER

A place for everything and everything in its place

S2

Visual tools such as shadow boards, floor taping, signboards are used to set and identify a clear location for everything needed to do the job.
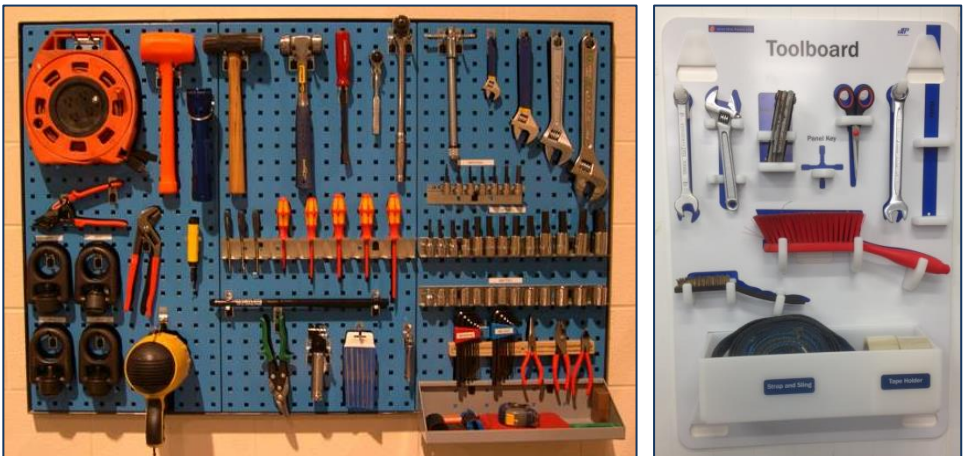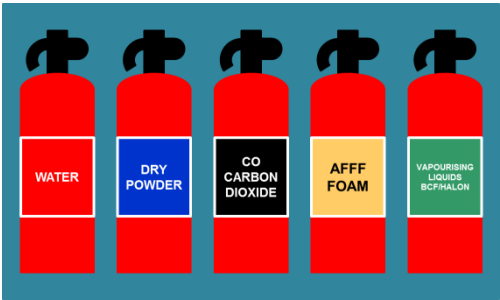

Figure 18   Examples of shadow boards

Assembly stations   Fire extinguishers

	Single Phase	Three Phase
Phase Conductor (Line)	Red or Yellow or Blue	Line 1 Red / Line 2 Yellow / Line 3 Blue
Neutral Conductor	Black	
Protective Conductor (Earth)	Green-and-Yellow	

Electrical wiring

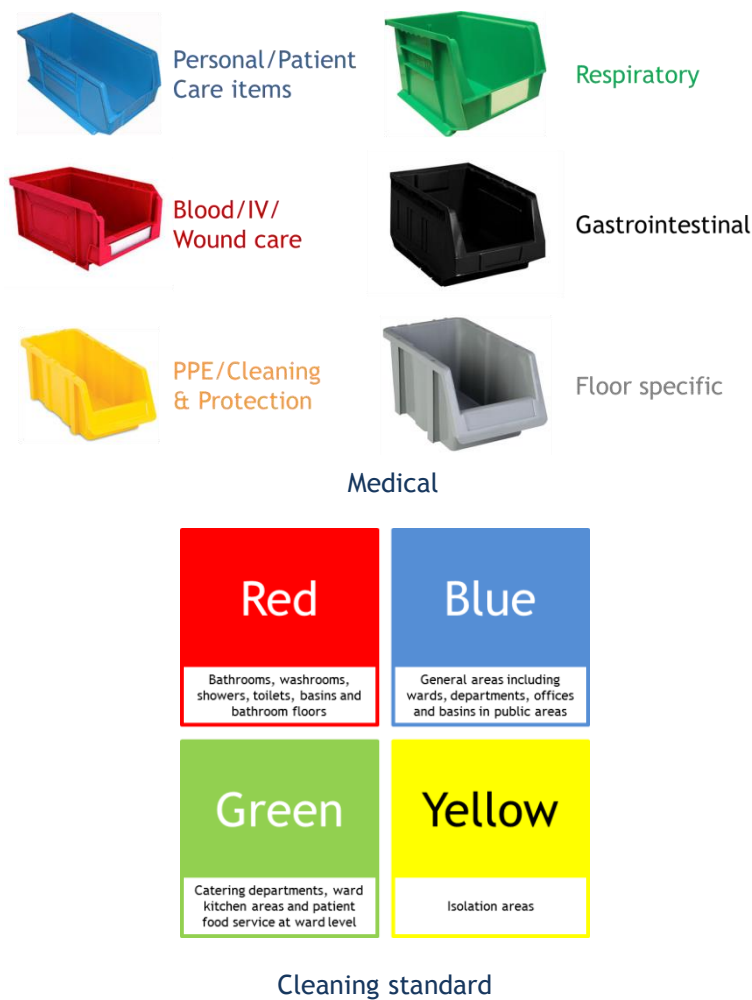Figure 19   Examples of colour coding

Introduction to Lean

Personal/Patient Care items

Respiratory

Blood/IV/ Wound care

Gastrointestinal

PPE/Cleaning & Protection

Floor specific

Medical

Red	Blue
Bathrooms, washrooms, showers, toilets, basins and bathroom floors	General areas including wards, departments, offices and basins in public areas
Green	Yellow
Catering departments, ward kitchen areas and patient food service at ward level	Isolation areas

Cleaning standard

Figure 20   Examples of colour coding

The result of the SET-IN-ORDER step is a new area or workplace layout with all storage locations carefully considered and marked, both in terms of the workbench or desk organisation and the overall work area layout. Completing the SET-IN-ORDER step eliminates wasteful activities such as searching for items, looking for parts, reports etc.
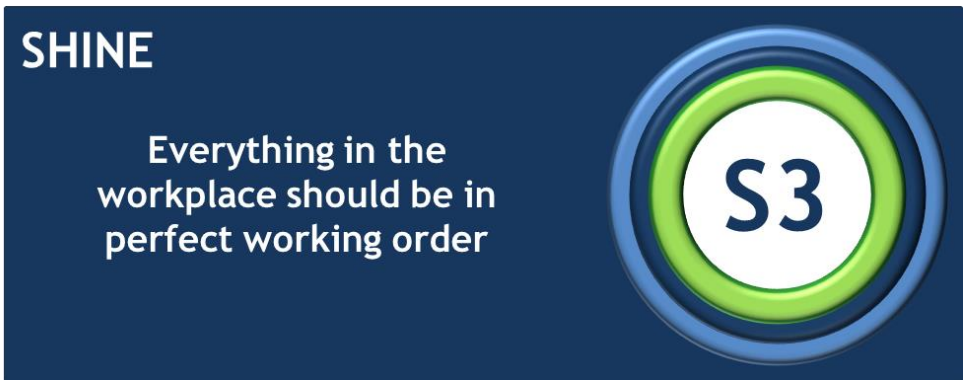
Figure 21   Examples of floor marking

7.2.3   Shine

This step involves cleaning the place of work, whether it's the bench or desk or floor, to eliminate all dirt, grease and dust. The process of cleaning the workplace leads to detection of issues with equipment e.g. lighting, wiring, leaks etc. If something is broken, or not working properly get it fixed now!

The aim of completing the first three "S" steps is to have the workplace in a state of readiness at all times for the job to be completed. By completing steps S1 to S3 you will also be setting the standard for the workplace.

7.2.4   Standardise

The main reason for implementing 6S is the establishment of a basic workplace standard to which everyone should works. A standard is required so that the output from a process (whether it be a physical product or a service) is consistent, predictable and of good quality.

The standard is established through the implementation of the first three "S" steps, but over time through continuous improvement, the standard should be reviewed and improved.

