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sustainability

technology

tools & techniques

Staying Lean

Thriving, not just surviving

strategy

leadership

behaviours

processes

Staying Lean:
thriving, not just surviving

The SUCCESS programme was designed to extend the focus on Lean Thinking away from just 'How do you get it going?' to 'How do you sustain it over the medium to long term?' Within the research, this subject has been addressed at a range of scales from individuals to teams, factory shop floors, single sites, groups of companies, supply chains and regions. This publication specifically addresses the group of companies scale, a level that has attracted very little academic study. We believe sustaining change is more important for organisations than their first efforts in going Lean or using Lean to increase profits. Hence, this publication extends our earlier works on *Going Lean: A Guide to Implementation* and *Lean Profit Potential*.

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February 2008

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Contents

Staying Lean:
thriving, not just surviving

Over the last 15 years we have consistently been asked a series of searching questions about the application of Lean Thinking:

1 Where do I start?
2 Is there a road map that I can follow?
3 What does Lean Thinking involve?
4 Who will I have to involve?
5 Is it only applicable to the shop floor?
6 Is it only for manufacturing firms?
7 What will the benefits be?
8 Will it make me more profitable?

To answer these questions we have produced two publications, *Going Lean* and *Lean Profit Potential*, which give a practical insight into these topics.

However, since these publications were produced in the early 2000s the set of questions we are asked has widened, with a series of additional queries:

1 How long is it before the benefits start fading away?
2 Why do people seem to have lost their enthusiasm for Lean here?
3 What is the secret of sustainability?
4 What is the difference between managing and leading a Lean change?
5 How do we ensure continued buy-in from the workforce?

We have written this guide to help you answer these questions and ensure that you don't just start a successful Lean programme in your business but that you sustain and build on your early successes.

We have designed the book with plenty of space for you to write notes next to the text, and have included a range of sources of further information and a jargonbuster towards the end.

Throughout this guide we use a real case, that of Cogent Power, to illustrate how Lean can be applied in a sustainable way across a group company operating mostly from brownfield sites within a range of product categories, countries and cultures.

We hope you enjoy reading the book and wish you a sustainable Lean journey.

Lean vision and principles
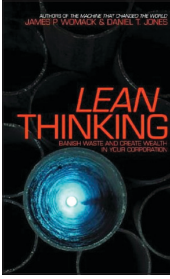
The characteristics of the Lean organisation and the Lean supply chain are described in *Lean Thinking – Banish Waste and Create Wealth in Your Corporation* by Jim Womack and Dan Jones. This book provides a vision of a world transformed from mass production to a Lean enterprise. The authors highlight the huge amounts of waste that occur in most organisations and show that a systematic attack on waste, both within companies and along the supply chains, can have tremendous benefits to the short-run profitability and long-term prospects of companies and organisations.

Lean production methods were pioneered by Toyota in Japan. *Lean Thinking* distils the essence of the Lean approach into five key principles and shows how the concepts can be extended beyond automotive production to any company or organisation, in any sector, in any country.

The five Lean principles
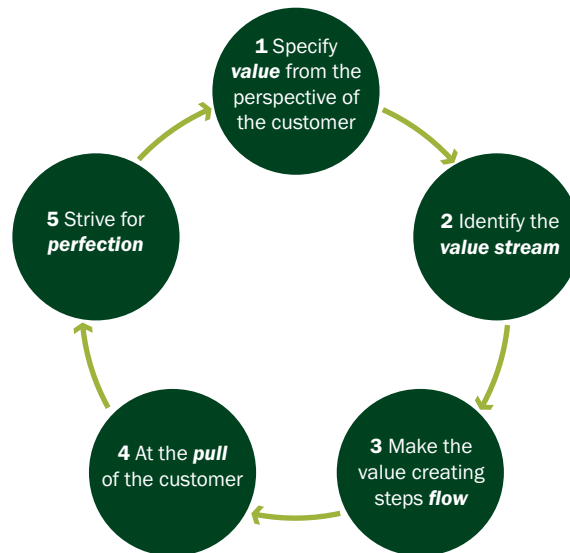
1. **Specify** what does and does not create **value** from the customer's perspective and not from the perspectives of individual firms, functions and departments.
2. **Identify** all the steps necessary to design, order and produce the product across the **whole value stream** to highlight non-value-adding waste.
3. Make those actions that create value **flow** without interruption, detours, backflows, waiting or scrap.
4. Only make what is **pulled** by the customer.
5. Strive for **perfection** by continually removing successive layers of waste as they are uncovered.

These principles are fundamental to the elimination of waste. They are easy to remember (although not always easy to achieve!) and should be the guide for everyone in the organisation who becomes involved in the Lean transformation.

If you are serious about implementing a sustainable Lean system, then the people in your organisation need to read *Lean Thinking* at the outset. If they haven't got enough time to do that, they probably won't implement Lean and certainly won't sustain it!

Understanding value and waste

In order to go Lean and stay Lean, you continually need to understand customers and what they value. To get your organisation focused on these needs you must define the value streams or processes inside your company and, later, the value streams or processes in your wider supply chain as well. To satisfy customers you will need to eliminate or at least reduce the wasteful activities that your customers would not wish to pay for.

Next you have to find ways of:
- setting the direction
- fixing targets
- seeing whether or not change is actually occurring.

You need a framework to deliver value for your customers, as well as a toolkit to make the change. The steps required to go Lean are described in *Going Lean* and *Lean Profit Potential*.

Lean focuses on creating value for the customer. This means eliminating, or at least reducing, everything else. In order to do this, Lean leader Toyota identified three key areas to address: *muda*, *mura* and *muri*. Organisations that implement, but often fail to sustain Lean systems, usually only concentrate on *muda*.

> **Readers beware!**
> Many organisations fail to recognise the importance of mura and muri. Pay attention to all three: *muda*, *mura* and *muri* if you want to succeed in, and sustain, your Lean implementation.

Muda (waste)

Identifying and eliminating waste is fundamental to a Lean organisation. However, on its own it is rarely sufficient. Improved customer focus and productivity gains lead to leaner operations, which in turn help to expose further waste and quality problems in the system. The systematic attack on waste is also a systematic assault on the factors underlying poor quality and fundamental management problems.

Waste is anything that does not add value to the customer. As a guide, seven wastes were identified by Shigeo Shingo as part of the Toyota Production System. The Japanese call this muda.

The seven wastes

| 1	2	3	4	5	6	7
Over-production	Defects	Unnecessary inventory	Inappropriate processing	Excessive transportation	Waiting	Unnecessary motion

Waste *(muda)*
Non value adding to product or service

Use the following chart to make a note of any of these wastes in your business.

Waste	Description	Examples in your organisation
1 Overproduction	Producing too much or too soon, resulting in poor flow of information or goods and excess inventory.	
2 Defects	Frequent errors in paperwork, product quality problems, or poor delivery performance.	
3 Unnecessary inventory	Excessive storage and delay of information or products, resulting in excessive cost and poor customer service.	
4 Inappropriate processing	Going about work processes using the wrong set of tools, procedures or systems, often when a simpler approach may be more effective.	
5 Excessive transportation	Excessive movement of people, information or goods resulting in wasted time, effort and cost.	
6 Waiting	Long periods of inactivity for people, information or goods, resulting in poor flow and long lead times.	
7 Unnecessary motion	Poor workplace organisation, resulting in poor ergonomics, eg excessive bending or stretching and frequently lost items.	

Mura (unevenness)

Once a Lean practitioner understands what muda is, they can focus on mura. Mura translates as unevenness or variability. If you have ever had a discussion with a Six Sigma devotee, this is probably what they were talking about when they tried to describe their approach. This may well have led to a debate about whether Lean (reducing waste) or Six Sigma (reducing unevenness) was better. You may even have had that debate yourself. Well, the reality is you need both. Consider the following figure.

Unevenness of order intake: MURA

← Time to respond to an order: MUDA →
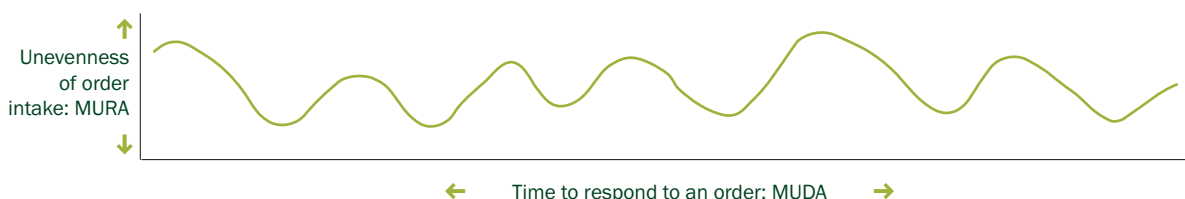
This shows the order intake of a manufacturing firm and its response time, which was not regarded as good by its customers. Should we reduce the lead time or reduce the response time?

Simple use of the '5 Whys' (keep asking why? to a problem until you have the root cause) will yield the answer. In many cases you will find that the muda is being caused by the mura. Here, the variability of demand is caused by the way sales people are rewarded. This in turn causes a long lead time. Trying to sort out this long lead time without addressing the reward system would be as effective as rearranging the deck chairs on the Titanic. Hence, always look for mura as well as muda.

Muri (overburden)

Have you ever tried to introduce Lean into an office environment where they don't actually make things? Did you start the discussion describing waste? Did you define waste as everything the customer does not want to pay for? Did you describe this as everything that was not concerned with the physical transformation of the product? Did they get the idea that everything they did was waste? Did you find it hard to embed Lean? Did they view Lean as a way to reduce jobs?

What was missing was an attention to muri. In our recent work at Cardiff University we have started to apply Lean to ourselves. To do this we have adopted the motto 'lightening the load'. We start our interventions (which are all in office-

type environments because we don't actually make things) with a question like, 'In your daily job are there any things that frustrate you or lead to you doing too much work or doing the same thing many times?' We are yet to receive a short answer!

However, the reason for the muri is often due to unevenness. So why, for instance, do nearly all postgraduate courses start in September at the same time as undergraduate courses, causing a huge spike in work for admissions staff? Well, they always have. So here mura leads to muri which probably leads to too many admissions staff for the rest of the year (muda). We are sure you could find many examples in your organisation of these vicious circles.

MURA
All courses start in September

MURI
High stress period for admissions staff

MUDA
Too many admissions staff in the rest of the year
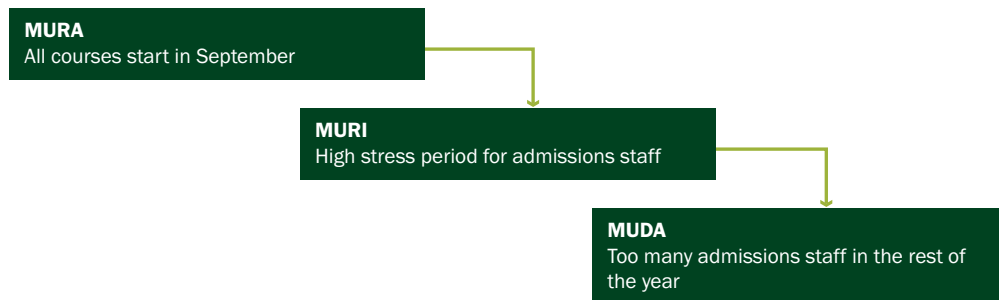
The key point is that we all need to look for muda, mura and muri. However, the most engaging and least threatening of these is muri, and sadly for the sustainability of Lean transformations, it is the one least often mentioned or addressed.

Going Lean and staying Lean

So why don't Lean programmes sustain? Well, there may be many reasons, but nearly all will be something to do with people, their leadership and their engagement. This is often made worse by a preoccupation with Lean tools.

Take, for example, white goods manufacturer Whirlpool and their application of Lean a few years ago in their North American facilities. The company adopted a Lean approach across their dozen sites with two distinctly different approaches. In half of the sites they adopted a highly focused Kaizen Blitz approach on the shop floor that yielded rapid results. In the other sites they adopted a much more careful but systematic approach focusing on culture change. In the short term this yielded little but in the long term it flourished, while the early 'hero story' sites using Kaizen Blitz started to fail.

Improvement opportunity ↑

Using Lean tools will improve performance. However, behaviours focused on continuous improvement/pursuit of perfection will provide sustainable long term improvement

Lean culture change

Greater, sustained results achieved

Lost and repeated results due to no sustainability

Improvement leveled off and eventually stopped due to lack of realising 'true' Lean opportunity

Short terms gains made

Results could be lost entirely if organisational structure not aligned to support and education level of all employees not increased

Kaizen Blitz

Awareness, education, organisation structure created to support Lean

Time ➡

Source: Chris Craycraft, Whirlpool

So what are the secrets of this 'green line' sustainability? Well, many of them are summarised below in 'Ten tips for staying Lean'. How are you doing?

Ten tips for staying Lean	How are you doing?
1 Think of Lean as a philosophy for success rather than a series of tools and techniques.	
2 Apply Lean right across the organisation, not just in the parts the textbooks talk about.	
3 Focus on improving processes or value streams, not departments.	
4 Link everything you do to creating value for your customers, your organisation and your people.	
5 Don't just copy others, think through your approach, based on what you are trying to achieve.	
6 Make everyone aware of what you are trying to achieve and why.	
7 Align your communication and key performance measures to creating and sustaining a Lean organisation.	
8 Provide sufficient resources in terms of people and training right across the organisation, not just your Lean coaches.	
9 Leaders need to not just talk about Lean; they need to demonstrate in their actions that they are serious.	
10 Make sure your finance and rewards and recognition system appropriately encourages Lean activity and motivates your people.	

Thinking it through

In our academic ivory tower we have attempted to think through what you need to do. Applying Lean is best explained by an analogy with an iceberg. It's not what you see, it's generally what you don't see that's more important… back to the Titanic again!

So, what did we see on our Japanese Lean pilgrimages? We went to a series of manufacturing firms which made discrete products from a series of components, like cars or electronics equipment. Within these firms we went to where the action was: the shop floors. What we saw was marvellous: we saw 5S, we saw kanban, we saw TPM, we saw flow, we saw all the typical Lean tools and techniques that you read about in textbooks (a good example of which is John Bicheno's *The New Lean Toolbox*).

With a little further gentle probing we also managed to establish that the secret to these firms' successes was that they worked in overriding processes. Inside the factory these were often described as Quality, Cost and Delivery. We deciphered these as three key internal processes:

- Innovation of new products (Quality)
- Lifecycle management of costs (Cost)
- Order fulfilment of existing products to existing customers (Delivery)

In addition to these tools and techniques and process-based management, it was what we did not see that was probably more important; in the Lean Sustainability Iceberg Model there are three key areas under the water which are all people-related.

The sustainable Lean iceberg

The Sustainable Lean Iceberg Model
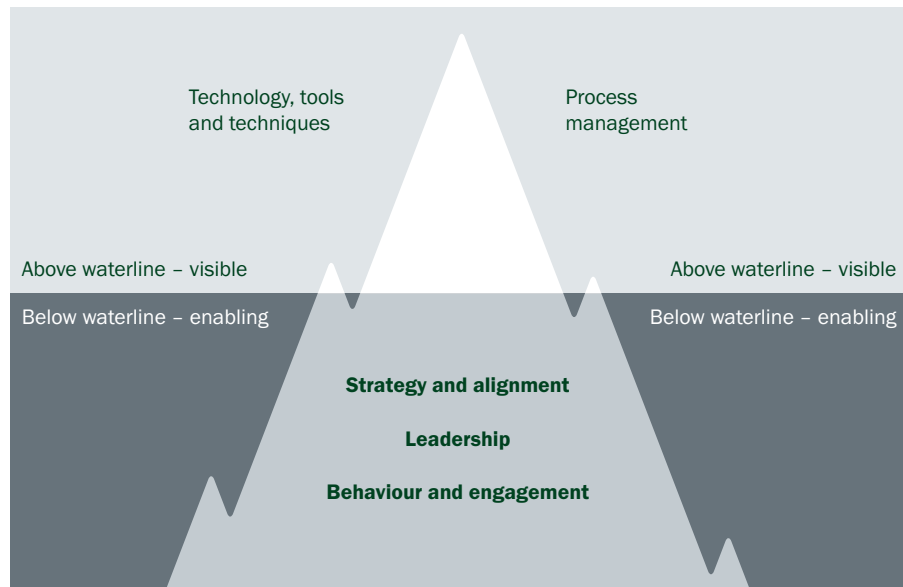
The sustainable Lean thinker needs to learn to see and act below the waterline as well as above it. The items below the waterline are:

1. Strategy and alignment

Many businesses we come across fail to establish a coherent strategy, vision and purpose. However, even if you in your organisation do, this is not enough in itself. What you need is a strategy that is fully communicated and deployed throughout the organisation. It needs to describe **what** you want to do and **why** this is important. This will guide your staff in **how** to focus their change activity.

We offer two questions to test whether this is the case today:
1 Can all of the people in your organisation clearly articulate what your strategy is?
2 Can they demonstrate what they are doing themselves in their normal job to help the organisation achieve this strategy?

If your answers aren't clear, you need to pay greater attention to strategy and alignment. In our experience, in a typical organisation, no more than 20% of staff can articulate the strategy and no more than 20% of these are able to show how they are directly contributing. This may mean than less than 5% of people are directly contributing to effective change.

2. Leadership

The second 'below the water' element is leadership. Many organisations possess good managers but not necessarily good leaders. Leaders are usually characterised as having a guiding vision, passion and integrity. When leading change they must have high energy levels, be innovative, focus on people, inspire trust, have a long-range perspective and challenge the status quo.

The role of the leader is to inspire with words, deeds and actions. This involves allowing everyone in the organisation to take part in the strategy process and encouraging everyone to get involved in delivering the actual change and reducing fire-fighting and non-value-adding work. A leader inspires their organisation to change from a typical organisation to a sustainable one. Which of the two types of organisation below has your leadership inspired?

The typical organisation

time spent

Strategic

Improvements

Fire fighting

Day job

Executives | Middle managers | Operatives
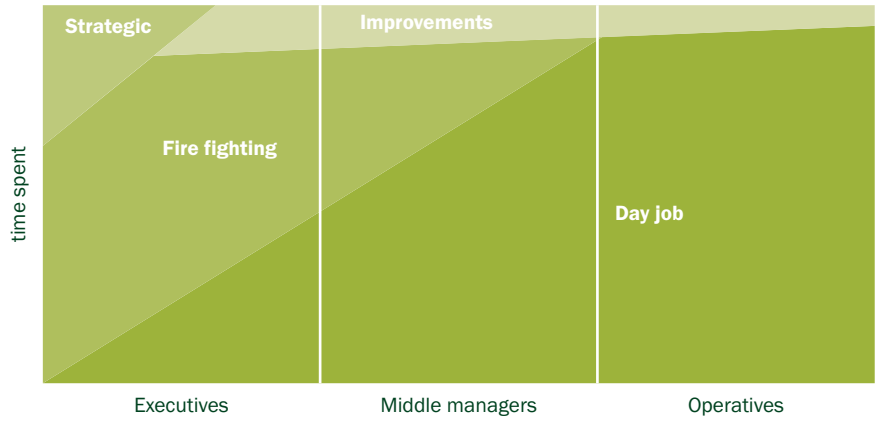
The sustainable organisation

time spent

Strategic

Improvements

Day job

Executives | Middle managers | Operatives
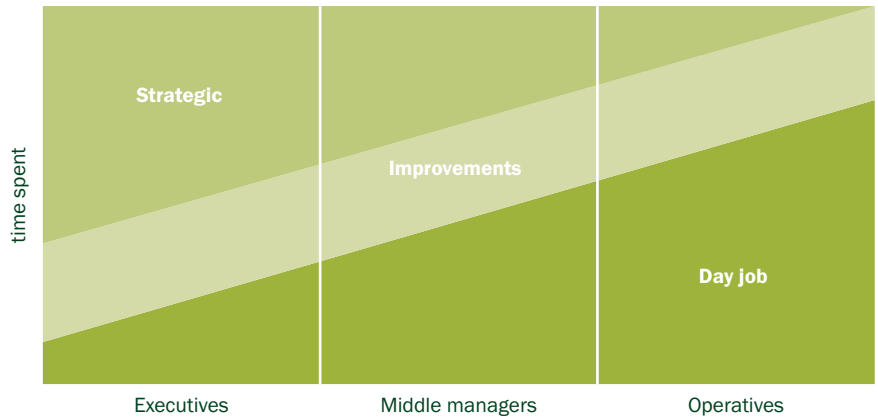
3. Behaviour and engagement

The engagement of people on a Lean journey is essential. It will predict their behaviour and your ultimate success. There are many steps on the engagement journey as you can see below, but effective strategy, alignment and leadership are a good start. Other key elements are partly due to the characteristics of the individuals themselves, how they are communicated with and how they are trained. The general social norms of your organisation will also impact on the journey.

Commitment

Understanding

Acceptance

8 Internalisation
7 Institutionalisation
6 Adoption
5 Implementation
4 Positive perception
3 Understanding
2 Awareness
1 Contact

If we fail →
1 Lack of knowledge
2 Confusion
3 Negative perception
4 Decision not to support implementation
5 Change aborted after initial utilisation
6 Change aborted after broad utilisation
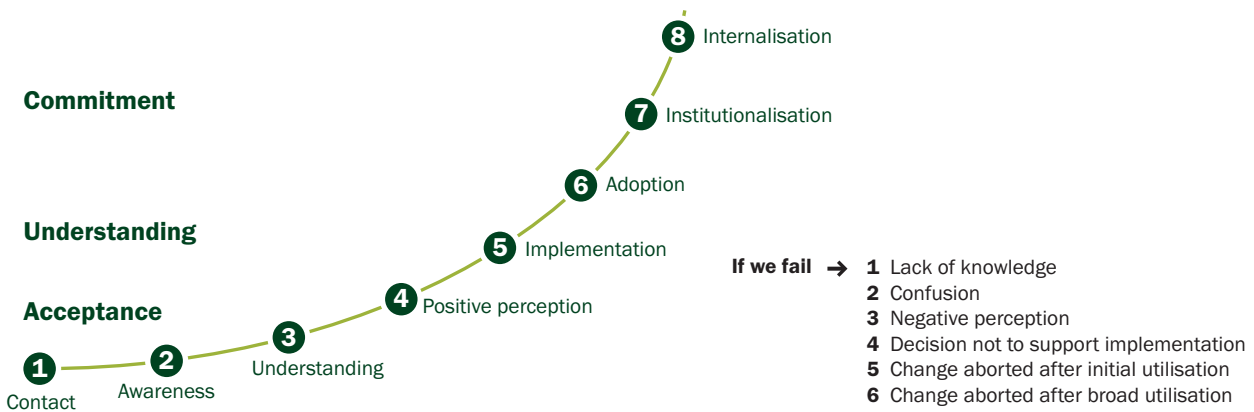
Source: Chris Craycraft, Whirlpool

Check your own personal engagement. What about your colleagues, how engaged are they?

Engagement area	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I enjoy my job and am clear about what is expected of me					
My job gives me a strong sense of achievement					
I am clear what I need to do to improve					
I am keen to make improvements					
I enjoy working with my colleagues					
My working environment is pleasant					

In summary, to establish a sustainable Lean organisation you need to address each of the five elements illustrated in our Lean sustainability iceberg:
- Strategy and alignment
- Leadership
- Behaviour and engagement
- Process management
- Technology, tools and techniques.

This needs to be achieved at all levels of the organisation, not just on the shop floor. When we tried to find texts on what to do right across an organisation, we were hugely disappointed. We found almost no guidance on how to do this more widely than at a single location site, so we decided to provide this guide on how to apply your own Lean iceberg at a group company level. Next we describe our case company.

Cogent Power began implementing Lean in 2003 to improve its competitiveness in the marketplace and help turn around its financial performance. Four years down the road the company has transformed its approach, with a renewed customer focus that has led to exponential sales GROWTH and a culture of continuous improvement.

The road to Lean

Electrical steels play an essential role in the generation, transmission, distribution and use of electrical power and are one of the most important magnetic materials produced today. Global electrical steel manufacturer Cogent Power has its head office in the UK and operates out of three major plants, in the UK, Sweden and Canada, which function as semiautonomous business units. Each operating plant has its own management structure, commercial and financial responsibilities. An internal supply chain exists where the UK plant supplies the Canadian plant with some of the raw materials for further processing and conversion. This is shown by the pale purple highlighting in the diagram below and is where Cogent Power focused its initial activities.
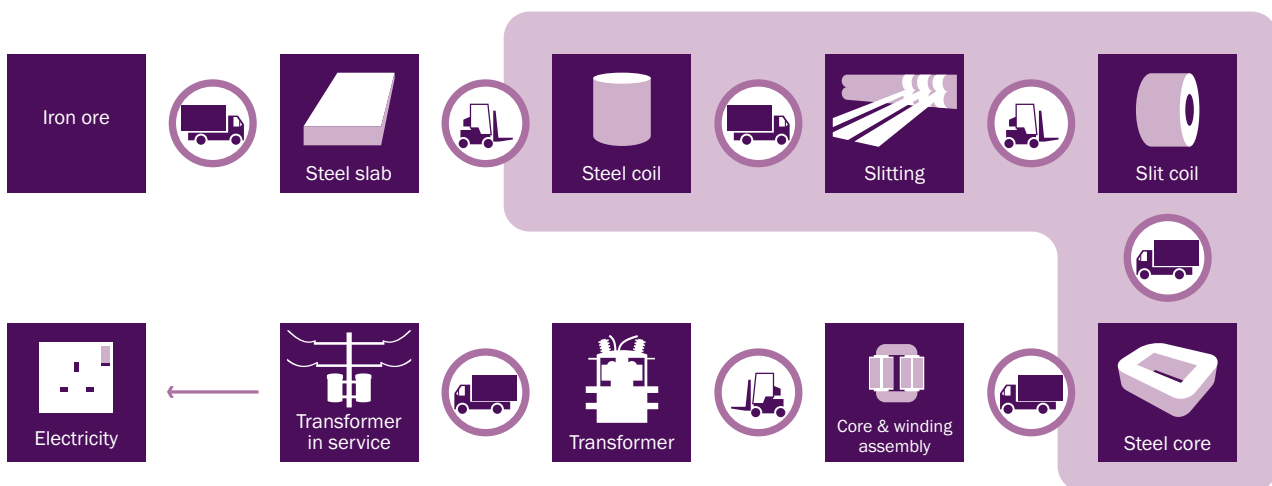
Company history

The union of the three plants occurred as a result of all being owned, or incorporated into, European Electrical Steels in 1991. Prior to this point they had unique and individual company histories.

European Electrical Steels (EES) Ltd resulted from a joint venture in 1991 between British Steel, which owned the UK plants, and Svenskt Stål AB (SSAB), which owned the Swedish and North American plants.

In 2000, EES, now part of the newly-formed Corus Group Plc, acquired the Kienle + Spiess Group, companies that specialised in downstream processing of non-oriented electrical steel. Cogent Power Ltd was formed as a joint venture out of this acquisition and comprised plants in UK, Sweden, North America, Germany and Hungary. Subsequently, Cogent Power sold the downstream businesses and these have returned to private ownership. In 2006 the Cogent Group comprised plants in the UK, Sweden and Canada, with its head office in the UK.

The Canadian plant only began operation in 1970, but both the UK and Swedish plants have much longer and varied histories dating back to the 19th and 16th centuries.

Cogent Power (UK) Ltd

Electrical steel has been manufactured at the UK site in South Wales since 1898 when it was founded by a private company. Before World War I more than 3,000 people were employed on this site; with the advent of new technology, around 400 people now produce more than 186,000 tonnes of electrical steel a year. The plant is the world leader in the production of grain oriented steel that is used in transformers.

Cogent Power (UK) Ltd – a brief history	
1898 WR Lysaghts company starts at Orb Works.	**1989** British Steel Corporation privatised.
1906 Transporter bridge built to carry men to work.	**1991** Orb becomes Orb Electrical Steels Ltd., part of European Electrical Steels Ltd.
1913 Expansion to 40 hand worked hot mills, 6 steam driven engines, 3000 employees.	**1995** Orb becomes Accredited Investor in People
1914–1915 Diversification into products for Great War effort: trench plate, helmet steel.	**1996** Orb receives Queens Award for Export Achievement.
1920 GKN acquires controlling interest.	**1998** Orb celebrates centenary with Open Day.
1933 UK first mechanical rolling mill installed.	**2000** EES acquires Keinle & Spiess group and forms Cogent Power Ltd.
1939–1945 Diversification again to help war effort: corrugated sheets and sheet steel. Pioneering rolling of 'duralumin' for aircraft.	**2002** Orb re-accredited as an Investor in People.
1944 King George VI and Queen Elizabeth visit the works in recognition of war effort.	**2003** Adopted Lean Thinking as the cornerstone of its forward business and operational strategy
1947–1950 GKN and Lysaghts join founding the Steel Company of Wales: electrical steels production for global customers begins.	**2004** The Lean Thinking philosophy became embedded as the Lean lifestyle with aesthetic business improvements and operational/financial benefits
1965 Last hand mills phased out.	**2006** Cogent Power sold its downstream business and the Cogent Group comprised Orb, Surahammars Bruk and Cogent Power Inc. consolidated in Canada.
1967 Orb becomes part of British Steel Corporation	

Cogent Power (Sweden) A.B.

The Swedish plant has a history dating back to the 16th Century that covers railways, automotives and steelmaking. Originally the company was completely vertically integrated and owned iron ore mines with iron- and steel-making plants. Since the 1980s these have closed, or been sold, and now the plant concentrates on non-grain oriented steel and produces more than 100,000 tonnes of electrical steel for use in motors and generators, employing 235 people.

Cogent Power in Sweden – a brief history	
16th century A 'crown hammer' in Surahammar	**1981** Mining, ironmaking and steelmaking are closed down
1627 Chancellor Axel Oxenstiema acquires two estates in Surahammar and erects a hammer at the weir	**1984** The North American companies acquired
1845 The goldsmith E. A. Zethelius buys the works and initiates the expansion	**1986** Svenskt Stal AB (SSAB) buys Surahammars Bruk
1866 The production of railway wheels for Swedish State Railways starts	**1991** Surahammars Bruck is incorporated into European Electrical Steels Ltd. EES, a joint venture between British Steel (75%) and SSAB (25%)
1897 The first Swedish car is made in Surahammar	**1993** Production of grain oriented ends. Capacity for non oriented steel is doubled
1916 ASEA acquires Surahammar Bruk	
1917 First delivery of hot rolled electrical steel	**1995** New yearly production record. More than 100k tonnes produced.
1959 Production of colled rolled oriented electrical steel starts	**2000** EES buys Kienle+Spiess
	2001 Cogent Power Ltd is formed
1974 New blast furnace and Q-BOP steelmaking	

Cogent Power (Canada) Inc.

In comparison, the Canadian plant, which began operating in 1970, has a relatively short history. It formed as part of a North American and Mexican group of steelmakers servicing the Canadian and US transformer market. The group was acquired by European companies and eventually became part of EES. Later, with the purchase of Kienle + Spiess, it became Cogent Power Inc. In 2003, following major restructuring, the North American operations were centralised and all production was consolidated and moved to a new state-of-the-art plant in Ontario.
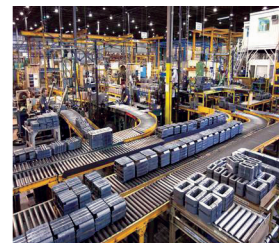
Cogent Power in Canada warehouses and slits a full range of electrical sheets for the transformer industry. It also provides a wide range of wound and stacked cores (included assembled) for small and medium power transformers.

The challenge facing Cogent

In 2003 the company was facing a number of challenges:
- Substantial pre-tax losses from global operations
- Business was losing cash from a number of its operating plants
- Static order book with emphasis on lower margin products.

In order to meet these challenges a new Managing Director, Marcel, was appointed to lead the business turnaround. He put in place a new organisational structure, based around a head office in the UK and three operating divisions: Electrical Steels, Laminations and Transformers. In 2006 the Laminations Division was sold and the new structure, based around Electrical Steels and Transformers produced across three sites in the UK, Sweden and Canada, was established.
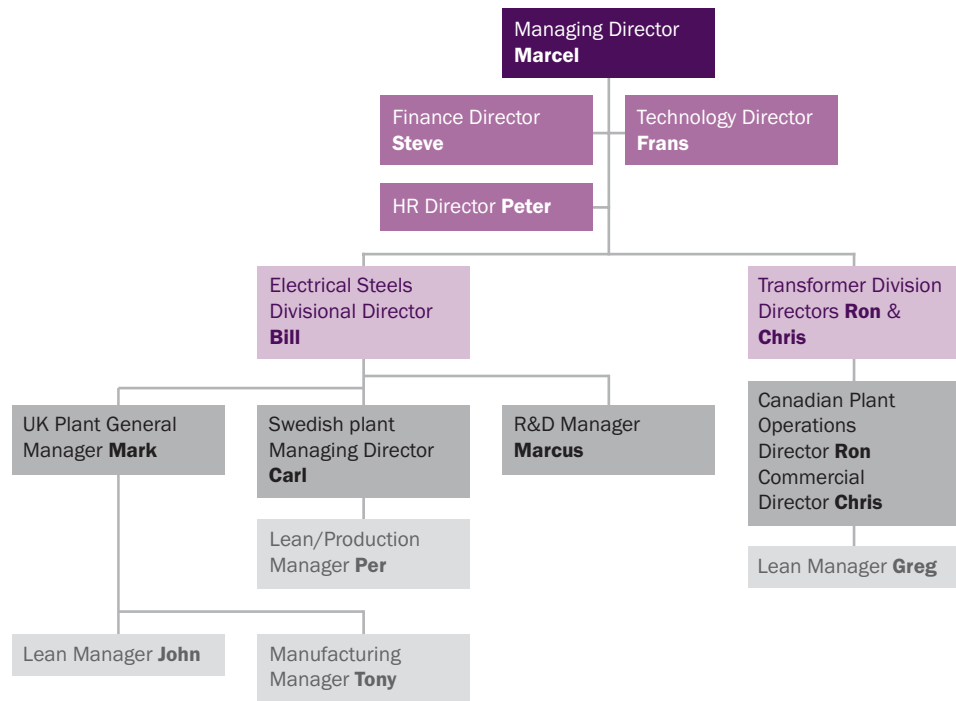
When Marcel took over in 2003 the culture and philosophy of the company, despite national differences, was based on traditional steel manufacturing. The main operational Key Performance Indicator (KPI) was tonnes of output produced, driving a mindset and culture of machine and labour efficiency. As a result there were high levels of inventory but poor levels of delivery performance. High levels of inventory and long batch runs were making the plants unable to respond quickly to changes in demand.

