

Lean Thinking - TOC-Lean Tools & Techniques

Why Combine Lean Manufacturing with Theory of Constraints (TOC) Techniques?

For many years now, 'Lean' has been a watchword of the manufacturing industry worldwide. Lean has been defined as 'a manufacturing philosophy that shortens the timeline between customer order and shipment by eliminating waste' and there is no doubt that the rigorous and continuous application of Lean principles can result in benefits such as reduced lead time, lower inventory and increased capacity utilisation. However, because Lean's ultimate goal is 'perfection' throughout the entire organisation, many companies find implementation somewhat daunting – if everything must be improved, where do they start? Conflicts can arise when every different department thinks it should be the priority. The Theory of Constraints, however, provides a cast-iron methodology for identifying the priority area and focusing improvements where they will have the most impact on the company as a whole.

Prof. Dan Jones, founder and chairman of the Lean Enterprise Academy, makes this point: "We are all guilty of one of the greatest sins with lean – not having the patience to really understand the problem we are trying to solve and then jumping to a solution that may or may not be the right way to solve this problem. This results in lots of Muda – wasted effort that does not really make a difference – to your organisation or to your consumers". Professor Jones advocates NOT using Lean everywhere but making sure that it is used in the place where it will have the greatest impact – the constraint.

This is why we, within the TOC-Lean approach, are arguing that the application of the focusing power of TOC substantially enhances the power of Lean to eradicate problems and issues. It is not as if the two approaches are in conflict, for there are key areas of overlap:

Some of the fundamental similarities between TOC and Lean:

- Both promote measures to protect due date performance, using a 'pull' system.
- Both techniques recognize that improvement must be continuous and encompass the whole company.
- The process flow/value stream must be accurately mapped at the start of the programme.
- Improvements must enhance the value of the product from the customer's viewpoint.

However, the techniques diverge in a number of key areas, and it can be seen that TOC has several advantages:

- Whereas Lean sees an organisation as a collection of parts which can be improved individually, TOC focuses on that one area (the 'constraint') which, when improved, will have the greatest holistic benefit. Improvements elsewhere are then made, but the priority at all times remains the constraint resource.
- Lean aims to reduce lead time and inventory and thus costs by eliminating waste; TOC aims to reduce lead time and inventory in order to gain capacity, increase Throughput (i.e. the rate at which money is generated through the sale of products) and provide a competitive edge – thus enabling the business to grow.
- Lean promotes maximum resource efficiency, whilst TOC promotes maximum resource flexibility.
- Lean strives to eliminate inventory, idle capacity and variability; TOC recognizes that in practice, variability can never be completely eliminated - but its effects can be protected against by the use of time buffers, whilst protective capacity and inventory can safeguard Throughput against variability of supply.

Thus it is evident that TOC methodology can provide Lean techniques with a high degree of focus which is both in tune with reality and achievable on a practical level, effectively bridging the knowledge gap that can exist between Lean in theory and Lean in practice. Because the bottom line benefits to be gained from increasing Throughput are greater than those likely to be realised via Lean waste/cost reduction alone, TOC provides Lean Manufacturing with a forward-thinking framework which not only directs improvement efforts where they will be most beneficial, but which is also an excellent platform for future growth.

The Implementation Approach of TOC-Lean follows the path described below:

- Identification of the core problem/s through robust analysis, e.g. value stream mapping and the collection of appropriate and accurate data.
- In-depth training in combined TOC-Lean principles.
- Use of collected data to plan implementation stages.
- Implementation of TOC-Lean principles and associated improvement techniques e.g. 5S, Six Sigma
- Mentoring and on-going support to forestall/overcome any obstacles that may hinder implementation.
- Mentoring and retained support to ensure that continuous improvement can be sustained.

Lean in Practice:

What Robs us of Fast (Value) Flow?