However, once the standard has been established everyone must work to it until a new standard is developed.

STANDARDISE

Everyone works to the standard to ensure consistency, until a new standard is developed

S4

7.2.5   Sustain

The fifth step, Sustain, is often the most difficult to keep up. Immediate benefit is generally seen in the implementation of the first four "S's", the difficulty comes in maintaining the gains made by implementing these steps.

The benefit of progressing to the "Sustain" step is that continuing to execute the four S steps means that the full gains of implementing 6S will be maintained.

SUSTAIN

Change habits, build a culture of Continuous Improvement

S5

Figure 21   Examples of floor marking

7.2.6 Safety

Safety should be the first consideration in any improvement project. It is imperative that you don't introduce any safety risks by changing existing processes. Safety should be implicit in any process of improvement. Promotion of safe practices is a priority for all employees in an organisation.

When implementing improvement projects, ensure all required safety equipment is put in place. A risk assessment should be completed by the Health and Safety representative to ensure that any potential safety risks are eliminated or at least mitigated with appropriate countermeasures in place.

7.3   Visual Management

Visual Management is defined as a set of techniques for creating a visual workplace, embracing visual communication and control throughout the work environment.

6S/workplace organisation is the first step on the Visual Management pyramid, which illustrates the levels of visual control which can be implemented. These range from the basic 6S to the ultimate level, error proofing where defects are prevented from happening in the first place.
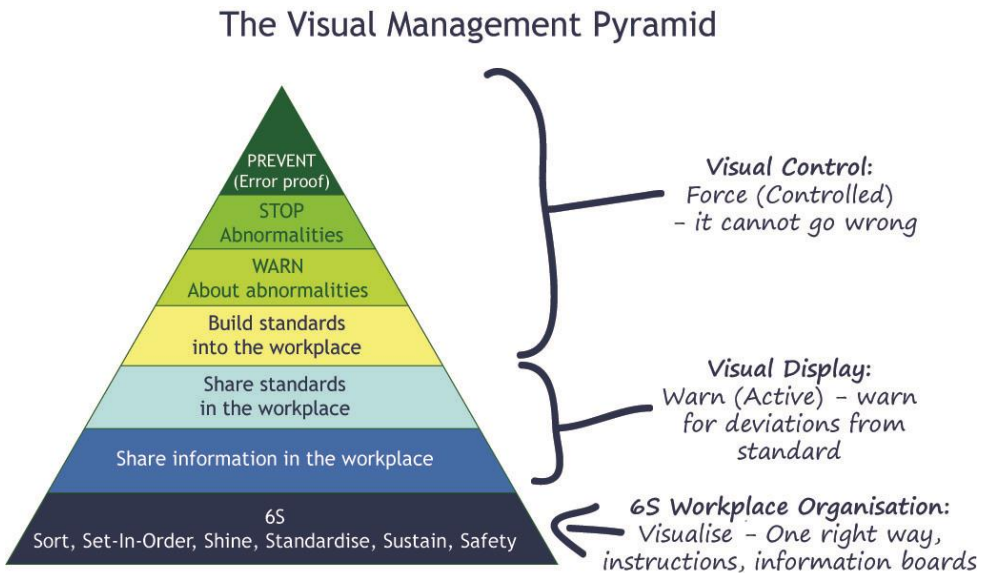
The Visual Management Pyramid

PREVENT (Error proof)
STOP Abnormalities
WARN About abnormalities
Build standards into the workplace
Share standards in the workplace
Share information in the workplace
6S Sort, Set-In-Order, Shine, Standardise, Sustain, Safety

Visual Control: Force (Controlled) – it cannot go wrong

Visual Display: Warn (Active) – warn for deviations from standard

6S Workplace Organisation: Visualise – One right way, instructions, information boards

Figure 22   The Visual Management Pyramid

7.3.1   Visual Display

Visual display serves as a method for improving communication between members of a work group. Visual display, as indicated in the graphic above includes sharing of information and standards for the group.

Ideally, team members themselves should maintain a display of area performance metrics, schedules, improvement actions, cross-shift management issues training matrices and other useful group. For example visual displays could include:

- Standard Work Instructions
- Performance information
- Status of current issues/actions lists
- Schedules of Maintenance, Calibration & other support activities
- Product and process information
- Customer requirements information
- Site level display board

7.3.2   Visual Control

The objective of the use of visual controls is to actually guide or control the actions of the team by visual means. Examples of visual controls which are
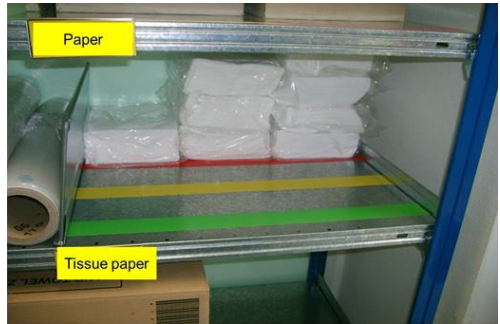
seen in general use are illustrated below.

Examples of visual control techniques include:

Andon lights

Kanbans

Visual control is often achieved through the use of notice boards prominently displayed in the workplace. These boards are updated frequently and used to control production or specific projects. The board below is used to highlight where issues exist on specific tasks and display an imbalance in the allocation of work to software developers.

Once the board is kept up to date, appropriate action can be taken to focus on the areas where issues exist to bring them back on track.

SOFTWARE PROJECT STATUS

| | IN DEVELOPMENT | IN TEST | COMPLETED | WAITING | UNSCHEDULED WORK |

Visual control is also referred to as "management by sight", in basic terms it means:

- Anything that doesn't belong is obvious.
- Anything that is in the wrong place is obvious.
- Anything that is unsafe is obvious.
- Anything that is out of sequence is obvious.
- Too many or too few is obvious.

Reference section 7.5, the PIT Process with regard to Visual Display and Control of production performance information.

7.3.3   Benefits of Visual Management

The most immediate benefit of the introduction of visual management is that it exposes abnormalities i.e. situations where standards are not being met. In addition, the following benefits are associated with the practical use of visual management.

- Facilitates employee autonomy – clearly sets expectations, empowering employees by giving them responsibility for their own work areas
- Serves to eliminate wastes such as searching and errors due to miscommunication or lack of communication of organisational targets
- Promotes prevention because it's easier to see when the work situation is not in control
- Fosters continuous improvement through regular monitoring of performance, detection of issues and associated problem solving
- Leads to information sharing automatically once the visual displays are kept up-to-date
- Maintains gains made by the implementation 6S programme

7.4   Standard Work

Standard work is defined as a precise description of each job (work activity), a simple written description of the safest, highest quality, and most efficient way known to perform a particular process or task.

STANDARD WORK
- Simple
- Written
- Safest
- Highest quality
- Most efficient

Standard Work Chart

It describes the best combined use of people, equipment and materials to do the job with minimum waste. It should be the only acceptable way to do the process it describes. Is an agreed upon set of work procedures that establish the best and most reliable work sequences for each team member. It's aim is to maximise performance while minimising waste in each persons operation and workload.

However, in the process of continuous improvement the process shouldn't be "cast in stone" but open continually be improved.

It is a basic tool for continuous improvement. It organises and clearly defines the movements of the team member to maximise efficiency.

Standard Work is usually displayed in the form of visual charts in the work area. It provides a pictorial depiction of work sequence for Supervisors and Team members, including material flow and production flow for all team members.

In addition it can assist the supervisor in monitoring work at each station, typically the standard work documentation will include a breakdown of the work the operator should have completed by a certain time.