It was Marcel's role to turn around the company's financial performance. He knew that to do this he needed to turn the company into a Lean Enterprise. Over the next few pages we follow what happened.

The journey to Lean

The Sustainable Lean Iceberg Model
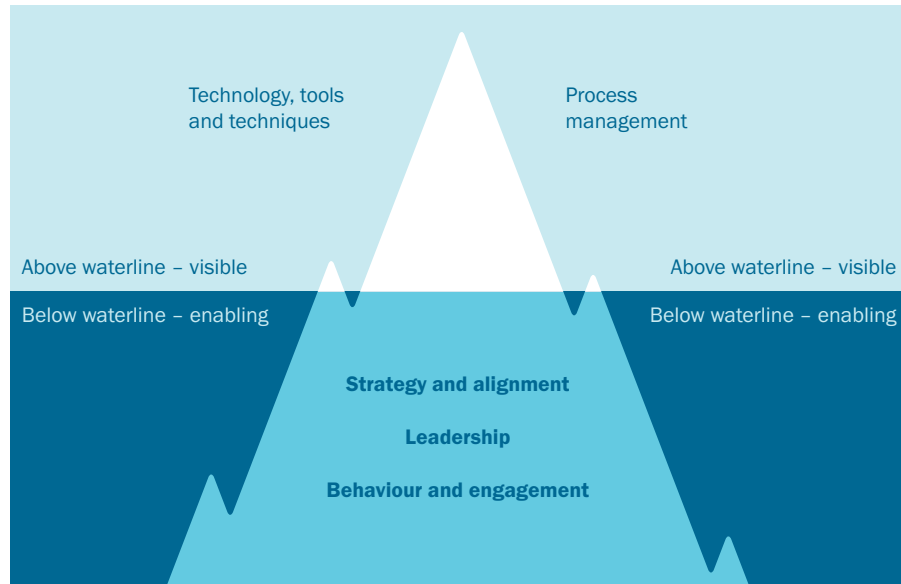
The route through the 'iceberg' is not always smooth and the route a company takes depends on its organisational characteristics: the strategy, structure, culture, learning abilities and goals as well as the product/process mix, factory layout and the age and condition of the plant and equipment.

As we will see, the route that Cogent Power took reflected its immediate goals and stage of organisational learning.

In the next section we examine the iceberg in detail, using Cogent Power as an illustration, but we will return to reflect on its journey and the lessons learned later.

Beneath the waterline are those enabling features that support a Lean transformation: strategy and alignment, leadership, employee behaviour and engagement. In this section we examine the features that can be found under the waterline of a 'REAL' Lean company.

Strategy and alignment

A successful strategy usually begins with:

- a realistic assessment of the current situation
- a coherent vision of the future
- an understanding of the transition required to bridge from the present to the future.

At the heart of the Toyota Production System is Hoshin Kanri, the 'Shining Needle'. In Japan this is the term for directional management or directional control. Hoshin Kanri is also known by its western name of 'policy deployment', which was introduced in our companion books *Going Lean* and *Lean Profit Potential*. It is the means for setting the direction for the organisation; hence the 'shining needle', the needle in a compass. Policy deployment is really a strategic management system that shares the vision and goals for the business with everyone in the organisation. It gives the senior management clarity of purpose and it engages everyone in the priorities of the organisation, giving employees an element of ownership and a sense of control. However, of all the Japanese management systems, policy deployment is the most invisible and most difficult to copy. See *Value Stream Management* by Peter Hines, Richard Lamming, Dan Jones, Paul Cousins and Nick Rich for more information on policy deployment.
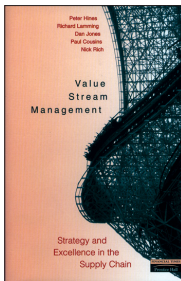
Why is strategy and alignment fundamental to sustaining Lean? Well, **strategy** is about improvement and setting the direction for the organisation. **Alignment** is making sure that everybody understands the strategy, and that everything they do contributes to the success of achieving the organisational goals. The best way of checking this is to see how the organisation measures and monitors progress using Key Performance Indicators (KPIs). We believe that there must always be a link between the KPIs, the strategy and the Lean improvement projects. KPIs that are not linked directly to business goals take away valuable resources, and this is a waste. So it is very important that the KPIs are clearly aligned to the overall goals and that they drive the right behaviours.

To gain commitment and ownership, employees need to feel involved in setting the KPIs so that they are clear about their own part in the overall scheme; if everyone shares in the vision and can see how it all fits together, they will understand the importance of meeting their own targets. Measuring and monitoring effective KPIs ensures that the business stays on course and that the improvement programme is sustained over time.

Cogent Power uses 'business cockpits' to deploy and sustain the management process. The business cockpit is a visual management system to display, on a single A3 page, everything that is important to help run the business. This should be applied in each area of the business, not just on the shop floor, and may include issues, improvement project plans, performance measures and key financial reports. There are business cockpits at all levels of the organisation, starting at the strategic top level and cascading down through the organisation to the operational

> " There should be a relationship between you and your colleagues and you should both be looking in the same direction. If you're looking in different directions you will never be successful. "
>
> **Frans, Technology Director**

Value Stream Management

Peter Hines
Richard Lamming
Dan Jones
Paul Cousins
Nick Rich

Strategy and Excellence in the Supply Chain

> " We didn't tell the businesses how to define the KPIs and we told them that they could change them as often as they wanted, because the only objective of a KPI is to give you feedback on the quality of your performance. "
>
> **Marcel, Managing Director**

team level; everyone is represented on one or more business cockpits. The business cockpits become the focus of regular review meetings as they hold all the information necessary to monitor progress and take corrective action. When we spoke to managers at Cogent Power they told us their cockpits drive the business, not some dusty annual plan only known about by a few senior managers.

There are different cockpits at different levels. At the top level are the corporate strategic issues and company measures and targets.

Business cockpit

Issues and Opportunities

1. Supplier OTIF measures and technical issues understood and resolved

2. Establish inventory reduction targets MC/SC, and complete MC/SC Kanban systems

3. Establish efficient reporting mechanisms/reports for timely reporting of all KPIs.

4. Deploy shop level KPIs and start reporting shift results

5. Successful reorganization of Sup/Team Leader structure (incl. Training)

Strategic Programs/Actions	Week No.			
	1	2	3	4
Supplier X technical issues, supply issues and OTIF measures concluded				
Customer Y Kanban and delivery system				
Kanban inventories for FG/MC/SC				
Deployment of business cockpit/operator level KPIs				
Sales acquisition process development				
Measurement Systems for Customers				

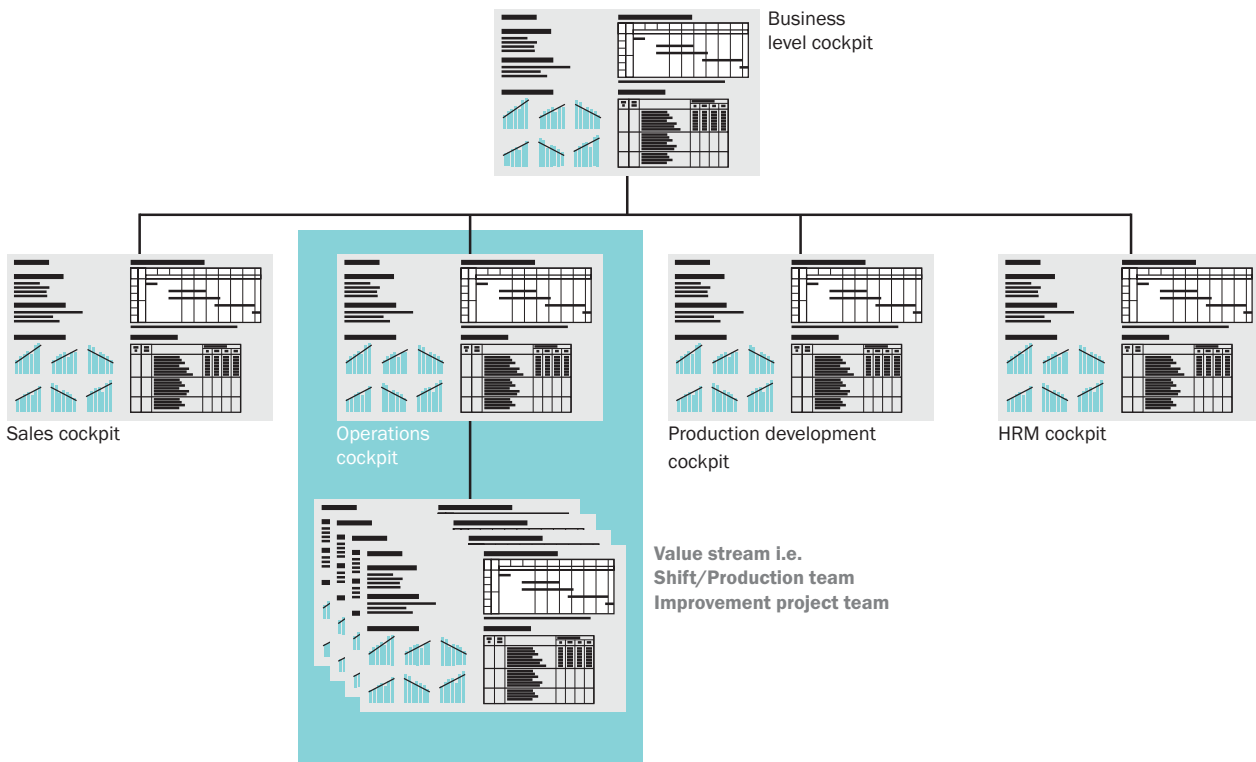| 2006	Month	Plan	Δ
Financial & Operational			
EBITDA/Sales Ratio			
Sales Volumes			
Fixed Costs			
Working Capital Days			
AR Days			
AP Days			
Inventory Turns			
Inventory Values			
Unit Production Costs			
OEE			
Scrap Rates			
Project Completion Rate			
Customer Satisfaction			
OTIF (Internal/External)			
# CCRR Complaints			
PPM Reject Rate			
Delivery Days			
VOC Surveys			
Employee Wellbeing			
Absenteeism (Attendance)			
Lost Time Accidents			
Recordable Injuries			

These are cascaded downwards as process or functional targets and measures, and team targets and measures. Each of these has its own cockpit so that managers can easily see how things are progressing.

In the illustration below , the business level cockpit shows top-level business performance measures. The operations department cockpit includes measures for overall production performance, typically including OEE (Overall Equipment Effectiveness), OTIF (On-Time In Full), direct costs etc. These are referred to in Cogent Power as 'Line of Sight' boards.

Cascading the strategy into the business

Business level cockpit

Sales cockpit

Operations cockpit

Production development cockpit

HRM cockpit

Value stream i.e. Shift/Production team Improvement project team

Each team has more detail on their cockpit of the OEE by machine, or bottleneck process, and the improvement project team will have measures on improvement targets and project progress. The cockpits have all the information that the team leaders need to manage their sections, that process or functional managers need to manage their departments and the senior managers need to manage the business; and each has a clear link, or 'Line of Sight', to the other.

The cockpits are reviewed and updated regularly. Senior management review the business level cockpit formally every month. Process or functional and team cockpits are reviewed weekly or monthly, depending on the nature of the KPIs and work plans. Operational targets are reviewed on a daily or shift basis, and these are available to the whole workforce.

So how do you go about policy deployment? The foundation of policy deployment is Dr Deming's scientific method – Plan, Do, Check, Act (PDCA).

P – Planning phase

> "You have to make sure that it is the right organisational model and that these are the right people. If they are not the right people, it doesn't mean that Lean is not right. It is important to evaluate and assess the organisation as a model and ask if the people are willing to change."
>
> **Frans, Technology Director**

Planning defines and sets the strategy. Strategy is about direction and vision, deciding where you want to go and what you need to do to get there. Strategy is also about getting the right organisational model and having the right people in place to support you.

Strategy is sometimes about making hard decisions on the best management model to apply. This is because it is important that the organisational structure and management team are capable of delivering the strategy and that they all are aligned towards the same common goals. You will hear more about this in the leadership and behaviours sections.

Strategy is about a vision for the future, but in order to get there you need to know where you are at the moment; what the gaps are between the current state and the future state and what factors you need to address to reach your goal. You tackle this by starting at the beginning; by understanding the external factors that are

affecting your business right now and those that you predict will affect you in the future. Some organisations use a PEST (Political, Economic, Social and Technological) analysis for this. PEST can also be extended to include environmental and legal issues (PESTEL). PEST assesses the market or industry from the company perspective. Once you have defined the external factors you need to do the same for the internal factors. It is important to make a complete and honest appraisal of everything that is affecting the organisation now, and of factors that are likely to affect it in the future.

The next step is to perform an analysis of the business strengths, weaknesses, opportunities and threats; this is known as a SWOT analysis. SWOT measures a business unit or idea; PEST measures the market or the industry. You always do PEST before SWOT.

This is an example of Cogent Power's early SWOT analysis; it is something you could try for your organisation. It is usually best done as a group so that you can discuss the items. You might find that it is easier to define the weaknesses and threats rather than the strengths and opportunities, but a well constructed SWOT can be a very useful tool for understanding situations and making decisions.

Strengths	Weaknesses
No. 1 in Europe	High cost structure
Presence in Eastern Europe	Cash drain
Expertise	No market strategy
Wide product range	Poor forecasting
New management structure	Poor process capability
Brand image	Limited sharing of technology
Customer loyalty	Lack of innovation

Opportunities	Threats
Increase added value business	Cash drain
Lean thinking to improve process capability	Increased competition
Increase automotive business	Customer migration
Share technology	Engineering skills shortage
Outsourcing opportunities	Customer consolidation
	Increased customer requirements

A technique used at Cogent Power is known as a Linked SWOT. This makes a linkage between the external market opportunities and threats and the organisation's strengths and weaknesses. Linked SWOTs make it easy to see where effort needs to be focused and to decide which issues need to be addressed.
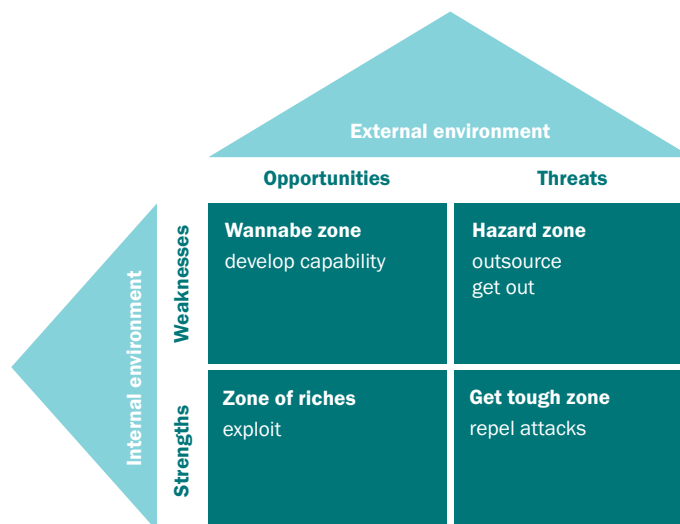
The 'Zone of riches' is where the company has existing strengths and there are market opportunities that can be exploited.

The 'Wannabe zone' is where there are market opportunities, but the company is currently weak. It makes sense here to develop capabilities, turning weakness into strength.
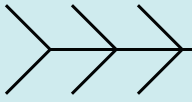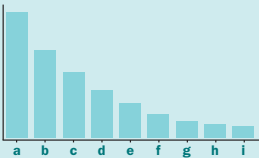
Where there are market threats, now or in the future, the zones are referred to as the 'Hazard zone' or the 'Get tough zone'. In these zones the organisation may choose to leverage strength to repel competition. Where the company is weak, it may choose to outsource or even exit the market completely.

This was a major exercise at Cogent Power, involving all the senior managers. From the analysis, 8–10 Critical Success Factors (CSFs) were negotiated and selected. For a large company or group of companies, the process would need to be repeated at each business unit. It should always start at the corporate level, to set the overall direction and business goals, but should then be repeated at each level to identify the business unit CSFs needed to achieve the overall corporate strategy. At Cogent Power this was developed at group level and then repeated at divisional and business unit levels. The CSFs formed the basis of the organisational and operational strategies.

The secret of good planning and strategy is to tell convincing 'stories' that people can relate to and understand. The Lean way of doing this is known as 'A3 thinking'. In this we develop strategies that can be described on one side of an A3 sheet of paper. The strategy should read as a persuasive 'story'. It starts in the top left-hand corner by stating the strategic gap and then it reads up and down, from left to right. The strategic gap is followed by a reflection on the reasons why the gap has not been breached in the past; this is often shown as a fishbone diagram. This is followed by a Pareto of the reasons for the gap and an action plan of countermeasures, targets and contingencies.

D – Doing phase

After the Planning cycle (P) comes the D – Doing phase. This is the start of deploying the policy; the idea here is to engage and involve everyone. The way that companies such as Cogent Power and Toyota do this is by a mechanism known as 'Catchball'. In Catchball the plans are shared horizontally and vertically throughout the organisation, level by level, and questions such as 'What do you think?' or 'Why can't we achieve this?' are asked. This encourages frank, fact-based discussion and leverages the collective knowledge and intelligence of the organisation to make the plans achievable. The Catchball process gets people involved and encourages buy-in as employees are given the opportunity to participate in setting realistic targets and KPIs.

The Catchball phase is important as it allows problems to be raised. In the Lean world, problems are considered to be treasures as, without problems and problem solving, an organisation cannot improve. This involves a different set of mental models to those of traditional organisations where problems are considered to

represent failure and are often hidden. In policy deployment, the mental model is that the leader is the teacher who asks questions and respects answers; not the dictator who sets targets and objectives without consultation. In *Doing the Right Thing*, Pascal Dennis describes the mental models we all have that influence our decisions. The Lean, policy deployment, approach requires a different kind of relationship between leaders and team members that involves mutual trust. The team members must trust the leaders' judgement in developing plans and the leaders must trust the team members' knowledge and ability to deploy the plans. There is more about this in the next section; for now we will stay with the PDCA of strategy and alignment.

C- Check phase

The next steps are to perform the actions and review progress. This is the C – Check phase, where the plan is monitored and problems raised. It seems simple, but this is the phase that often fails in traditional planning. Check entails simple connected meetings where exceptions are shared and discussed openly; back to the Lean mental models of problems being treasured as opportunities for improvement. Policy deployment is a formal process and the key to it is the review process. There are three levels of review:

1 Review the work done on a weekly or monthly cycle
2 Review the key issues on a monthly or quarterly cycle
3 Review the planning system as a whole on an annual or bi-annual cycle to ensure that it works for your organisation.
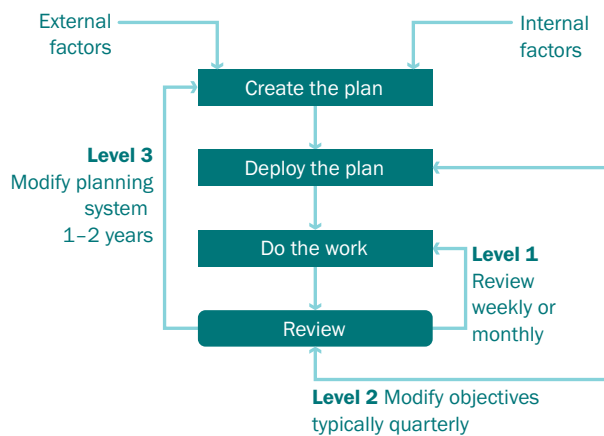
As the Lean implementation matures the organisation learns from the process, and new opportunities open up that were impossible when it first started. The skill is to take advantage of the new opportunities and to stay focused on steering in the right direction. Cogent Power has done this by maintaining alignment and using the business cockpits to monitor progress. As the organisation has learnt from the process, it has used the knowledge, skills and improved process capacity to introduce new products and business offerings that have enhanced customer satisfaction. The organisational learning has been so successful that new markets have developed that were not even on the horizon when the Lean programme was introduced.

A – Act phase

The final phase of the PDCA cycle is the A – Act phase, sometimes also known as the Adjust phase.
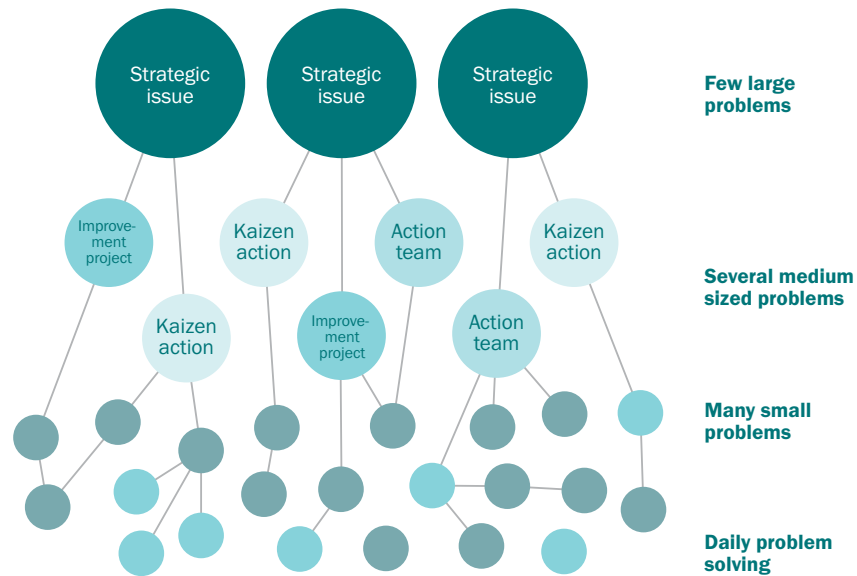
Source: Pascal, D. (2007). *Strategy deployment: What is it? Why should I care?*, Lean Enterprise Institute Webinar

This is the problem solving phase and the focus here is to maintain alignment with the goals, so problems that emerge and disrupt the flow need to be addressed. Problems are usually distributed; there will be two or three large problems, ten or so mid-size problems and generally hundreds of small problems. It is these small issues that cause irritation or frustration; if you can solve these, then many of the larger problems disappear. However, there are usually too many for a small group of people to solve, so problem solving needs to be shared and distributed throughout the organisation. This again involves different mental models. In the traditional organisation there are specialists, usually engineers, who use complex tools to solve problems. This 'expert' problem solving is often done 'to' people and, hence, disengages the workforce. The Lean organisation recognises that most problems can be solved without complex tools. So the mental model here is to involve everyone in problem solving, using simple tools, leaving the specialists to concentrate on the large, complex problems.

Strategy and alignment is about setting the direction for the organisation and making sure that everyone is on board so that the organisation stays on course and maintains steady progress. Strategy and alignment is based on policy deployment, developed from Dr Deming's scientific method and the PDCA cycle. It can be summarised as:

Act/Adjust
Solve problems as they arise
Improve the system
Learn from the process

Plan - Develop the strategy
Where do we want to go?
What do we need to do to get there?
A3 storyboards

Check/Review progress
Are we maintaining progress?
What are the problems?
Exception management
Checking the business cockpits

Do - Deploy the strategy
How can we achieve success?
How will we know we are succeeding?
Catchball
KPIs

This is illustrated by the 'Cogent Way' model.

The Cogent Way
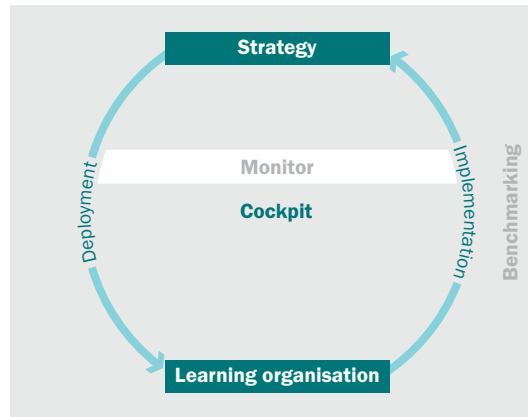
Leadership

Leadership is often seen as the holy grail of successful management. Indeed, poor leadership has been identified as the reason for poor sustainability of Lean change, as these top 10 reasons for failure show. These findings are based on a review of the major issues leading to poor sustainability across a range of UK manufacturing and distribution organisations.

1	Lack of a clear executive vision
2	Lack of an effective communication strategy
3	Failure to create and communicate a real sense of urgency
4	Poor consultation with stakeholders
5	Lack of structured methodology and project management
6	Failure to monitor and evaluate the outcome
7	Failure to mobilise change champions
8	Failure to engage employees
9	Absence of a dedicated and fully resourced implementation team
10	Lack of sympathies and supportive human resources policies

Source: Lucey, Bateman and Hines, 2005

We have found that there is often some confusion between management and leadership. Many people talk about managing transformations rather than leading change. This may sound like a subtle difference, but it is an important one. Warren G. Bennis, in *On Becoming a Leader,* describes some of the differences he sees between managers and leaders.
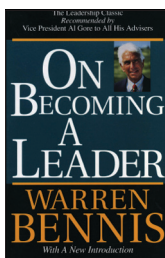
Leader	**Manager**
Innovates	Administers
Is an original	Is a copy
Develops	Maintains
Focuses in people	Focuses on systems and structure
Inspires trust	Relies on control
Has a long-range perspective	Has a short-range view
Asks why	Asks how and when
Has his eye on the horizon	Has his eye on the bottom line
Originates	Imitates
Challenges the status quo	Accepts the status quo

Think of some managers in your organisation. Are they leaders or managers?

Leaders, in our view, foster change and create an environment where change is the norm, whereas managers stabilise the organisation and assure that the changes are well implemented. In fact both sets of behaviour are necessary to achieve excellence and different approaches may be needed at different times, depending upon where you are in the transformation. Also, leadership is not confined to the top level of an organisation; leaders can emerge at all levels and part of the role of managers is to recognise and develop potential leaders so that they can contribute to the business goals.

Think about some of the other people in your organisation: trade union shop stewards, supervisors, influential employees; how would you describe them?

Leadership is about establishing direction, developing a vision of the future and setting strategies for making changes to achieve that vision. Leadership involves aligning people; communicating the direction by words and deeds to the entire workforce to get the co-operation that is needed. It is about influencing the creation of teams that understand the vision and accept their roles in the implementation of the strategy. It is really about inspiring people to want to change.

Level 5 leadership

Level 5
Level 5 leader: Paradox of personal humility and professional will. Put the other good-to-great concepts into practice.

Level 4
Effective leader: catalyses commitment to and vigorous pursuit of clear and compelling vision, stimulating higher performance standards.

Level 3
Competent manager: Organises people and resources toward the effective and efficient pursuit of pre-determined objectives.

Level 2
Contributing team member: Contributes individual capabilities to the achievement of group objectives and works effectively with others in a group setting

Level 1
Highly capable individual: Makes productive contribution through talent, knowledge, skills and good work habits

In *From Good to Great* Jim Collins found that success is mainly due to the abilities, competence and style of the leader. He identifies five levels of leadership, with the highest level leading to the most sustainable and effective business.

Level 5 leaders channel their ego away from themselves and into the larger goal of building a great company. It's not that Level 5 leaders have no ego or self-interest. Indeed, they are incredibly ambitious – *but their ambition is first and foremost for the institution, not themselves.* (p. 21)

Tesco's Chief Executive Terry Leahy and Fuijo Cho, the head of Toyota, are good examples of Level 5 leaders.

We observed a similar lack of ego in Marcel, Cogent Power's Managing Director.

However, leadership is not just about the characteristics of the leaders. Jim Collins suggests that acquiring, or more accurately, growing a Level 5 leader, is just the first step. Once the right leader is in place, he or she must get the right team about them: 'They *first* got the right people on the bus, the wrong people off the bus, and the right people in the right seats.'

When Marcel joined Cogent Power in 2003, he had already had experience of working in a Lean organisation. His background was in automotive, so he needed no convincing of the benefits of implementing Lean thinking in a company. He was absolutely positive that this was the right path for Cogent Power to follow; all he needed to do was to gain the same level of conviction from the employees. This was not too difficult as the company had a history of continual improvement and TQM with a project named Transformational Mapping (TMAP), which was based on a number of Lean principles. Although the earlier initiatives had not sustained beyond the implementation phase, they did provide a foundation of change management and a number of the Lean coaches and change agents came from running TMAP projects. Marcel's vision was that Cogent Power would become a self-propelling organisation, an organisation able to move forward by its own force. Ron, one of the Canadian directors, developed a cartoon that symbolised a self-propelling organisation to communicate the idea to the workforce.

Marcel arrived in August 2003 but he stayed in the background for the first few months. During this time he was developing the strategy and assessing the organisation, making sure that it was capable of fulfilling his vision. During this time he held intensive interviews with all the managers and key people, in which he asked very searching and challenging questions. He described this time in terms of his favourite hobby, training horses.

There is only one way to train a horse, and that's from a positive attitude. You have got to have an eye for positive development and make the horse aware of the fact that you like what he is doing and, whenever he does something negative, you ignore it. Of course first of all you've got to be sure that the material, the horse itself, is capable of doing the things you want him to do. If it has only three legs, you probably wouldn't want to train it. It is the same with an organisation; you have to be sure that the people you've got on board can deliver. If you are not sure at the start of the programme and you find out later that they can't, it won't make sense to punish them. That is basically where I come from.

Sidebar quotes:

It is a mistake to suppose that men succeed through success; they much oftener succeed through failures. Precept, study, advice, and example could never have taught them so well as failure has done.

Samuel Smiles, British Author of *Self Help* 1856 (favourite of Sakiichi Toyoda)

cartoon symbolising self-propelling organisation

Marcel raised the bar and set the standards, he was the person telling us what was expected of us; Frans was the person showing us the way.

Mark, General Manager, Cogent Power, UK

His commitment involved some hard decisions and a reorganisation of the management team. To assist him he invited Frans, a former colleague, to join him as Technology Director. They made a formidable team, highly respected and hugely influential.

Jim Collins found that focus and perseverance were necessary: 'You must maintain unwavering faith that you can and will prevail in the end, regardless of the difficulties, *AND at the same time* have the discipline to confront brutal facts of your current reality, whatever they might be.' This was also true at Cogent Power, but added to this was Marcel's emphasis on trust – not only on being trustworthy himself, but also on trusting his management team to deliver the results, and on trusting that the organisation was actually capable of change.

Trust pervades the company. Ron told us,

> One of the things that helped the implementation was the trust relationship. Because of this they accepted that I knew what I was talking about and that I had their best interests at heart. I'm not naive enough to think that everybody thought that way, but there is a general trust. When I started in this company it was not in a good way and one of the first things I did was to raise wages and this got co-operation and as a result the business grew, so they believed in me.

So how do leaders manage Lean organisations? In a recent presentation, Jim Womack said that every organisation must address the **purpose**, the **processes** and the **people**. He believes that most organisations struggle because the purpose is not clearly defined, the processes are not clearly specified and the people are not fully engaged. In his view getting this right is the responsibility of the leaders and management.

Jim Womack believes that one of the problems is that traditional organisations have a vertical focus, and managers think vertically to optimise their area, department or function. Lean managers, on the other hand, think horizontally, in the direction that value flows through the organisation. This is not to say that functions are less strong in Lean organisations. In many cases, including Toyota, they are even stronger. Lean organisations create strong horizontal focus by assigning a responsible person to manage product flow at the same time as they create strong functions that focus on knowledge capture and career paths. Toyota does this via the Chief Engineer role. The Chief Engineer at Toyota takes responsibility for the whole value chain of a particular product, from design to delivery. However, this is not a matrix organisation where people have two bosses; the Chief Engineer has to negotiate with the functional heads about what is needed from the functions to support the product. Every employee has only one boss; the functional head, who has to prioritise the work schedules.

At Cogent Power, Lean Managers fulfil this horizontal, cross-functional role and negotiate with functional heads to train employees and to give them time to work on improvement projects. Lean coaches, who form part of the functional teams, provide resources that support process improvements within the department and participate in cross-functional teams that perform company-wide improvements.

Marcel and Frans don't believe that managing Lean is the job of one individual or one department. They believe that it is the responsibility of all managers, and that the responsibility starts with spending time with front-line workers; going to the *Gemba*, or place where the action is happening. Gemba management is a critical element of Lean leadership, crucial to sustaining Lean. Leaders must be seen to be 'walking the talk' and leading by example. To do this they must spend time on the shop floor, or in the data processing offices, where they can observe at first hand what is going on.