Making value flow is one of the most crucial areas of the TOC-Lean approach, and it is where we focus our attention. In our work with many different types of companies where flow is critical to success we have come across one very interesting phenomenon – **capacity thieves**. If organisations wish to win new markets and retain existing customers, then being able to deliver right first time, every time and on-time is critical. At the same time there is continuous pressure to reduce the overall lead time without jeopardising delivery performance, so a fast flow must be maintained too. Hence our interest in what we have called a capacity thief – defined as *'that which robs flow of capacity and thus slows, or even stops, flow in its tracks'*. The capacity thieves that we deal with most often are:

- **Material**
- **People**
- **Breakdowns**
- **Set-ups**
- **Defects**

Addressing these capacity thieves requires the application of the key tools and techniques of the TOC-Lean approach:

Material is dealt with through the application of the Drum – Buffer – Rope approach contained within the TOC Operations methodology.

Please see our sister web site, www.constraintmanagement.co.uk for details of the DBR solution.

People - issues related to People are dealt with through the application of Buffer Management and changes to the measurement systems, removing efficiency measures and replacing them with measures that determine flow and the effectiveness of the flow management system to the bottom-line.

Breakdowns are addressed by Total Productive Maintenance (TPM) - or Production Led Maintenance. This is where we focus on the equipment used throughout the company in order to ensure that it remains capable of doing the work it was originally purchased to do. Maintenance is a necessary condition for ensuring that schedules are not disrupted by breakdowns or having to run the machine slower than the specification etc. Where the machine is a constraint this has considerable implications for the flow, and the ability of the system to make money.

The six big losses addressed through this approach are:

- Breakdowns
- Set-Up and Adjustments (see **SMED** below)
- Idling and minor stoppages
- Reduced Speed Losses
- Start-up Losses
- Quality Defects (see **Kaizen** and **DMAIC** below)

We run a programme for the implementation of TPM which over five days comprises some in-company training for key staff and the development of simple spreadsheet-based tools to track what is happening out on the shop floor and how that relates to the two key measures used within maintenance – Mean Time Between Failure (MTBF) and Mean Time To Repair (MTTR).

We have used this approach in a number of companies with great success, bringing control to an area that is usually given little or no priority and focus by senior management. We work with the maintenance team, helping them to develop more robust procedures for all aspects of maintenance, from daily checks through to the main service overhauls. We work with the scheduling team to make sure that the time for maintenance is properly set aside.

The data capture system we provide comprises maintenance records on a daily, weekly and monthly basis, defect reporting on the machine (this links with our Kaizen and DMAIC activity), and 5S activity (see below). Weekly incident reports reference breakdowns etc.

Set-Ups are addressed by Set-Up Reduction (SMED)

The importance of set-up reduction cannot be underestimated. In many types of organisations we see the ability to move from one product line to another constrained by two factors: firstly, having to work according to a 'large batch' system and secondly, having to maintain high levels of efficiency on each machine. Both of these aspects lead to considerable waste within the system. Through a simple understanding of "internal set-up time" and "external set-up time" and the use of video to capture the actual set-up it is possible to reduce the time taken to move from product line A to product line B.