7.4.1   Elements of Standard Work

Standard work is defined by 3 critical elements for every person doing the work

- **Takt time** – matching the pace of production to meet customer demand
- **Work Sequence** - The most efficient work routine (steps & cycle times) within Takt time
- **Standard Work In Process (SWIP)** - The minimum amount of inventory required to keep the process flowing smoothly.
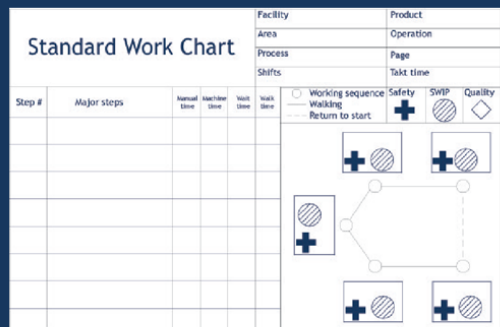
7.4.2   Takt Time

Takt Time is a calculated value which establishes the rate at which a product must be manufactured to meet customer demand. Is is derived from "TAKT", a German word word for "meter" or "beat". It represents the production rate, or pace, for the entire production system based on the actual customer demand.

Takt time is calculated by taking the long term average demand for an organisation's products and relating this to the actual time available to produce the goods.

TAKT TIME

$$= \frac{\text{Work time available}}{\text{Average demand}}$$

The aim of working to takt time is to produce what the customer wants when he wants it. Takt time brings standardisation and supports standard work in that the work is designed and balanced to fit the time available to meet customer demand.

Working to the takt for the operation means that the team member knows

exactly what they are expected to produce in a specified amount of time.

7.4.3   Work Sequence

The optimum work sequence for any operation is produced by firstly observing the current process and through analysis and simplification remove variation and standardise the task elements.

The first step is to go to the workplace and observe, collect and record actual data on the current task. It is generally recommended that observations be taken over a minimum of 7 cycles. It is essential to go to the actual workplace and collect real data instead of using existing standards, the collection of new data helps highlight waste in the existing process.

The following need to be considered:

- The lowest repeatable time for the work element
- The Total Cycle Time - the time to complete the entire work cycle from the start to the finish – this should be balanced and improved so that it is approximately 90% of the takt time; this allows for variation in the process

The data provided by observation allows you to identify fluctuations in the work cycle, which are calculated by subtracting the lowest repeatable time from the highest value. These fluctuations contribute to waste in a process and must be eliminated to achieve continuous flow.

The information gathered from the work floor is used to reorganise and improve the work cycle

The final work cycle is documented and the charts are displayed at each workstation for visual display and immediate access to Work cycle information.

7.4.4   Standard Work-In-Process (SWIP)

SWIP an be defined as the minimum amount of inventory required to keep the process flowing smoothly.

SWIP = (Manual cycle time + Automatic cycle time)/Takt time

If the total operation time is less than or equal to the Takt time, standard work will be one unit.

7.5   Levelled Production

One of the Lean Principles is "Flow", the aim of which is to achieve single or one-piece flow. In practical terms this generally will not be achieved immediately (or in the short term). However, the goal is still to reduce batch sizes as much as possible, reducing work-in-progress i.e. the wastes of inventory and overproduction.

Many companies release work to their production processes in large batches, which can introduce several problems:

- Takt time (customer demand) doesn't drive planning of production
- The value stream does respond to pull (from the customer)
- The volume of work is uneven over time (peaks and troughs create stresses on equipment and people)
- Management find it difficult to establish whether production is ahead, behind or on target
- Production sequence is often re-ordered depending on who shouts loudest, orders are 'leapfrogged' over others which increases lead time on some orders and forces expediting of others

The ultimate goal of load levelling is to produce the same amount of products in every production period (usually daily).

Level loading is the equalisation of quantities (and types) of products produced in any value stream. It's a process of putting customer orders in a sequence and adjusting the product mix to smooth day-to-day variability while still meeting customer term demands.

Introducing level loading eliminates peaks and troughs and over-production, it seeks to take variation out of the demand pattern, which allows organisations to more closely match production capacity with demand.

7.6 PIT Process

The PIT process provides a mechanism for performance monitoring against the stated plan and allows for:

- Identification of the appropriate actions required to remedy any variance immediately
- Escalation of issues if the determination of the root cause is outside the team's control.

PIT is a quick production focused review aimed at ensuring that the agreed production target for an area is achieved consistently. The scope of the PIT meeting is the current production period to focus on the daily target, but the determination of the root cause for recurring issues should be addressed through other forums.

The name "PIT" is an acronym drawn from the following three words:

Performance
PIT involves a review of the performance of the current operation i.e. progress with respect to a stated goal. For example it could just as easily be yield, uptime as much as productivity.

Issues
PIT identifies the issues currently impacting performance, and how these issues are being addressed. Immediate action must be taken to contain the issue and protect output. However, the frequency and impact of the issues should be captured in an actions list for root cause analysis and resolution, feeding into a longer term Continuous Improvement effort.
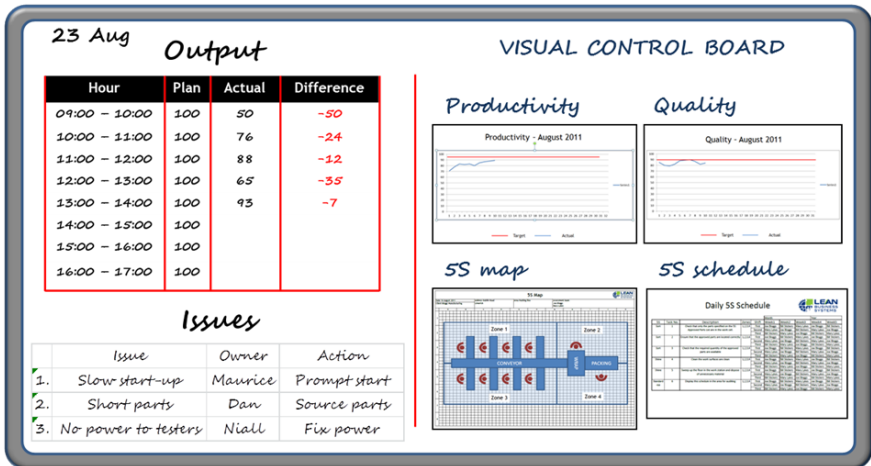
Targets
PIT involves setting clear unambiguous goals which meet the business needs and asks the best of the team.

Production data for review is recorded during the production shift on a visual display board in the production area. The PIT meeting takes place around this board and is chaired either by the production supervisor or the appropriate line lead. The attendees will be the supervisor, line lead, relevant team members and support staff (e.g. Engineering, Planning, Quality, Purchasing, Logistics etc.).

In production, the PIT process is implemented by the area team members, line leader and line supervisor. While completing process related activities, they must collect data to monitor performance vs. the plan. The PIT meeting serves to review this data, highlight issues and take appropriate action to ensure that any performance gaps are closed with immediate effect, so that the daily output is protected.

This is best done in the production area in front of a white board which displays the KPI information (see sample layout below).

23 Aug

Output

Hour	Plan	Actual	Difference
09:00 – 10:00	100	50	-50
10:00 – 11:00	100	76	-24
11:00 – 12:00	100	88	-12
12:00 – 13:00	100	65	-35
13:00 – 14:00	100	93	-7
14:00 – 15:00	100		
15:00 – 16:00	100		
16:00 – 17:00	100		

Issues

	Issue	Owner	Action
1.	Slow start-up	Maurice	Prompt start
2.	Short parts	Dan	Source parts
3.	No power to testers	Niall	Fix power

VISUAL CONTROL BOARD

Productivity — Quality

5S map — 5S schedule

In this case, the board clearly states what the output should be for each hour of the shift. Beside this, the actual output is stated and the difference highlighted. The reasons for not meeting the target are listed on the lower left hand side of the board and the action required to fix the issue is identified. These actions must be acted on swiftly to ensure the output is achieved.