When Ron first took over at Cogent Power's Canadian plant he spent most of his time on the shop floor. By doing this he established strong relationships with the workforce and built up trust in his leadership.

> I have been in this business for 11 years and, for the first 5 or 6 years, I spent more than 50% of my time on the shop floor every day. This is

where I built the reputation and the trust. Employees feel free to contact me directly, which extends beyond the core of the 80 or 90 production workers who have been here all this time, and who I have developed the sort of relationship with. They feel that I can relate to them individually. I have also had new guys, who I have barely met, who have come to me for advice. I grew up on a dairy farm. So I had humble beginnings, and I think this has helped my attitude and approach. **"**

Ron, Transformer Divisional Director, Cogent Power, Canada

John Shook was the first American manager at Toyota Japan and he thinks that the leader's job at Toyota is, firstly, to get everyone to take the initiative to solve problems and, secondly, to ensure that everyone's job is aligned to the company's goals. It is the leader's job to develop people by mentoring, coaching and example.

We talked earlier about mental models that influence our decision making.

In *The Fifth Discipline* Peter Senge describes mental models as one of the five learning disciplines that build learning capabilities in an organisation. Mental models are the discipline of reflection and enquiry focused around developing awareness and attitudes that influence thoughts and decisions. The Toyota leadership model is a good example of this as it relies on very different mental models to those found in many traditional organisations. Leaders or managers of traditional organisations tend to follow either the old 'Dictator Style', often referred to as *command* and *control,* or the laissez-faire 'Empowerment Style' of the 1980s. A generalist manager with a command and control mental model delivers top-down directives and expects people to 'follow the rules'. His or her approach might be 'Do it my way', whilst a top-down task manager might say 'This is what to do and how to do it – now do it my way'.

Managers or leaders holding a bottom-up 'empowerment' mental model might take a different approach and say 'You are empowered to make the decisions. This is what I want to achieve, I don't care how you go about it, as long as you deliver the results – do it your way'. In contrast, Toyota leaders want to know enough technical details to understand the problem and appreciate the solution but their approach would be 'Follow me and let us figure this out together'. The Lean leader style is that of a mentor, coach and active participant in problem solving. This is what engages and motivates the workforce.

> ! To be a truly effective and sustainable Lean enterprise we believe that the leader's role is to set the direction and inspire people to achieve this, in other words the WHAT and WHY. However, their role is to trust the employee to come up with the plan, in other words the HOW.

Bottom-up empowerment

Group facilitator
'You're empowered'
'Do it **your** way'

Builder of learning organisations
'Here is our purpose and direction. I will guide and coach'
'Follow me and let's figure this out **together**'

Top-down directives

Bureaucratic manager
'Follow the rules'
'Do it **my** way'

Task manager
'Here is what to do and how – do it!'
'Now 'Do it **my** way'

General management expertise   **In-depth understanding of work**

Lean leaders also understand that a good financial performance is a result of a well managed process and that financial results reflect the control and performance of the process. As Frans told us,

> If you are doing the right things then the bottom line results will follow; if you constantly chase the bottom line then this may result in doing the wrong things.

This has certainly been true for Cogent Power as, by doing the right things, they have turned the company around from loss-making to highly profitable in three years. Mark, the General Manager at the UK factory, believes strongly that success comes not only from doing things right but also from *doing the right things*. He uses the efficiency / effectiveness matrix to put Lean into context and to illustrate to his team the need for being both efficient and effective.
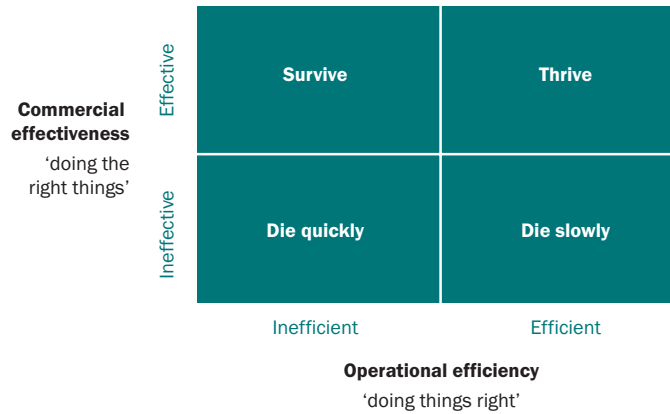
		Inefficient	Efficient
Commercial effectiveness 'doing the right things'	Effective	Survive	Thrive
	Ineffective	Die quickly	Die slowly

Operational efficiency 'doing things right'

Leadership is important at every stage of Lean transformation, but particularly at the start and during the 'it isn't worth it' phase when management typically becomes extremely unhappy as the benefits often appear smaller than the pain of gaining them, usually somewhere between 18 and 24 months after starting a transformation. It was during this period that Cogent Power recognised that the middle managers were struggling. Early emphasis had been on developing the senior management team, who were responsible for driving the change, and the Lean coaches, who were going to train shop floor operators in Lean improvements and problem solving. This top-down and bottom-up approach had neglected the middle managers, who were being asked to manage the Lean transition but did not have the same level of skills as the people they were managing.

In order to re-engage the middle managers Peter, the HR Director, developed a Lean management training programme for all the managers across all sites. The programme was based on the 14 Toyota Way Principles described by Jeffrey Liker in *The Toyota Way* and by Douglas Howardell in *Seven Lean Skills*. Managers were taught not simply to look at reducing muda but also to take responsibility for reducing mura and muri.
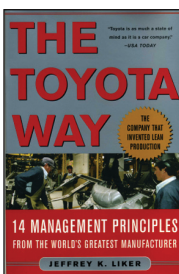
The roles and usual impacts of Lean on different levels in the organisation

The role is:

To provide vision and incentive

To lead the operational change

'Doers'

CEO

Senior management

Middle management and front line supervisors

Frontline

The impact of Lean is:

Like the results

Left with changed uncertain roles

Enjoys the involvement
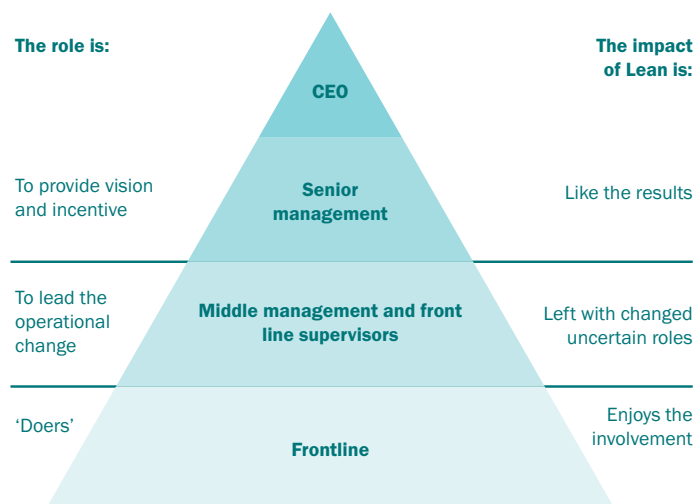
Source: Shook, J. (2007). *Lean Management and Lean Leaders*, Lean Enterprise Institute Webinar

The result was that line managers and team leaders were given skills that emphasised the change in roles and responsibilities expected of the entire leadership community as it went forward. The programme, with the aim of helping individuals and teams to 'lead the Lean lifestyle', integrated the latest Lean thinking and leadership techniques with the strategic goals of the business.

Multi-level leadership programme

Senior level leadership
Making informed strategic choices on the continuous improvement systems and behaviours that best align to the future needs of the business.

Middle level leadership
Aligning future roles of operational leaders and their teams to meet the business goals and deploying a process for continuous and sustainable improvement.

Local level leadership
Understanding the needs of the local area, in order to lead and enable the team to sustain continuous improvement.

The programme challenged individuals to continuously push themselves and their teams out of the 'comfort zone' and into the 'stretch zone'. Much of the emphasis was on the importance of values and behaviours that would be needed to lead the organisation into the next phase of maturity. All attendees had to commit formally to leading a Lean improvement activity in their area in order to support the business; the programme provided a fresh impetus to the Lean journey just at the right time.

Lean thinking and the 'stretch zone'
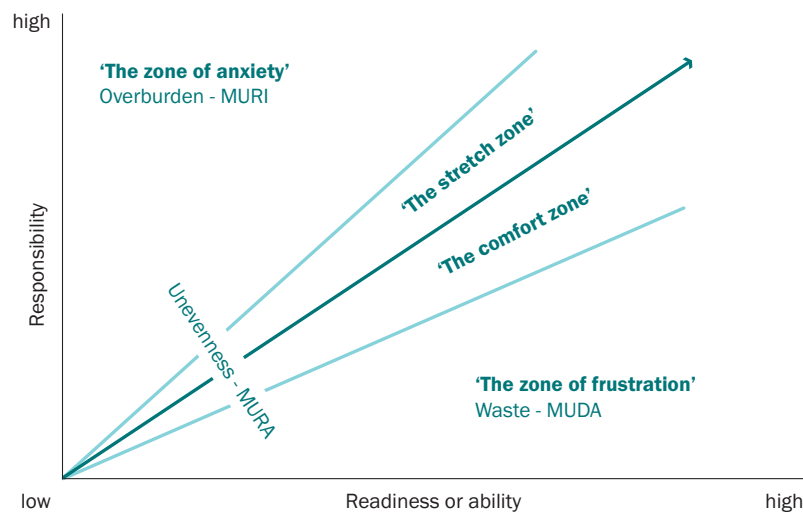
Adapted from *Flow: The Psychology of Happiness*, Mihaly Csikszentmihalyi

It is the leader's responsibility to develop people. This means constantly moving them out of their comfort zone and stretching them a little, but there is a balance here that can be explained in terms of muda, mura and muri.

During one of the leadership sessions, Cosimo (a production manager at the Canadian plant) explained how, when he first was asked to manage a new PULL system, that he was 'off the scale' in the zone of anxiety as he was nowhere near ready for the responsibility that had been handed to him. Within six months of working on the pull system, Cosimo reflected on his position and announced that he was now in 'the comfort zone' and needed another challenge.

Continuous improvement aims to develop people so that they stay just above the comfort zone. Lean is about more than continuous improvement, it is also about *respect for people*. This means avoiding the zone of anxiety where employees feel overstretched and are given responsibility beyond their readiness or ability. Respect for people also means keeping them out of the zone of frustration by respecting their abilities and pushing them gently to achieve more. At Cogent Power the employees constantly strive to keep in the stretch zone and the managers and leaders know and appreciate the dangers of human resource muda, mura and muri.
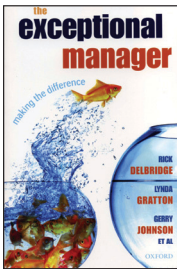
In *the exceptional manager: making the difference*, Rick Delbridge, Linda Gratton and Gerry Johnson provide an insight into the qualities of exceptional managers and how they can make a difference. Exceptional managers are able to step out of their comfort zones and display the qualities of commitment and trust that they expect of others. They champion a learning environment, are participative and have the capacity to challenge and reflect. Exceptional managers engage others in reflective conversations that help the company on its journey to sustainable long-term prosperity. These are some of the qualities that are observed in the managers and leaders at Cogent Power; they are seen in abundance in Marcel and Frans.

Leadership

- Strong decisive leadership with Lean experience is needed in the early phases of the programme
- The later phases require more dispersed or adaptive leadership that takes more hands-on responsibility and leads the incremental continuous improvement
- Leaders must be prepared to review themselves critically, and the process, in order to push the business forward
- Continually develop Lean leaders at all levels, on all shifts and within all areas of the business and adopt a 'leading the Lean lifestyle' programme

Behaviour and engagement

Companies initiating Lean change often focus on the tools and techniques such as Value Stream Mapping and 5S. Although this approach frequently leads to quick wins and helps foster confidence among employees, sustaining these improvements in the long term can be problematic.

Three important groups are often ignored:
- Customers; the supposed focus of the first Lean principle.
- The company itself; 'What are we doing that will benefit the company?'
- The employees; when we make any change we always need to ask ourselves, 'What's in it for the employees?'

This section concentrates on people, and looks at how employees, at all levels of the organisation, can be motivated to adopt Lean behaviours and become engaged in the transformation.

Why focus on the employees? Organisational change for many people is associated with feelings of insecurity, uncertainly and anxiety, often leading to lack of buy-in and employee resistance. Getting all employees on board from the outset is crucial to sustaining Lean change.

> Michael Hammer, reflecting on the failures of BPR told the Wall Street Journal (November 26, 1996) that he, and other re-engineering leaders, forgot about people. 'I wasn't smart enough' he says. 'I was reflecting my engineering background and was insufficiently appreciative of the human dimension. I've learned that's critical.'

Marcel had a vision of Cogent Power as a self-propelling organisation. He recognised that to achieve this required a change in culture, encouraging the right attitudes and developing capabilities. His leadership helped to inspire a set of appropriate behaviours and high levels of engagement. In the Canadian plant Ron took Marcel's vision and translated this into their flagship Lean identifier across the plant.

> **Self-propelling organisations**
>
> We have talked at different times about the desire within a Lean thinking company to be what is termed a 'self-propelling' organisation. In the spirit of waste elimination and continuous improvement, this means that the organisation as a whole has the attitude, the culture and the capabilities at all levels within the organisation to achieve continuous improvement and sustain itself in the future. It is an organisation that does not require a management initiative, a customer initiative, a shareholder initiative to improve – it comes from the desire and the will of the people inside the organisation.
>
> This requires a commitment everywhere in the organisation to improve and to eliminate those obstacles that delay, prevent or inhibit improvements. It is management and leaders' responsibilities to ensure that the organisation takes actions on all employees ideas and suggestions for improvement, and that good ideas for improvement are acted on quickly so that wastes can be eliminated and improvements generated.
>
> It takes a whole cultural change to make this happen. This is our desire, and our goal. We will continue to work at this until we achieve it.
>
> *Source: Marcel, Managing Director, Cogent Power*

In this section we look at the types of behaviour and attitudes we want to encourage and how people can be motivated to adopt them. We then discuss the importance of engagement and how to get people engaged with the organisation and the Lean implementation process. But before we start, it is worth thinking about the organisational model and the skills and competencies of the people who will help drive the change.

Changing the organisation

Sometimes changing the organisation and getting the organisational model right involves making hard decisions. If some people are really not willing or able to make the change, it is better to take the decision to move them earlier rather than later when problems have arisen.

Within any organisation there will be some people who will resist change and try to maintain the status quo, whilst others adapt quickly and easily. In *Who Moved My Cheese?* Spencer Johnson tells a light-hearted story about four fictional characters Sniff, Scurry, Hem and Haw who represent the different approaches people take to change. People like Sniff seek change and enjoy working in places that are constantly changing. Others, like Scurry, immediately jump into action to get things done when change happens. These people enjoy the activities and actions that facilitate change. Then there are the people who Hem and Haw. These people do not like change, they are comfortable with their old regime and will try to preserve it; they view change as a loss of something: power, status, responsibilities, privileges etc. At first they will deny that there is a need for change and will feel resentful. The difference between these last two groups is that the Haws are open-minded. They eventually recognise that change is inevitable and that all that is holding them back is their own fear. Once this happens they will start to change; first by accepting, and then by enjoying, and finally they embrace the change and thrive in it. In contrast the Hems never accept the need for change and feel they are victims. They think that change is risky and feel safer with what they know. This sense of false security gives them comfort, but when they realise that the real danger is in not changing, then some of them will become Haws. Generally about 80% of the Hems will eventually change, or become ineffective, but some hard-core resistors, irrespective of all the efforts, will always resist change. The Hems that remain become anchors and try to prevent change happening; they may even try to sabotage it. This puts the organisation in danger of stagnation. As much as organisations want to keep all their employees, sometimes, as a last resort, they have to let some people go.

At Cogent Power people were given every chance to join in with Lean. They were given training and support but, inevitably, a few remained who were not prepared to change. These employees had to go, as they would not even be able to survive the change. In making the decision to replace them, a strong message was sent out to all employees, which signalled that the leaders were very serious about Lean.

> Before you start with Lean you must be sure that you have the right organisational model and that these are the right people to make it work. If they're not the right people, it doesn't mean that Lean is not correct; it is the people that are wrong. I make the comparison with horses. If you have show jumpers and workhorses, you can train the workhorses all the time, but you will never make them jump. And it's the same with Lean; you need the right people to make sure it is a success.
>
> **Frans, Technology Director**

> We changed our management structure as we looked at our organisation in terms of what we are trying to do with improvements in Lean. There were some key changes that we needed to make. Two out of four front-line supervisors were changed, and we lost two plant managers and three operators. We haven't hesitated to make the changes, which has been a big part of our success. We made it quite clear that the first plant manager was changed because he didn't agree with the initiatives and waste elimination etc. So the statements were loud and clear. We had a guy in purchasing, basically an internal supplier, but he had a much bigger role in creating obstacles, so we let him go at the end of last year. But all of this takes time. We train them, we support them, we give them every opportunity to join in and to change, but at the end, sometimes you have to let them go. We had to make management, staff and operational changes to succeed. If as an organisation you are determined to make the change successful you cannot be hesitant in removing key people if they are blocking a progress; this is the message that I'm sending and I was quite conscious to make this message clear. You understand that if you have a vision of where you want to get to, you have to make changes in attitude and culture to get there and you have to be tough enough to remove the obstacles in the way.
>
> **Ron, Transformer Divisional Director, Canada**

Before we consider Lean behaviours and behavioural change, let us think carefully for a moment why some people resist change.

Overcoming resistance to change

Many people resist change through fear and this drives negative and defensive behaviours. Understanding resistance and working to remove it is critical to successful cultural and behavioural change. There are four basic forms of resistance: organisational, political, individualised and technical.

Think about resistance you have encountered in your organisation, or in yourself, and reflect on how it was expressed.

Understanding resistance

Organisational resistance

Underlying issues are lack of control and ownerships.
Expressed as NIH (Not Invented Here)

Political resistance

When change is seen as a loss and / or a threat to the status quo

Individualised resistance

Expressed as WIIFM (What Is In It For Me)

Technical resistance

That which is not understood is resisted. Expressed as becoming overwhelmed by highly specific details

Source: Eckes (2001)

The most common form of resistance is technical resistance. This is where employees fear that they will not have the right skills to do the job and lack confidence. The right training and communication can help overcome this. We discuss training and communication more in the section on engagement.

Political and organisational resistance is associated with perceived or real loss of control. In political resistance this is a loss of power or position. Political resistance can be felt by anyone, but it is most often associated with management resistance. Organisational resistance is more to do with loss of pride or ownership, and is expressed as *Not Invented Here* (NIH) syndrome.

Sometimes, in any change, the loss is real and then support mechanisms are required to deal with the consequences of political and organisational resistance. Where the loss is perceived, making sure that people are given the opportunity to get involved, and are supported and encouraged in their new roles, should help alleviate it. But do not assume that this is easy. A lot of politics had to be dealt with at Cogent Power before Lean could be successfully deployed. It takes hard work and lots of effort to overcome political and organisational resistance.

Political resistors will try to maintain the status quo. In *Real Lean – Understanding the Lean Management System*, Bob Emiliani explains that Real Lean means continuous improvement and respect for people. Fake Lean is where a company concentrates only on the continuous improvement and just deploys some Lean tools. Bob thinks that Real Lean cannot be implemented unless leaders and employees are prepared to challenge the status quo.
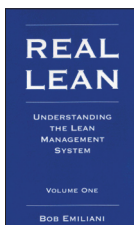
Challenging the status quo

	Status quo	Non status quo
Non status quo	Maybe Lean	'Real' Lean
Status quo	No 'real' Lean	Not 'real' Lean

Leaders (vertical axis), Employees (horizontal axis)
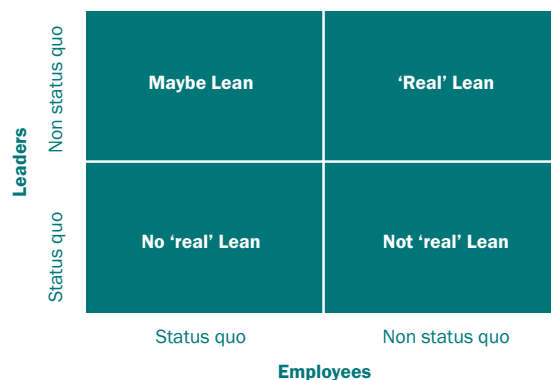
Adapted from Emiliani, 2007

Individualised resistance is expressed as 'What is in it for me?' the question we posed at the start of this section. Answering this requires an appropriate reward structure that shows appreciation and recognition of the extra effort everyone has to put in to facilitate change. Rewards do not have to be financial, but they do have to be equitable. People crave genuine acknowledgement of their contributions and often value a simple 'Thank you' or 'Well done' more than a financial reward. We discuss rewards in more detail later.

So what do we mean by behaviours? What are the behaviours that we want to encourage and how do we change people's behaviour?

Lean behaviours

Examples of Lean behaviours include: trust, honesty, openness, consistency, respect, reflection, observation, objectivity and listening. Wasteful behaviours include: blame, ego, distrust, cynicism, sarcasm, ambiguity, subjectivity, insincerity, self-imposed barriers and negativity.

> Bob Emiliani defines Lean behaviours as:
>
> "Lean behaviors are simply behaviors that add or create value. It is the minimisation of waste associated with arbitrary or contradictory thoughts and actions that leads to defensive behaviors, ineffective relationships, poor co-operation, and negative attitudes.
>
> He concludes that:
>
> "Lean behaviors exhibited by corporate culture should be a strong source of competitive advantage…Once Lean behaviors are deeply understood, they must be practiced diligently under all conditions until they become sustaining behaviors that replace old habits."

So how do we create Lean behaviours? Well, you can recruit people that exhibit Lean behaviour and then you can equip everyone with the right skills through training and development; but this is not always enough to achieve the right change in culture that is necessary to ensure that the change sticks.

Many years ago Kurt Lewin, a German psychologist, said that human **Behaviour** is a *function* of both the **Person** and the **Environment**. He used a mathematical formula to describe this that became known as Lewin's Equation.

$$B = f(P,E)$$

This may seem simplistic, but it does highlight the point that the work environment plays a big part in encouraging the right behaviours.

So how do you build an environment for sustainable Lean? It involves examining all the elements of the organisational structure with its policies, procedures, measures and rewards to see if any are acting as roadblocks and stifling progress.

Changing behaviours involves changing the culture of the organisation. So let us consider culture for a moment.

Organisational culture

In order to make change happen and to embed the changes in an organisation, you need to understand the organisation and this means understanding its culture.

> Two quotes from Edgar Schein's book *Organizational Culture and Leadership* may help to understand the importance of culture when implementing Lean. These are:
>
> "Organizational culture is the key to organizational excellence… and the function of leadership is the creation and management of culture."
>
> And:
>
> "Organizational learning, development, and planned change cannot be understood without considering culture as the primary source of resistance to change."

Culture is like the wind. You can feel the strength of it, you can see the effects of it, but there is nothing tangible for you to describe. So we tend to think about culture as the s*ocial, moral and behavioural norms* of a group or organisation, which are

based on the *beliefs, attitudes, values and priorities* of the members. The culture of the organisation is typically created unconsciously, based on the principles of the top management or the founders, of an organisation, and it exists where a group of people have been together long enough to have shared problems and have had the opportunity to solve them.

To make any significant organisational change, such as Lean, stick involves creating the right culture; *a Lean culture.* There is a lot of debate about whether cultures can be managed and deliberately changed. Edgar Schein believes that culture has three levels, but it is only at the top two levels that culture can really be changed and managed. These are the values which are strongly influenced by senior management and include the shared beliefs and meanings and the visible artefacts: the symbols, language and rituals.

Schein's model of levels of culture and their interaction

To facilitate any cultural change the strategy has to be internally consistent with the secondary features of the organisation, its design and structure, systems and procedures, the physical layout of the plant, the narratives, myths and legends about the organisation and the formal expressions of policy and outlook.

Marcel was always very aware that changing the culture of the organisation would be an essential part of implementing and sustaining change. He started at Schein's top level; the visible artefacts.

He would say to employees, "Look at your environment and ask yourself these questions. Would you be proud to show your family your workplace? Would you dare to show them the rest rooms, the toilets, the canteens?" He says that three years ago no-one would have wanted to show their family around, but they would do now because it is a nice working environment. He says that they are even working on the outside of the building.

The upgrading of the toilet facilities is symbolic; part of the visible artefacts, but it has demonstrated Marcel's values and his respect for people. The tale has now been passed down as one of the stories that support the cultural change.

A second symbolic gesture has been the creation of a Lean Centre. This facility sits in the centre of the UK plant and serves as a training centre, project room or meeting room. It is highly visible; a clean and bright new building that has been very well appointed. As a facility it is impressive, but as a symbol of commitment and seriousness it is inspirational.

As well as organisational culture, countries have different national cultures and these can affect the approach and speed of change. Cogent Power has three manufacturing sites: UK, Canada and Sweden. Marcel and Frans set the vision and direction but they allowed each of them to implement Lean in a way that reflected their different national cultures. Each implementation was therefore different but all were successful.

> "It is the small things that are extremely important. If you pay attention to these you get benefits that would be very expensive to acquire. Marcel always gives respect and shows appreciation. There have been tangible and intangible benefits. The mess rooms and personal protective equipment have been improved; people are given the tools to do the job and this is a much better place to work than three years ago."
>
> **Bill, Divisional Director, Electrical Steels**

> "You can't calculate the return on these, so we sold the land we didn't need and used the proceeds to improve the environment, making it a good looking plant that people can be proud to work at. This is one of our ways for rewarding all their efforts."
>
> **Marcel, Managing Director**

National culture

Cultural differences due to national characteristics have been studied by several authors. The best known is probably Geert Hofstede, the author of *Culture and Organisations: Software of the Mind*, who analysed national cultures on the basis of:

- **Power Distance Index (PDI)**: the extent to which the less powerful members of organisations accept and expect that power is distributed unequally
- **Individualism (IDV)** as opposed to collectivism: the degree to which individuals are integrated into groups
- **Masculinity (MAS)** vs femininity: this refers to the nature of the dominant values – e.g., assertiveness, monetary focus, well-defined gender roles, formal structure – vs. concern for others, focus on quality of relationships and job satisfaction and flexibility
- **Uncertainty Avoidance Index (UAI)**: this deals with a society's tolerance for uncertainty and ambiguity
- **Long-Term Orientation (LTO)** versus Short-Term Orientation. Values associated with Long Term Orientation are thrift and perseverance; values associated with Short Term Orientation are respect for tradition, fulfilling social obligations, and protecting one's 'face'.

The Hofstede analyses for Canada and the UK illustrate their strong feelings about individualism and masculinity, indicating a preference for formal structures and a relatively low preference for collectivism. For both countries long-term orientation ranks lowest, indicating that change can be achieved more rapidly than in many other countries. Compare this to Sweden, which has very low orientation towards masculinity, in line with its consensus culture, and a higher long-term orientation.

The Lean implementation at Cogent Power initially progressed much more slowly in Sweden than in the UK and Canada. This was because the culture dictated that they discussed everything thoroughly before gaining consensus and approval to take action. However, once they did act, there was a much higher degree of acceptance within the workforce. So the initial pace was slower but more determined.

Hofstede analysis
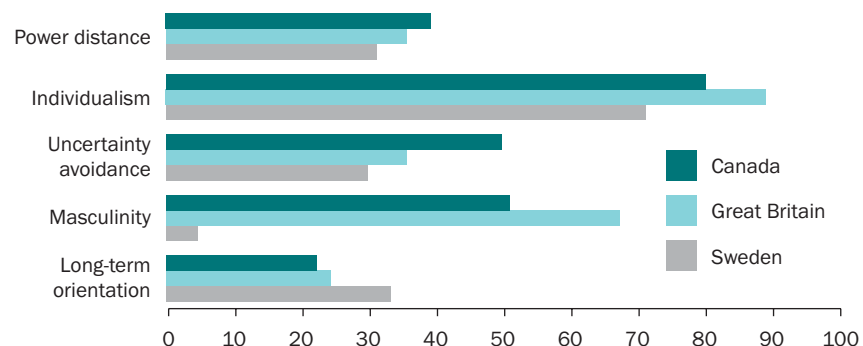
Source: www.geert-hofstede.com

> I supported all kind of investments in Canada. They have that entrepreneurial behaviour that I like.
> **Frans, Technology Director**

In contrast, the culture at the Canadian plant was much more entrepreneurial and 'have a go' than at either of the European counterparts. Entrepreneurship is widely accepted as part of the business culture of North America, where it is viewed as the process of discovering, evaluating and exploiting opportunities. Entrepreneurs are characterised by fierce determination and optimism. They usually take a pragmatic approach to problem solving and are willing to take risks to achieve their goals. As a result they tried more things at the Canadian plant; some worked well, and others were, at best, learning opportunities.

In the UK the pace was much smoother, with a steady improvement progression that indicated a more analytical, measured approach reflecting the reserved British culture. Here, pilot projects were very important. They convinced everyone of success before being rolled out across the plant.

Behaviours are, therefore, part of the cultural systems that are influenced by the visible artefacts and the underlying values and beliefs of the individuals who make up the organisation. Let us look now at how we can change behaviours.

Changing behaviours

So how do you influence Lean behaviours? It starts with *beliefs*. First, you have to believe that something is right for you, and is consistent with your own values and the perceived values of the organisation. Second, you need the reassurance that the people you respect would behave in a similar fashion. Finally, you have to believe that you have the necessary skills, competency and resources to make the change possible. Then you are more likely to behave in a certain way; so beliefs and attitudes drive behaviours.

Behaviour is a matter of individual choice and intention. You choose your behaviour according to your values, beliefs and attitudes. The *Theory of Planned Behaviour*, developed by Icek Ajzen in 1988, is based on the premise that people do what they intend to do, not what they intend not to do.

Theory of planned behaviour (Icek Ajzen)
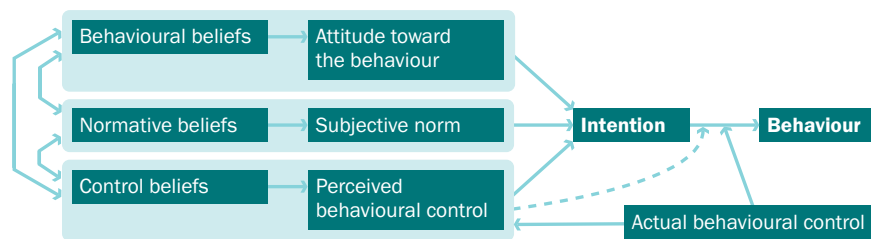
Source: http://www.people.umass.edu/aizen/tpb.diag.html. Copyright © 2006 Icek Ajzen

Behavioural intention is the antecedent of behaviour and is influenced by our attitudes, the opinions of people we respect and whether we believe in our own ability. Jo Beale, a researcher at Cardiff University Innovative Manufacturing Research Centre (IMRC), has applied the Theory of Planned Behaviour to Lean implementations and has shown communication and training to be effective intervention mechanisms that affect an employee's willingness to adopt Lean behaviours.

People-centred Lean sustainability model
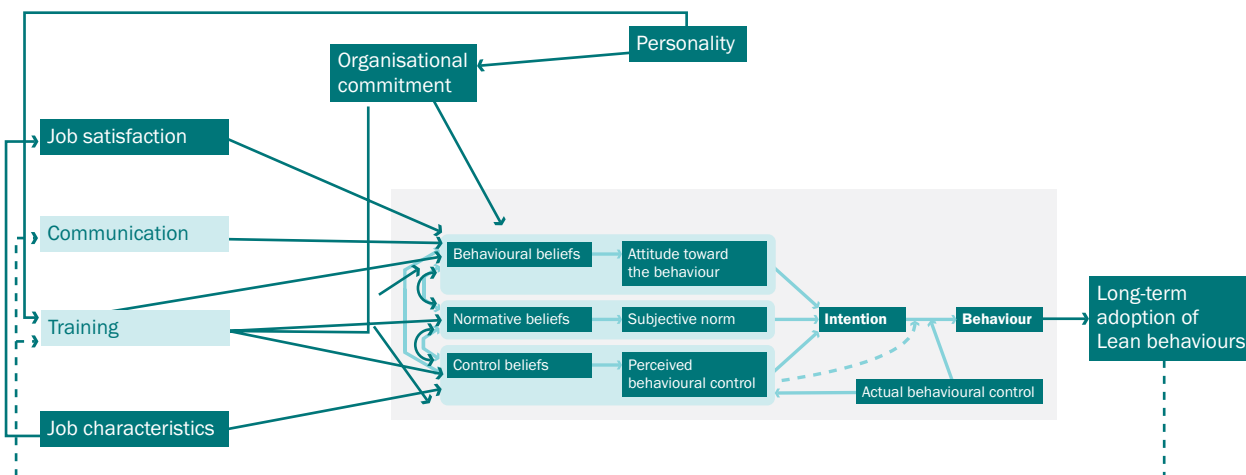
Adapted from Beale & Hines, 2007

People perform better when they know the reasons why change is necessary. One of the keys to gaining an employee's motivation for change is communication. Employees need to be made aware of the reason for introducing the Lean approach within their organisation, what outcomes can be expected and what role they will play in the new organisation. Effective two-way communication can serve to include workers in the change programme, to give them a sense of ownership of the changes taking place and to foster an open and democratic environment.

