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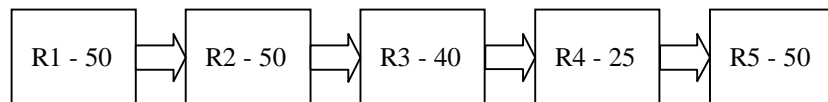
TOC and Lean - Why They Work Better Together Than Apart

It is becoming fashionable to question the results gained by many "lean" improvement projects. Indeed Professor Dan Jones has, in his recent newsletters, argued strongly for a radical re-think of just how and where Lean is applied. This is a message that is very familiar to TOC practitioners around the world, 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



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be introduced to make sure that urgent orders are expedited quickly, thus adding to overall confusions 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!

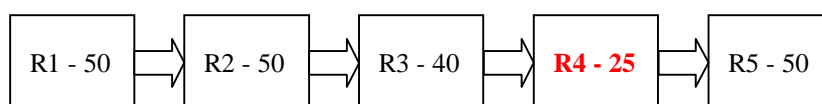
Lean talks about making flow a reality, pulling from the perspective of the market, making value flow and addressing those areas that are causing flow to be reduced or stopped altogether. TOC makes the same statements but with one key difference – **focus on the one resource that is having the greatest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

1. Identify the constraint
2. Exploit the constraint
3. Subordinate all other activities to the requirements of the constraint
4. Elevate 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 can be 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 now 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 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 will 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: http://www.toc-lean.com/Flow_Manufacturing.htm - 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.

For more details of the TOC-Lean approach, please contact Ted by e-mail: tedh@toc-lean.com

'Inherent Simplicity' the latest book by Dr Eli Goldratt

Book Review by Dr Ted Hutchin

When the latest book from Eli arrived on my desk I approached it with both anticipation and trepidation. The former due to the expectation that I would learn a great deal from reading the book, understand what Eli was trying to say and to then apply it to my own life, the latter because he might reveal my own lack of clarity in thinking and that is always a painful process to go through!

The book follows his usual style of being a narrative which covers a range of issues and experiences that he has had, and all in the framework of a conversation with his daughter Efrat.

The first lesson for Efrat focuses on the importance of understanding what is meant by the term "freedom of choice" and linked to that the term "degrees of freedom". This is a term familiar to those with a scientific, or systems, background but not necessarily for all. We start with one of Eli's usual stories about the ability to tap into an opportunity when most see none. What is it about Eli's ability to see clearly what others do not?

Of course, in the story he covers some of the core issues that have affected the world-wide sales of TOC for many years, primarily the inability to really see the scale of opportunity that sits before us. This is linked to our inability to really capture the attention of our own prospects by enabling them to see the real opportunity they might have, and how we can help. In the story Eli argues that retail is probably the perfect target market for TOC, plus any one major retailer leads to many suppliers, and this gives him the platform to open up a discussion with Efrat about freedom of choice and the notion of degrees of freedom.

So under questioning Efrat manages to drag out of Eli the statement "The more complicated the situation seems to be, the simpler the solution must be" (p24). In explanation Eli makes the point that in most companies today there is the assumption that they are complex, that the markets they serve are complex and that therefore the only way forward is to use a complex solution. People, argues Eli, are "looking for sophisticated explanations for complicated solutions". Of course what is being suggested is that with the right analytical

approach, what appears to be a complex situation, with many complicated connections, is often not the case - but just how many people actually believe this statement?