Illustrated below is a set of boards currently in use in one organisation. The first board sets out the plan for the week and tracks progress to the plan on a daily basis.

AREA NAME						
	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
LINE 1						
Plan:	6000	6000	6000	6000	6000	2000
Actual:	5700	5950				
Delta:	300	50				
LINE 2						
Plan:	8000	8000	8000	8000	8000	4000
Actual:	7900	8100				
Delta:	100	100				
LINE 3						
Plan:	10000	10000	10000	10000	10000	5000
Actual:	9990	900				
Delta:	10	1000				
LINE 4						
Plan:	2000	2000	2000	2000	2000	1000
Actual:	1900	2000				
Delta:	100	0				

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Each individual line has its own separate board (see below) which feeds into the summary board above.
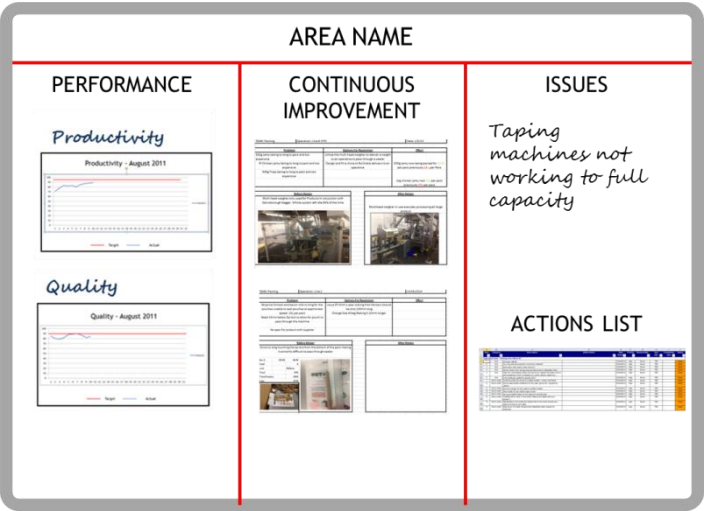
Issues and performance data are posted to a summary board which is used to drive an action list to root cause issues and promote fixes. The continuous improvement section is used to display the status of current improvement projects for example.

AREA NAME				
HOUR	TARGET	ACTUAL	DELTA	DAILY TARGET
8–9	1000	800	–200	10000
9–10	1000	980	–220	ISSUES
10–11	1250	1150	–320	Short packaging
11–12	1250	1300	–220	Taping machine downtime
12–13	500			
13–14	1000			
14–15	1000			
15–16	1000			
16–17	1000			
17–18	1000			

7.7   Stability - Summary

The goal of standardisation is to introduce the basic minimum level of performance in the workplace.

- **6S or Workplace Organisation** clears the workplace of all unnecessary items leaving only what is needed, organised in the safest and most efficient fashion. It reduces the waste of time spent searching for things, whether they be tools, equipment, documents, files etc.

- **Visual Management** ensures that all deviations from the established standard are immediately obvious, issues are made visible and action can be taken promptly to remedy them.

- **Standard Work** makes sure that everyone knows what is expected of them in terms of activity and performance i.e. they know what to do and the rate at which it should be done. Introducing standard work makes the work and performance more measurable and reduces the wastes of inventory and overproduction.

- **Levelled Production** standardises, as much as possible, the load on the process/people in the given production period, reducing stresses on processes and people and unpredictability in work loadings.

The overall result is a standard, predictable output from processes which is easier to monitor and measure.

Finally, introducing the **PIT Process** means that management at all levels regularly check what is happening at the workplace, that clear targets are set and achieved.

Chapter 8 – On-Time

8.1   Introduction

The "On-Time" pillar in the Lean house of quality is concerned primarily with the Lean Principles of **FLOW** and **PULL**.
"On-Time" refers to activities which make materials flow smoothly through process steps. The goal is to deliver the product or service to the end customer when he or she wants it, to achieve this the entire Value Stream must be considered.

The main concepts and disciplines concerned are:
- Takt Time
- Just-In-Time
- Kanban
- Flow
- Pull
- SMED (Quick Changeover)

8.2   Takt Time

Takt time was already referred to in section 7.4.2, where it was defined as the rate at which a product must be manufactured to meet customer demand. Takt Time is calculated as:

TAKT TIME

$$= \frac{\text{Work time available}}{\text{Average demand}}$$

The ideal for the organisation is to work to the customer takt (demand) when manufacturing a product or delivering a service. This refers back to the fourth Lean principle "PULL" where upstream operations do not produce anything unless responding to demand from downstream operations.

8.3   Just-In-Time

Just-In-Time or JIT is defined as a system for producing and delivering the right items at the right time, in the right amounts. The key elements of Just-In-Time are Flow, Pull, Standard Work and Takt Time.

The objective of Just-In-Time is to reduce the amount of inventory held between process steps.

In practice, Just-In-Time may translate to establishing local suppliers and having them hold the inventory, delivering it on a "call-off" basis at an agreed frequency. "Call-off" means that regular deliveries are agreed between the supplier and customer reducing the cost exposure to the customer.

Introduction to Lean

8.4 Kanban

Kanban is defined as a material management and replenishment system which 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 the downstream process must pull from the upstream process thus giving it permission to produce more parts only when needed. This will eliminate the waste of "Inventory" in the production area.

A Kanban is a signal to withdraw or manufacture goods, essentially a form of Visual Management to ensure that only goods that are needed are withdrawn.

The signal is usually in the form of a card which gives information concerning:

- What to produce
- When to produce
- The quantity to produce
- What means to be used (i.e. the procedure or work instruction)
- How to transport it
- Where to store it

Kanban Card		LEAN BUSINESS SYSTEMS
Card ID: 252	Withdrawal Kanban	Print date: 4 May 2013
Lot size number: 1 of 4	Part number: 123456ABC	Ref. dwg. no: 123ABC Revision C
Part name: Spindle	Kanban quantity container type: Tote	
Supply point: B		
Usage point: C		

Revision 00   January 2009

There are six rules which govern the introduction of Kanban:

Six Rules of Kanban

1. An upstream process never sends a defective product to a downstream process

2. The downstream process must come to withdraw goods

3. The upstream process produces the exact quantity to be withdrawn

4. The introduction of Kanban is only applicable for stable (level load) environments

5. Kanban is a tool for fine tuning your production

6. To successfully introduce Kanban the process must be stabilised and rationalised

Kanban can only be successfully introduced where the load on the process is level or consistent, and processes have been standardised to work to customer takt. This is referred to as Heijunka, a method of levelling the demand on production and is a pre-requisite for the introduction of Just-In-Time systems. It involves averaging both the volume and sequence of different model types on a mixed-model production line.

Kanban is only suited to stable environments, all processes must be capable of meeting demand (in terms of time and quantity) without overproducing. All equipment must be well-maintained as break downs will stop the system.

A significant point to note is that defects should be fixed where they occur and not passed on to downstream process steps. The further into a process a defect passes, the more it will cost to rectify it.

8.5   Flow

Flow is the third Lean Principle, where materials flow through process steps without delay or stoppages.

The aim is to remove the bottlenecks which prevent materials (or files or reports etc.) moving through their respective process steps. For example, bottlenecks could include material shortages, machine stoppages or other process delays such as lack of paperwork, drawings, specifications or approvals.

Ultimately, the job should not be started until everything is in place to finish it, whether it be materials, tools or equipment or specifications.

In practical terms, the primary considerations supporting flow are:

ELEMENTS OF FLOW

- Layout
- Materials
- Machines
- Methods
- People

See overleaf for detail on each of these elements.