> ! There is no set recipe for the structure and set-up of any Lean coach community other than the selected team must best represent the situational needs of the organisation. In plants where people culture is critical consider a variety of options (such as support coaches) to better engage and motivate people at all levels of the organisation.

In December 2003 Marcel held a two-day meeting at Mathern Palace, in South Wales (it's not as grand as it sounds!). He invited all the senior managers from all plants. At this meeting he announced his intention to turn Cogent Power into a Lean organisation. For many this was their first introduction to Lean, so he had external consultants to take them through a Lean awareness session. This meeting has gone down in the Cogent history as 'The Mathern Palace Meeting' that effectively kick-started the Lean transformation.

Early in their journey, Cogent Power embarked on a comprehensive Lean coach training and development programme. This training was in theory and practice but with more emphasis on the latter. The coaches were selected mainly from inside the organisation and these volunteers were chosen for their experience in manufacturing, sales, technical and engineering disciplines. The coach programme offered both theoretical and hands-on tools and techniques training. The coaches were supported by the local management teams and the focus of their improvement activity was aligned with the business strategic and operational priorities. During the first phase of the journey, the business carried out two externally facilitated Lean coach programmes and also began internal education at plant level. Employees who demonstrated a willingness to participate in the Lean journey were encouraged, and given additional training and responsibility for improvement activities.

At one of the plants, one of the Lean coaches moved on to another position and the plant advertised internally for a replacement. Peter, the HR director, received 28 applications for the post and made the inspired decision to take them all on. He designed a programme that would enable all applicants to spend time out of their positions working with the formally trained Lean coaches. After a three-month period they would return to their position with the title of Support Coach and the added responsibility of supporting improvement activities in their area.

Frans and Peter were heavily involved in the Lean coach programme. Frans was appointed by Marcel as the Lean maestro and given operational responsibility. Frans took a very hands-on approach and arranged quarterly 'Quo vadis?' networking sessions. 'Quo vadis?' literally means 'Where are you going?' or 'Where do we go from here?' These sessions were formal review and direction setting meetings that involved all the Lean coaches from all sites.

> The first Quo Vadis session was incredible. We met in Holland. All the Lean coaches were there and we invited Marcel, the Senior Directorate and General Managers. Marcel opened the meeting in his typically frank style and asked all the coaches to make a presentation on progress. We split into focus groups then. There was a lot of blood-letting with honest feedback and challenge that people weren't used to. This made them sit up and think 'Hey guys – this is for real.'
>
> **Peter, HR Director**

It was at one of these meetings that it was recognised that the middle managers had been neglected. The emphasis had been both top-down and bottom-up, leaving the middle managers at a disadvantage. They were supposed to be driving change but did not have the same level of Lean skills as the people they were managing. This was rectified by designing a specific programme – Leading the Lean Lifestyle – which all managers attended. Because Frans and Marcel's leadership was so unremitting, the senior managers gradually realised that this was very different from any earlier change programmes and that it involved everyone *leading the Lean lifestyle*.

We have talked about the management group influencing behaviours, but we also need to consider another influential group – the trade unions – and how they were involved in the change.

Involving the unions

Both the UK and Swedish plants are unionised and the trade unions were involved from the very beginning.

When Marcel was announcing his intentions at the Mathern Palace meeting, Peter was communicating the same message to the trade union representatives and shop stewards. Marcel and Peter had discussed the state of the business with them on earlier occasions, so it was no surprise to them that something had to change. They had feared that this would mean redundancies and job losses, but Marcel and Peter were quite emphatic that this would not happen as a result of Lean. Marcel asserted that by improving flexibility and responsiveness to customer demands, Lean would make Cogent more competitive. It was up to everyone, including the unions, to make Lean work and turn the company around. It was only by all working together that this could succeed. The strength of Marcel and Peter's conviction persuaded the unions that Lean meant more jobs, not fewer, so they accepted the challenge to help sell Lean to their members.

Initially there were some sceptics who had 'seen it all before' and did not expect it to last. But they soon discovered that this was different; it was not going to go away.

The TU members respected the visible changes that were happening and were impressed by the money that was being spent on training and upgrading facilities such as the toilet and canteen blocks. The investment in the Lean Centre demonstrated the management's commitment and conviction that Lean was the way forward.

Several of the TU shop stewards later applied to become Lean coaches and, with the management team, became some of the most ardent Lean supporters.

> "The trade unions were involved right at the beginning. We were given the challenge to convince people that Lean would help secure jobs. It was surprisingly easy, in a very short time we had convinced more people than we thought possible. Some people got involved who were previously 'retired-on-the-job' and they are still involved today."
>
> **Trade union representative, Cogent Power UK**

Motivation for change

Theories of planned behaviour draw heavily on expectancy models. These were developed by Victor Vroom and modified later by Lyman Porter and Edward Lawler in *Managerial Attitudes and Performance*. These models recognise that the relationship between employees' behaviour at work and rewards is not straightforward. Victor Vroom suggested that employees can be motivated to perform better if they believe that:

- Performance relies on effort
- Performance leads to reward
- Rewards are worthwhile.

The authors of these models realised that an employee's performance is influenced by factors such as personality, skills, knowledge, experience and abilities. As a result people are motivated differently, so when designing rewards all of these factors need to be taken into consideration. Rewards can drive the wrong behaviours, and rewards that are not considered equitable or satisfactory can de-motivate rather than motivate. So, care must be taken in the design of rewards. There is a link here to KPIs, which also need to be designed to drive the right behaviours. For example, if employees are rewarded on output, it is pointless expecting them to be motivated to reduce finished goods inventory.

> "Motivation is about self-esteem and doing a job well."
>
> **Peter, HR Director**

Peter, the HR Director, designed an array of rewards. The first is financial. There is a quarterly bonus scheme that comprises four elements, all directly impacted by Lean improvements. These are measured through KPIs. However, Peter does not just rely on financial rewards as these do not motivate some people. So to complement the bonus scheme he introduced other rewards and recognitions. There is a monthly Lean Award Scheme where individuals are nominated by their managers or peers. The scheme is open to everyone, including full-time contractors. The winning nomination for the Lean Award is decided by the Works Management Council. The winner is entitled to take his or her partner, family or friends out for a meal at a restaurant of their choice to a value of £100. No money is given in lieu; the winner submits the receipt and the cost is reimbursed. The winner is announced at the monthly trade union meeting and a photograph is taken to be publicised in the Lean Magazine and on the Lean Intranet website, along with all the other nominations and individual contributions.

Employees are also given additional support and training in things that they want to do outside the training required to perform their work-related roles, for example car maintenance, DIY or academic educational subjects. They are entitled to apply for any training course they wish to attend. Attendance for all non-work related

training is outside working time, but all courses will be paid for by the company. The reason for this is that, as people develop new skills, they bring the capacity to learn to work, which increases organisational learning.

Cogent Power also organises family days where employees' families are invited and shown around the workplace. They are treated to barbecues cooked and served by the managers. All the rewards are designed around the expectancy model to improve performance and increase job satisfaction.

Expectancy model
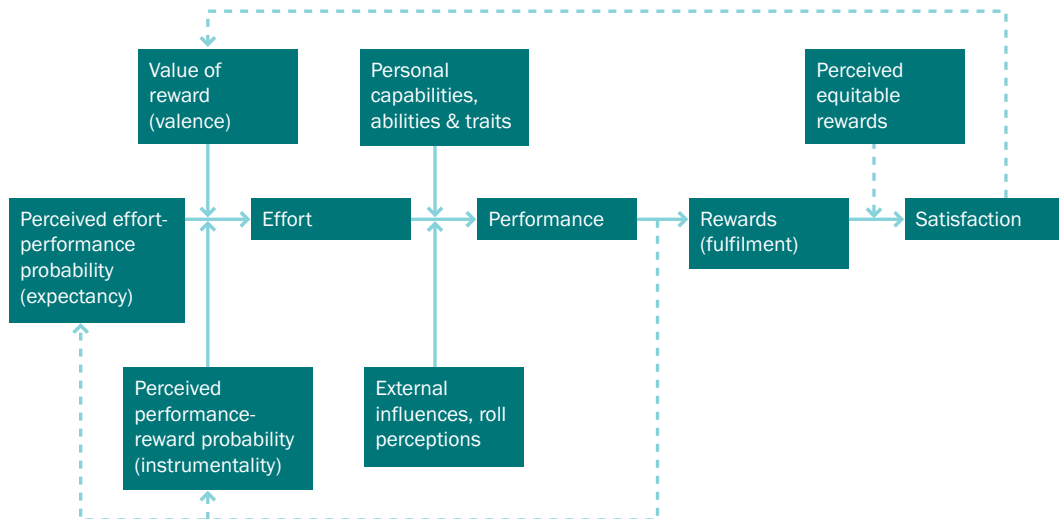
Adapted from Porter & Lawler, 2007

Finally, all employees desire respect and they thrive where they know that they are valued. You can show respect in many ways: by listening to people, congratulating them, recognising and appreciating them. Encouragement contributes to the success of achieving lasting change. People who are not encouraged tend to lose motivation and give up. Marcel's vision of a self-propelled organisation stresses the responsibility of management and leaders to encourage and act on all employee suggestions. This means keeping employees informed, even if the suggestions they make are not considered for action. Once people know the reason why, they can understand and accept decisions. If suggestions are made and nothing further is heard, employees soon become de-motivated and lose interest.

Engagement
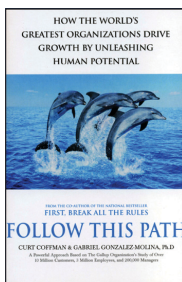
Between 1995 and 2001, the Gallup Organization surveyed over 10,000,000 customers and 200,000 managers. More than 300,000 business units, in hundreds of organisations worldwide, participated in the study. The purpose was to discover what distinguished successful, productive workplaces from those that were not so successful. The results were published in 2004 by Curt Coffman and Gabriel Gonzalez-Molina in *Follow This Path: How the World's Greatest Organizations Drive Growth by Unleashing Human Potential*.

In his foreword to the book James K Clifton, CEO of the Gallup Organization, states that 'The success of your organisation does not depend on your understanding of economics, or organisational development or marketing. It depends, quite simply, on your understanding of psychology: how each individual employee connects with your company: how each individual employee connects with your customers.'

Traditionally organisations have concentrated all their efforts on the things that improve performance: productivity, profits and growth. They have under-valued the influence of their employees' emotional attachment to the business as a driver of profitability and growth. Toyota is one company that has recognised the value of employee engagement.

The Gallup study found that the biggest differentiator between great and less successful organisations was that great organisations create environments that allow their employees to excel. They also build connections between customers and employees that are emotionally driven. The term that the study used to describe these is 'emotionally engaged employees'.

However, engaged employees are rare. In 2000, the Gallup Organization developed the National Engagement Index. This set out to determine just how large a proportion of the employed population was actually uncommitted to their jobs, which they defined as 'emotionally unemployed'. The national trend indicates that only about one-third of the workplace in the United States is engaged, while approximately one-fifth is actively disengaged.

There is a financial cost attached to disengagement. Gallup has calculated that the cost of actively disengaged employees to the US economy is in the range of $253 to $363 billion annually, more than the US budget for defence or education. Just imagine how economies could grow if all employees were engaged with their organisations.

> **Mike Morrison, Dean of Toyota University said in an interview with Gabriel Gonzalez-Molina (Gallup Management Journal, 8th August 2003):**
>
> Lean thinking is best defined as creating organisational wealth. Lean thinking:
>
> ■ Adds value by focusing on customers
>
> ■ Creates flow by focusing on people and processes – and by developing engaged employees who collaborate to engage customers by understanding and anticipating their needs
>
> ■ Achieves mastery by focusing on personal and group learning. This is the final element of Lean thinking. It encompasses one of the most basic human needs: the drive for meaningful growth and progress.

So, if engagement is a win-win situation, how do we go about it? The Gallup Organization has developed a set of twelve conditions that are necessary to create a workplace where employees can become engaged.

1 Having clearly defined expectations
2 Having the right equipment
3 Being given the opportunity to excel
4 Receiving timely recognition or praise
5 Having line managers that care about you as individuals
6 Being given encouragement to achieve more
7 Having your suggestions and opinions taken seriously
8 Being part of the big picture
9 Having pride in delivering quality output
10 Mutual trust and supportive bonds with other employees and managers
11 Having the opportunity to regularly review progress
12 Having the opportunities to learn and develop.

The first two conditions are the foundations and answer the questions 'What does my job entail?' and 'Do I have the right tools for the job?' Conditions three, four, five and six refer to the care that the employee will receive during his or her employment. Seven, eight, nine and ten refer to the environment and each component adds to the other. All are important, but none are sufficient on their own to build the right environment; teamwork is essential. Criteria eleven and twelve refer to performance monitoring and development.

If you want employees who are involved and engaged then open, honest and timely communication is an absolute must.

One thing that is very clear at Cogent Power is the high level of employee engagement; at all the plants employees comment on the 'family atmosphere'. This engagement has built up over time and existed before Marcel and Frans arrived. It undoubtedly helped make the transformation easier and more successful. Part of the engagement is down to the age of the plants, particularly in Sweden and the UK, where the plants are over 100 years old. Companies of this age often have several generations of employees and Cogent Power is no exception. It is not unusual to have second or third generations of the same family working there, or having worked there. When this happens a lot of history builds up that extends

beyond the company into the local community. The distinction between work and social leisure becomes blurred as work colleagues participate in local neighbourhood teams and community events. Part of the engagement is also down to the work of Peter and other HR managers, in developing the atmosphere of inclusion by holding family barbeques, including families in the Lean Award prizes and including contractors in the eligibility to apply for awards.

It is not just in the older plants that engagement is high. It is also clear at the Canadian plant, a greenfield site with many employees who have only been with the company for the last few years.

Like behavioural change, communication is the key to engagement. People need to be aware of what needs to change and why. Everyone needs to be told the same story at the same time. Engagement does not wait for the ripple effect as news permeates the company.

Seven LEAN Skills
- Customer consciousness
- Enterprise thinking
- Adaptation
- Taking initiative
- Innovation
- Collaboration
- Influence

Source: Doug Howardell

Another important mechanism for engagement is training. This took place early in the Lean implementation at Cogent Power. The first session was for the senior management, over two days at the Mathern Palace Meeting in December 2003. All the senior managers and divisional directors were given an intense introduction to Lean, covering policy deployment, value stream management, cross-functional teams and Lean tools. The second phase involved developing and training the Lean coaches. The emphasis here was on 'train the trainer'. The Lean coaches were equipped with the knowledge and skills to run improvement projects and train others in the Lean concepts and tools. However, as we have seen, the middle managers were not initially involved. They therefore became disengaged and did not get involved in the early stages. At soon as Peter became aware of this he instigated a Lean leaders training programme that all managers attended.

To maintain progress and engagement Peter used the Seven Lean Skills described by Doug Howardell as part of the recruitment and annual appraisal process. Employees are reviewed formally by their line managers and their competence in each of the seven skills is assessed.

> "If someone's behaviour or lack of engagement is blocking progress, it needs to be addressed in the same way that any other problem is addressed. This is difficult to take on, but can have extraordinary results."
>
> **Peter, HR Director**

Recently Peter and the management team introduced another formal process aimed at identifying 'Blockers'. These are employees who knowingly or unknowingly block the improvement progress. The purpose of this process is to address the root cause of the problems and bring them into the open. There are many reasons why someone might block progress; there could be a training need, a capability issue, a resource issue or some underlying personal reason that needs to be addressed. The 'Blocker' issues are raised at the management meeting and appropriate action agreed. A manager is assigned to 'own' the issue and it is their responsibility to resolve it before the next meeting. This has had a profound effect. Once individuals are confronted with the problem that results from their behaviour there is always a reaction. Usually the initial reaction is one of hurt or anger. The manager has to be very skilled to cope with this as, handled well, the second reaction is generally very positive. The approach is very similar to any other problem diagnosis. The manager needs to collect the data, to make sure that it is factual, and then advise the individual, invite a response and discuss possible solutions. It does require that the managers handling these issues have acquired some pastoral skills. Since its introduction, the effect has been dramatic and, to date, all the 'Blocker' issues have been resolved and the performance of the individuals completely changed.

Peter told us that when one individual was approached and confronted with his actions he was profoundly hurt, but he came back a few hours later and said "You know what you were saying; I have just realised that you are right." From that time on his behaviour changed and he became totally engaged with the process.

Summary

As the failures of earlier change programmes have shown us, it is all about the people. Get this wrong and the best laid plans will not sustain long-term, if they succeed at all. Employee behaviour and engagement are voluntary actions that are influenced by values, attitudes, beliefs and intention. Building the right cultural environment for sustainable change and overcoming employee resistance are vitally important if you are embarking on an organisational change programme, such as a Lean transformation.

Learning points – Behaviour and engagement

- Lean coaches play a key role in the effective deployment of the Lean programme. The early pace of change often depends on the drive and experience of the coach and therefore the selection of an appropriate Lean coach team is essential.

- The coaches who had been deployed to help drive the programme at Cogent Power became the real leaders of Lean and it was accepted that, in taking a top-down and bottom-up approach to the programme, the middle managers had been neglected. It was evident that they were not owning Lean and therefore not 'living the Lean lifestyle' which is so critical to sustainability.

- Inject pace into the programme by using experienced, motivated and multi-disciplined people to form an internal Lean team.

- Encourage sharing and learning throughout the programme, take every opportunity to get people together to discuss continuous improvement.

- Lean organisations need Lean people who are both competent and capable of pushing themselves and their teams out of the comfort zone and into the stretch zone.

Above the waterline

Above the waterline are all the visible features of a Lean implementation. Organising around key business processes and engaging in process improvement are the cornerstones of a Lean enterprise. Applying Lean tools, technology and techniques to improve, sustain and maintain business processes is the route commonly taken by organisations attempting to enhance performance. Visit any 'Lean' organisation and you will see examples of process management and the application of Lean tools. Visit any 'Real Lean' organisation and you will still see process management and Lean tools; what you won't see is all the effort that has been put in below the waterline; to strategy and alignment, leadership, behaviours and engagement that sustains the Lean transformation.

In this section we examine the features 'Above the waterline'.

Processes

In *Going Lean* we defined key business processes as: *patterns of interconnected value-adding relationships designed to meet business goals and objectives.*

Two things are important when looking at businesses processes.
- Which processes are key to the core business?
- How do you design and optimise key processes to deliver value to the customer, business or value stream?

For a detailed discussion on defining processes see *The Lean Enterprise* by Dan Dimancescu, Peter Hines and Nick Rich.

Each business process comprises a number of steps, tasks or activities that convert a series of inputs into outputs. Our example shows some common processes, but you should always define and agree your own for your organisation.
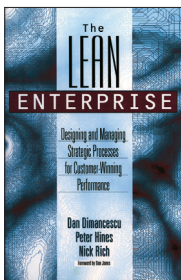
Key process	Definition
1 Product lifecycle management	Managing customer needs for new products. Designing and developing new products, bringing them to market and retiring obsolete products.
2 Order creation	Winning new business with existing or new customers.
3 Order fulfilment	Transforming raw materials into products that meet customer orders including taking orders, order processing, production planning, production, delivery to the customer and payment management.
4 Technology, plant and equipment management	Developing, managing and maintaining operating equipment, including IT.
5 Human resource management	Developing, managing and maintaining employees, including training, recruitment and retention.
6 Strategy and policy deployment	The strategic management of the company, focusing on change and management of critical success factors.
7 Supplier integration and development	Integrating suppliers into other key business processes, developing new suppliers and managing supplier relationships.
8 Continuous improvement	Continuous radical, or incremental, improvement of other key business processes.

In our experience many companies make the mistake of defining too many processes. It is better to settle for between four to ten key business processes that can be defined from start to end.

Many companies find it useful to classify their processes into categories. For example, you might divide the processes into three categories:

- Processes that focus the overall direction of the organisation but don't directly deliver against the targets – strategic processes
- Processes that directly deliver on top level targets – core processes
- Processes that indirectly deliver on top level targets – support processes.

Strategic processes	Core processes	Support processes
Strategy and policy Deployment	Order fulfilment	Human resource management
	Order creation	Continuous improvement
	Product lifecycle management	
	Technology, plant and equipment management	
	Supplier integration and development	

Referring to the customer-facing processes, 'Do any of these poorly or less well than the competitor next door, and you are out of business.'

Dimancescu, Hines and Rich (authors of *The Lean Enterprise*)

The strategic processes set direction; the core processes, aided by the support processes, deliver the targeted results. Within the core processes, some can be identified as customer-facing, such as order fulfilment, order creation and product lifecycle management. Designing and managing core processes effectively and efficiently ensures that the company can compete and remain competitive.

Our companion book *Going Lean* describes how you can select processes to deliver targeted improvements and we refer you to this for further information.

We believe that improvement in core processes either focuses primarily on waste reduction or, alternatively, on value creation. For example, improving the order fulfilment process is primarily reducing or eliminating waste so as to enhance performance, increase capacity and reduce cost. Focusing on order creation primarily adds value by generating more sales to utilise excess capacity. Indeed, some people will argue that you cannot create value by increasing sales until you have improved operations and stabilised the process, thus releasing excess capacity. We believe the most effective way is to improve both processes simultaneously; absorbing the excess capacity generated by improvements in processes such as order fulfilment with new sales generated through value adding processes such as the order creation process.

Why do waste reduction and value enhancement go hand in hand? Waste reduction is often considered to be a way of reducing costs; after all, waste is costly. But cost is not the only way to compete. Think here about prestige cars, such as Lexus, BMW or Mercedes-Benz and compare these to lower-cost alternatives. As well as status, the perceived value of a prestige car is about service, design or quality. Some processes focus more on adding value, others more on cost reduction. The illustration below demonstrates how this might look.
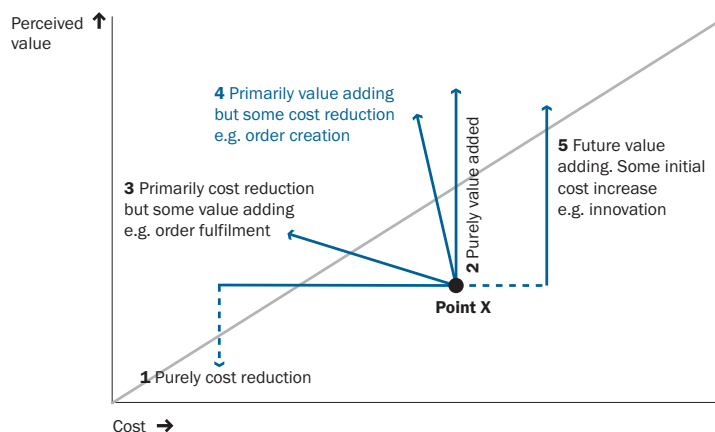
Consider a product that has slightly above average costs and slightly below average perceived value (Point X). Strategically there are a number of options.

1 You could reduce costs and make the product cheaper by reducing all non-value-added activities. The danger of purely reducing costs is that this may not make the product more attractive. Take Rover cars, for example. Cost reduction through job losses alone actually reduced the perceived value (see dotted line). Once you are in this position you are in a continual spiral to keep driving costs down.

2 You could enhance the product to add perceived value. The danger of purely adding value is that, unless you know exactly what the customers value, you might just be adding unwanted features.

3 Removing waste in the order fulfilment process has other benefits, such as improved quality, flexibility and delivery. So, although this is primarily cost reduction, it might also be value enhancing.

4 Focusing on the order creation process includes understanding customer values. Eliminating activities and transactions that add no value can also reduce costs. So, although primarily value adding, there may also be some cost benefits.

5 Some processes may incur costs early on; these are 'future value adding', such as some innovation processes. Once the new products are developed, and sent to market, they can become the focus of further waste reduction and value enhancement.

We believe that you need to focus on both waste reduction and value adding. Let's see why.

Ask yourself the following question. What is the saving from a typical Lean order fulfilment improvement project, such as changing the material flow in a manufacturing cell, that reduces the requirement for people by 25%?

There are three potential responses:

Scenario	What we hear	What it means	Longer term result
1	We have saved 25% of direct labour costs as we have made a quarter of our shop floor staff in the cell redundant.	We have unwittingly disengaged our workforce and almost certainly removed the opportunity for future successful improvement.	Lean has become synonymous with job cuts and has created shop floor opposition.
2	We have saved 25% of direct labour costs from the shop floor cell as we have moved these people 'somewhere else'.	In most cases this means that there has been no real cost savings as 'somewhere else' does not imply increasing output.	Firms fail to realise real benefits from the application of Lean thinking as they focus on savings that are all too often unreal.
3	We have reinvested the 25% of people who were freed up in new business in another area where new work has been brought in to the business.	The benefit of the freed-up people has been multiplied by getting them to work on new business with their 'free' labour.	A multiplier effect is produced when waste removing and value creating processes work in tandem that greatly enhances the benefits and results in profitable growth.

However, this systematic approach requires expert project management skills and strong cross-functional management to ensure that the additional capacity is released in time to meet the extra sales. Failure to achieve the right balance could lead to a worsening on-time delivery performance and customer satisfaction, with a consequent loss of repeat new orders.

Although much of the early focus at Cogent Power was on getting stability in the order fulfilment process, there was also some initial Lean work with commercial departments to standardise the order creation process. Mindful of the first Lean principle, *Understanding value from the customer's perspective*, Cogent Power began engaging with key customers at the outset, discussing the basic value requirements in terms of quality, cost and delivery of both products and service. Capturing the 'voice of the customer' and understanding customer value clearly is fundamental to Lean, but it is often missed by companies who concentrate on

implementing Lean tools. The voice of the customer (VOC), as you will see later, features at three points in the order creation process; setting the marketing vision, generating new business and retaining existing clients.

In this section we concentrate on Cogent Power's experience of developing two core processes, order fulfilment and order creation, as examples of waste reduction and value creation.

Eliminating waste in the order fulfilment process

The removal of waste both inside and between companies is fundamental to a Lean system.

To eliminate waste, you must first learn to see waste; put your muda glasses on.

When thinking of waste, consider the activities within an organisation. There are three types of activity:

1 Value adding: activities that, in the eyes of the customer, add value to a product or service. These are activities that are not wasteful and are part of the product or service that the customer is happy to pay for. Some of these may create future value-added, such as new products.
2 Non-value-adding: activities that, in the eyes of the customer, add no value to a product or service. These activities are clearly wasteful and should be the target for immediate removal.
3 Necessary non-value-adding: activities that, in the eyes of the customer, do not add value to a product or service but are necessary at the present time to deliver the product or service to the customer. These activities should be the target for future improvement, or longer-term radical change.

In the physical environment (manufacturing or logistics flow) the ratio between the various activities is commonly:
- 5% value added
- 60% non-value added
- 35% necessary, but non-value-added.

This looks poor, but in an information flow environment (e.g. office, distribution or retail) the ratio is commonly:
- 1% value added
- 49% non-value added
- 50% necessary, but non-value added.

So there is generally considerable scope for improvement. Let's see how Cogent Power went about identifying waste and removing it from the order fulfilment process.

Identifying waste in the order fulfilment process

Order fulfilment is the complete process from the point-of-sales enquiry to delivery of a product or service to the customer. It includes order processing, production, inventory and materials management, logistics, shipment and distribution. The scope of the order fulfilment process ultimately includes the whole supply chain from raw material suppliers to end customers.

Before you can eliminate waste, you need to be able to identify it. One way of doing this is to map the current state of the process and get a visual picture of the physical and information flows. This will highlight where the flow is disrupted by detours, backflows, waiting or scrap.

The technique they used at Cogent Power was Big Picture Mapping. This is described in detail in *Learning to See* by Mike Rother and John Shook, and the reader is referred to this and other texts on mapping, such as our companion booklets, *Going Lean* and *Lean Profit Potential*.

The key to any process mapping is to be clear on the end-to-end process; this is where your definitions come in. Start by mapping one value stream, but always be conscious that processes can contain more than one value stream and resources may be shared across the value streams. Before you start, choose a value stream that is important to the business, such as a key product line to a key customer or market segment.
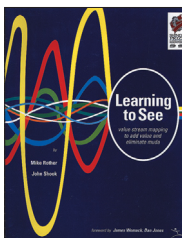
Big Picture Mapping is a useful tool borrowed from Toyota. It will:

- Help you visualise the flows
- Help you see where waste is
- Pull together the Lean thinking principles
- Help you decide who should be in the implementation teams
- Show relationships between information and physical flows
- Create buy-in from the senior team undertaking the big picture mapping.

Big Picture Mapping is a five-phase process. But forget the dusty procedure manuals; in this, and other value stream mapping tools, it is important to record what *actually* happens, not what is *supposed* to happen. Most waste can be found in the workarounds that have become custom and practice. The tools and resources you need are:

- A cross-functional mapping team, which includes some senior people to give it authority, and some direct employees, shop floor or office based, who can give it depth of knowledge
- Large sheets or rolls of brown paper
- Coloured pens or pencils
- Coloured Post-It notes.

Phase 1; start by collecting all the information on customer demand for the product or products you are mapping:

- What is the customer demand or how many products are wanted and when?
- How many different parts are made?
- What is the delivery pattern? How many? How often? Any special information e.g. multiple delivery points, delivery windows.
- What packaging is required?
- How much stock does the customer hold?

Phase 2; map the information flow:

- What sort of forecast and call-off information is supplied by the customer?
- Who (or which department) does this information go to in your firm?
- How long does it stay there before being processed?
- What sort of forecast and call-off information do you give your suppliers?
- What order quantities do you specify?

Phase 3; map the physical product flow:

- What is the pattern of raw material supplies? How often and how much is delivered?
- How much raw material stock do you hold?
- For each step in the process record:
  - How long it takes to process, i.e. the cycle time.
  - How many people are involved.
  - How long it takes to set up and change over between parts, i.e. change-over time.
  - The batch size.
  - How long the product waits before it passes to the next stage, i.e. the WIP inventory.
- How much finished goods stock do you hold?

Phase 4; link the information flow with the physical flow:

- What sort of scheduling information is used?
- What sort of work instructions are produced?
- Where is the information and instruction sent from and to?
- What happens when there are problems in the physical flow?

Phase 5; add a time-line:

- record the value-adding component of the total production lead-time to complete the map.

Complete 'Big picture' map

Supplier

Box Size = 800

Long Term Forecast
Weekly Schedule
Daily Expedites

26 hours | 3 hours | 20 hours

Material Planning | Manufacture Planning | Customer Schedule

Long Term Forecast
Weekly Order (Daily call-off)

Customer

Variable Quantity
2 days stock

x5 daily shipments

x2 weekly   Q

Shortages

SHORTAGES

REJECTS

Daily Priorities
Shop Floor Supervision

REWORK LOOPS

?

I VARIABLE | I 3 DAYS | Q I VARIABLE | Q 100% I VARIABLE | I VARIABLE | Q 100% I MANAGED | Q I VARIABLE | Q 100% I VARIABLE

MATERIAL RECEIPT	MATERIAL INSPECT	VACQUA BLAST	WASH & LUBRITE	POLLARD	HONING & WASH	ASSEMBLY	TEST	PACK & DESPATCH
2–4 hours	4–12 hours	1–10 hours	1–6 hours	8–32 hours	1–5 hours	5–14 hours	1–6 hours	3–21 hours
Random Arrival	Supplier confidence low	160 /hour Plan to Eliminate?	Trolley=160 Rate= 160/90min 45min/Batch Up-time 80% 1 Shift	Bin Size=400 Target Rate= 120/hour Variable Batch Up-time 85% 3 Shifts 24 trays of 10	Trolley=240 Target Rate= 160/hour Variable Batch Up-time 95% 3 Shifts 1 piece flow output	Trolley=240 Target Rate= 122/hour Variable Batch Up-time 95% 3 Shifts Right 1st time=low	3min cycle Rate= 180/hour 10% retest 3% rejects 3 Shifts	4.30 daily Own transport Returnable packaging Multiples of pack quantity

Production Lead Time = 26–110 hours

Value Adding = 9.75 hours

1.5 hours | 0.75 hours | 4 hours | 0.5 hours | 3 hours

! The application of value stream mapping tools needs to focus on longer term management, not just mapping. Don't be a 'happy mapper' who never gets past just doing mapping exercises.

This example is taken from *Going Lean*. At Cogent Power they used Big Picture Mapping to map the order fulfilment process for critical products or key customers at all the plants, and these maps formed the basis of the improvement projects. The best way of viewing current state maps is not on the screen of a PC but on a large sheet of brown paper on the wall of a prominent office or project room, where the whole mapping team and senior managers can gather and discuss what they see.

Once you have mapped the current reality it should be easy to identify where waste is accumulating and causing disruptions in the flow. These should be marked on brightly coloured Post-It notes as they will be the focus of future improvement projects.

From current state to future state

It is all very well to identify waste in the current state, but this alone will not give you any improvement. The next step is to create a picture of the process once all the non-value-adding steps have been eliminated and then identify the tasks that you have to complete to realise this. These are termed 'Future, or ideal state maps'. It is possible that there are a number of future states that you have to develop before you can reach the ideal state.