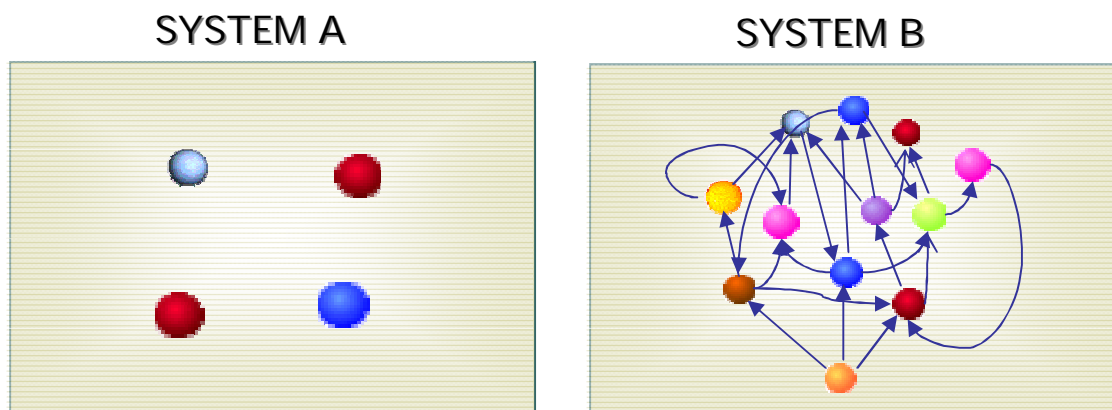
So Efrat needs to understand what this means and therefore Eli gives her an example in the form of a case study, based around the clothing industry. The story is not new, but that is not the point. The point is that there is an underlying logic here that most people miss entirely. (As an aside, capturing the logic contained in the case study (Chapter 4), is rather a good exercise to carry out to test your own capability in using TOC).

This leads us to the point where Efrat now has to think about why, when given all the relevant facts, she still did not see what Eli had seen, and he makes no claims about being inherently smarter! But the direction that Eli takes is now different to that expected – it is more about having a meaningful life.

The basic thrust of the argument is that people spend a great deal of time trying to develop and implement complex solutions that they know will not work, when a better way exists: using the effect-cause-effect relationships that exist in all organisations. It is these Effect-Cause-Effect relationships that determine every aspect of our lives and they are what Eli defines as “common sense”.

So it is now important to understand what Eli calls “inherent simplicity”, namely the application of a thinking process that allows us to delve into the causal relationships within problems to determine those few (and there may be only one) key areas upon which to focus. It is the discovery of common causes that leads to the understanding of inherent simplicity.

It is this radical approach that allows Eli to see what others cannot – his total subordination to the tools of his trade. He is a physicist by profession. He knows these tools work, he has used them all his life, they are second nature to him, if not to others. He uses the diagram shown below to make the point.



Which system is more complex?

Now I have used this diagram many times and it is interesting how many times people tell me that B is more complex than A. But Eli explains that if the definition of complexity is the number of things we have to describe then maybe B is the right answer. But, Eli continues, if we look at it from a systems perspective then you must ask a different question, concerning ‘degrees of freedom’. So the focus turns to the minimum number of points you have to touch in order to have an impact on the whole system.

Now the answer is definitely that A is more complex, because there is only one point in B that has to be touched in order to affect the whole system. Whereas for A, the number is four, meaning that it is a far more complex environment to control; and what if there are more than four? So if we change the definition of complexity we will have a very different answer. Thus the first step in understanding, and thence using, inherent simplicity is uncovered – the use of Effect-Cause-Effect logic to determine the root cause of the organisation, and focus our efforts there. But Eli urges caution, we are not done yet.

We can now understand the importance of a logical analysis, but what about the many contradictions and conflicts that abound in any system where people are involved? This takes us to the next step in the discussion between father and daughter. Many times when we do such analyses we come across conflicts and apparent contradictions. Of course within the Theory of Constraints there is a tool for dealing with conflicts – the evaporating cloud. Here we search for the underlying assumptions that hold the conflict in place and then remove the cause of the conflict by dissolving the assumptions - thereby eliminating the conflict altogether.

So now there are two stages in the process of using inherent simplicity, the first is to arrive at “the conclusion that meaningful opportunities are open when one sees how to remove a blockage; how to overcome an undesirable situation that I’m convinced I cannot change” (p66) and then to realise that the second obstacle is “that people’s perception is that conflicts are a given and that the best we can do is to seek a compromise” (p66).

It is at this point the Efrat manages to elicit from Eli the statement “What I mean by Inherent Simplicity is that reality, any part of reality, is governed by very few elements, and that any existing conflict can be eliminated” and then he goes on to say “If we take that as a given, as absolutely correct in every situation, we’ll find ourselves thinking clearly” (p67). But knowing this does not mean everyone can do it, or indeed Efrat for that matter, so the story continues.....