ELEMENT	DESCRIPTION
LAYOUT	Organise processes, machines and equipment in a logical fashion to support flow. Primary considerations are the wastes of TRANSPORT and MOTION. Complete a 6S exercise to ensure that all tools, equipment and furniture are in place as required.
MATERIALS	Implement just-in-time systems to ensure the correct amount of what is needed is delivered when it is needed, directly to the point-of-use. Work to customer takt and determine how systems like Kanban can be implemented.
MACHINES	Where processes are dependent on machines to complete process steps, breakdowns or stoppages will stop the line, resulting in delays in delivery to the customer. Implement programmes such as TPM or OEE to reduce and eventually eliminate delays, breakdowns or stoppages. **TPM (Total Productive Maintenance)** is defined as a company-wide team-based effort to build quality into equipment and to improve overall equipment effectiveness. All employees are involved, it aims to eliminate all accidents, defects and breakdowns. Regular maintenance tasks are performed by the machine operator to keep equipment in good condition without having to wait for official maintenance personnel. **OEE (Overall Equipment Effectiveness)** is a composite measure of machine effectiveness determined by considering three aspects of the machine's performance: availability, efficiency and quality.
METHODS	Standard work should be put in place, standard work instructions should be available for each task to be performed.
PEOPLE	People should be fully trained in the tasks they need to perform. In addition, as much as possible, people should be cross-trained to avoid disruption due to illness etc.

8.6   Pull

Pull is the fourth Lean principle and means that the system produces only what has been consumed by downstream activities i.e. the internal or external customers. Application of the concept of Pull will include the implementation of Kanban, as this is a primary mechanism for matching production to demand.

Pull is in direct opposition to the traditional "Push" system where upstream activities produce to a forecast irrespective of customer demand. Push systems promote the proliferation of the eight wastes, in particular INVENTORY, OVERPRODUCTION and WAITING for large batches to be completed.

The primary driver of Pull is understanding what the customer wants, in what quantities he wants it and when he wants it. Systems of production, whether they be for a physical product, an electronic file or report, or delivery of a service must then be set up to supply only what the customer desires.

8.7   SMED (Single Minute Exchange of Dies)

SMED is a methodology for reducing changeover/set-up times to less than 10 minutes with the long term objective being zero, or instantaneous changeovers.

Changeover time is defined as the time elapsed between the last good piece of product A being produced and the first good piece of product B being produced.

Last good piece of product A   **First good piece of product B**

Total setup

The most basic cornerstone of any setup reduction is to first understand the difference between external and internal elements:

- **Internal elements**: operations that must be performed while the machine/process is stopped
- **External elements**: operations that can be performed while the machine/process is still running

The process is started by closely observing the changeover process so that the distinction between internal and external elements are made clear.

Once the difference is understood, the process of converting internal to external can be initiated. The key is to complete all preparatory work before starting the changeover, eliminate search-and-find work and have tools & materials arranged beforehand.

Machine settings should be standardised, machine stops or visual marks should be put in place to eliminate the time wasted due to "trial-and-error" adjustments to get the settings correct.

On large machines is may be possible to establish "Parallel" steps, which are completed at the same time by two people, one at the front and one behind the machine.

In short:

- Functional fixtures and jigs should be used, such as motion fasteners, levered or one-turn fasteners or interlocking wedges or slots.
- Eliminate adjustments by using preset pins, guides, notches etc.
- Eliminate the need to leave the machine by delivering material to the point-of-use via external suppliers or dedicated material allocators.

A 6S programme will assist by establishing the Visual factory, through setting up logical locations for tools (SET-IN-ORDER), colour coding of parts bins or tools which relate to a product or assembly, and the availability of checklists defined as part of the Sort step.

The goals of SMED are:

- To reduce inventory
- To reduce batch sizes
- To reduce changeover time
- To reduce impact on equipment utilization
- To improve quality after changeover
- To improve repeatability
- To improve throughput
- To improve flexibility

8.8   Summary

"On-time" means not only on-time delivery to the customer, but it also applies to each individual process step. It aims to reduce inventory to the minimum to support production, implement flow and work to the takt of customer demand.

The main concepts and disciplines which support the concept of **ON-TIME** are:

- **Takt Time** – produce to customer demand in terms of quantity and delivery
- **Just-In-Time** – organise supply of material so that it's delivered only when you need it
- **Kanban** – only produce what is needed
- **Flow**- make materials run through each process step without delay or stoppage
- **Pull** – understand what the customer demands and produce only what is needed, when it's needed
- **SMED (Quick Changeover)** – reduce the time requirement to set-up processes when changing from one product to another

Chapter 9 – Built-In-Quality – Right-First-Time

9.1   Introduction

In chapter 8 we discussed the first pillar of the house of Lean, On-Time or Just-In-Time. The other pillar refers to Quality or "Built-in-Quality". "Built-In-Quality" relates directly to the seventh waste defined by Lean i.e. Defects. The aim is to reduce or eliminate wasteful activities such as double-handling and failures. The Lean concept of quality contradicts the traditional notion of "inspecting in" quality after the work is done, by insisting that people take responsibility and are accountable for the quality of their own work, expressed as "Right-First-Time". Each person does his or her job correctly and if there is an issue, it is identified and fixed immediately so that the issue is not passed on to the next process step.
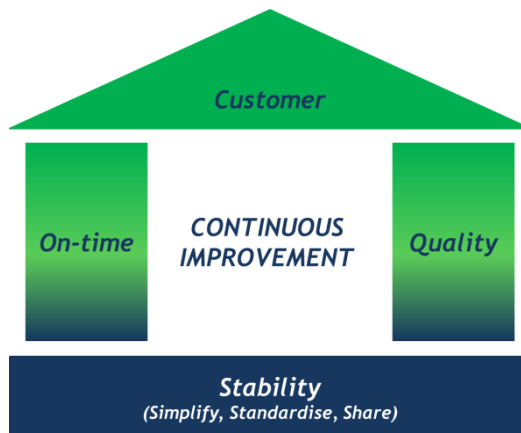
9.2   Errors vs. Defects

Defects are caused by process errors, where a mistake occurs in an operation or process, resulting in the defect.
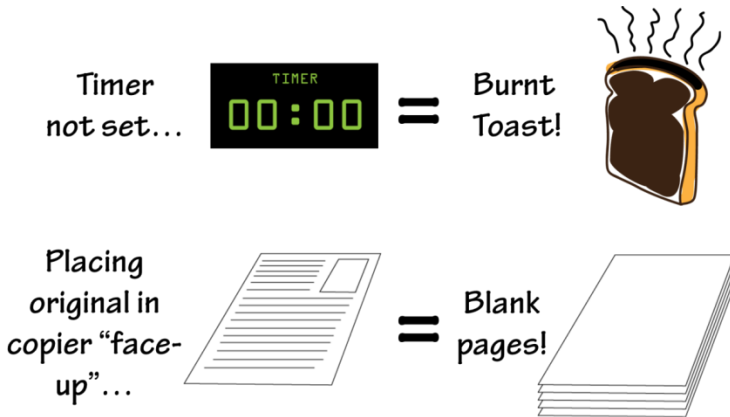
It is important to note that while human errors are inevitable, defects can be eliminated. "Built-In-Quality" is a process designed to reduce or eliminate the occurrence of process errors which lead to defects.

The Visual Management Pyramid

In the discussion on 6S and Workplace Organisation, reference was made to the Visual Management pyramid. Implementation of successive levels of the pyramid supports Built-in-Quality, through the introduction of improved communication and standardisation of processes.

The highest level of the pyramid, "error-proofing" makes it virtually impossible for an error to occur.