Current state map at Cogent Power

AKM (1 day of inventory? Confirm)
- One of 2 NA grain oriented suppliers
- Butler, PA (overnight delivery)
- 4 times/wk
- 100% of supply to ABB Jeff
- Recent Q/A issues – Edge of wave & coil set
- Easy to slit (no burr)
- Poor business relationship

- Improve quality
- Build better relationship
- Alternative supplier

4/Week

Material receipt
- Coil storage workplace organisation (store anywhere)
- Decanning area beside scrap bin area
- No coil number on test cert. paperwork
- Excessive transportation

- Improve workplace organisation (Coil storage)
- Obtain pre-ship information

`1-5 days` `Q I/P`

`17 days`

Slitting
- Excessive raw material stock
- Excessive time spent finding coils
- Excessive slit stock
- Issue with slitter process alignment
- Rust
- Long change over times

- Lower both MC/SC stock levels
- Improve workplace organisation
- Lower change over times (increase OEE)
- Improve process capability
- Buy slit coil from supplier

`2 hrs – 7 days` `Q I/P`

`12 days`

Priority list
- Creating customer order
- Excessive transport

- Less fire fighting
- More value added

`1-12 hours`

Production planning
- Excessive transportation
- On foot
- Deciphering order priorities
- Batching order updates
- Information bottlenecks
- Unclear definition of order progress
- Poor system - very manual
- Reworking reports

- Improve information flow/accuracy
- Less batching
- Reduce transportation

`1 hr – 3 days`

Unicore
- Poor understanding of machine by maintenance
- Inconsistent product off unicore
- Coils misplaced
- Tooling/measurement devices missing (workplace organisation)
- Running speed of machine

- Establish previous maint. programme
- Establish best practices (AEM)
- Increase OEE (process capability)
- Improve workplace organisation

`2 hrs – 7 days` `Q I/P`

Furnace
- Lindberg furnace reliability
- Poor position in relation to annealed production
- Loss of traceability at time of processing

- Consider shift of unicore to Lindberg/ small products to GASMAC
- Improve traceability of product @ furnace (through plant)
- Improve workplace organisation
- Establish geometry constraints on Lindberg
- Review non-annealed cores

`12 hrs – 3 days` `Q I/P`

Material control
- Unnecessary processing steps (very manual and redundant)
- Supplier order confirmation
- Lots of reports from different systems unable to communicate with each other

- Simplify operation
- Work with supplier
- Improve information flow and accuacy

`2 hrs – 1 day`

Test & pack (teardown)
- Excess delays. Transportation and space restriction issues
- Plate storage & availability for use (cool down)
- 100% tested/zero failure
- Weight scale/FLT availability
- Customer skid weight spec

- Improve workplace organisation (more scale)
- Review test & pack specifications

`5 hrs – 3 days` `Q I/P`

`½ day`

Sales
- Order batching delays
- Verification/approvals
- Fax, pigeon hole location

Note: receiving 50% of orders by fax

- Simplify operation

`1 hr – 4 days`

Shipping
- Shipping distances covered to complete order
- Shipping lead times
- Poor paper flow (tag collection)

- Improve workflow
- Improve workflow organisation

`1 hr – 1 day` `Q I/P`

Weekly

ABB – Jefferson City, MO
- Large transformer business
- Delivery 1 to 2 loads/week
- We provide 5% of their normal demand
- Highly favourable perception of Cogent
- Great opportunity for future outsourcing business

- Opprtunity for future business growth
- Long term business opportunity

Accounting
- Double/triple entry of accounting functions
- 4 sytems

- Comprehensive ERP solution

Connecting labels: Delivery schedule (XL); Priority; Tags (MCBA); Production plan (XL); Production plan (XL); W/O & priority; Priority (XL) & W/O (PPlus); Priority; W/O; Rework W/O; Tags (MCBA); Rework priorities; Tags (MCBA); Invoice; P/O (PPlus); Delivery confirmation; Order ack. (email); Order faxed (weekly); Work orders; Invoice copy; rework

From this they developed an initial ideal future state map that took out virtually all of the non-value-adding waste. To achieve this they had to make major changes, which did not happen all at once. They had to identify many projects that would form the road map to get them from the current to the ideal future state. They also had to reorganise the structure and performance metrics, and involve suppliers and customers.

One of the things they had to do was replace the old hierarchical, functional system with a new cross-functional team. They replaced the single Operations Manager role with four new roles; three reporting to the Operations Director and the fourth to the Commercial Director. The new roles were:

- Materials manager – responsible for all material supplies to the whole process
- Two production managers – each responsible for separate production processes, acting as internal customers and suppliers
- Order Fulfilment Manager – responsible for overseeing the whole process from customer order to customer satisfaction.
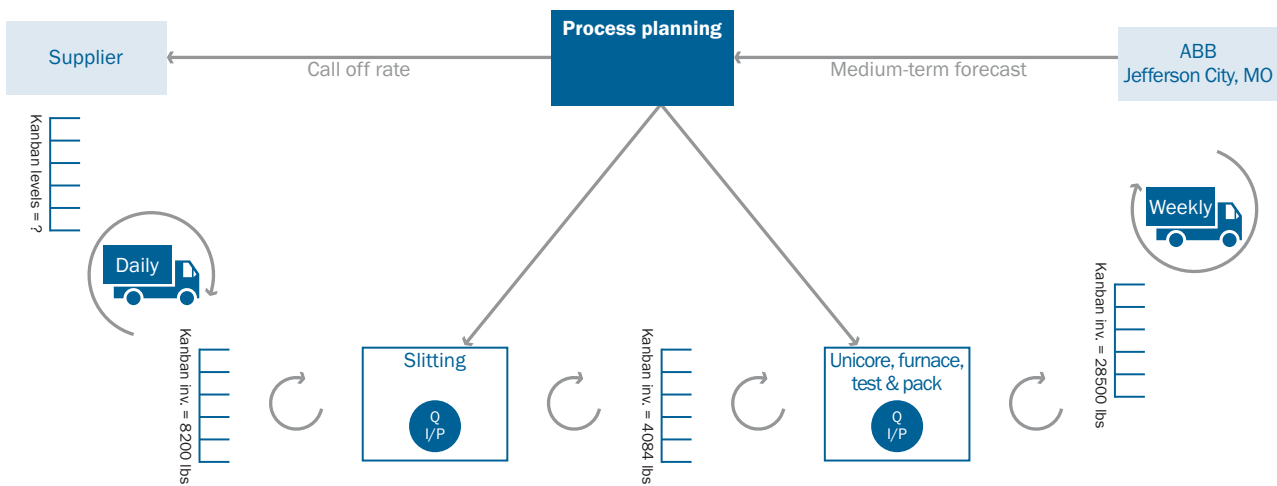
As well as the management team, Cogent also developed a new team leader structure to provide the needed leadership at the shop-floor level. This has been one of the keys to long-term sustainability.

The ideal future state map is very much simpler than the old current state and uses technology in an innovative way. It also relies heavily on introducing 'pull', a major improvement project that has been successfully implemented using the following pull system design principles. However, creating future state maps is not a one-off exercise. As the organisation evolves and learns, it must revisit the future state to see if it still meets expectations. Organisational learning takes place during the transformation. Future states that could not have been imagined early on become feasible as the transformation progresses.

Pull system design
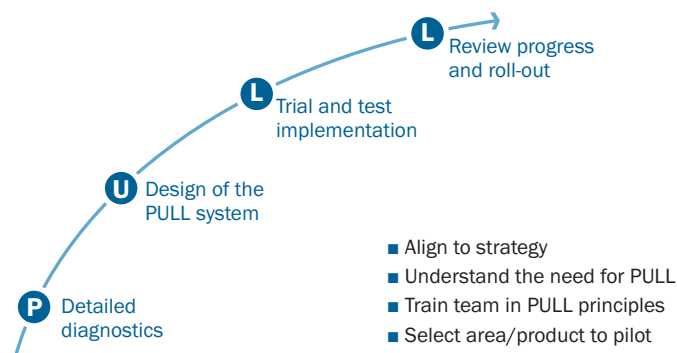
The senior management teams of the plants reviewed the profit potential of the various value streams and, based on volumes, margin and future growth criteria, were able to select the key areas of focus for the operating teams to work on. The business imperative for one of the chosen value streams included:
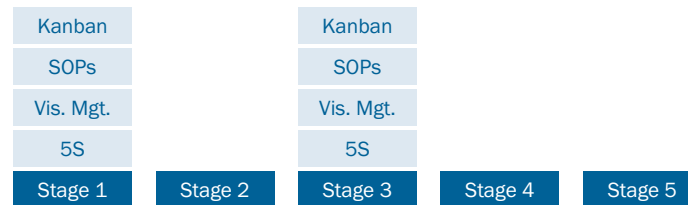
- Improve on-time delivery
- Reduce space
- Reduce internal stock
- Reduce supplier stock-outs
- Reduce customer lead times.

So far in this section we have looked at identifying waste and recognising areas for improvement. Now we will look at the approaches you can take to process improvement. We term this the 'Pillars or platform approach'.
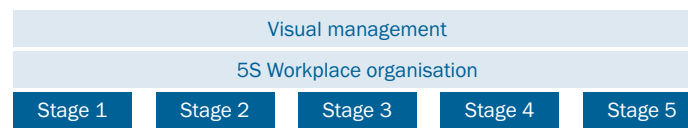
1 Stages in a process or value stream to be improved

Stages in value stream

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5

2 Adopting a pillar approach

Kanban		Kanban		
SOPs		SOPs		
Vis. Mgt.		Vis. Mgt.		
5S		5S		
Stage 1	Stage 2	Stage 3	Stage 4	Stage 5

3 Adopting a platform approach

Visual management				
5S Workplace organisation				
Stage 1	Stage 2	Stage 3	Stage 4	Stage 5

A 'Pillar' approach typically takes one or more steps in the process and applies several Lean tools or techniques, such as 5S, Visual Management, Standard Operating Procedures (SOPs) and Kanban, to improve it. The benefit of this approach is that you can quickly demonstrate the benefits of the tools and you can use this to pilot improvements. Pilots generate involvement and belief, so they have a vital role in any change programme. But there is a danger in developing pilots into 'Pillars of excellence', as this can lead to employees in the unimproved areas feeling isolated and becoming disengaged from the programme. Sometimes, this approach can also have a negative effect on the employees in the improved areas who wonder why they are being asked to change when others are left to their own devices, particularly if these employees think that they are being asked to work harder.

An alternative approach is what we term a 'Platform' approach. In this, a small number of tools are applied systematically across the whole process. It suffers from taking a longer time to produce results but it is more engaging of the whole workforce. The longer time period can mean that managers give up before the change becomes embedded.

We believe that sustainable change requires a judicious combination of both approaches, possibly starting with Pillars, to act as pilots to test the tools and demonstrate their value, followed by a Platform approach to roll them out across the plant.

We look at the application of Lean tools, techniques and technologies in the next section. For now we will return to process improvement and consider how we can increase the value by improving the order creation process.

"Pilots are very important to convince people, you have to demonstrate and give them the confidence. With confidence they can do anything."

Frans, Technology Director

Beware!
Consultants almost always only use a Pillar approach which may not be best for you. Confronted with such advice, ask yourself: 'Why am I being told this?'

Adding value in the order creation process

Order creation comprises two business functions: sales and marketing. Within the process each function has different roles and responsibilities. However, what we frequently see in businesses is trench warfare between sales and marketing functions, each trying to control the other. Within order creation we are combining them in a seamless strategic and operational process.
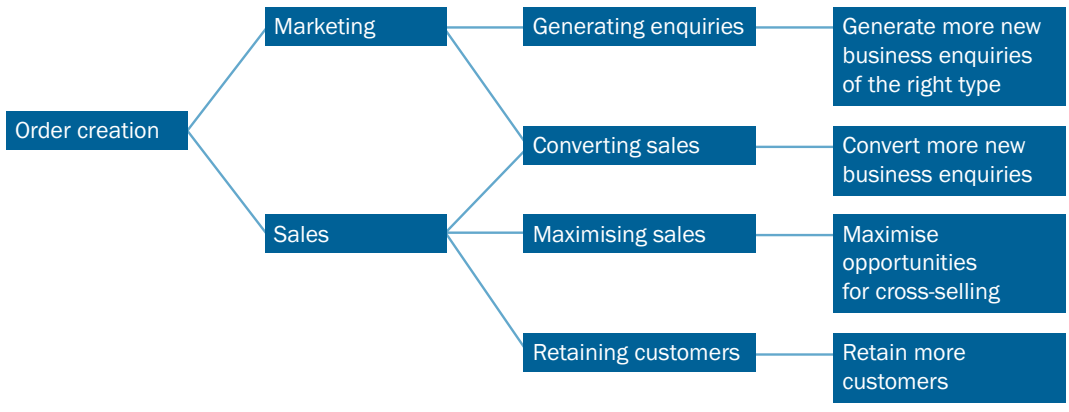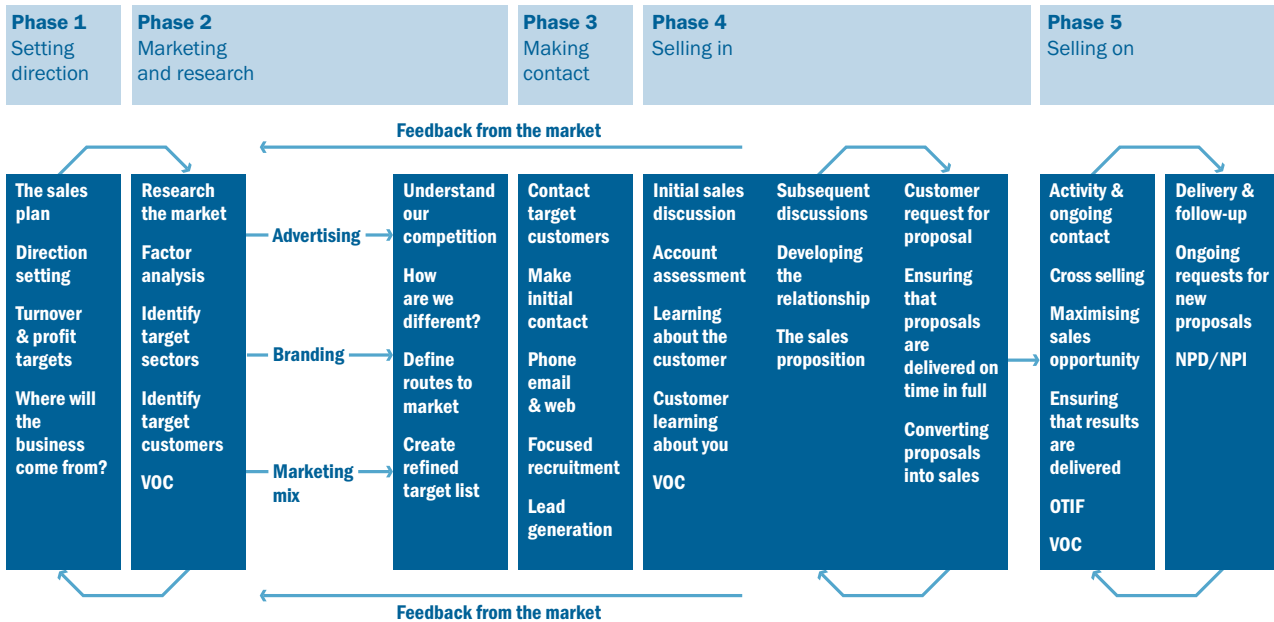

Order creation adds value by generating more sales. These sales are required to create the profit potential multiplier effect by soaking up the extra people, equipment and space capacity created primarily by waste removing processes such as order fulfilment.

Like order fulfilment, improving a process starts by understanding the current state of the process. This means putting on the muda glasses again and identifying waste. However, here we are in an information based environment, so we need to reinterpret the seven wastes as follows:

Classic seven wastes	Renamed seven wastes	Some common symptoms in order creation
Overproduction	Doing too much or too soon	Generating more enquiries than can be processed
Defects	Getting it wrong or doing it twice	Not understanding what the customer actually wants (value criteria). Not getting a sale after doing all the work. Poor enquiry rate of the right type for the business. Poor conversion rate of the right type for the business. Poor retention rate of the right type for the business. Customers/enquiries/orders of the wrong type.
Unnecessary inventory	Overloading	Some salesmen having too many customers – others not having enough. Too many orders of the wrong type.
Inappropriate processing	Inappropriate processing	Where the internal process obstructs the delivery of what the customer wants or needs. Inability to maximise sales from existing customers.
Unnecessary motion	Poor layout or routing	Unnecessary travel. Poor workstation layout.
Unnecessary transportation	Unnecessary movement	Excessive information flow within the business and between the business and the customer.
Waiting	Delay	Where information comes to a complete stop. Poor response time in responding to customer requests. Time taken to respond to a Request for Quotation.

Order creation can be described as a five-phase process that might look something like this:

| Phase 1
Setting direction | Phase 2
Marketing and research | | Phase 3
Making contact | Phase 4
Selling in | | | Phase 5
Selling on | |

Feedback from the market

| The sales plan

Direction setting

Turnover & profit targets

Where will the business come from? | Research the market

Factor analysis

Identify target sectors

Identify target customers

VOC | Advertising

Branding

Marketing mix | Understand our competition

How are we different?

Define routes to market

Create refined target list | Contact target customers

Make initial contact

Phone email & web

Focused recruitment

Lead generation | Initial sales discussion

Account assessment

Learning about the customer

Customer learning about you

VOC | Subsequent discussions

Developing the relationship

The sales proposition | Customer request for proposal

Ensuring that proposals are delivered on time in full

Converting proposals into sales | Activity & ongoing contact

Cross selling

Maximising sales opportunity

Ensuring that results are delivered

OTIF

VOC | Delivery & follow-up

Ongoing requests for new proposals

NPD/NPI |

Feedback from the market

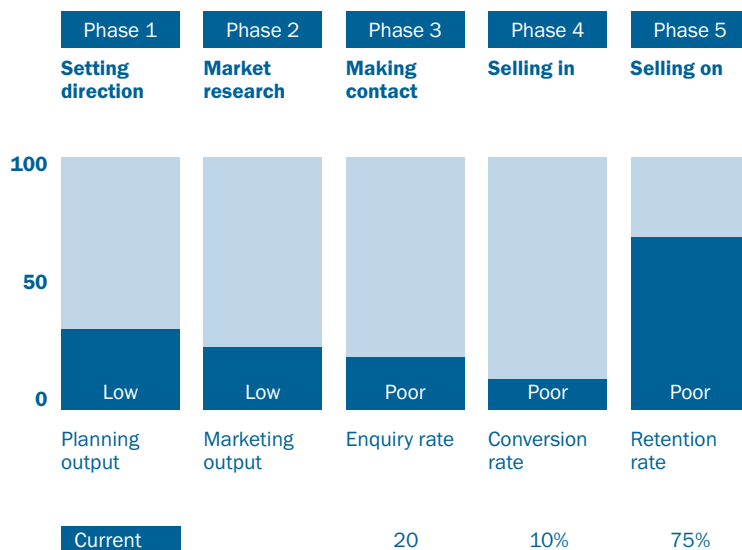The 'back office' support processes run the length of the process

Diagram copyright © S A Partners 2007

This illustrates both winning new business and generating repeat business. You can see that the Lean term 'Voice of the customer' (VOC) sits within phases 1 (Setting the direction), 4 (Selling in) and 5 (Selling on).

As in order fulfilment there are a number of tools that you can use to map and understand the process.

The main purpose of mapping processes is to produce a visual representation of the current state to make it easier to identify disruptions in the flow of the process so that these can be removed or reduced.

Another purpose is to determine the baseline so that improvements can be measured and monitored. This helps to sustain the effort and encourages people to improve continually. In the order creation process, it is useful to determine a value for each stage in the process.

Phase 1 **Setting direction**	Phase 2 **Market research**	Phase 3 **Making contact**	Phase 4 **Selling in**	Phase 5 **Selling on**
Low	Low	Poor	Poor	Poor
Planning output	Marketing output	Enquiry rate	Conversion rate	Retention rate

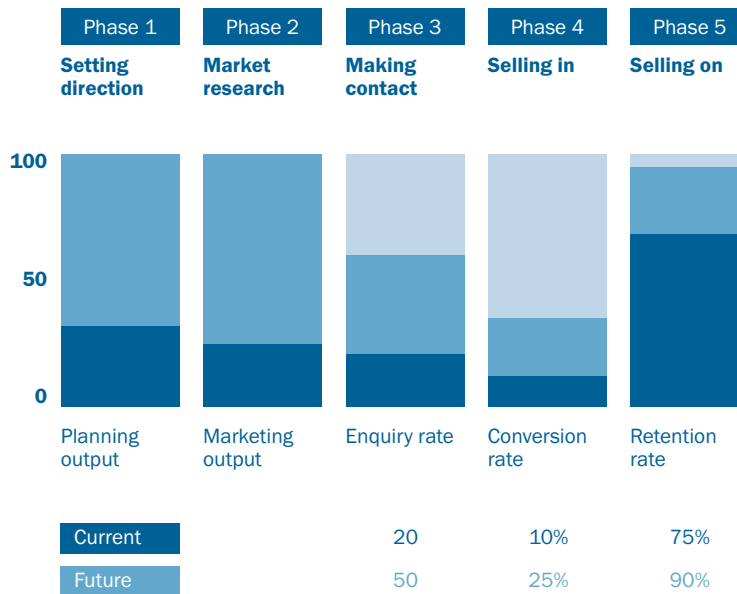| Current | | 20 | 10% | 75% |

From existing data on enquiries you can calculate the rate for converting enquiries to sales and, by looking at repeat orders, you can determine a rate for customer retention.

By examining all the data and brain-storming the issues and opportunities, you can develop realistic and timely targets for a future state map.

In order to improve, you need to understand how and why your performance levels are operating at a certain level and then start to remove the waste.

But first there is one important question to ask about removing waste from a system.

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Setting direction	**Market research**	**Making contact**	**Selling in**	**Selling on**

	Planning output	Marketing output	Enquiry rate	Conversion rate	Retention rate
Current			20	10%	75%
Future			50	25%	90%

How can you remove waste from a process unless you know what the customer values from that process?

The answer to this is that you cannot, so understanding customer value becomes very important, particularly in the customer-facing business processes. As shown in the following illustration, understanding customer value informs strategy and other processes, such as innovation and product lifecycle management. In addition, customer value analysis is a separate activity that runs simultaneously with the order creation mapping to feed into the future state maps, forming the basis for improvement projects.
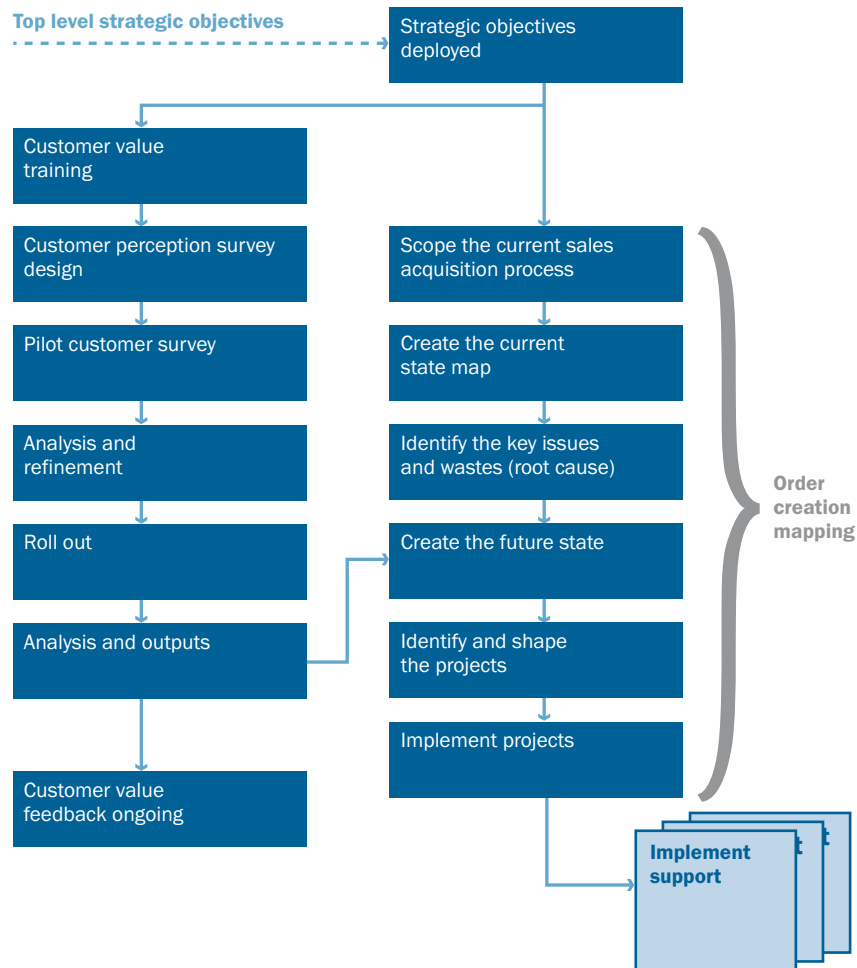
Let us now look at understanding the voice of the customer and see how this helped Cogent Power to change the face of its business. Later we will look at an example of mapping how orders are created.
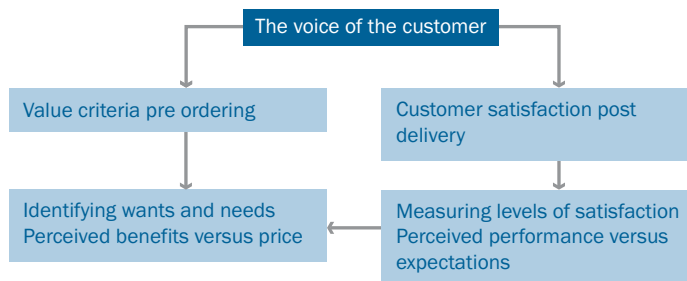
Understanding the voice of the customer

Integral to Cogent Power's success was the recognition that it needed to put into practice the first principle of Lean. The organisation needed to understand the voice of the customer and, with the improvements in order fulfilment, it was now in a position to do something about it.

> In common with traditional businesses, customer value was initially perceived as merely quality, cost and delivery (QCD), and the business had not yet really captured the true voice of the customer.

The problem is that there is little written in the Lean textbooks about how to capture the voice of the customer and, although this is seen as the first Lean principle, 90% of companies applying Lean will do little or no customer survey work and immediately jump in to mapping and applying Lean tools. Indeed we often ask our students and partner companies to name Womack & Jones' four Lean principles, as the first, 'Specify customer value', is so rarely seen in practice!

The Lean term, 'voice of the customer' is an interesting concept. In practice there are two distinct components:

- Pre ordering – where the supplier needs to listen and then demonstrate that they have heard and understood the things that are important to the customer, the value criteria
- Post delivery – which is about the level of customer satisfaction achieved. Did the product / service offered meet expectations, exceed them or fall below them?

Both parts of the voice are measurable and should inform all other key processes, including strategy, innovation, order creation and even the people development processes.

```
The voice of the customer
├── Value criteria pre ordering
│       └── Identifying wants and needs
│           Perceived benefits versus price
└── Customer satisfaction post delivery
        └── Measuring levels of satisfaction
            Perceived performance versus expectations
```

Many companies fall into the trap of believing that they know what their customers really value – in reality a large number actually don't know. In most customer/supplier relationships, suppliers know who the key decision makers are within their customer's operation. Importantly, surprisingly few actually have an accurate fix on the influencers of the buying decision and these people have value criteria which need to be heard and understood.

True customer satisfaction is only really achieved when a supplier consistently meets or exceeds their customer's expectations measured against a range of their customer's value criteria.

There are usually more people in an organisation who influence the buying decision than is realised. These people are touch points in the process. Really understanding the range of value criteria at all the key touch points, and being able and willing to respond is a differentiating factor which companies need to recognise.

Understanding what the customer really values versus your perception of what the customer values
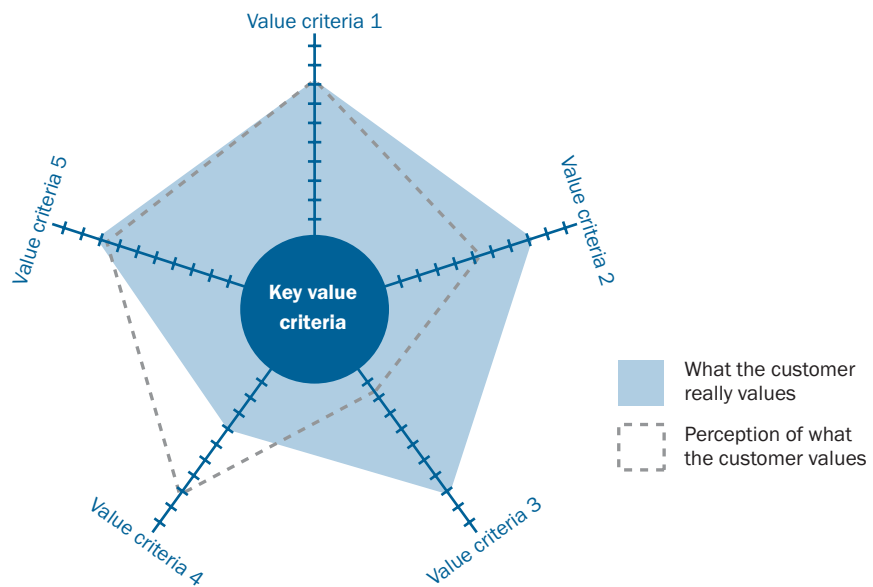
When they first started Lean at Cogent Power, it was little different than in most companies. According to Chris, the Divisional Director,

> We started with customer surveys and I have to be honest about this, I made a complete and total mess of it when I first started. I went out to our biggest customers and I came back really with a hodgepodge of stuff. There was nothing that we were able to collate, correlate or observe. Things like 'We don't like your delivery' etc. Richard, the consultant, came out and we got going on the [order creation] process and started talking about the voice of the customer. I shared my experience with him and he said 'Let's look at the survey again,' and, in the end he showed us how to do it, with the appropriate people in place; not just them and me sitting in front of each other, with them looking at the time, wondering how long it was going to take and when it would be over.

The first thing that Richard said to Chris was 'You want to improve the process. Okay, first let us do a survey to get the voice of the customer and then I'll be back to analyse the order creation process.'

At Cogent Power they used the survey to help them really understand customer value.

The survey team was initially made up of three people.

- The relationship holder, Chris, already had a number of contacts and his primary role was to manage customer expectations throughout the project.
- The Lean Manager, Greg, acted as a 'Lean standard'. His job was to run the interviews and ask all the questions in a set pattern. Greg received specialist interview training to help him discover exactly what the customers really valued.
- The Cogent Power team also decided to take along an engineering specialist. His job was to help record the information given by the customers and to investigate any technical issues.

The Canadian plant selected 17 key customers and conducted 130 face-to-face interviews. Each interview lasted approximately one hour. The interviews set out to understand the customer values at different touch points and specifically what 'good service' looks or feels like against each of the values. The team did all the interviews face to face with a targeted cross section from their customers.

- They identified the individual value criteria from each person interviewed.
- They ranked the values in terms of importance to the customers.
- For their existing customers, they measured their own performance against the customers' expectations.
- They explored the future in terms of where the market and supply chains where going.
- They explored additional areas of 'value-add' which they could offer their customers.
- Finally, they asked the customers to sum up their experience of dealing with them as a supplier.

The team quickly made some very interesting and exciting discoveries:

- Many of the things they were doing were right; they just needed to do more of them and release time from activities that were not adding value from their customers' perspectives.
- Despite having supplied customers for many years and having thought that they knew the real influencers – they didn't.
- Many of their customers wanted to have more advanced proactive partnerships.
- The nearer to the shop floor they conducted the interviews, the more quick wins they discovered that they were able to act on.

According to Chris and Greg the response from customers was fantastic. Chris told us,

“We interviewed 130 people across 17 customers. I was a bit concerned that all of these guys would want to talk to us, that it wasn't personal enough, but in fact the opposite was true. It was, 'You are a very special person, and here is your day.' Even the coolest characters opened up after five or ten minutes. As a result, the information that we got from our customer base was fantastic. We went and put money into some key areas. We couldn't do everything, but we are working through it.”

Conducting the survey

The first step is to identify all the touch points, all of those people who, in some way, come into contact with the product or service. This is maybe one of the managers, the buyer, the materials handlers, invoice clerks or shop floor operators who process the products. At Cogent Power they identified up to 18 touch points per customer.

Step one is to ask each interviewee what constitutes value from their individual perspective. This determines the customer value criteria against which your product or service will be assessed.

Step two is to ask them to rate how you perform against their expectations; how you perform against the competition and, finally, how you perform against the best supplier of any product or service which they come into contact with. This illustration is an example of the survey conducted by Cogent Power.

**Voice of the customer insight survey: how survey value criteria is influenced person to person**

Customer Value Criteria	Against Expectation			Against Competitor			Against Best Overall		
	Better Than	Same As	Worse Than	Better Than	Same As	Worse Than	Better Than	Same As	Worse Than
Pricing	XX	X	X	X	XX	X	X	XX	X
Quality	X	XXX		XX	XX		X	XX	X
Customer Service	X	XX	X	XX	XX			XX	XX
Technical Support	X	X			XXX		X	X	X
Communication of Info		X		X			X		
Delivery (Incl Prototype)		XX	X		XX	X		X	XX
Environment		X		X					X
Partnership	XX		X	XX		X	X	X	X
Packaging	X	X		XX			X		X
Safe Handling			X		X				X

⬛	Purchase Mgr.
🟥	Shop Floor
🟦	General Mgr.
⬛	Design Mgr.
🟩	Quality Mgr.

Once all the responses have been collated and summarised the scores for each category can be used to calculate an overall customer perception index.