The key for Eli is to recognise that if we are dealing with a range of undesirable effects then at the root must be a chronic conflict – that is a conflict that does not have an acceptable compromise. This is linked to the fact that for many people such a conflict is so difficult that they give up and do not address the core issue. As Efrat describes it in talking to her father “Your belief in Inherent Simplicity caused you to take for granted that these problems can be solved because they are the result of a root conflict and that the conflict can be removed. That’s why you didn’t have a tendency to camouflage these problems” (p69).

As Efrat moves forward in her journey of discovery, Eli takes her through the importance of harmony, of understanding and seeing the issues from the perspective of the other side and of going into the blame culture that dominates many relationships, both internally within organisations and between organisations. The key here is to recognise that for every relationship there is a change that will cause the parties to achieve what they need from the relationship and thus achieve a level of harmony previously thought unachievable. This is all about changing the mind set such that win-win relationships can be developed and encouraged to grow. The definition of win-win that Eli uses is interesting and novel: the win for my side is less than that for the other side!

Eli explains the dangers of tautology, making sure that in our analysis we are not resorting to circular logic, that we are indeed delving into the real causal relationships which are often intangible – which is where the potential for tautology comes in. The understanding of convergence and predicted effect are discussed, their strength being that they can deal properly with tautology. The predicted effect may show that the suggested, intangible cause is not correct – and this is of course excellent as we can now start to consider what the real cause is.

The book continues the story, using the clothing/retail industry case study as the vehicle to explain just what is meant by “Inherent Simplicity”. If you want to know more you will have to read the book, but I hope I have created a hunger to learn more about this approach.

Please contact Ted by e-mail: tedh@toc-lean.com if you would like to further explore the concepts contained in ‘Inherent Simplicity’.

TOCICO Examinations—Autumn 2008

The next set of examinations will be held at our training centre in Melton Mowbray on the following dates:

Fundamentals exam.....	10th November	4 hours
Project Management exam.....	10th November	8 hours
Thinking Process exam.....	11th November	8 hours
Supply Chain Logistics exam	11th November	8 hours
Financial Management exam	12th November	8 hours

However, please be aware that the examination subjects can be altered within the dates above to suit your individual requirements.

For more information contact Diane Jeary in our training office on +44 (0)1664 502860 or e-mail dianej@toc-lean.com These dates, and further information, can also be found on our web site and the TOCICO web site: www.tocico.org

Introductory Seminars

The dates for our next set of seminars are as follows:

The Goal Breakfast Briefing.....	15th September, 7.30am – 9.30am
Critical Chain Project Management	15th September, 1.30pm – 4.30pm
Operations Management.....	16th September, 9.00am – 12.30pm
Financial Management.....	16th September, 1.30pm – 4.30pm
Thinking for Change—Organisational Focus	17th September, 9.00am – 12.30pm
Thinking for Change—Team Focus	17th September, 1.30pm – 4.30pm
Sales & Marketing.....	18th September, 9.00am – 12.30pm
Supply Chain Management.....	18th September, 1.30pm – 4.30pm
Lean-Flow Car Bodyshop Solution - FREE Introductory Workshop:	26th September, 10.30am—2.00pm

For more details contact the training office on 01664 502860
or email dianej@toc-lean.com

Company News

- ◆ We have been active in attending conferences recently. Dr Hutchin presented for CIMA (Chartered Institute of Management Accountants) in Coventry on the subject of TOC and Operations and again for CIMA, this time in Milton Keynes on the subject of Critical Chain Project Management. The presentations are available for download at our web site: <http://www.toc-lean.com/Presentations.htm>
- ◆ The news from I & J Munn Ltd, our consulting wing, is the start of a new project with a leading UK supplier of solutions for the Child Care market. This is a two year project developing both internal capability and the creation of new services for the child care market which will address many of the key problems and issues relevant to that market.
- ◆ We are also active in the provision of scheduling solutions within the NHS, in particular Out-Patients and Diagnostics. In addition, we have recently started working with a number of high-tech manufacturing organisations, particularly aerospace, in the provision of both Operations Solutions based around TOC and Lean and strategic solutions based around the Thinking Processes of TOC.