Error-Proofing is defined as a structured process which seeks to prevent errors through robust process design, to eliminate or immediately detect defects as they occur. It ensures that defects are **NEVER** passed onto downstream processes.

Where defects occur, immediate detection is vital so that the problem is not passed onto successive process steps. The further down the process a defect is gets, the more it will cost to rectify if it can be reworked, or else it may be scrapped.

9.3   Poka Yoke

Poka-Yoke is a Japanese word which refers to Error-Proofing a device or procedure that can immediately identify errors, and will prevent defects from being passed to the customer.
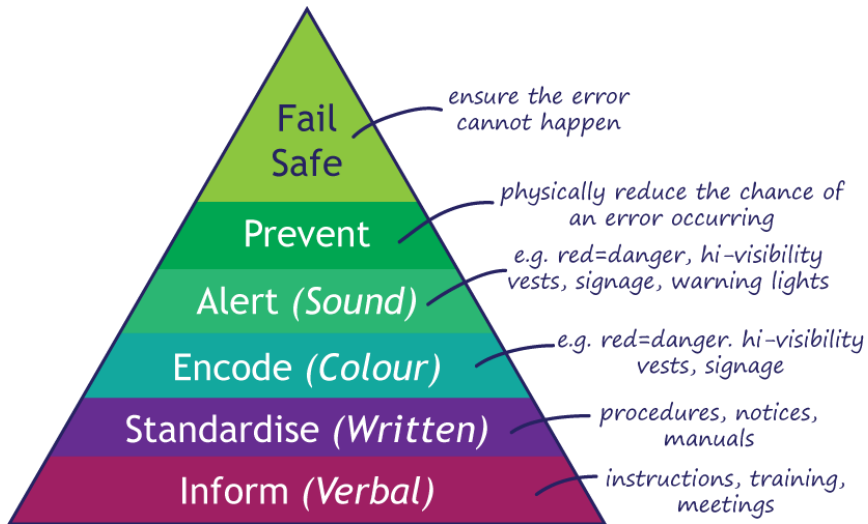
It demands that the process is designed so that mistakes cannot occur or if they can occur that they are easily spotted and corrected.

The benefits of implementing Error-Proofing are:

- Promotion of Job Safety leading to the prevention of personal injuries
- Avoidance of the production of sub-standard products or services
- Prevention of damage to equipment
- Promotion of Customer Satisfaction

Depending on the nature of the process, different degrees of Error-Proofing may be appropriate. The steps in Error-Proofing are summarised in the graphic

below**.**

Introduction to Lean

Pyramid diagram (top to bottom):
- **Fail Safe** — ensure the error cannot happen
- **Prevent** — physically reduce the chance of an error occurring
- **Alert (Sound)** — e.g. red=danger, hi-visibility vests, signage, warning lights
- **Encode (Colour)** — e.g. red=danger. hi-visibility vests, signage
- **Standardise (Written)** — procedures, notices, manuals
- **Inform (Verbal)** — instructions, training, meetings

Some commonplace examples of Poka Yoke are illustrated below.

EVERY DAY EXAMPLES OF POKA YOKE

FILING CABINET

Only one drawer can be opened at a time to prevent the cabinet falling over

FUEL CAP

1. Ratchet on cap to prevent over-tightening
2. Cap attached to car body to prevent loss
3. Spout will only fit correct pump

MOBILE PHONE

Left in the shoe so that it's not forgotten in the morning!

9.4   Do the things right

How can you ensure things are done "Right-First-Time" and errors are eliminated? By implementing some of the ideas discussed in earlier chapters of this book!

For example, a well organised workplace will make it easier to do the job correctly and see where issues exist (6S/Workplace Organisation and Visual Management). Work processes which have been standardised will take you further along the path to Customer Satisfaction.

Clearly defined processes with clear work and the use of visual aids, jigs and fixtures will reduce the opportunity for variation in the performance of the work activities. The work should be set up to ensure that things can be done only one way, the right way i.e. the standard. Everyone works to the standard until a new standard is developed. The drive towards Continuous Improvement will mean improvements to the existing standard, however, changes should be achieved by following a structured, scientific method.

The aim should be to make the best way also the easiest way, so that it is more difficult to produce a defect than not to produce a defect.

Standardised process and work procedures are one significant element of Right-First-Time, however, those operating the standardised process must be accountable and take responsibility for the quality of their own work. Having the best processes in the world won't get you anywhere if people don't stick to them!

For example, each team member should be empowered to stop the line to prevent further generation of waste where an issue has been detected.

A culture of Continuous Improvement entails empowerment of employees to contribute ideas for improvement of issues which have been found. This implies a degree of flexibility on the part of the employee, and a willingness to constantly be on the lookout for potential enhancements of the offering to the customer.

Introduction to Lean

9.5   Do the right things

In doing things "Right-First-Time", it is implied that the right things are being done in the first place!

Generally it will be accepted that management's role is to set the overall vision for the organisation and break this down into annual high level objectives, in terms of revenue, profitability, expansion into new markets etc.

Subsequently, each level passes on targets to the next level in the organisation. At each level down managers and employees participate in defining their annual targets and detailed action plans.

Each level under top management is, in turn, involved with the level above it to make sure that its proposed strategy corresponds to requirements.

Regular reviews take place to identify progress and problems and to initiate corrective actions.

Conversely, in a culture of Continuous Improvement, information should feed up into the organisation's plans through the continual identification and resolution of day-to-day problems.
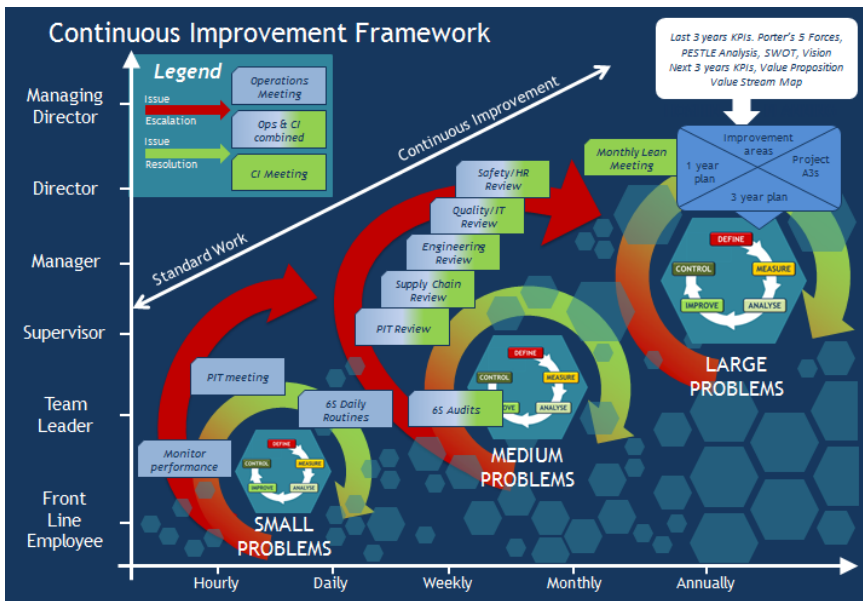
The type of problems that businesses generally experience can be divided roughly into three categories; small, medium and large and their approach to resolution is illustrated in the above diagram.

"Small" issues generally demand an immediate fix, and this day-to-day problem solving is typically performed by operators and team leaders. This is achieved primarily through the 6S process and monitoring of performance through the PIT process.

"Medium" issues raised may require the establishment of cross-functional project teams to implement improvement projects over a period of weeks or months. In the course of implementing these projects, fundamental issues may arise which demand support from senior management.