The majority of Cogent Power's customers cited quality as one of their most important value criteria. Conducting the survey helped Cogent Power to drill down to explore the perceptions of quality in detail. This produced some surprising results and identified 22 design and engineering related issues, some of which were very easily remedied. For example, many customers criticised the way products were labelled. Changing this was straightforward and it delighted customers.

Voice of the customer insight survey: summary of follow-up opportunities

22 Design and engineering related opportunities
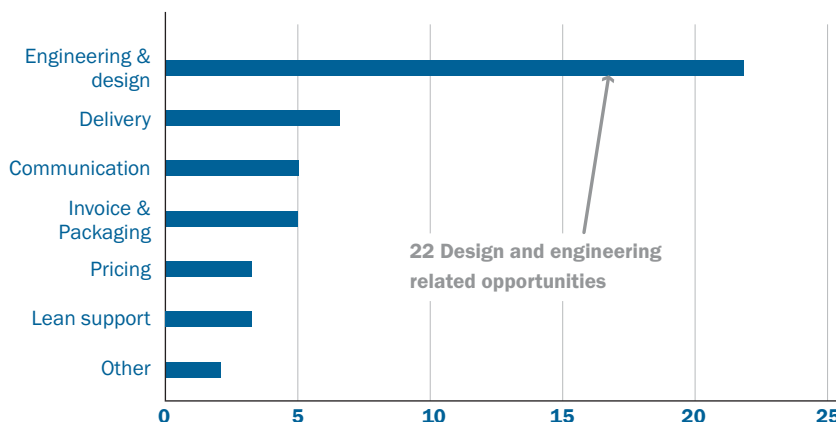
Other issues were more complex and these were fed into the strategy review process. However, response to all the issues raised was fed back to the customers to keep them informed.

Managing customer expectations is very important when considering a survey like this. Not all suggestions can be turned into actions at first but it is essential that, where they can be, they are.

Customers will soon lose interest if they see no improvement and this can easily turn a reasonably satisfied customer into a dissatisfied one.
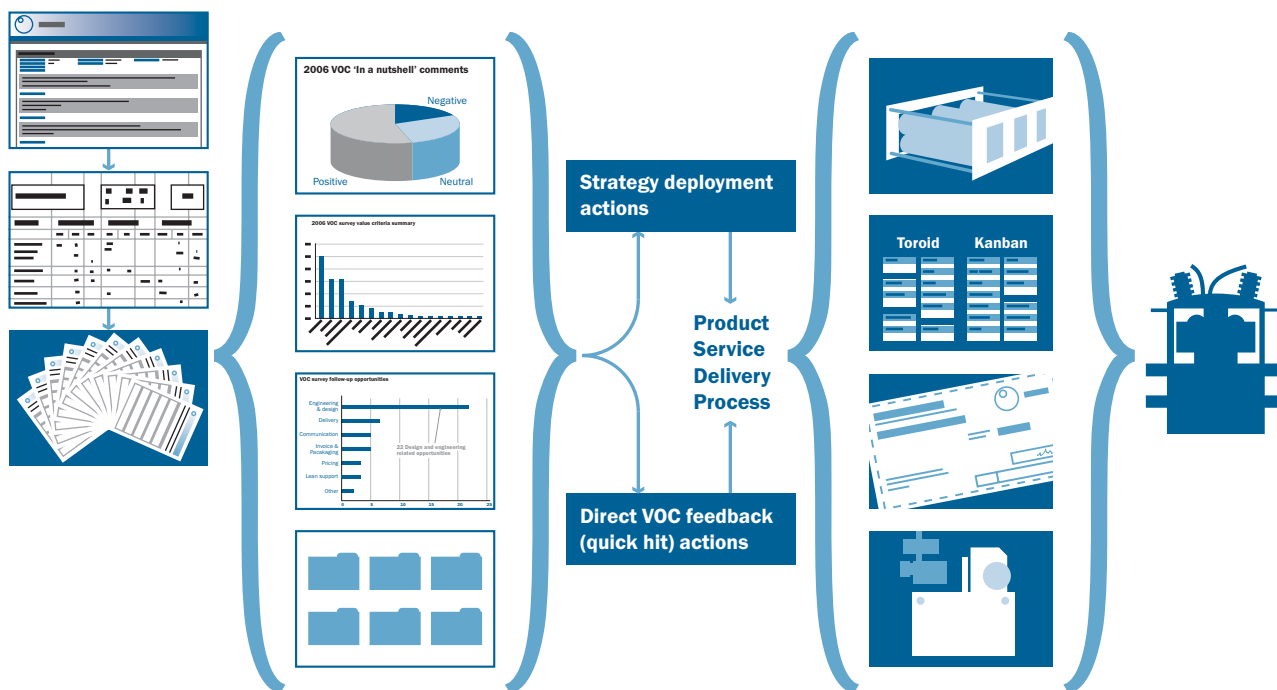
So two things are necessary; firstly that there is top-level commitment and support for the process and secondly, that customers are told honestly and up-front that some suggestions will have to be postponed if the finances or resources are not available immediately. The important point is that the communication is open and honest, and that people are kept informed.

As Chris said, conducting the survey was one of the most satisfying experiences of his career. Other employees also reported that it opened their eyes and made them realise their own role in satisfying customers. This served to engage the commercial areas in Lean as they could see how the programme impacted on improved customer relationships and additional business.

> One of our customers invited some of the suppliers to a meeting to explain that they were implementing Lean. I was a key supplier, so I spent two days with them. They had spent a ton of money bringing in this Japanese sensei. And they went out and kaizen blitzed the place over two days and they were all cheering. I sat in the presentation, and somewhere through the process I had spoken to the vice president and I wanted to share with him a bit of our experiences, which were a little bit different. I was trying to explain that we had done it differently; that we had gone through the strategy and all our managers understood the strategy. But he was not going to hear some small company that he'd never heard of from Canada telling him how to do things. There is no chance in the world that this company has the faintest clue what the customer really wants, none at all, none whatsoever, they are not set up to do this. Don't get me wrong, there's nothing wrong with kaizen blitz but don't attach that to Lean or sustainability.
>
> **Chris, Commercial Director, Canada**

The feedback indicated that there was a real market opportunity for the business to grow into new but aligned markets where they did have expert knowledge. Traditionally the business had supplied quality component parts to other manufacturers; but Cogent Power's end users were indicating that there was now a real opportunity for the business to add value to their existing products by moving up the 'value ladder' and developing a higher quality engineered product and service at a competitive price.

The improvements they had made in order fulfilment had created excess capacity and this gave them the opportunity to 'in-source' part of the value-adding activity from their customers at little extra cost. The result of this was that they could profitably grow the Cogent Power business at the same time as shortening the supply chain to their customers, reducing the threat from competition in what is traditionally a mature, highly competitive, price-sensitive marketplace.

Mapping the order creation process

The order creation process can be mapped just like any other. Mapping enables the manager to identify key areas of non-value-added activity and waste which can then be removed.

In another example at Cogent Power they mapped order creation using a technique called Four Fields Mapping. We discuss the technique, and a later modification of it, in more detail in the section on Technology, Tools and Techniques, but essentially:

- Field 1 breaks the process into phases
- Field 2 identifies the stakeholders
- Field 3 lists the criteria or standards
- Field 4 maps the activities.

During the mapping, major issues and key concerns are raised. These are listed and become the focus for improvement.

For each problem or issue, the root cause is identified and categorised as a process or a cultural issue.

Before the future state is developed, the teams identify the critical success factors and align these to the strategy. They assess how difficult or easy it would be to implement the potential improvements and what the impact would be on the business and the customer. The example shown here identifies the speed of quotation as a target for improvement. Reducing the time taken to process Requests For Quotation (RFQ) would have a major impact both on the business and on the customer.

	Critical success factors	Impact	
		Business	Customer
1	Accurate analysis of markets and competitors	H	M
2	Understand customer values/satisfaction and exceed expectations	H	H
3	Focus on new business – added value	H	H
4	Proactive /skilled KAM	H	H
5	Generate correct RFQs – in line with business objectives	H	H
6	Improve speed of quotation	H	H
7	Improve conversion rate	H	M

The next step consolidates the list and identifies measures and targets. This forms the basis for the design of the future state and the detailed action plan.

Sales Measure	Today	End 04	End 05	End 06	Vision
Turnover vs. AP	AP+6%	AP+10%	2004$_{4\%}$	2005$_{4\%}$	5% ORG
Forward order book loading	90 +/- 10%	92+/-8%	95+/-5%	98+/-2%	99+/-1%
Date of receipt to date of quote ✳ Simple enquiry - C ✳ Medium complexity - B ✳ Very complex – A	✳ 10 ✳ 15 ✳ 40	✳ 10 ✳ 15 ✳ 40	✳ 8 ✳ 14 ✳ 33	✳ 5 ✳ 11 ✳ 25	✳ 3 ✳ 10 ✳ 20
No of New key accounts contacted per year – resulting in a qualified enquiry	?	?	10	15	12
Number of qualified RFQ's per QTR ✳ New tooling ✳ Catalogue types (Minimum value)	? ?	? ?	7 10	10 15	11 17
Conversion rate of RFQ's ✳ first follow up on quotes sent out within no later than x days	✳ 5 – 50+	✳ 5 – 50+	10	5	3 working days
Skills matrix	?	?			
Market share ✳ Existing customers ✳ Overall available laminations market (Europe) ✳ Self Producers	23%	23%			?
Number of new initiatives with customers	Ad hoc	0	1	2	3
Customer Satisfaction	32%	40%	50%	60%	67%

Future state mapping of order creation should take a standard approach so that all five phases are covered; in this way the whole process is optimised, rather than just individual elements.

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Generate sales plan	Customer contact	Generate quote	Negotiation	Order verification
Start – Receipt of YTD figures	Start – Receipt of verified plan	Start – Receipt of RFQ	Start – Customer receipt of quote	Start – Order received
Finish – Plan verified	Finish – Receipt of RFQ	Finish – Quote to customers	Finish – Receipt of YTD figures	Finish – Order verified and passed to order entry

Whether it is on the shop floor or in support offices, well designed processes should always be aligned to the strategy and part of the Lean management system. The same business cockpits used to manage shop-floor processes can also be used to manage commercial and support areas. Having the same Lean management system helps to engage everyone in the organisation and demonstrates to the commercial areas that they are also part of the Lean journey.

Order creation (some key points):

- In many businesses, sales are seen as a department rather than as a process. In reality, order creation is just like any other process in the business: order fulfilment, new product development etc.
- It is very often the case that sales people, who have a specific set of skills, are not always clear process thinkers. They miss out on the ability to improve performance by looking at sales as an activity through a different set of lenses.
- Because of this there is very often a feeling in commercial departments that the principles of Lean, being applied in other parts of a business, simply don't apply to them.
- The ability to think about order creation as a process with distinct phases means that the process can be analysed more easily to identify strengths and weaknesses.
- Measures and targets can be aligned across the process and, equally as important, the business can start to join up processes as part of the whole value stream that is seen through the eyes of the customer.
- Cogent themselves initially exhibited all of these traits and then undertook a detailed review of their order creation process that changed the face of the business.

Learning points – process management driven by customer value

- Apply the VOC process rigorously to really understand the range of value criteria at key touch points within the organisation. Be able and willing to respond to and align with those needs to differentiate your business from the competition and build long-term business relationships.
- Distinguish between understanding value criteria and delivering customer satisfaction and use the data to inform all the key internal and external processes and therefore build an end-to-end Lean, profitable and sustainable business model.

Technology, tools and techniques

Technology, tools and techniques are the fifth element of our Sustainable Lean Iceberg, and the last; this is deliberate. Tools should be driven by the needs of the customer, the business and people within the business; they should be *pulled*, not *pushed*. Nothing better demonstrates the different approaches the three Cogent Power plants have taken than the way technology, tools and techniques have been applied. Marcel and Frans were not prescriptive in how Lean was to be applied; they simply provided the education, resources and inspiration. In this section we draw on the wealth of literature surrounding this area and illustrate it with examples taken from the real-life application at the various plants.

We start by looking at the Lean tools and techniques and then consider the role of technology in a Lean environment.

Lean tools and techniques

We have discussed some of the Lean tools and techniques already. Let us review these.
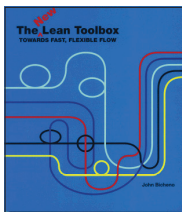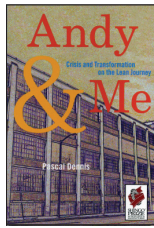
Section	Lean tools and techniques
Strategy and alignment	Policy deployment / Hoshin Kanri A3 planning and storyboards Catchball PDCA Visual management
Leadership	Lean leadership
Behaviours and engagement	7 Lean skills Team cultures Lean coaches Continuous improvement
Process management	Big Picture mapping Four Fields mapping Pull systems Voice of the Customer insight tool

In this section we bring the tools and techniques together and illustrate them with examples from Cogent Power.
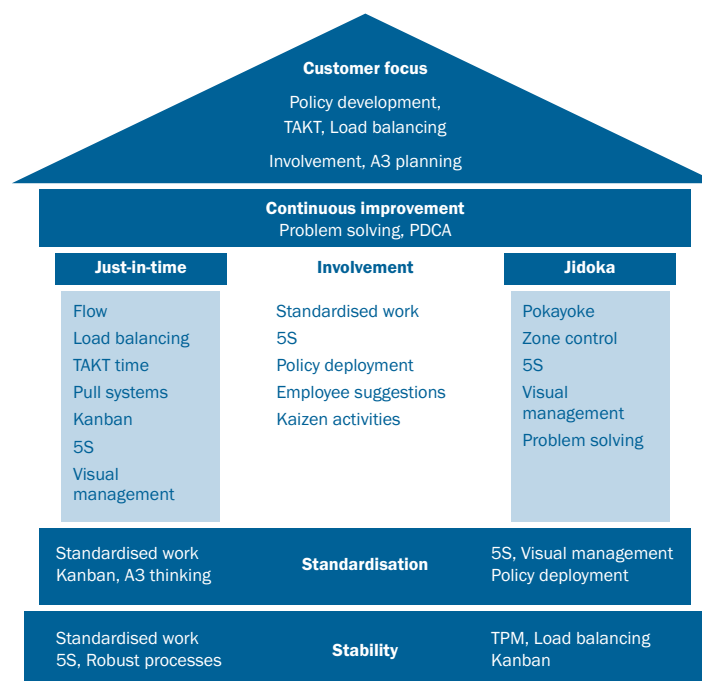
Adapted from *Andy & Me: Crisis and Transformation on the Lean Journey* by Pascal Dennis

One way of bringing the tools and techniques together is through the Toyota Production System (TPS) House Model developed by Taiichi Ohno and Eiji Toyoda in the 1950s to explain Toyota's system to employees and suppliers. The TPS House comprises two pillars of Just-in-Time and *Jidoka* (automation with a human touch). The house is supported by solid foundations, represented by stability and standardisation and is maintained and improved through iterations of continuous improvement, or kaizen, following PDCA, or the scientific method. At the heart of the Toyota Production System are the people; those flexible, motivated employees who continually strive for perfection.

In *Andy & Me: Crisis and Transformation on the Lean Journey*, Pascal Dennis, a former engineer at Toyota Motor Manufacturing Canada, shows where the Lean tools and techniques fit within the TPS temple. As you can see from the illustration, some of the tools and techniques apply across many areas, for example 5S, Visual Management, Kanbans and problem solving.

This section is not meant to be an exhaustive description of all the tools and techniques. For detailed discussion you are referred to some of the excellent texts on the subject, for example *The New Lean Toolbox* by John Bicheno.
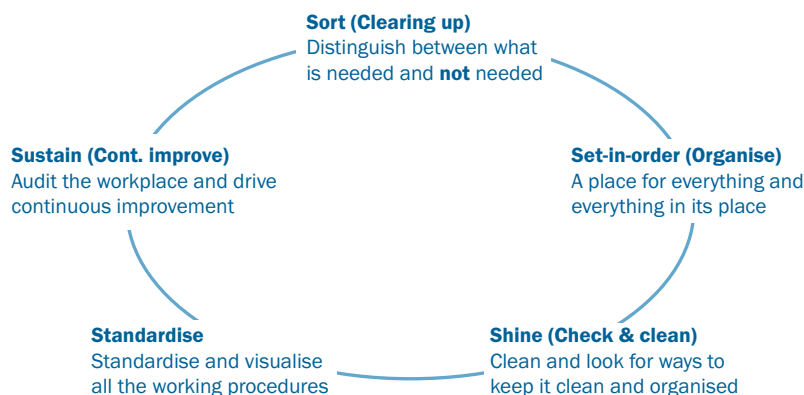
Instead we will concentrate here on the tools and techniques for managing Lean organisations and some that are used for Lean operations.

Lean tools for managing Lean enterprises

Fundamental to Lean are the tools and techniques for empowering and involving employees and managing the Lean enterprise. At the heart of these are policy deployment, which we discussed in the section on strategy and alignment, 5S, visual management and problem solving. These tools are applicable everywhere in the organisation, from the shop floor, through the commercial office environment, to the boardroom. We even saw examples of 5S in the washrooms at Cogent Power in Canada. Let us examine these in a little more detail.

5S – workplace organisation

5S is a powerful system of workplace organisation. At its basic level, it is good housekeeping; at another level it is the first step to improving productivity. 5S is part of a visual workplace.

Sort (Clearing up)
Distinguish between what is needed and **not** needed

Set-in-order (Organise)
A place for everything and everything in its place

Shine (Check & clean)
Clean and look for ways to keep it clean and organised

Standardise
Standardise and visualise all the working procedures

Sustain (Cont. improve)
Audit the workplace and drive continuous improvement

We all feel better when we can find things easily, when they are clean and well maintained. We are more productive when we are not spending time looking for items, only to discover that when we find them they are not fit for purpose. Even so 5S does more than simply ensure that a workplace is tidy and well organised. 5S is a management tool that involves and empowers people, with five traditional steps.

1 **Sort**. As managers you are saying to employees 'You decide what is necessary to do the job and sort out what you do, and what you do not, need'. In this you are empowering people by giving them choice and responsibility to make decisions about their workstation.

2 **Set in order**. This requires management intervention to provide the means for appropriate storage: shadow boards, bins, trolleys, tool cabinets etc. This demonstrates management commitment and involvement.

> "5S has made a huge difference in our area. It is tremendously better now, so much more organised than it used to be. You are not digging around trying to find things all the time."
> **Maintenance Leader, Canada**

3 **Shine, sweep or scrub** means taking responsibility for the cleanliness of the workstation; it also requires that management acknowledge that time for cleaning is part of the working day. In this step, a regime and standards for cleaning are made.

4 **Standardise** is about maintaining and supporting the first three steps; this requires employee buy-in and commitment. Standards on what things are kept (S1), where they are kept (S2) and by whom, with what, when and how they are cleaned (S3) are made. At this stage visual aids for 5S audits are created.

5 **Sustain**, or discipline; this is about making 5S a way of life and embedding it in the culture of the organisation.

One of the main reasons why 5S was sustainable at Cogent Power was that through their policy deployment approach each employee understood why they were doing 5S and how it would help them achieve their own goals. In other words it was a tool that was pulled by employees. It was not just another tool pushed at an unsuspecting workforce.

5S is often a platform approach starting a Lean implementation. It involves and empowers employees and it has huge visual impact. It also releases capital and space held in holding obsolete stock and equipment.

At Cogent Power, 5S was one of the first Lean tools to be implemented at all three plants. In Sweden it was highly influential. Carl, the Managing Director, found that it was a useful way of convincing people.

Due to the consensus culture in Sweden, they took rather longer to start the implementation. Frans spent a lot of time helping Carl and Per, the Lean Manager, to convince the management team and unions of the benefits of Lean, and he built up considerable trust. Once they had started with 5S, they soon got employee buy-in and, when we met them, there was universal praise for the improvements that a clean and well organised shop floor had delivered. As part of the exercise they identified all the obsolete machinery and sold or removed it. This created space that was used to lay out maintenance areas better. These were cleaned, painted and supplied with better lighting to make a cleaner, safer environment to work in. All the tools were displayed on shadow boards and other items labelled and stored in new cabinets. Even the bicycles used by plant engineers were given designated bays, so that they could be easily located.

Visual management and 5S are closely integrated. 5S maintains workplace organisation by visual means, such as shadow boards and labelled containers. We now look at some other examples of visual management.

Visual management

In the section *Strategy and alignment* we talked about A3 planning and business cockpits. These are all forms of visual management aimed at making information available at the point of operation. The information presented should be timely and understandable to help everyone manage and improve the process. The visual management triangle is based on the concept of shared knowledge and responsibility. If information is visible at the workplace, problems are detected earlier and improvements can be made, or monitored more easily. Compare this to information held in a computer and accessible only to those people who have access to the computer screen. Visual management is much more immediate if it is available to groups of people who can share the knowledge and participate in problem solving. Typical information that you would expect to see in a Lean organisation includes performance charts, skills matrices, schedules, team attendance and health and safety records. One of the tests of Lean is seeing if information is visible and up to date.

Visual management triangle
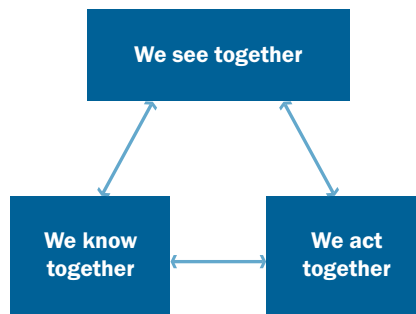
Source: *Andy & Me: Crisis and Transformation on the Lean Journey* by Pascal Dennis

Let us consider the Lean metrics here. You can use this table to check the metrics in your own organisation, but remember that the metrics should be easy to collect and understand. Also, they should be critically aligned to your customer, business and employee needs. Making them too complex or difficult to collect is a waste. Record only the metrics that you need to manage and monitor the process efficiently and effectively.

Metric	Description	Used for
Inventory turns (Stock turns)	The number of times that an organisation's inventory cycles or turns over per year = Cost of goods sold Average inventory	Monitoring holding cost. Reducing holding costs improves profitability, as long as revenue from sales is constant
Finished goods inventory	Number of units or days of finished goods stock	Inventory management
Total WIP	The number of units or days of work in progress	Inventory management
Total lead time	The total time needed for an order to be processed	Monitoring efficiency or lead-time
Total cycle time	Total time taken from start to end of a process	Monitoring efficiency
OTIF	On-Time Delivery In Full. The number of deliveries in a cycle that were delivered on-time and in full.	Monitoring delivery performance
Schedule adherence	Internal measure of ability to hit target for quality and quantity on a day-by-day basis	Monitoring internal consistency
OEE	Overall Equipment Effectiveness is a measure of relative availability, performance and quality of plant or equipment **OEE%** = Availability% x Performance% x Quality%	Monitoring how well equipment is running compared to the ideal plant. Important for managing bottleneck equipment
RFT	Right First Time. The number of parts that are passed on free of defects compared with the total number of parts produced.	Monitoring quality
Lost-time incidents	Number of accidents or other incidents that result in an employee losing time	Monitoring health and safety
Attendance	Percentage of time that employees attended work. The reverse of absence, hence a positive measure.	Monitoring morale
Appropriate skills	The percentage of skills types in each work area that have an appropriate level of cover	Monitoring alignment and morale

Availability of plant was a big issue at Cogent Power in Canada. Here they use OEE combined with other measures as their standard for performance.

Production boards are displayed prominently on the shop floor. On each of these the KPIs are coloured coded in each of the key areas: financial, customer satisfaction, employee wellbeing and sustainability. Initially the operators used to write down the scores on pieces of paper and these were later entered on to an IT system which calculated the values. In 2007 they changed to simpler calculations and made the team leader in each area responsible for entering the figures on to a

whiteboard. They employed a lot of psychology in this and it took four to five months to complete. There is a barrier to writing your figures down and displaying them if they are below target. It makes your personal or team performance visible. By putting the figures in public view the team leaders are taking responsibility for the results. So the team leaders have to be persuaded that, by highlighting the problems, they will be given resources and help to improve. At Cogent Power in Canada they are convinced that they would not have generated the improvements they saw if they had not made this change.

Last Year			This Month	KPI Target	Trend
	Financial				
27%	OEE		31%	35%	+ve
18	Inventory Turns		22	24	+ve
95%	Quality		90%	98%	-ve
	Customer Satisfaction				
93.1%	OTIF (External Customer)		91%	100%	-ve
98.1%	OTIF (Internal customer)		99.3%	100%	+ve
4824	Customer Failure Rate (ppm)		6204	500	-ve
	Employee Wellbeing				
97%	Employee Attendance		98.1%	100%	+ve
0	LTA		0	0	+ve
	Sustainability				
46%	Process Audit/ 5S Scores		62%	85%	+ve
99.3%	Inventory Accuracy		99.5%	100%	+ve

The colour coding is standard across the plant, although the individual measures may change to be appropriate to a team or department.

Where the trends are negative they become a target for improvement. Improvement targets follow a standard procedure where problem solving skills are used to define the problem and suggest countermeasures. Responsibility for the action is then given to the team, who set up an improvement project. Note it is the team that takes responsibility. If the actions are aligned as we discussed in the section *Strategy and alignment*, the team level PDCA cycles drive the departmental projects which drive the business level cycles; like a series of gears. The business cockpits are used to monitor these and make visible all the projects at each level. The effectiveness of the system as a whole is determined by the effectiveness of each zone; teams, groups, departments and so on.
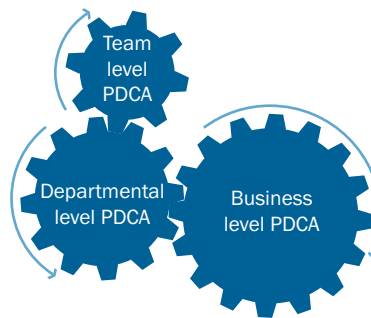
Continuous improvement is keeping the gears turning and solving the problems that each project uncovers. Problem solving is like peeling an onion; each layer removed uncovers more layers. Common problem solving tools include the 5 Whys. If you ask 'why?' five times you get nearer to the real problem. At Cogent Power they use 5 Whys and 4M fishbone diagrams to brainstorm the cause of problems. 4M refers to problems that derive from Man, Machine, Material or Method issues. When the teams have defined the problems they create continuous improvement projects to solve them. Mark, the General Manager at Cogent Power in the UK, was inspired by a quote from James Dyson, founder of Dyson Ltd.

Based on this, Mark started a 'Quantum Leap' initiative at Cogent Power, UK. In one brainstorming session hundreds of actions were generated. As part of this, a new concept called '100 Day Projects' was introduced. Each action, or improvement project, must be completed in 100 days. The clock starts ticking as soon as the project starts and the timeline is monitored by the leader at each zone. The team leader is monitored by his or her manager and then by the senior management team. The concept breaks the problem down into achievable steps, keeping the improvement moving forward and sustaining the continuous improvement culture.

This approach has also shown improvements in the involvement and engagement of employees. Employee suggestions are monitored as a measure of employee buy-in.

In 2004, the suggestion scheme generated 26 suggestions; this had risen to 54 in 2005. In 2006, when they embarked on Quantum Leap, this increased to 254; with 50% of suggestions being safety related and the other 50% process related. The proceeds of the improvements are put back into the business to improve the working environment, making the improvements both highly visible and engaging.

5S and Visual Management are tools that extend across the whole business. Whilst all three plants have implemented these, in Sweden the main focus of Lean has been in 5S and Visual Management. In the next section we look at how other Cogent Power plants have implemented Lean tools to improve flow.

> "The 100 day projects have been a remarkable success. We have seen benefits in the team dynamics and we have improved yield by reducing defects from 6000 ppm to 500 ppm. We even installed a new quality system in 100 days."
>
> **Mark, General Manager, Cogent Power UK**

Lean tools to prepare for flow

Physical products, information or creative ideas all need to be allowed to flow through with minimum disruption and diversion.

The first step to create flow is to define the customer demand; this is often done by defining the *Takt* time, the rhythm or drumbeat of customer demand. The second step is to establish the capacity of the system and identify bottlenecks, or constraints. Like order creation, you cannot improve the process unless you understand it. Until you understand the capacity you do not know where to target the improvements. If you apply Lean tools before you understand the process you risk implementing inappropriate solutions. Take manufacturing to the takt time, for example. This could ensure that production matches the actual demand of their customer. However, when the process involves large pieces of kit, such as ovens or smelters, it is not always practical to use takt time as the production rate. In this instance Kanbans, or time-based buffer stocks, should be used to control the flow through the bottleneck.

At Cogent Power in Canada they have put in a pull system to manage the upstream processes but the oven is still a bottleneck. They manage the flow of these with buffers. For further information on managing bottlenecks and flow, see *The Goal* by Eliyahu M. Goldratt and Jeff Cox.
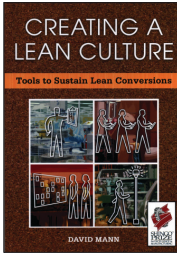
Some of the tools to improve flow are:
- standardised work to stabilise the process
- mapping to understand the flow
- TPM and SMED to improve the reliability and reduce changeover and set-up time

Cogent Power have used all of these tools to improve the flow of materials.
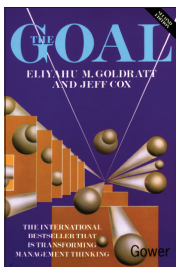
Standardised work

At Toyota work is broken down into operations. Each operation is standardised so that everyone performs the same actions to do the same work, whether this is operating or maintaining a machine or running a project. By continually performing activities in the same way, they become routine and embedded as the 'way of life'. Standard methods make sustaining the Lean transformation and continual improvement easier. If everyone behaves differently each time they perform a task, it is more difficult to make improvements, and easy to revert to old habits. Standardised work methods improve performance because tasks can be taught to new employees more easily and processes are easier to audit. Having standards makes abnormalities more visible and persistent problems more repeatable; this makes problem solving more straightforward. In *Creating a Lean Culture: Tools to Sustain Lean Conversions*, David Mann discusses standard work for leaders as one of the principle elements of a Lean management system.

Having standard processes and standard operations is a way of improving flow. Mapping those processes is a way of detecting waste and blockages. We have discussed big picture mapping in the section on processes. More mapping tools are described in the book *Value Stream Management*, particularly the chapter by Peter Hines & Nick Rich. In this section we describe some other mapping tools that are useful for mapping information flows and managing projects.

Mapping

Four fields mapping is a useful technique for process mapping, particularly for information flows; it identifies the WHAT, WHO, WHY and HOW of a process.

1 WHAT. The first field takes into account the phases that the process goes through
2 WHO. The second field relates to the stakeholders that are involved.
3 HOW. The third field describes the activities that take place.
4 WHY. The fourth field recognises the criteria, or standards, that have to be met.

Some companies also use two more fields, time elapsed and resource time taken. As each phase is being mapped it is useful to capture the issues and opportunities for improvement on Post-It notes and then transfer them to flip-charts to form the basis of the future state improvement plan.

Phases	Stakeholders (Field 2)	Criteria or standards
Field 1	Field 3	Field 4

Document   Activity   Meeting   Decision
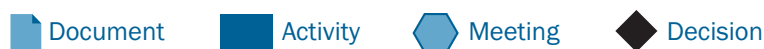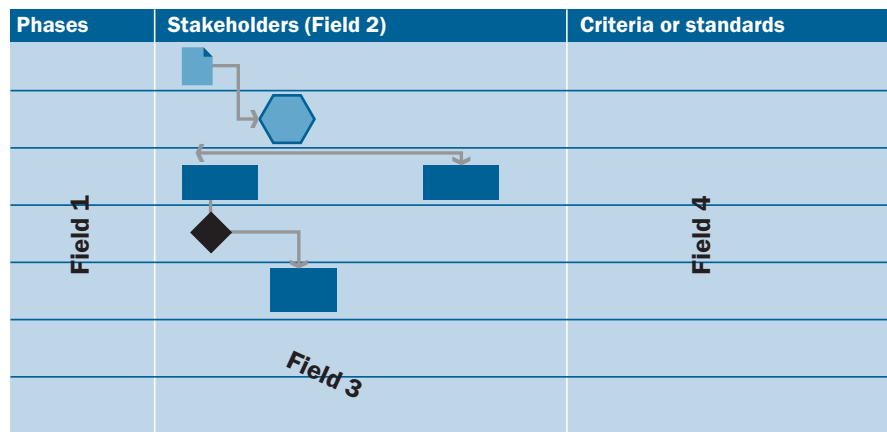
In the section on processes we illustrated how Four Fields Mapping was used early on at Cogent Power to map some processes, but a new mapping tool was developed to handle the complexity of order creation. This mapping tool listed all the defined steps and the issues and concerns, as well as the stakeholders.

Order Creation Current State Map

Company Name:				
Phase no:	Phase name:			
Input:			Date:	

NUMBER	Key defined steps (list them all)	Which departments are involved	Key Issues & Concerns (What could be improved)	Standards & Criteria
				■

Output:

Order Creation – Root Cause Analysis

Company Name:				
Phase no:	Phase name:			
Input:			Date:	

Key Steps	Wastes (list them)	Root Cause		Possible Solutions/Ideas
		Process	Culture	

Output:

Order Creation– Future State Map

Company Name:				
Phase no:	Phase name:			
Input:			Date:	

Key steps	Future State Proposals (recommendations)	Thinking about the change process		Standards & Criteria
		Barriers to progress	Counter measures	

Output:

The mapping process always starts with a review to test that the strategic objectives have been clearly defined and deployed; this is followed by a very detailed scoping and planning session. Once this is complete the detailed mapping process and analysis can begin. It starts with mapping the current state and is followed by a root cause analysis on the issues and concerns.