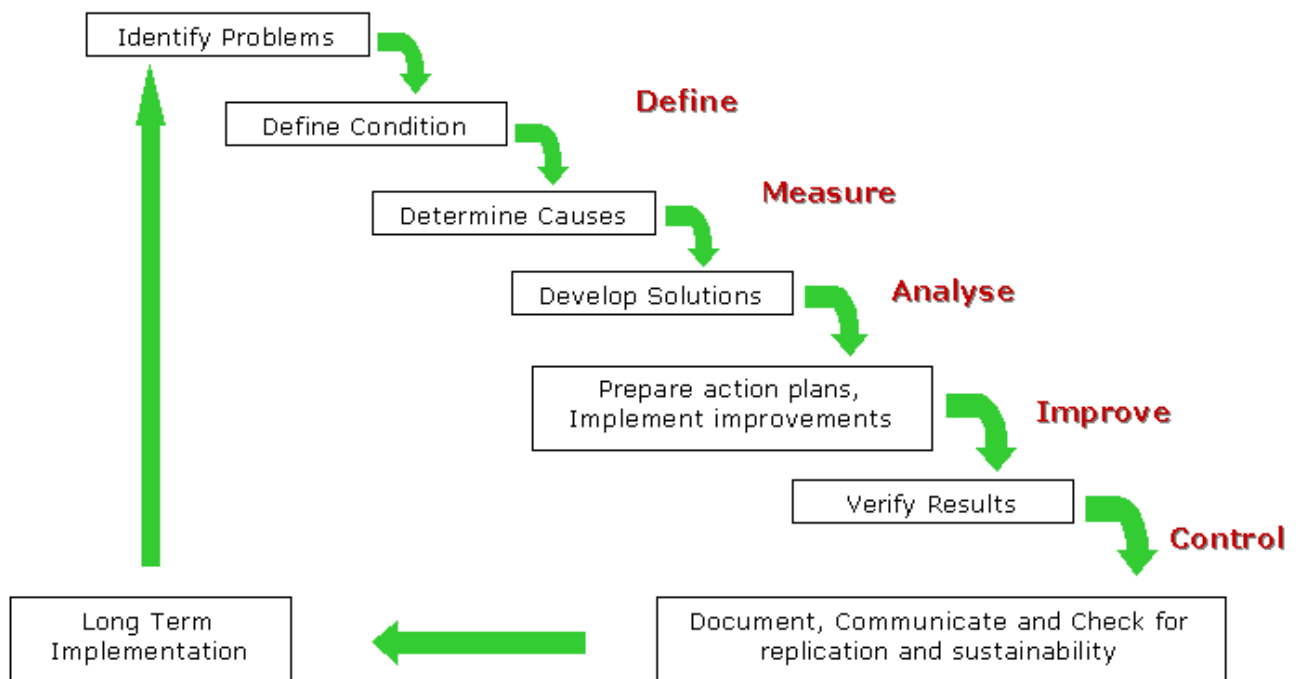
Our programme of set-up reduction focuses on working with the setters and the operators in order to fully understand the change-over procedure and to then produce a quicker and more robust set-up procedure.

Defects are addressed by Quality Improvement (DMAIC Kaizen and Deming)

Defects are the bane of almost all environments, not just manufacturing. Considerable investment is made each year to try to gain control over working environments that are deemed to be statistically out of control. The rise of techniques such as 6 Sigma is testament to this need to produce zero defects. However, tools and techniques such as Six Sigma are not enough - they need to be integrated into an organisational culture and process.

DMAIC

This is the key process contained within the Six Sigma approach. It comprises five steps: Define, Measure, Analyse, Improve and Control.



Kaizen

Of the techniques contained within the umbrella of Kaizen we have found the following to be the most useful when trying to understand and improve the performance of any system:

- The 3-MU checklist, comprising Muda (waste) Muri (strain) and Mura (discrepancy)
- The 4M checklist, comprising Man, Machine, Material, Method
- The 5 Whys – asking the question “Why?” five times with respect to something is a powerful tool for delving behind assumptions and developing greater clarity.

Other aspects of Kaizen are detailed below.