In addition, periodic review by senior management of the types of problems being encountered may identify areas where changes to the overall company strategy is required. These areas can be described as "large" issues or opportunities for improvement. Examples could include response to specific customer issues which drives a re-evaluation of the organisation's value proposition or a re-evaluation of supplier/partner alliances to secure better terms for the company.

In this fashion, a culture of problem solving leads to improved planning and competitiveness for the organisation.

9.6   Root Cause Analysis

Root cause analysis is used to manage a complex problem by breaking it down into logical components with the aim of solving the real problem instead of its symptoms. Adopting this approach should ensure a permanent fix for the issue, preventing its recurrence.

The first step in the process is to understand and clearly define the problem to be solved, and secure agreement from all stakeholders that this particular issue deserves attention.

Then using the appropriate problem solving tools identify a list of possible causes.

For each cause highlighted ask: "Why is this a problem?" and continue to explore the causes until the root cause is identified. A general guideline is to ask "Why?" at least five times.
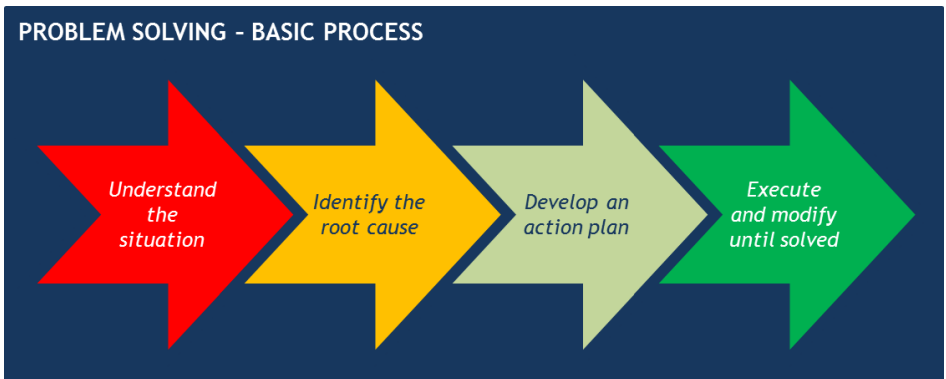
The analysis phase follows, where data is collected to verify that the true root cause has been identified. Once the root cause has been established, a suite of countermeasures can be designed to implement a permanent fix. Proposed solutions should be evaluated by all stakeholders to pinpoint the best alternative.

Once a consensus has been reached, the solution is implemented, a periodic check should be put in place to ensure that the problem has been stopped at its root.

The steps described above align with the Six Sigma problem solving methodology DMAIC, which is described in more detail in the next section.

9.7   Problem Solving

A culture of continuous improvement necessitates that all individuals in the organisation are trained in a basic problem solving methodology and in basic problem solving tools. A simple Problem Solving methodology is illustrated in the graphic below:

PROBLEM SOLVING – BASIC PROCESS

Understand the situation → Identify the root cause → Develop an action plan → Execute and modify until solved

Lean thinking advocates a structured approach to problem solving; the use of a scientific methodology makes it more likely that improvements will be more easily quantifiable and sustained in the long term.

The problem solving approach defined on Six Sigma is referred to as DMAIC,

which is an acronym for Define, Measure, Analyse, Improve and Control.

The steps in the DMAIC process are illustrated below:

DMAIC

|		
?	**D**EFINE	*Obtain a clear understanding of what the issue is, clearly state the exact nature of the problem*
	MEASURE	*Collect data to get a clearer picture of the extent of the problem – the "pain" it causes to organisation*
	ANALYSE	*Review the information collected and brainstorm possible countermeasures or actions which can be taken to fix the problem permanently. Select the planned improvements for implemention.*
	IMPROVE	*Implement the change*
	CONTROL	*Ensure the change made has brought an improvement and that the gain made through its implementation is sustained*

There are a number of commonly used problem solving tools which are used to fix issues permanently. These are briefly described below, for more information a separate publication is available from LBS. (Problem Solver booklet ISBN 978-0-9570203-2-0).

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The main Problem Solving tools employed are:
- Process mapping
- Check sheets
- Run & Control charts
- Pareto charts
- Cause & Effect diagram
- Scatter diagrams
- Histograms

PROCESS MAPPING
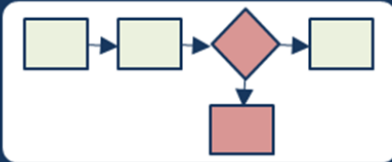
- Used to identify process steps and decision points.

- An "As-Is" process map shows how the process works today.

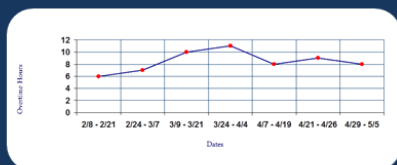- Completed to understand the process and get an idea of where issues may currently exist.

CHECK SHEETS

- Used to collect and organize data to tally the number of occurrences of an event and to translate opinion into fact.

- Usually consists of a simple tally sheet designed around a specific event.

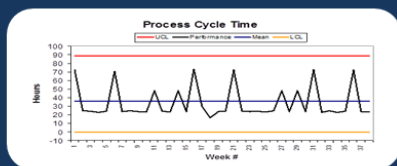- For example the number of defects found per hour of production.

RUN CHARTS

- Used when you need to do the simplest possible display of trends within observation points over a specified time period.

- A Run Chart is an aid to understanding basic characteristics of a process.

CONTROL CHARTS

- When Process Capability needs to be observed, the Run Chart can be expanded into a Control Chart.

- With a Control Chart, the control limits help you decide whether to adjust the process depending on the performance of the process.

PARETO CHARTS
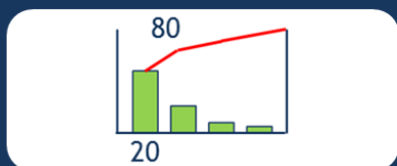
- Used to rank and prioritise problems, to show how a few problems can cause the majority of rework and/or scrap.

- A bar chart where you arrange the bars by height in descending order.

- The order of the bars reflects the importance or costs of the causes or categories associated with the issue.

CAUSE & EFFECT DIAGRAM

- Used to identify and explore all possible causes of a specific problem and analyse the relationship between causes.

- Is a brainstorming tool that guides you in organizing your thoughts.

- The main purpose is to identify sources of variation and to drill down to root cause.

SCATTER DIAGRAM

- Used to show how 2 variables are related.

- Used to test for cause and effect relationships.

- Cannot prove that one variable causes the change to the other, however you do know a relationship exists so you also know how strong the relationship is.

HISTOGRAM
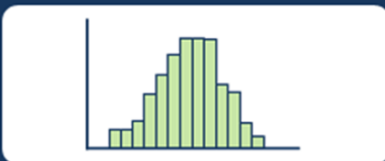
- Used to enable you to see patterns not easily visible in a table of numbers.

- It is a graphic display of variation in a set of data.

The first five tools listed above are the more commonly used of the seven, that is:

* Process mapping
* Check sheets
* Run & Control charts
* Pareto charts
* Cause & Effect diagram

These are generally referred to as the seven problem solving tools. You may also see them referred to as the Seven Basic Tools of Quality. Depending on the nature of the issue a customised solution may be required which will demand the use of a selection of these tools.

9.8   Summary

Built-In-Quality relates directly to the seventh Lean waste, Defects. Improvement results from the reduction or elimination of entirely wasteful activities i.e. the production of rework and scrap or indeed any error processing.

When processes are standardised and each person does his or her job correctly, if an issue arises it is identified and fixed immediately using basic problem solving tools and is not passed on to the next process step.

A culture of continuous improvement necessitates that all individuals in the organisation are trained in the use of these problem solving tools. The use of a formal approach to solve problems makes it more likely that improvements will be more easily quantifiable and sustainable in the long term.