The root cause analysis examines process and cultural issues and suggests possible solutions. Finally it results in a future state map that is used to improve the flow of the process.

Once the processes have been mapped and the standard operations defined, it is time to look at the reliability of the plant and equipment.

Total Productive Maintenance

Total Productive Maintenance, or TPM, is a technique designed to optimise the performance, reliability, and productivity of plant and equipment. It involves passing the responsibility for maintenance into the hands of the operators and seeks to address the 'Six Big Losses' that affect equipment performance and reliability. TPM links directly to OEE as the six big losses are divided into three categories: availability, performance and quality. These categories are the basis of OEE. People often think that TPM refers only to manufacturing or production, but the term is Total *Productive* Maintenance, and the concept applies as much to the office environment as it does to the shop floor. Think for a moment in terms of computer hardware and networks as equipment. Computers and networks break down, causing availability issues. Networks run slowly affecting performance. Incomplete or erroneous data causes rejects and rework, quality issues.

Availability - affected by losses due to:
Equipment failure
Changeover – setup and adjustments

Performance – affected by losses due to:
Idling and minor stoppages
Reduced speed

Quality – affected by losses due to:
Process defects
Reduced yield

Availability

Breakdown losses due to equipment failure are unplanned stoppages that require repair. These are usually counted as a breakdown if the stops are longer than 10 minutes. It is important to record the nature and *cause* of the stoppage, whether it is electrical, mechanical, hydraulic or pneumatic. Improvement is about eliminating the cause of breakdown.

Changeover includes set-up and run-up adjustment losses that occur when one product is changed to another. Changeover is measured by the time it takes between the normal operating speed of one product to the normal operating speed of another. SMED, or Single Minute Exchange of Die, is the objective for fast changeover, where equipment can be changed from one product to the next in less than 10 minutes. SMED is integral to TPM. We will come back to SMED later.

Performance

Idling and minor stoppages are those that are less than 10 minutes. The causes of these are many and may include jams, material loading, removal of debris and small adjustments. In an analysis it is often found that minor stoppages create the most downtime. It is important to record the number of minor stops as these are often ignored.

Reduced speed losses result from running the machine more slowly than the design speed due to problems with materials, worn tools or belts and other causes. This can be calculated by recording the actual production and comparing this to the expected production for a given time period.

Quality

Process defects that result in scrap or rework are usually the result of problems that cause the machine to work outside of its specification.

Reduced yield may be a result of poor materials but also results from material losses during changeover when old material is running out and new material run in.

TPM is essential in a JIT, or pull, environment as equipment reliability is a critical component. Because stock levels have to be increased to cover breakdowns, poor quality and lost time, equipment reliability directly influences inventory levels. So,

> OEE can drive the wrong behaviours as OEE can be shown to go up by increasing batch size and reducing changeovers. We saw another company who proudly displayed their 'world class' doubling of OEE to 85%… but at the cost of a trebling (overproducing) finished stock. So make sure OEE calculations are always combined with other measures, such as stock turns and schedule adherence.

improving reliability through a TPM programme can improve OEE and allow you to reduce inventory. Nick Rich discusses TPM in detail in *Total Productive Maintenance: The Lean Approach*.

Cogent Power used a TPM process model that started with collecting OEE data and managing by fact. 5S was used to organise the workplace and design the workstation so that the tools and spares necessary for maintaining the equipment were labelled, available and replenished when required.
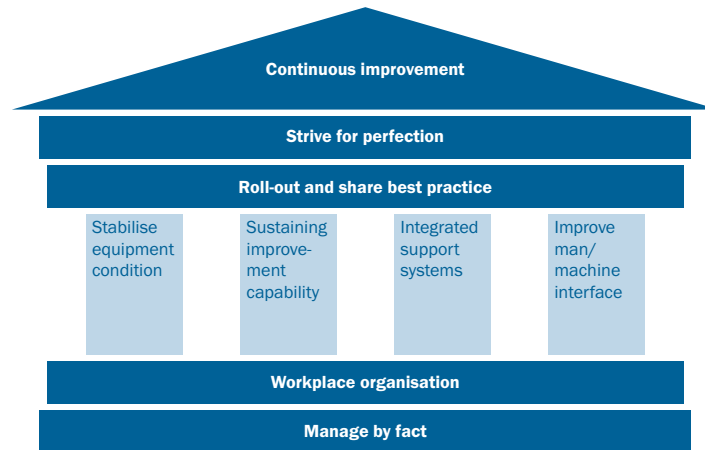
TPM projects involved multi-disciplinary teams of operators and engineers who agreed roles and responsibilities and defined skills training.

Project teams worked simultaneously on the two outside pillars to stabilise the equipment condition and improve the man-machine interface. As each project neared completion, support systems and methods to sustain the improvement capability were established.

The improvements included visibly marking all gauges and lubrication points, having tools and spares located at point of use and setting standards to ensure that the process is easy to operate, maintain, clean, check, set-up and changeover. As a result of TPM activities, OEE improved significantly at all three plants.

Let us return to SMED now to discuss how they reduced the changeover and set-up time in Canada.

Single Minute Exchange of Die (SMED)

Changeovers are part of OEE and so SMED activities are included as part of a TPM programme. Initially the place to concentrate on SMED is at the bottleneck resources. There is little point in reducing set-ups on non-bottlenecks until you have first focused and improved the machines that are actually constraining flow.

When implementing SMED activities, Cogent Power followed a 4-phase analysis process using the classic Shigeo Shingo methods.

The 4 phase analysis process
Process based on classic Shingo methodologies

1 Current state
Internals & externals mixed together

2 Split phase
Separate internals from externals

3 Transfer phase
Convert internals to external and streamline internals

4 Adjustment phase
Eliminate adjustments and streamline remaining internals **and** externals
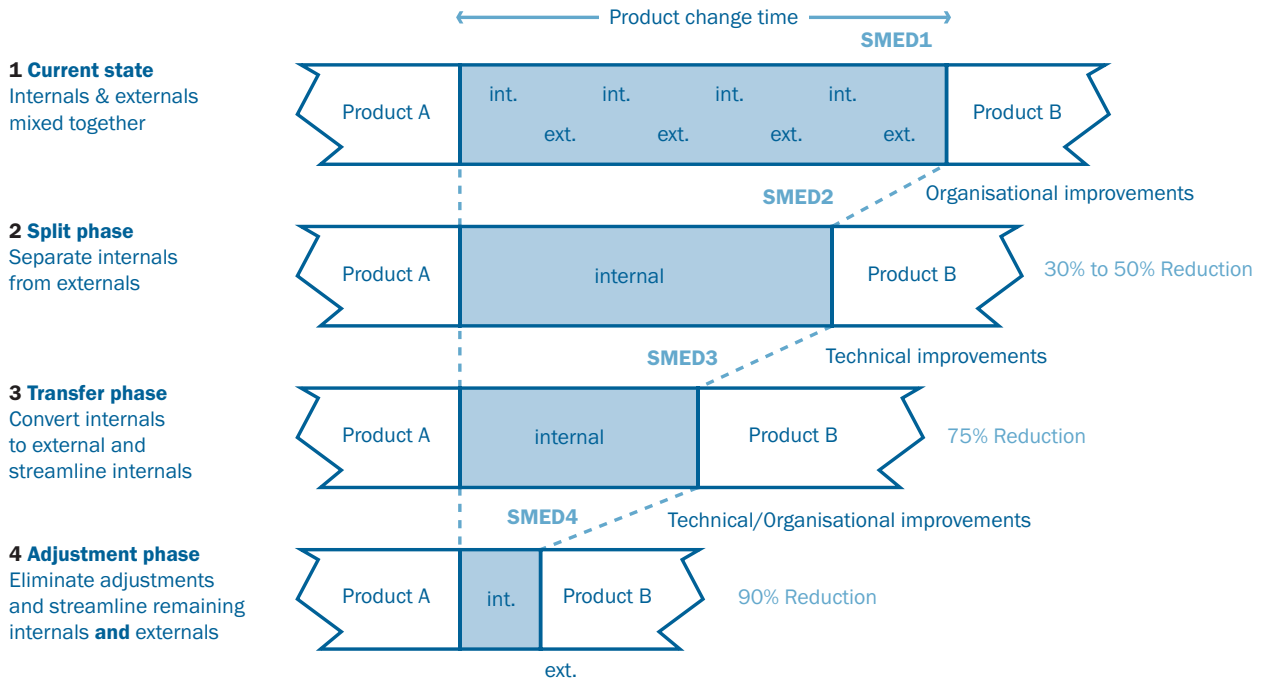
The process started by forming a multi-disciplinary team including operators, engineers and planners. Taking a PDCA approach, they collected data on demand, machine performance, OEE trends and sequence dependencies. They videoed and timed the current state and used the videos to separate 'internal' from 'external' activities. They mapped the current state against a timeline on large sheets of brown paper and used these to identify opportunities for improvement. SMED projects included 5S on the changeover tools and dies, changing layouts, simplifying and re-sequencing some activities as well as making any necessary engineering changes. '*Poka-yoke*', or mistake proofing, devices and visual controls were established.

Targets for improvement were fixed and priorities established. A paper kaizen of the future state was developed to model the improved changeover. The activities were planned and implemented in a phased process, each phase followed by checking and adjusting in classic PDCA style. When the new process was finally established, standard operating procedures (SOPs) were developed and operators trained.
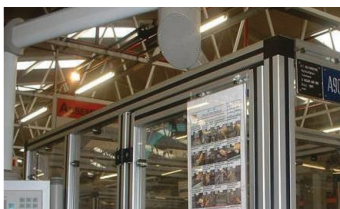
Once the SOPs are created they need to be maintained and audited to sustain the improvement.

SOPs in a Lean enterprise are dynamic and set by operators consensually. They should be written by the operators in their own words and adapted with continual improvement. They should not be rigidly scripted but flexible and adaptable, and should include detailed work sequences, timing and any standard inventory or kanban requirements. Good SOPs make use of photographs that show normal conditions and settings. They should also contain instructions on what to do if something goes wrong. Finally, they should be visible; positioned on the machine at the point of use.

TPM and SMED have been implemented in all three Cogent Power plants; it has been a particular focus in UK and Canadian sites.

In the next section we look at some tools and techniques used to operate Lean enterprises and illustrate these with examples from Cogent Power.

> Remember to involve the team in SMED and think about the people who will be doing the changeovers. If you reduce the batch sizes and increase the number of changeovers, make sure you consider the physical demands that this places on employees.

Tools and techniques for Lean operations

One of the TPS pillars is Just in Time (JIT). To operate JIT requires that the machines are reliable and available, operators are skilled and capable and that demand from customers can be translated to signals on the shop floor and to the material suppliers. This involves TPM to improve machine reliability, training and development programmes to ensure operator skills and pull signals from customer demand.

In this section we consider pull systems implemented in the Canadian plant.

Pull systems

In the section on processes we introduced the pull system that Cogent Power implemented in Canada. In this section we examine the tools and techniques in more detail.

Pull signals are based on response to actual customer demand; not in response to orders *pushed* onto the shop floor from schedules based on forecasts. Pull is based on a sell-one (or use one), make-one concept. We believe that implementing pull systems should come later in a Lean transition as it is not something that can be sustainably embarked upon until the system is stable and capable. For example, demand needs to be as smooth as possible to eliminate spikes and allow the products to flow. Think for a moment where pull comes in the 5 Lean principles. It comes fourth, just before striving for perfection.

Let us just remind ourselves of the 5 Lean principles to see what has to be in place before we can implement pull.

First we need to know what customers value. We need to have identified the value stream and been able to make value creating steps flow and then we can pull products to customer demand.

Pull systems need to be aligned to strategy, supported by senior management and operated by skilled employees. Pull may not be the best strategy for all products; some products (strangers) that are made infrequently may be best left to be 'made to stock' and replenished when needed. One of the techniques for selecting which products to put onto a pull system is to use the 'Runners, Repeaters and Strangers' concept.

- **Runners** are products or product families that have sufficient volume to be produced very frequently, typically every day. They are usually high volume, low variability. Sometimes these products justify dedicated lines.
- **Repeaters** are products or product families with intermediate volume and variety, that are made frequently but not necessarily every day, and the volumes do not justify dedicated lines.
- **Strangers** are products or product families that are made infrequently and are often highly variable.

> **!** Beware of simplistic Lean texts that assume everything you make is a runner product… you will end up putting in kanban systems everywhere. If you have stranger or even repeater products, you will be creating a sustainability disaster!

A Pareto analysis (80/20) can be used to categorise products into runner, repeaters and strangers.

Pull systems are best suited for runners and some repeaters with short lead-times. Strangers are not likely to be candidates for pull systems. However, it should always be the aim to convert repeaters to runners and strangers to repeaters.
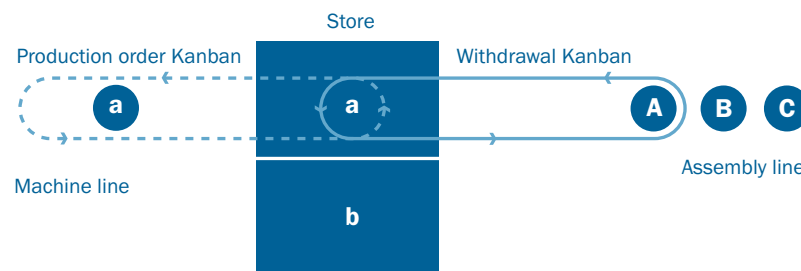
Kanbans

One of the ways of signalling production in a pull system is by kanbans. This is the system they have adopted in the Cogent Power Canadian plant.

Kanbans are signalling systems that are the means through which JIT is achieved. The term, kanban, derives from '*kan*' meaning visual and '*ban*' meaning card, or board. Traditionally kanbans were developed as two-card systems although now there are many other forms, including squares, balls or lights.
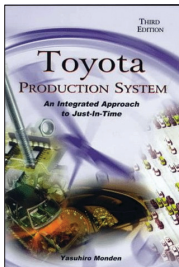
The principle behind kanban is that products are only made, or moved, when a signal is given. In a card system there is traditionally a withdrawal card and a production ordering card: a *make* card. Take the example below from Yasuhiro Monden's book, *Toyota Production System*. An assembly line is making products A, B and C in sequence. The parts used in production are a, b and c, machined by an upstream process. Parts a, b and c each have a *make* card attached to them. The material handler from the assembly line will go to the store with a *withdrawal* card for part a. When the part is withdrawn from the store, the make card is taken off and sent back to the machine line to produce another part a. The number of kanbans in the system is determined by the customer demand. The kanban system is supported by levelled scheduling, SMED, standardised operations and jidoka. Kanbans help to reduce inventory and eliminate overproduction.

The flow of two Kanbans

Source: *The Toyota Production System*, Yasuhiro Monden

A kanban system can easily be extended to the supply chain by sending the make signal physically or electronically to the downstream suppliers.

Kanbans can also be used in the visual office environment, for example replenishing printer paper. If the boxes of paper have an indicator card to show when more must be collected or produced, then there is less chance of running out and disrupting the workflow. We probably all use mental kanbans at home, in our kitchens, bathrooms or garages. After all, what is an empty toilet roll holder, if not a kanban signal?

At Cogent Power they make good use of kanbans to manage supplies. They use kanban boards to manage internal stocks and have developed an innovative way of using technology to manage material stocks from their suppliers, and are extending it to their customers to help manage finished goods stocks.

At the Canadian plant they have installed web cameras that are directed at pallet locations. The suppliers who are responsible for the supplies to these pallet locations are connected to the cameras and they can check the status of the stocks. The stocks are marked by red, amber, green levels; when the stock reaches an amber level this is the signal to prepare to produce and ship more products to replenish the stock to the green level. If stocks hit the red level the supplier has to have the stocks due for delivery, or to have notified the plant of a delivery date.

The term they have used for this is **cambans**.

Cambans are now installed in the finished goods area. These are connected to key customers who can check the finished goods stocks that are being held for them by Cogent Power as part of a Vendor Managed Inventory (VIM) system. The customers can use the information to improve their forward planning and to inform Cogent Power of any changes to their demand profile.

We have considered the tools and techniques for managing and operating Lean environments. Let us now turn our attention to some of those that can be used to sustain a Lean environment.

Tools and techniques to sustain a Lean environment

When asked what makes a Lean change stick, many managers have told us that it is leaders who 'walk the talk' and implement effective measures and monitoring systems. At Cogent Power, Marcel and Frans were adamant that leaders at all levels embrace the change and lead the Lean lifestyle.

Leading the Lean lifestyle was the focus at Cogent Power in the UK. Marcel and Frans were often found on the shop floor or in offices, and they expected to see Lean being practised wherever they went.
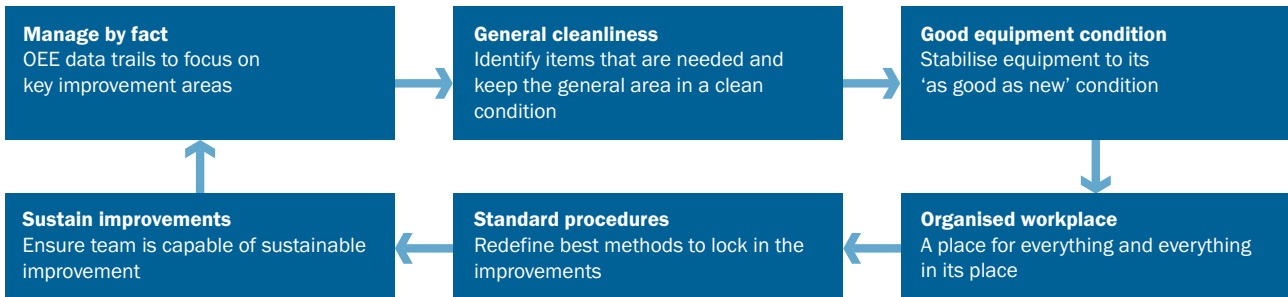
The emphasis here has been on sustainability of the whole rather than the application of individual tools and techniques. They took a 'one step at a time' approach, applying tools and techniques to deliver quick wins that could be used to demonstrate the benefits of leading the Lean lifestyle. Once the message had got across they progressed to more ambitious, long-range projects.

Of particular importance here has been visual management, through the cockpits and regular process auditing.

> "Lean is not a one-off event that you can measure by a return on income. Lean is a lifestyle and a way of running your business."
> **Bill, Director, Electrical Steels, UK and Sweden**

Audits

Audits are a way of life in a Cogent Power plant. There are weekly audits of 5S and equipment condition. These are displayed prominently and discussed at management meetings. Actions that occur as a result of the audit are given to teams to resolve, such as 'Red Tag' issues. Red tags are put on equipment that requires attention. The outstanding issues and the team responsible are displayed and the status of the action recorded.

Plant and process audit criteria

Manage by fact OEE data trails to focus on key improvement areas	→	**General cleanliness** Identify items that are needed and keep the general area in a clean condition	→	**Good equipment condition** Stabilise equipment to its 'as good as new' condition
↑				↓
Sustain improvements Ensure team is capable of sustainable improvement	←	**Standard procedures** Redefine best methods to lock in the improvements	←	**Organised workplace** A place for everything and everything in its place

As well as the internal audits, the Lean implementation is audited. The audit is conducted by external auditors and is designed to measure Lean maturity and sustainability.
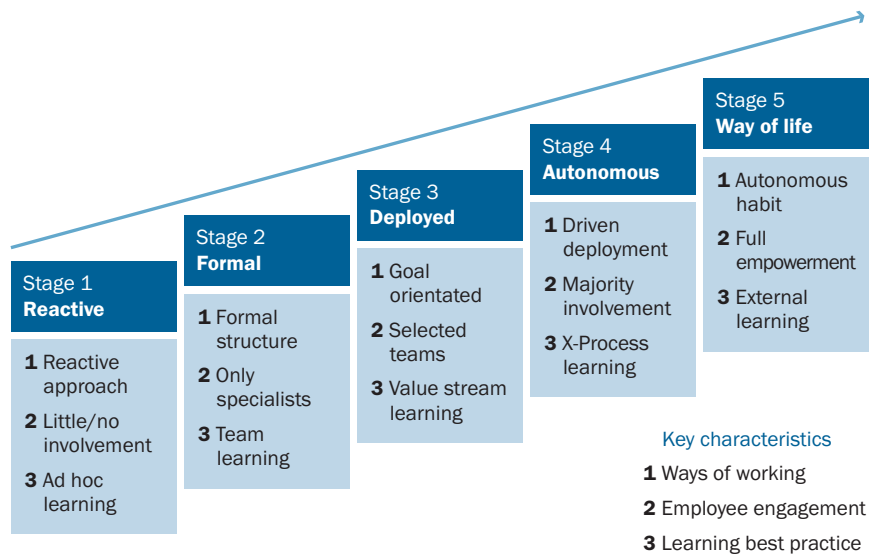
Plant and process weekly audit report			Poor	Fair	Av.	Good	Ex
Step							
Managed by fact	1	OEE is regularly collected in workplace					
	2	OEE data is analysed and feedback to the workplace so that it is up-to-date					
	3	All people are trained to understand OEE					
	4	People are given opportunity to feedback on data					
General cleanliness (sort and shine)	5	The working area is kept clear of unwanted items					
	6	The area (floors, workbenches) are kept in desired, safe, working condition					
	7	Cleaning materials are available within the area					
	8	The walkways and gangways are kept clear					
Good equipment condition	9	All of the key production equipment is kept in good condition					
	10	All gauges, levels and measures are clearly labelled and working					
	11	All other equipment is clean and in good condition					
	12	All plant safety equipment is in place and in good condition					

The method of establishing the level of Lean maturity was developed by S A Partners and looks not only at 'What' is being done but more importantly 'How' it is being done. It quantifiably and subjectively measures the maturity of both process and behaviours in all aspects of business; strategy alignment, leadership, engagement, process and supply-chain management and the application of Lean tools. The scoring index for maturity starts at level 1 where an organisation takes an *ad hoc* or reactive approach to improvement. The maturity then moves through the milestones of formal, goal orientated, managed autonomy and finally onto level 5 where Lean has become the way of life and the entire organisation is capable of self-sustaining continuous improvement.

The milestones of Lean maturity

Stage 1
Reactive
1 Reactive approach
2 Little/no involvement
3 Ad hoc learning

Stage 2
Formal
1 Formal structure
2 Only specialists
3 Team learning

Stage 3
Deployed
1 Goal orientated
2 Selected teams
3 Value stream learning

Stage 4
Autonomous
1 Driven deployment
2 Majority involvement
3 X-Process learning

Stage 5
Way of life
1 Autonomous habit
2 Full empowerment
3 External learning

Key characteristics
1 Ways of working
2 Employee engagement
3 Learning best practice

The audit determines the current position and the target position. From this it is possible to identify gaps and weaknesses that need to be addressed to take the organisation to the next level of maturity.

	Maturity stage 1	Maturity stage 2	Maturity stage 3	Maturity stage 4	Maturity stage 5

Strategy deployment
Value stream management
People enabled processes
Lean toolkit
Extended enterprise

What / How

Reactive — Formal — Deployed — Autonomous — Way of life
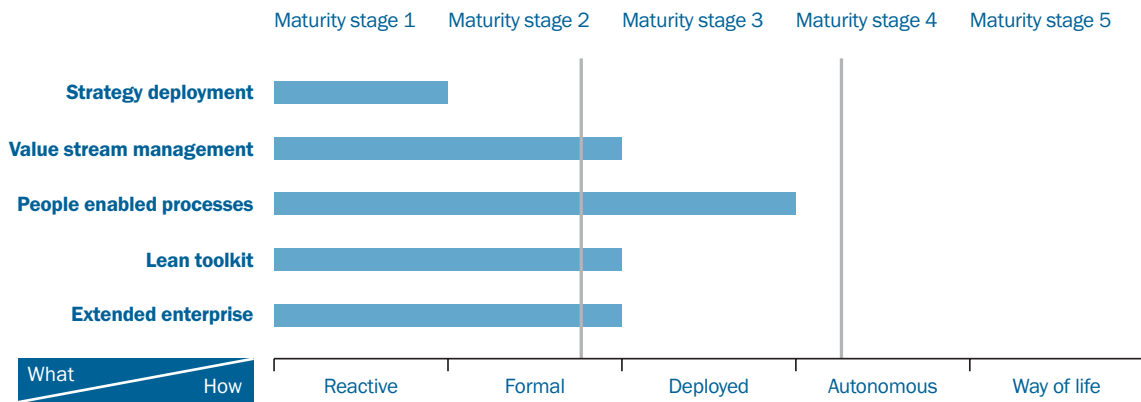
This audit process helped to identify the early weaknesses in the Lean implementation at Cogent Power. It also confirmed that organisational learning was taking place.

As the organisation learned, it was able to develop more sophisticated approaches that took the company to a new level. Opportunities that were not possible or could not have been imagined at the beginning emerged and took shape. Individuals began to make more challenging suggestions that took them and their teams out of their comfort zones. People started asking when improvements were going to be made in their areas and expectations rose.

Greg, the Lean Manager at Cogent Power, Canada, told us that he thinks that they have got Lean now. Instead of him and the Lean coaches *pushing* Lean at every opportunity and sending people on training courses, they are now *pulling* Lean. People are now asking 'Is this Lean?' every time they do something new and are challenging established ways of doing everything.

As a result they have adopted Lean and continuous improvement as the Cogent way of life.

Lean business model factor	2007 (focus for improvement)	PDCA	2009 (future vision)
Strategy and alignment	Further simplify and reduce the KPIs to the Vital Few and encourage a 'bias for action' at all levels	→	Everybody understands their contribution to achieving strategy through deployment of a simple set of KPIs
Process management	Refine the strategic growth policy and co-ordinate improvements for an integrated set of commercial processes	→	Robust processes for order creation, innovation and new product introduction exist to support a clear growth strategy
People enabling processes	Provide the appropriate development for middle and line managers to enable their effective support and coordination of Continuous Improvement	→	Line level managers throughout the organisation are capable of, and motivated to, autonomously support Continuous Improvement
Lean tools	Enhance approach to best practice sharing and learning to help accelerate and sustain balanced Continuous Improvement	→	The process of sharing best practice is a daily habit that encourages innovation within the bounds of the Cogent Way
Supply chain integration	Initiate and drive strategic cross-divisional steel supply chain improvement programme	→	A mutually beneficial supply chain strategy is in place with our supply chain partners and 100% OTIF is achieved

Technology

Many early Lean practitioners held the view that IT was not necessary for Lean operations and considered that ERP systems were only suited to traditional 'batch and queue', push scheduling environments.

Without doubt, the concepts behind MRP, MRPII and ERP were based on forecasts; from these plans were generated and operations executed. It has long been recognised that forecasts are usually wrong, plans are too inflexible and push concepts lead to overproduction and waste. However, the reality of managing the Lean demand-driven approach without the help of software is very difficult. In addition, many business measures that are essentially financial use data derived from the ERP system to monitor performance.

It is important to continually review the monitoring system during a Lean implementation, as many traditional cost accounting measures are inconsistent with pull systems and conflict can arise when performance measures have not been adapted in line with the new Lean processes.

An example here might be departmental productivity measures developed when departments had individual schedules and targets. These measures are no longer appropriate, or even collectable, in a Lean process-focused, cross-functional environment and if departmental managers continue to be measured against inappropriate performance indicators they will naturally regress to old methods so as to improve their 'performance'.

Instead of using MRP at the Canadian plant, Cogent Power developed a model for long-term planning that uses information generated from the ERP system to drive long-term purchase requirements.

"We don't use MRP any more. MRP doesn't work very well with the long lead-times for steel and short order notice from our customers, but we do use our ERP system to manage our purchasing. We operate VIM that is handled by our ERP system. From the initial data entry everything is handled electronically by barcodes. We have full traceability back to the mill with 98% data accuracy, so we only need to stock check bi-annually now."

Greg, Logistics and Purchasing Manager, Cogent Power, Canada

They have also used IT creatively to develop the Cambans, described earlier. This is currently being extended across the supply chain to include vendor managed inventory for key customers.

In addition they are constantly striving to improve the information flow and reduce the need for manual re-keying of data. They have worked with customers and installed software, essentially an advanced print driver, which is linked to the internet. When the customer prints a purchase order it is transferred via the web and input directly into the Cogent Power ERP system, saving substantial effort and time.

Maintaining misaligned legacy systems and redundant key business measures is wasteful and potentially damaging. It is very important to involve the finance and IT people early in a Lean transformation, as the IT systems and financial measures must be adapted to keep pace with the Lean change programme. Where these cannot be modified, there should be no hesitation to replace them as they will severely limit the performance of improvements and this often makes Lean stall.

Where the IT systems and business measures are aligned, enhanced performance improvements can be expected and the change is more likely to stick. Aside from financial gains, benefits of aligned Lean and IT include enhanced visibility across the supply chain, increased flexibility and responsiveness, lead time reduction and increased productivity.

Summary

Applying Lean tools and techniques alone will not make an organisation Lean. These are just things that Lean organisations use to help solve problems and support their Lean strategy. Ask yourself 'Is their any reason why a traditional mass producer cannot use 5S, Visual Management, TPM and SMED?' No, there is no reason why they can't use them, but without the Lean philosophy they will still be traditional mass producers. Real Lean organisations are not just companies who have successfully applied Lean tools, they are organisations that have successfully adopted the Lean philosophy; they have a vision and a clear, aligned, sense of *purpose*, they have organised their business around key business *processes*. They have developed the right *people*, from the top to the bottom of the organisation, who are engaged and exhibit the right behaviours; people who are capable of 'leading the Lean lifestyle'.

Learning points – Technology, tools and techniques
■ Lean tools and techniques are not an end in themselves. To achieve long-lasting results they need to be applied logically to solve defined problems rather than simply taking a scatter-gun approach
■ Use appropriate 'bundles' and 'combinations' of Lean tools and techniques to achieve the specific value stream goals and financial improvements
■ Key value streams need to be strategically selected and supported by senior management
■ KPIs need to be simplified and monitored to ensure that they are appropriate and linked to the strategy
■ Use simple and proven technologies such as web cams and software to better manage and make the bridge between customer and supplier demand profiles
■ Align Lean and IT to avoid waste and enhance the benefits

Cogent Power's journey to Lean involved addressing all elements of the sustainable Lean iceberg, but the progress that they made reflected local decisions and corporate policies. A number of important lessons were learned as a result.

Route to Lean

Let us remind ourselves of the journey taken by Cogent Power as they travelled through their Lean transformation. Their journey started with Marcel announcing his vision to the senior managers. At this time it was understood that Cogent Power was in poor financial health, making huge losses, and a rapid turnaround was needed.

Although Marcel announced his intentions to the management team in December 2003 the transformation programme was launched officially in January 2004 with the aim of stemming the financial losses and making the company more productive. Progress was reviewed formally in July 2005 and, despite making considerable advances, some concerns were raised regarding the pace and sustainability of change. As a result the road map of the journey changed slightly and more emphasis was put on what we now recognise as the 'below the waterline' elements of a sustainable Lean Iceberg.

In this section we explore the road maps in more detail and illustrate the route they took by using circles and numbers to signify the stages. The size of each circle represents the emphasis that was placed, in terms of effort, on each of the elements.

Road map 1

4 Technology, tools and techniques

3 Process management

Above waterline – visible

Below waterline – enabling

1 Strategy and alignment

Leadership

2 Behaviour and engagement

Above waterline – visible

Below waterline – enabling

The first phase of the transformation took about eighteen months and resulted in establishing an awareness of Lean within the organisation. The training and communication programmes that were started in this phase involved many people, although they did not engage everyone totally in the transformation. There were still many sceptics and those who had 'seen it all before'. The emphasis at this

stage was on getting the right management team together and applying Lean tools and techniques to improve productivity. At this stage, it was mainly focused on order fulfilment.

This is illustrated by a fishbone diagram:

Focus in roadmap 1
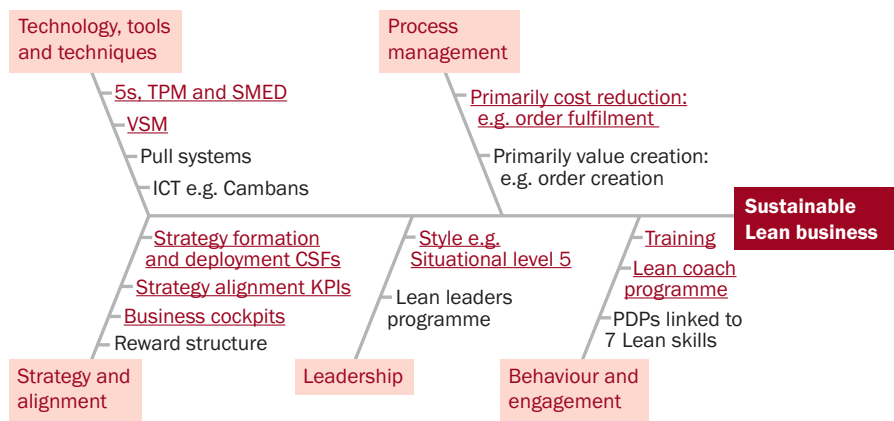
Although there was considerable improvement in productivity and also sound progress in the financial turnaround, the senior managers were concerned about both the pace and the scope of change; some sites and areas were seemingly progressing better than others. As a result, a Lean assessment was conducted and a number of issues were identified.

| Key theme	Key learning from Lean experience
Leadership, behaviour and engagement	The coaches who had been deployed to help drive the programme had become the real leaders of **Lean** and it was accepted that, in taking a top-down and bottom-up approach to the programme, the middle managers had been neglected. It was evident that they were not owning **Lean** and therefore not 'living the Lean lifestyle' which is so critical to sustainability.
Strategy and alignment	Although **KPIs** had been reasonably well deployed during the first round of deployment, a second round was needed to ensure that process teams and individuals were aligned with a full 'line of sight' to the business strategy.
Process management	In common with traditional businesses, customer value was perceived as merely quality, cost and delivery (QCD), and the business had not yet really captured the true voice of the customer. It was also agreed that not enough effort had been given to applying Lean tools to help improve the way non-manufacturing processes were managed.
Technology, tools and techniques	Key value streams needed to be strategically selected with more emphasis on 'bottom-line' improvement activity. The value stream mapping improvements had been focused on building internal stability and it was recognised that, to make a real impact, work was needed across the extended enterprise. The use of technology to better manage end-to-end supply chain 'pull' systems would make a difference.