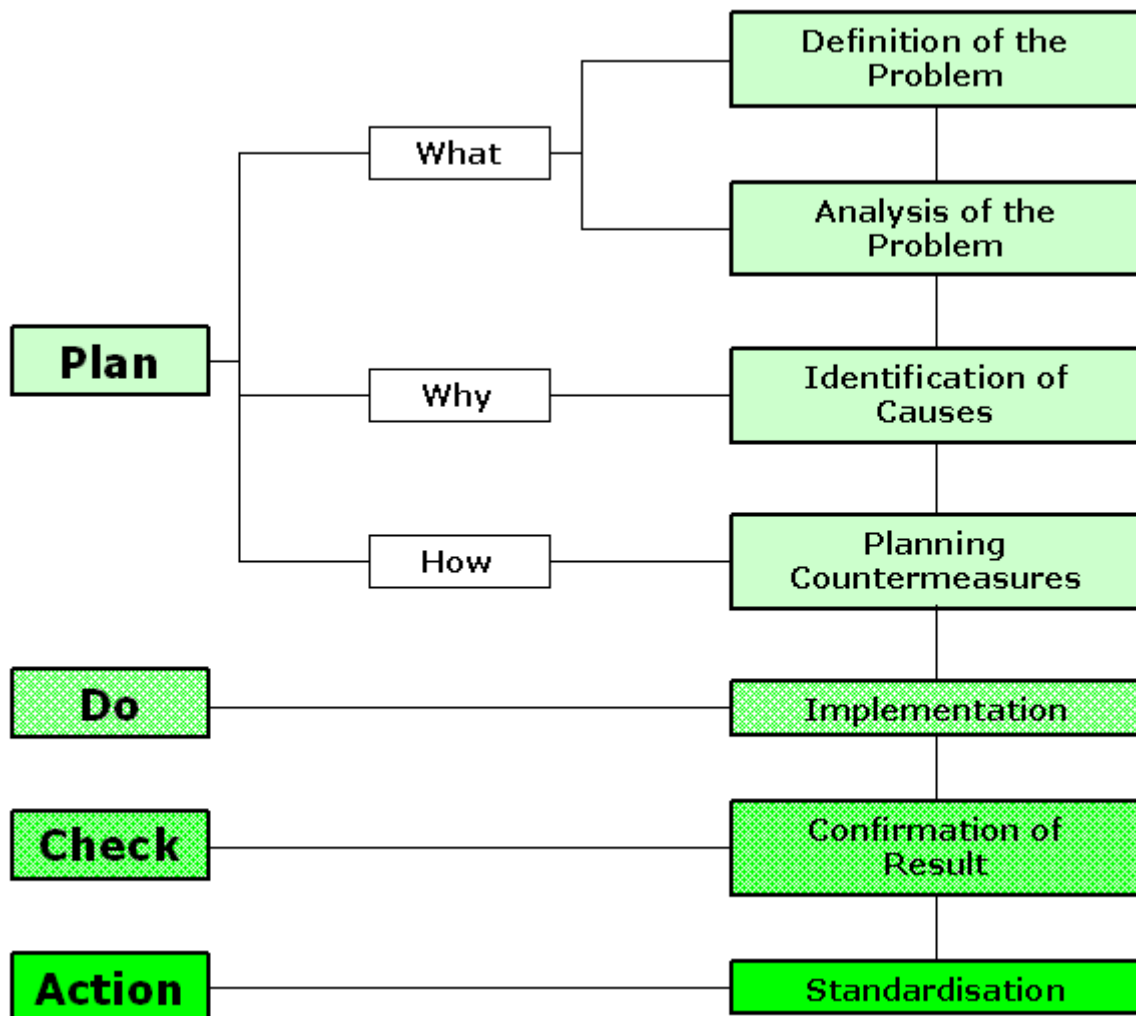
Statistical Tools

Within any quality environment it is necessary to use statistical tools. Via our programme of Quality Management courses we teach people how to use the following tools: Pareto, Cause and Effect, Histograms, Control Charts, Scatter Diagrams, Graphs and Check-sheets.

Our programme works through the DMAIC process, using a variety of techniques at each stage to ensure that the issues defined as problems are dealt with once and for all. There is a very clear link between our training in DMAIC and the Deming approach which is described below.

Deming

The Deming approach is primarily the four key steps of Plan – Do – Check – Action. We have developed that approach as can be seen from the diagram below.



Our training programme develops the skills and knowledge necessary to address issues related to quality and defects and thus improve flow, reduce costs and increase profitability.

5S

This is a technique used to establish and maintain a quality environment in any type of organisation. It should be used to improve not just the physical environment but the thinking processes as well. It comprises five key areas:

- Structure
- Systemise
- Sanitise
- Standardise
- Self-Discipline

We present a five day training programme, in-company, where we spend two days working with the internal 5S team. In that time we develop their skills in the understanding and implementation of 5S throughout the whole of the organisation. We have developed simple spreadsheet tools to assist with the implementation which can then be used by the team to maintain progress and the transfer the technique to other parts of the organisation. The remainder of the time is spent working directly with the 5S teams, developing their skills and application of the approach in each area of the company - shop floor, offices etc. We help them to develop a measurement system which can be used in all departments to monitor progress towards a clean and effective working environment.

TOC-Lean Institute
c/o I & J Munn Ltd
22, Digby Drive
Melton Mowbray
Leicestershire
LE13 0RQ

Tel: 01664 502860
Fax: 01664 502870

www.toc-lean.com
www.constraintmanagement.co.uk

If you would like further information or wish to arrange a course at a time to suit you and your organisation, please contact us by telephone or email:

Ted Hutchin
tedh@toc-lean.com

Diane Jeary
dianej@toc-lean.com