

# Why TOC and Lean Work Better Together

This article by Ted Hutchin originally appeared in the July 2008 TOC-Lean Forum Newsletter

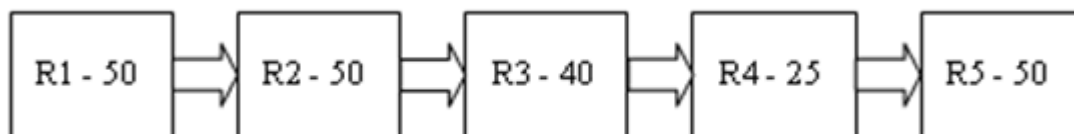


It is becoming fashionable to question the results gained by many Lean improvement projects. Indeed Dan Jones, Chairman of the Lean Enterprise Academy, has recently argued strongly for a radical re-think of just how and where Lean is applied. This is a message that is familiar to TOC practitioners around the world, and is not new to the either. So perhaps it is reasonable to re-state the fact that TOC and Lean in partnership are much more powerful than either alone.

In any type of organisation where there is flow through a series of dependent resources there are likely to be problems. Think of it as shown below:



To make a product, material flows from left to right, and assuming no mistakes or defects comes out the other end and continues on to the client. But the diagram is misleading as it contains little information of value to us, we only know the dependencies. So let's add some information.



What we have added is the number of each resource, its own individual capacity and its connection to the next resource: for example resource 1 feeds resource 2 and both resources are capable of making 50 units each and every day – let's assume a perfect plant for the moment. In many companies that we visit even this level of information is not always available, and if it is, often not correct! Now the usual way of trying to make plants efficient is that people and resources must be kept busy at all times, so material is released in line with the consumption of the first resource, in this case 50 units a day. What will the impact of this be?

Well all resources except R5 will be very efficient, which means busy. Material will however start to build partly at R3 and more so at R4. Can you imagine what will be happening as material continues to be released? Before too long priorities will start to change as material cannot escape from the plant, schedules will start to be changed regularly, the shop floor will be taken up with more and more WIP, which will need to be moved around, more and more. The overall lead time of the plant will start to grow and the due date performance will drop. New and possibly extreme measures will be introduced to make sure that urgent orders are expedited quickly, thus adding to overall confusion and chaos in the plant – but we will be keeping our efficiencies up, our cost per part down etc.....!!

There has to be a better way!

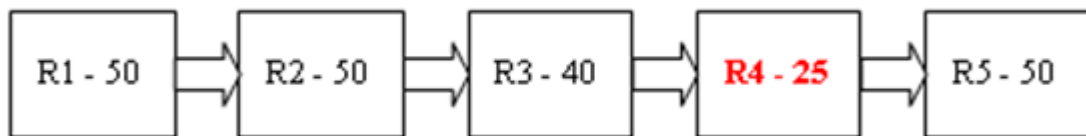
Lean talks about making flow a reality, pulling from the perspective of the market, making value flow and addressing those areas that are causing flow to be reduced or even stopped altogether. TOC makes the same statements but with one key difference – **you must focus on the one resources that is having the greatest impact on flow – the constraint.** Hence the application of the Five Focusing Steps:

1. Identify the constraint
2. Exploit the constraint
3. Subordinate all other activities to the requirements of the constraint
4. Elevate (improve the performance of) the constraint
5. If the constraint has been broken go back to step one

So what happens when we apply this to our simple company? Well, from the data provided we can determine that the constraint is R4. But what does this mean? It means that if the company sells the products at a price of £1,000 for each product then the maximum that this company can make in one day is the capacity of the constraint times that sales value – so that means  $25 \times £1,000 = £25,000$  per day.

But is that what the company really makes? Well no, we have to take off the variable costs that the product attracts – e.g. Raw Material or other purchased parts or services – and let's assume that for our company that figure is 50%. This means that the money retained by the company is the sales value minus the variable costs which is now £ 12,500. This income, known in TOC as Throughput, is what the company gets to keep and use to pay for the all the fixed costs and deliver a profit that can be used to develop new products, or new markets, or whatever form of investment is required to keep the company successful.

But does R4 always make 25 each and every day? NO! Capacity is lost due to things such as breakdowns, set-ups, material not available, defects, people missing and so on. These are what we call capacity thieves. And this is where lean comes in, for lean is excellent at addressing capacity thieves, usually in combination with rigorous quality tools such as DMAIC. Now lean is being used just where it has the most impact to the bottom-line, due to the focusing power of TOC.



So now we know where to focus – the constrained resource, and how to exploit it by making sure that it always achieves as close to its capability as possible. But what about the other resources? The next step is to make sure that all the other resources maintain the ability of R4 to keep working, because if that resource stops the whole company stops.

So we need a robust schedule for shipping that is directly linked to the capability of R4, which means no more than 25 items can ever be shipped in one day. Thus high no more than 25 items should ever be released at R1 in any one day. Think of the shipping schedule determined by the constraint as the 'drum' of the whole company; if we use a figurative 'rope' to tie that schedule to the capacity of the constraint and to the release of material at R1, we have the start of Drum – Buffer – Rope. The length of the rope is measured in time and is called the 'buffer'. We use all our Lean and DMAIC tools first and foremost at the constraint, then also after the constraint, and at release, in order to make sure that R4 keeps going with zero defect parts at all times.

We can now measure our shipping in terms of Due Date Performance which is On-Time, In-Full (OTIF) with zero defects as a given and watch our lead times come down. Remember lead time is a function of the schedule and once that is robust we have lead times the Sales Department can believe in. We also have a measure for the release of material – what we call Physical Material Released On Time (PMROT) and this too is used to determine the capability of all our suppliers, both internal such as Engineering and external. The buffer - which protects the constraint, so that it never runs short of work - can now be set, using time as its measure. We can also remove all the usual efficiency and cost allocation measurements as they are now seen as driving the wrong behaviours throughout the whole of the plant.

In execution we release in line with the buffer requirement and then measure progress through the plant. If an order gets stuck it will quickly show up in the buffer status reports and these can be used to check whether there are more problems within the plant for which Lean and DMAIC are the appropriate tools.

This is by necessity only a brief overview of how TOC and Lean work together. In our two-day Flow Manufacturing training programme – details of which can be found on our web site – we go through this in much greater depth, using interactive computer simulations. The programme forms an excellent springboard for companies, enabling them to envisage how TOC and Lean can be utilised within their own operations.

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](http://www.toc-lean.com)  
[www.constraintmanagement.co.uk](http://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](mailto:tedh@toc-lean.com)

Diane Jeary  
[dianej@toc-lean.com](mailto:dianej@toc-lean.com)