There were also some other areas of concern:
- Some people were still identified as 'Roadblocks' to progress and a formal process of confronting these people was needed.
- Organisational structures were still traditionally set by function and needed to be better aligned to value streams.
- Establishing what 'Best Practice' looks like for the business sector and setting new and improved standards for the Cogent Way would help visualise the goal for the operating units.

This is not unusual at this stage and it is often where many Lean implementations stagger or stall.

We describe the situation that we saw here as a narrowing of the iceberg beneath the waterline. It happens when the emphasis has been placed on the activities above the waterline; the processes, technology, tools and techniques. In this case, because of the turnaround situation, this was the correct path, but only for a certain period. This is the time when companies think that they have implemented Lean. In reality, this is often when the implementation is in its most precarious and vulnerable state. To achieve sustainable results the focus needs to be increasingly below the waterline, to build strong foundations and to support and keep the business afloat.

To Marcel, Frans and Peter it signalled a need to refocus and address the shortcomings.

Road map 2
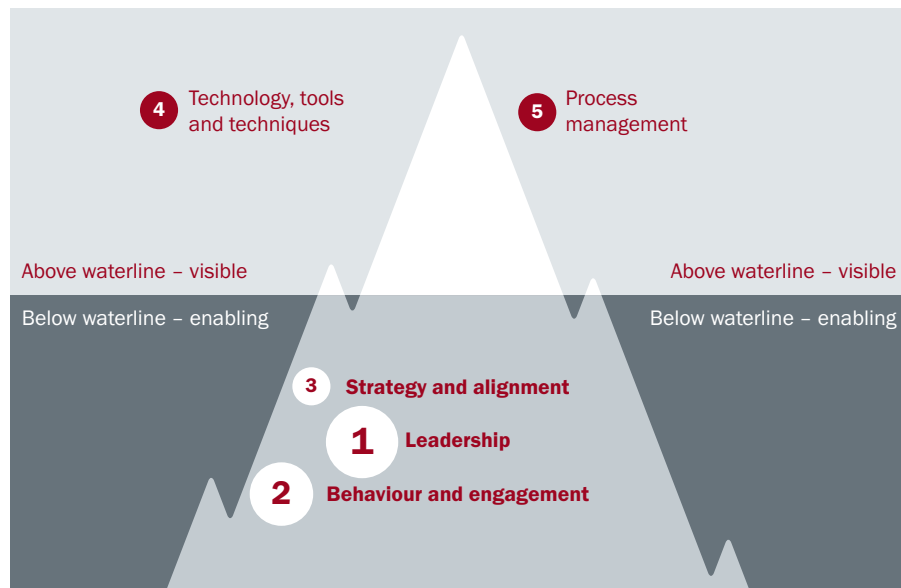

Focus in roadmap 2
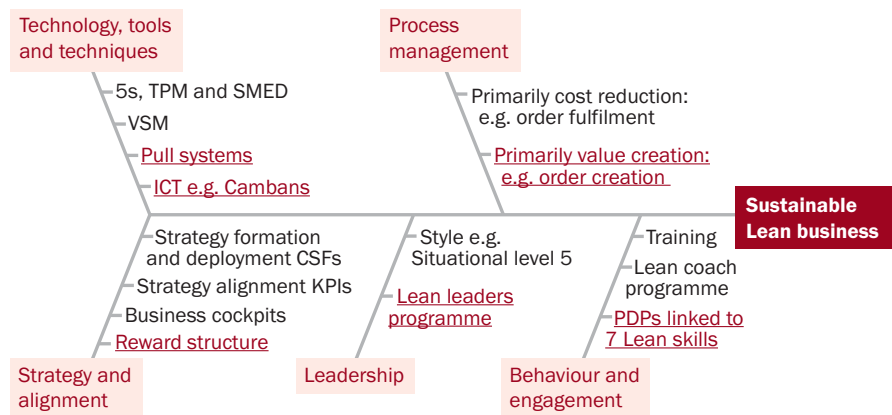
A key part of this second phase was focus on leadership, behaviour and engagement. There had been a lot of strategic Lean work at senior management level and also Lean implementation at shop-floor level. However, this top-down meets bottom-up approach had left the middle community lacking in the skill, competence and motivation needed to take Lean to the next level. Extra training was put in at the middle management level so that the line managers and team leaders were given skills that emphasised the change in roles and responsibilities that were expected of the entire leadership community going forward; helping individuals and teams to 'lead the Lean lifestyle'.

Another focus during the second phase was on the maturity with which the business units were able to apply 'bundles' of tools and techniques in order to achieve real performance improvements. This came from enhanced, or 'double-loop', learning, where the senior management teams of the plants began reviewing

the profit potential of the various value streams and, based on volumes, margin and future growth criteria, were able to select, with knowledge, the key areas of focus for the operating teams to work on.

An integral part of the success was the recognition that the company needed to put into practice the first principle of Lean and better understand what its customers (both existing and new) really valued in a supplier. The organisation needed to understand completely the true 'voice of the customer'. Again, the timing was right here as by this stage, the company was in a position to act on its understanding. This is best illustrated by the following graphs developed by Mark and John from Cogent Power (UK) with help from the consultant, Gary, to show their progress in improving operational performance (efficiency) and commercial effectiveness in a changing market environment.

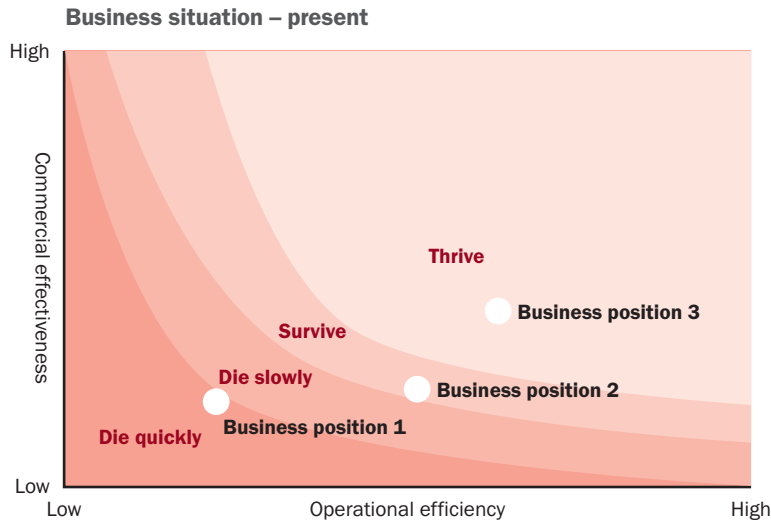**Business situation – thrive or survive**
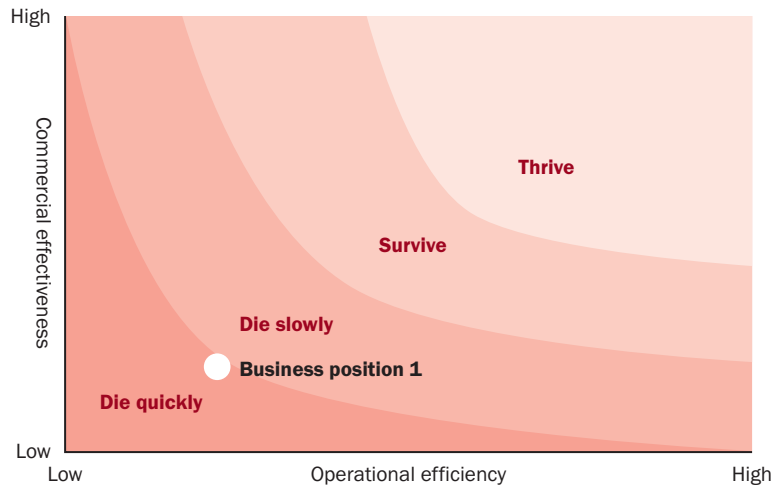
Business Position 1 was the starting point of the Lean transformation, with little focused effort on operational efficiency and weak commercial effectiveness.

Business situation – mid-way
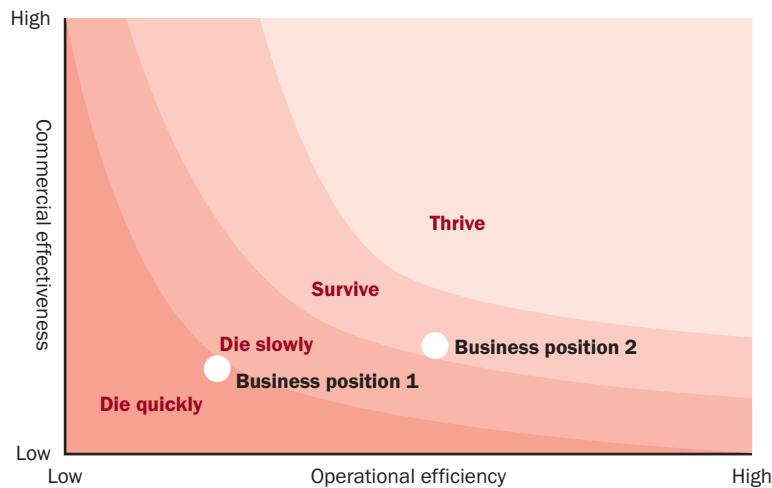
Business Position 2 was mid-way through the programme. Operational efficiency had improved significantly but the external market had changed, making survival easier.

Business situation – present

Business Position 3 showed the improvement in commercial effectiveness but the strong market conditions are enhancing the overall business performance. The challenge now is to continue the improvements to be able to thrive, or survive, when the market for electrical steels returns to normal.

Addressing all elements of the iceberg helped to change the business, with the organisation becoming much more customer-focused. The financial turnaround was accelerated by the exponential increase in sales that was achieved at controlled costs, and the business is now underpinned with the capability to 'continuously improve the process of continuous improvement'.

As Cogent Power in Canada became more customer-focused they changed the face of the company and moved up the value chain by taking on some processing for their customers. They were able to do this without adding extra internal costs due to the operational improvements they had made. In doing this they were able to extend the supply chain out towards the customers.

Extended enterprise
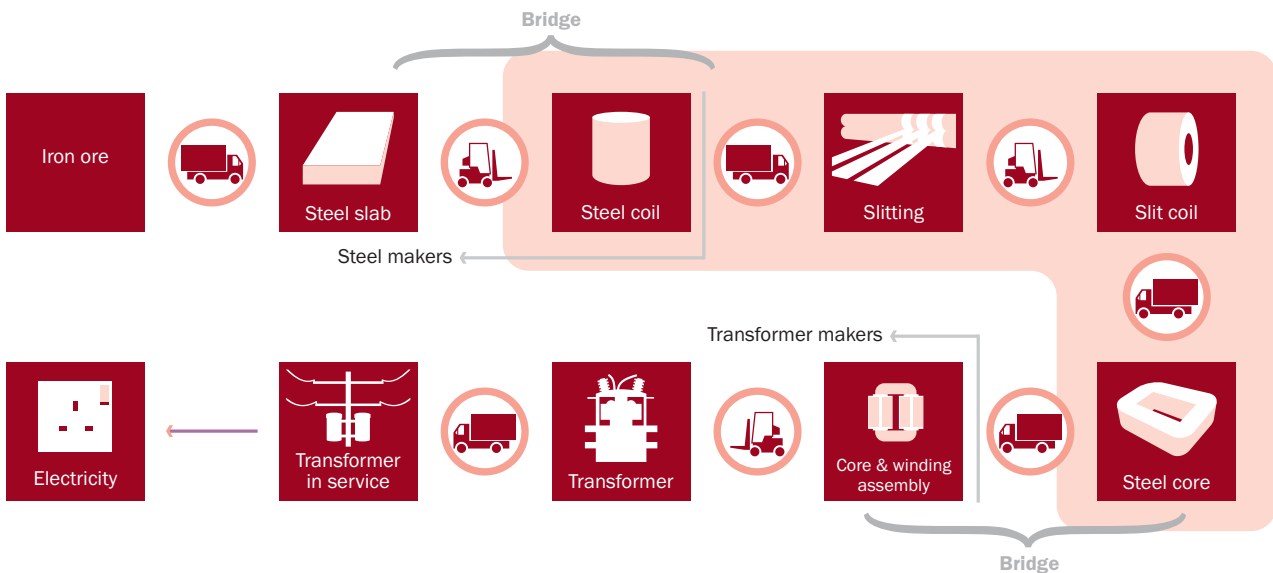
The challenge now is to take the understanding and learning and to achieve similar performance benefits across selected global supply chains, and to embed the changes for long-term sustainability.

At each stage of the Cogent Power journey there were lessons to be learned. For real, sustainable Lean, each element of the Lean Iceberg needs to be in place. If any element is missing the whole is at risk. We try to summarise and illustrate this by using a model for change developed by Tom Peters.
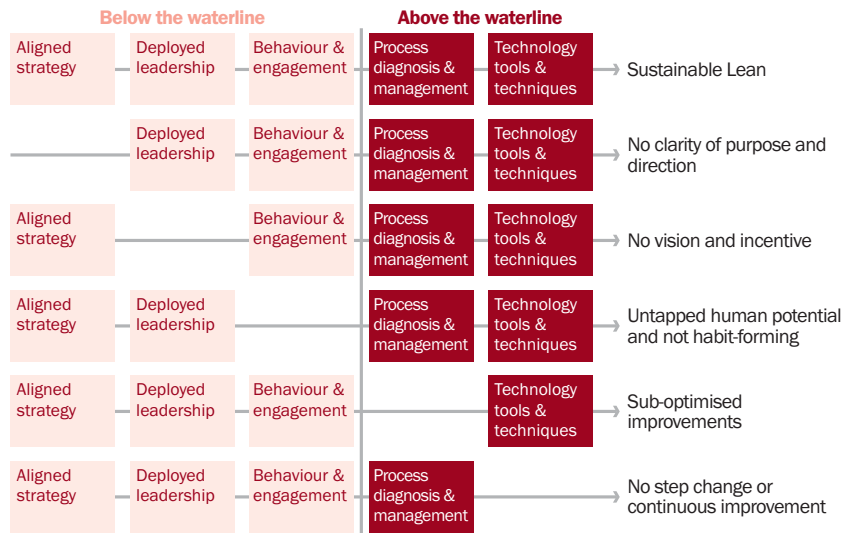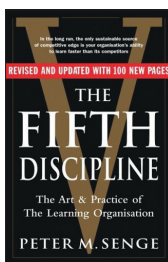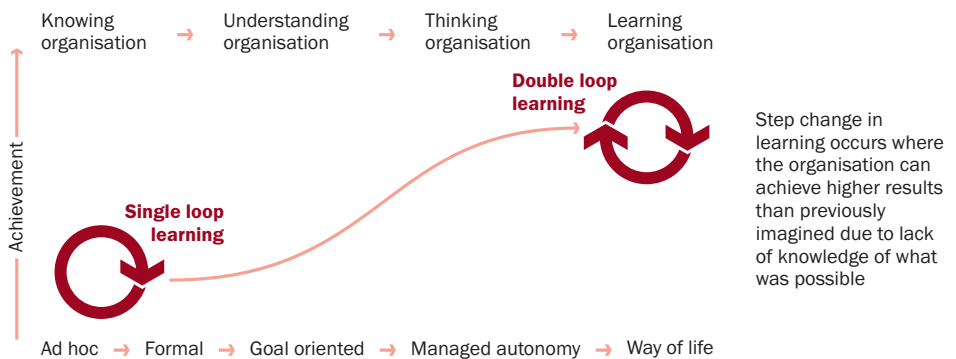
	Below the waterline		Above the waterline		
Aligned strategy	Deployed leadership	Behaviour & engagement	Process diagnosis & management	Technology tools & techniques	Sustainable Lean
	Deployed leadership	Behaviour & engagement	Process diagnosis & management	Technology tools & techniques	No clarity of purpose and direction
Aligned strategy		Behaviour & engagement	Process diagnosis & management	Technology tools & techniques	No vision and incentive
Aligned strategy	Deployed leadership		Process diagnosis & management	Technology tools & techniques	Untapped human potential and not habit-forming
Aligned strategy	Deployed leadership	Behaviour & engagement		Technology tools & techniques	Sub-optimised improvements
Aligned strategy	Deployed leadership	Behaviour & engagement	Process diagnosis & management		No step change or continuous improvement

Diagram based on Tom Peters concept adapted by P. Found and G. Griffiths

One of the key observations that we made was that organisational, or 'double loop', learning was taking place. The result was that improvements which could not have been envisaged at the start of the journey were now not only feasible but also possible. Without organisational learning, many of the results would not have been achieved. We have illustrated the process that we observed by mirroring the Lean maturity path to McGill and Slocum's classification of organisational learning.

Lean maturity and organisational learning

Knowing organisation → Understanding organisation → Thinking organisation → Learning organisation

Achievement

Single loop learning

Double loop learning

Step change in learning occurs where the organisation can achieve higher results than previously imagined due to lack of knowledge of what was possible

Ad hoc → Formal → Goal oriented → Managed autonomy → Way of life

See Peter Senge's book *The Fifth Discipline: The Art and Practice of the Leaning Organisation* for more information on 'double loop' learning.

Following Cogent Power's Lean journey has shown that delivering sustainable Lean change is complex and not always achieved in a single journey. It requires focusing not only on the visible elements of Lean – process management, Lean tools and techniques – but more importantly, on the invisible elements; strategy and alignment, leadership and employee behaviour and engagement. Real Lean leaders are people who are able to reflect and modify the route, recognising that organisations need time to learn to be able to achieve the highest results; they know that it is only when they have learnt that they are truly capable of 'leading the Lean lifestyle'.

As you embark on your Lean journey, we hope that this book helps you and gives you some insight into the issues that are involved.

We wish you an enjoyable and rewarding experience.

Key lessons for staying Lean

Key theme	Lessons learned
Strategy and alignment	■ Take time to define clear and stretching CSFs and build in a P-D-C-A cycle to improve the deployment process. ■ Work to build up the capability of individuals and teams to self-manage the business cockpits at all levels. ■ Deploy words and numbers to ensure full 'line of sight' is achieved, so that people know the business plans and their contribution to making them happen
Leadership	■ Strong decisive leadership with Lean experience is needed in the early phase of the programme. ■ Leaders must be prepared to review themselves and the process critically in order to push the business forward. ■ Continually develop Lean leaders at all levels, on all shifts and within all areas of the business and adopt a 'leading the Lean lifestyle' programme.
Behaviour and engagement	■ To inject pace into the programme take experienced, motivated and multi-disciplined people to form an internal Lean team. ■ Encourage sharing and learning throughout the programme, take every opportunity to get people together to discuss continuous improvement. ■ Lean organisations need Lean people who are both competent and capable of pushing themselves and their teams out of the comfort zone and into the stretch zone.
Processes	■ The application of value stream mapping tools needs to focus on longer-term management, not just mapping. ■ Senior management need to select strategic key value streams that need sustained improvement focus by addressing pillars and platforms. ■ Continuously apply customer value analysis to inform and improve all other key business processes
Technology, tools and techniques	■ Early application of the basic tools and techniques needs an emphasis on self-sustaining systems of management. ■ Use appropriate 'bundles' and 'combinations' of Lean tools & techniques to achieve the specific value stream goals and bottom-line improvements. ■ Use simple and proven technologies such as web cams and software to better manage and make the bridge between customer and supplier demand profiles

Sources of further help

Research assistance at Cardiff University

At Cardiff University we have a number of ongoing research programmes in both the manufacturing and the service environments, on group and individual bases. If you would like to discuss your specific requirement please contact:

Professor Peter Hines
Lean Enterprise Research Centre
Cardiff Business School
Cardiff University
Cardiff Business Technology Centre
Units 1.03 – 1.07
Senghennydd Road
Cardiff CF24 4AY

e-mail: hinespa@cardiff.ac.uk or visit:
www.leanenterprise.org.uk or www.cuimrc.cf.ac.uk

Educational assistance at Cardiff University

A range of educational courses are run at LERC including Masters level courses in Lean Operations for both Manufacturing and Service sectors and in Supply Chain Management. These are complemented by a number of open or bespoke short courses. For further information please contact:

Claire Gardner,
Education Manager
Lean Enterprise Research Centre
Cardiff Business School
Cardiff University
Cardiff Business Technology Centre
Units 1.03 – 1.07
Senghennydd Road
Cardiff CF24 4AY

e-mail: gardnerca@cardiff.ac.uk or visit:
www.leanenterprise.org.uk

For further information on S A Partners please contact

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Recommended publications

Companion books to this publication

Peter Hines, Ricardo Silvi & Monica Bartolini, *Lean Profit Potential*, (Lean Enterprise Research Centre, Cardiff, 2002) available as a download from www.leanenterprise.org.uk
A practical guidebook on how to use Lean thinking to unlock hidden profit potential illustrated through application to a single car dealer.

Peter Hines & David Taylor, *Going Lean: A Guide to Implementation*, (Lean Enterprise Research Centre, Cardiff, 2000) available as a download from www.leanenterprise.org.uk
A practical introductory guidebook on how to go about starting to apply Lean thinking.

Other useful texts

Icek Ajzen, *Attitudes, Personality, and Behavior*, (The Dorsey Press, Chicago, 1988)
The classic work on Theory of Planned Behaviour.

Jo Beale and Peter Hines, *Behavioural Aspects of a Sustainable Lean Manufacturing System*, (Working Paper, Cardiff University Innovative Manufacturing Research Centre, Cardiff, 2007)
An exploration of what you need to do to affect the behaviour of people to make Lean implementations sustainable.

Warren Bennis, *On Becoming a Leader*, (Perseus Publishing, Cambridge, MA, 2003)
An excellent introduction to the difference between a manager and a leader.

Curt Coffman and Gabriel Gonzalez-Molina, *Follow This Path: How the World's Greatest Organizations Drive Growth through Unleashing Human Potential*, (Random House Business Books, London, 2004)
A worldwide survey on how engaged people are in their organisations and what can be done about it.

Jim Collins, *Good to Great*, (HarperCollins, New York, 1991)
A breakthrough text on the understanding of how to be sustainable leader.

Rick Delbridge, Lynda Gratton, Gerry Johnson et al, *The Exceptional Manager: Making the difference*, (Oxford, 2007)
Results of a collaborative research by Senior Fellows of the AIM initiative that focuses on the role of management in UK competitiveness.

Pascal Dennis, *Andy and Me – Crisis and Transformation on the Lean Journey*, (Productivity Press, University Park, IL, 2005)
An outline of the Toyota Production System and what it really means to apply it.

Pascal Dennis, *Getting the Right Things Done*, (Brookline, Mass, The Lean Enterprise Institute, 2006)
A good summary of Strategy Deployment based around a case example.

George Eckes, *Making Six Sigma Last*, (John Wiley and Sons, New York, 2001)
A look at sustaining Six Sigma activities.

Bob Emiliani, *Real Lean – Understanding the Lean Management System*, (The CLBM, LLC, Kensington, CT, 2007)

Michael Hammer, In Joseph White, *Next Big Thing*, Wall Street Journal, 26th November 1996
A reflection on why BPR did not work and why a process view is necessary.

Peter Hines & Nick Rich, *Understanding Improvement Areas in the Value Stream*, In: Peter Hines, Richard Lamming, Dan Jones, Paul Cousins & Nick Rich, *Value Stream Management*, pp. 13–31 (Pearson Education, London, 2000)
A description of the use of a range of Value Stream Mapping tools.

Geert Hofstede and Gert Jan Hofstede, *Culture and Organizations: Software of the Mind*, 2nd Edition, (McGraw Hill, New York, 2005)
Explores how organisational and national cultures differ, and how they can be managed.

Douglas Howardell, *Seven Lean Skills*, http://www.theacagroup.com/leanarticle.htm
An insightful text on developing leadership skills.

Spencer Johnson, *Who Moved My Cheese?*, (Random House, London, 1999)
A light-hearted approach to managing change.

John Kotter, *Leading Change*, (Harvard Business School Press, Boston, 1996)
A (or the) definitive text on change management.

John Kotter and Holger Rathgeber, *Our Iceberg is Melting: Changing and Succeeding Under Any Circumstances*, (Macmillan, Oxford, 2006)
A light-hearted fable about doing well in an ever-changing world.

Kurt Lewin, *Behaviour and Development as a Function of the Total Situation*, (Manual of Child Psychology, John Wiley and Sons, New York, 1946).
Classic text on change management.

Jeffrey Liker, *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*, (McGraw-Hill, New York, 2004)
A classic text on the application of Lean thinking at Toyota.

Jeffrey Liker & David Meier, *The Toyota Way Fieldbook: A Practical Guide for Implementing Toyota 4Ps*, (McGraw-Hill, 2006)
A step-by-step guide to developing a Toyota-style Lean enterprise.

John Lucey, Nicola Bateman & Peter Hines, *Why Major Lean Transformations have not been Sustained*, Management Services: Journal of the Institute of Management Services, Volume 49, Number 2, pp. 9–13, 2005
A brief practical synopsis of why Lean efforts fail to be sustained.

David Mann, *Creating a Lean Culture*, (Productivity Press, University Park, IL, 2005)
Discussed standard work for leaders as part of a Lean management system.

Michael E. McGill and John W Slocum Jr, *The Smarter Organization: How to build a business that learns and adapts to marketplace needs*, (John Wiley and Sons, New York, 1994)
A guide to transforming businesses into 'smarter' organisations.

Yasuhiro Monden, *Toyota Production System*, (Engineering and Management Press, Norcross, GA, 1988)
Perhaps the definitive text on TPS.

Lyman Porter and Edward Lawler III, *Managerial Attitudes and Performance*, (Irwin, Homewood, IL, 1968)
An exploration of expectancy models and how these motivate people's behaviour.

Nick Rich, *Total Productive Maintenance: The Lean Approach*, (Liverpool Business Publishing, Liverpool, 2001)
A useful companion book to guide the use of TPM.

Nick Rich, Nicola Bateman, Ann Esain, Lyn Massey and Donna Samuel, *Lean Evolution: Lessons from the Workplace*, (Cambridge University Press, Cambridge, 2006)
A detailed implementation guide and illustration of how other companies have applied Lean thinking in practice, highlighting the key challenges and pitfalls.

Mike Rother and John Shook, *Learning to See*, (Brookline, Mass, The Lean Enterprise Institute, 1998)
Textbook summarising how to use the Big Picture Mapping tool.

Edgar Schein, *Organizational Culture and Leadership*, (John Wiley and Sons, New York, 2004)
How to understand about business culture and its link to leadership.

Peter Senge, *The Fifth Discipline: The Art and Practice of the Learning Organisation*, Revised Edition (Random House Business Books, London, 2006)
The classic text on developing a learning organisation.

Samuel Smiles, *Self-Help*, (Waking Lion Press, West Valley City, 2006)
How to learn from mistakes.

David Taylor and David Brunt (eds), *Manufacturing Operations and Supply Chain Management – The Lean Approach*, (International Thompson Business Press, London, 2000)
A case book detailing the application of Lean thinking within an automotive supply chain context.

Victor Vroom, *Manage People, Not Personnel*, (Harvard Business school Press, Boston, 1990)
An exploration of expectancy models and how these motivate people's behaviour.

James Womack & Daniel Jones, *Lean Thinking: Banish Waste and Create Wealth in your Corporation*, (Simon & Schuster, New York, 1996)
The definitive text on the five Lean principles and their application

James Womack, Daniel Jones and Daniel Roos, *The Machine that Changed the World*, (Rawson Associates, New York, 1990)
The classic Lean text that describes the results of benchmarking the world's major auto makers.

Jargonbuster

Big picture mapping A specific visual approach designed to display at a high level a major part or whole *Lean enterprise*.

Catch-balling The feedback and agreement process for plans with *Policy deployment*.

Core processes Those central processes that directly deliver results against targets. See also *Key business processes, Strategic processes* and *Support processes.*

Critical success factors (CSFs) Those key external or internal elements that a business needs to focus on for success, such as market growth or employee involvement.

Current state map A visual method of succinctly recording the key aspects of the current structure and processes in the whole or any part of a supply chain. See *Big picture mapping.*

Flow All activities being undertaken within the Lean enterprise at an even rate without delays, interruptions or other batching.

Future state map A vision of a Lean system which is used as the guide for the change process.

Future value adding (FVA) activity Those activities within a company or supply chain that directly contribute to satisfying end consumers in some future time period and hence will be happy to pay for.

Hoshin Kanri See *Policy deployment*.

ILU charting A skills and competency charting method that visually displays the existing position for each employee against a given set of targets to identify necessary training and development needs

Key business process Patterns of interconnected value-adding relationships designed to meet business goals and objectives, or the main cross-functional activities required in a business for success. See also *Strategic processes, Core processes* and *Support processes.*

Key performance indicators (KPIs) A set of measures designed to benchmark a business's most important characteristics against a set of strategic targets.

Lean A consumer focused approach to the provision of effective solutions involving the consumption of a minimum of resources.

Lean enterprise The extended supply chain responsible for effectively satisfying consumer requirements using a minimum of resources.

Lean thinking The process by which individuals can understand the need for, create and implement a Lean enterprise.

Mapping The use of a appropriate tools and technique to analyse the current situation in any process.

Muda The Japanese term for *waste*. Any activity which consumes resources but adds no value. A target for reduction or elimination.

Mura The Japanese term for *unevenness*. Any activity that has not been levelled out creating consequential complexity and cost. A target for reduction or elimination.

Muri The Japanese term for *overburden*. Any activity that causes physical or mental stress to those people involved in it. A target for reduction or elimination.

Overall equipment effectiveness A composite measure of the ability of a machine or process to carry out value adding activity. OEE = % time machine available x % of maximum output achieved x % perfect output. It measures the degree to which machines are adding value by not being wastefully employed due to planned or unplanned downtime or in producing defects.

Pareto analysis Sometimes referred to as the '80:20 rule'. The tendency in many business situations for a small number of factors to account for a large proportion of events. For example 80% of total sales volume might be attributable to 20% of customers and to 20% of the product range. In terms of quality, 80% of defects might be attributable to 20% of causes. The 20% is sometimes referred to as 'the vital few'.

Perfection The complete elimination of *muda* so that all activities along a value stream create value.

Poka-yoke A mistake-proofing device or procedure to prevent a defect during order intake or manufacturing.

Policy deployment A strategic decision making tool that focuses resources on the critical initiatives necessary to accomplish the *critical success factors* of the firm. The term usually also encompasses the cascading of this by *Key business process* together with the control, measurement and feedback of results. Also known as *Hoshin Kanri*.

Profit potential The profit potential is the effect on the 'bottom line' of any activity that occurs during a Lean transformation programme.

Pull All activities being undertaken within the *Lean enterprise* according to and at the rate of the actual demand requirements of the end consumer.

Repeaters Products or services that have an ongoing demand but are difficult to predict. They exhibit a medium risk to the business and may have medium levels of inventory. They generally have intermediate volumes but not dedicated facilities.

Runners Products or services that have a regular ongoing, predictable demand which represent a low risk in the business and may have low inventories. Such products generally are high volume and have dedicated facilities.

Seven wastes A framework of seven types of activity that do not add value, originally defined by the Toyota company.

Strangers Products or services that are hard to predict and will exhibit highly irregular but generally low demand profiles.

Support activity (SA) or necessary non value adding activity Support activities which are necessary under the present operating system or equipment.

They are likely to be difficult to remove in the short term but may be possible to eliminate in the medium term by changing equipment or processes.

Strategic processes Those processes that help focus overall direction but do not directly impact on targets. See also *Key business processes, Core processes* and *Support processes.*

Support processes Those processes only indirectly impacting on targets but providing support to the core processes that do. See also *Key business processes, Strategic processes* and *Core processes.*

Uptime The percentage of time that a machine is available for productive work.

Value adding (VA) activity Those activities within a company or supply chain that directly contribute to satisfying end consumers, or those activities consumers would be happy to pay for.

Value attribute A value attribute is a feature directly desired by the customer and considered as a core criterion in making a purchasing decision.

Value stream The specific activities within a supply chain required to design, order and provide a specific product or service.

Value stream mapping The process of charting out or visually displaying a *value stream* so that improvement activity can be effectively planned. See *Mapping.*

Waste (W) or non-value-adding activities Those activities within a company or supply chain that do not directly contribute to satisfying end consumers' requirements. Useful to think of these as activities which consumers would not be happy to pay for. Sometimes called *Muda*. See also *Seven wastes.*