The seven main Problem Solving tools commonly employed are:

* Process maps
* Check sheets
* Run & Control charts
* Pareto charts
* Cause & Effect diagram
* Scatter diagrams
* Histograms

Chapter 10 – The Customer

10.1 Introduction

Throughout this volume various aspects of Lean Thinking such as the Lean Principles, Wastes and many of the individual tools and techniques have been described. At this point, the big questions should be "why?", "what?" and "how?" i.e.

- Why should an organisation adopt Lean?
- What will it do for the company?
- How will it help achieve customer satisfaction?

In chapter 1, the customer was defined as the person who pays for the product or service, and that value could only be defined by the ultimate (end) customer.

The definition of value included the questions:

VALUE

- Would the customer pay for the activity?
- Was the product transformed or improved?
- Was the activity performed "Right-First-Time"?

10.2   Value Proposition

A value proposition is a statement which sets out how the organisation provides value for their customers. It needs to explicitly state:

• who the customer is in the first place
• what the specific benefit provided to the customer is
• what distinguishes the organisation from other similar organisations which may provide similar products or services.

For example, if the customer's primary consideration is price, the organisation could look at the performance or features of the product or service to specify them appropriately, and not waste resources providing something the customer doesn't need.

The value proposition for the customer can be thought of in terms of three critical aspects; Quality, Cost and Delivery.

Usually this translates to a quality product or service, delivered when the customer wants it and at a price he's willing to pay for it.

Introduction to Lean

Quality – The main Lean discipline which helps improve quality for the customer is the concept of only doing things once and correctly i.e. "Right-First-Time". Another expression used in this context is "Built-in-Quality".

Everyone's thinking is directed toward producing a quality product or service the first time, all of the time.

The drive toward Standardisation is an enormous step to building in quality. The system is put in place with all the necessary supports such as standard methods and instructions, so that tasks are performed in a reliable fashion which will deliver a reliable output.

The decision to follow the "Right-First-Time" discipline will reduce rework and scrap resulting in cost reductions to the organisation.

The concept of stability, encompassing tools such as 6S, Visual Management, Standard Work, levelled production and regular performance reviews (PIT) forms a significant step toward enhancing value for the customer.

Delivery – is supported by the pillar of "On-Time"; the idea being to improve flow to reduce delay in getting the product or service to the customer. Fundamental to this concept are the Lean principles of Flow and Pull, helping the understanding of what exactly the customer needs and when he needs it.

Reducing waiting time between process steps, for example, means that the product or service will be delivered to the customer in a more timely fashion.

In terms of tools and techniques, Lean supports improved delivery through the implementation the disciplines such as Just-In-Time (JIT), Kanban and reduction of changeover times (SMED) between products.

DELIVERY

- *Just-In-Time*
- *Kanban*
- *Quick changeover (SMED)*

Cost – Lean aims to produce the same output using the same or less resources which will lead to a reduction in the cost base for the organisation.

One of the key initiatives necessary to successfully complete a Lean transformation is the measurement of performance through monitoring of certain key indicators (referred to as Key Performance Indicators or KPI's).

These measures will include some of measure of how much the company spends to provide the product or service (unit cost per product/service for example).

A reduction in the organisation's costs is achieved through the relentless elimination of the eight wastes as defined by Lean.

Introduction to Lean

THE EIGHT WASTES — LBSPartners

TRANSPORT
The unnecessary movement of things, equipment, parts, tools or materials from one location to another.

OVERPRODUCTION
Making too much or too many, completing a task before it is needed. Making products that the customer hasn't ordered.

INVENTORY
Making more than is necessary to meet the customer demand, building up unnecessary stocks, between processes/process steps.

OVERPROCESSING
Duplicate or redundant operations, performing wasteful steps where they are not required. Typically is present because old norms are not questioned – "We've always done it this way".

MOTION
Unnecessary movement of people, walking to get things when they should be located closer to the point-of-use.

DEFECTS
Failing to produce a quality part the first time, generating rework or scrap. Not delivering the product or service "Right-First-Time".

WAITING
Delays between operations, because parts are missing. Work stopped: waiting for parts, waiting for machines, waiting for people.

SKILLS
Failing to utilize the skills and capabilities of everyone in the workforce. Not listening to people, not fully utilising their knowledge, not learning from past mistakes or not fixing issues.

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Examples of how direct costs will be reduced are:

- Reducing the inventory held by the company will reduce holding costs and handling costs of storing parts which are not needed
- Reducing the delay between process steps will improve delivery performance and avoid the cost of expediting late deliveries and paying for couriers
- Reducing the occurrence of defects will eliminate the cost of double handing and extra processing and rework of the product or report
- Reducing defects will also save the cost of scrap being generated
- Paying attention to what the customer needs will eliminate producing what is not needed, and storing it when the customer doesn't buy it!

COST

- **Customer value**
- **Eyes for waste**
- **Key Performance Indicators**

Overall, cost is reduced through the alignment of the company's operations with customer needs. By taking the vital step of understanding what the customer wants, and taking out what isn't needed to supply this need.

10.3   Summary

Lean Thinking has the ultimate aim of enhancing value for the customer. The Lean principles and eight wastes provide the roadmap to the implementation of a Continuous Improvement culture. This is based on the foundation of stabilising the current operation through the implementation of tools such as 6S, Visual Management, Standard Work and Load Levelling.

Once the day-to-day operation has been standardised, the focus changes to more closely matching customer requirements in terms of what he wants and when he wants it, working to customer takt.

Steps are then taken to improve how the customer's requirements are delivered, by introducing flow and pull to improve delivery, employing the concepts of Right-First-Time, Just-In-Time and using Root Cause Analysis to improve the quality of the product or service delivered.

Continuous improvement is served through the implementation of projects to identify and eliminate waste, by constantly being on the lookout for waste and opportunities to remove it.

A vital component of the improvement process is the development of people so that they are aligned with the aim of customer satisfaction and that they are equipped with the skills, such as problem solving, to consistently achieve the stated aim of enhancing value for the customer.

10.4 What now?

Now that you've invested the time to read about Lean Thinking, the Principles and Wastes, the challenge for **you** is to get value from this experience! Take the Principles and Wastes and put them to use in **your** business.

Go back to your place of work and look at what is done with fresh eyes with the eight Lean Wastes in mind.

Ask yourself, "Who is my customer?" noting that within the organisation there are internal customers as well as the end (external) customers. Always keep the end customer's needs in mind as you work with your internal customers.

Another vital question (in production terms) is "How do I distinguish a good day from a bad day?" In other words if performance is being measured, what is the current performance level? If no measurement is in place already, start thinking about what key indicators should be put in place.

Begin the adoption of Lean Thinking by asking simple questions like:

"What does my customer want?"

"How does my job help satisfy the customer?"

"What do I need to do my job?"

"Is this really needed to do the job?"

"Is this the best way to lay things out?"

Lean implementation typically begins with the appointment of a Lean champion for the organisation who will drive Lean inside the company. A basic programme of Lean Awareness for all employees is a precursor to a successful Lean transformation. Respect-for-people is based on inclusiveness; it will be very difficult to drive change without everyone's help.

Move on to implement 6S, Workplace Organisation and the introduction of Visual Management. Set down the basic standard for doing the job. Start to measure performance using the PIT process. If you are in an operations environment review how planning is done and put the plan up so that everyone can see it. If you are in a back office environment consider what the key deliverables of the processes there are and start to understand when these key deliverables get done and the issues which prevent these being completed in a more efficiently manner.

Once you've introduced stability into the system, you can start to improve things by identifying where waste exists and setting up projects to eliminate it. Once people start to see that things are improving, you can build momentum to sustain the effort.

The important thing now is to go do it. Good luck!

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