

# Lean And TOC: Leverage The Best Of Both

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## Abstract

Have you ever been in a debate concerning what is the 'best' operations improvement approach for your company? There can be very spirited discussions on this topic for different industries or situations on: Lean Manufacturing, Theory of Constraints (TOC), Demand Flow, One Piece Flow, TQM, Six Sigma, etc. One such raging debate is which philosophy and set of practices to utilize between Lean Manufacturing and TOC. Unfortunately, the debate centers around an either/or scenario when combining both has many advantages. Lean provides many specific hands on practices to improve physical flow. It complements the TOC mantra to improve profitability. In addition to supply chain flow, TOC identifies the managerial CONFLICTS to increasing revenues and profit and provides the HOW to align around the necessary POLICY changes.

If conflicts across your supply chain exist, then they will ultimately be major impediments to change. TOC provides the resolution approach to align people, organizations and initiatives. Once aligned, then and ONLY then can Lean tools and techniques bring the most value to the constraining resources. TOC recognizes the value of the training investment, flow improvement techniques and problem solving approaches within Lean. What our Lean leaders and initiatives should recognize is the limitations of those techniques to identify and resolve the real CONSTRAINTS to improving growth and profitability: organizational conflict.

## 1. Introduction

Leveraging Lean and TOC requires a combination of the overall business improvement philosophy to implementing change. On the surface, bringing them together appears to be selecting the best tool for a given application, but this is really a combination of overall TOC philosophy with Lean tactics.

Section 2 starts with Lean and TOC philosophies, describing how both share the relentless pursuit of improvement and a linkage to customer demand for pull. This same philosophy is also evident in TQM, Six Sigma and TPS, but each has some uniqueness and all are viewed as 'holistic' improvement approaches.

The TOC and Lean approaches are described in section 3. It starts with an introduction of the Lean tools and techniques which are usually applied on the shop floor. Starting with value stream mapping, setup reduction or cellular flow design, Lean has applications throughout the business. Yet, it is frequently viewed as a manufacturing centric initiative. TOC techniques are shown to relate to the entire organization first and foremost.

Then, Section 4 addresses how TOC must take precedence as the overall philosophy. TOC drives focus, challenges management policy and enables growth strategies. These elements of business performance are critical to transition from a manufacturing and cost reduction focus (for the improvement initiative) into holistic profit and growth. Examples of TOC approaches include marketing, product development, and resolution of cost accounting conflicts.

Lastly, the Conclusion attacks impediments to implementation and management inertia. The keys to success lie in HOW you think about and lead enterprise transformation rather than WHAT you call an initiative.

## 2. Lean And TOC Philosophy

Lean's overall mantra is the elimination of waste in people, equipment and movement. This is accomplished by focusing on the value added versus non value added steps in the entire supply chain from supplier to customer. Naturally, the effort is to reduce non-value added activities, ones that a customer would not pay for such as quality problems, material movement, storage and many others. With this relentless pursuit to eliminate waste, many good

things should happen: cycle times reduced, inventory eliminated, quality improved, costs reduced and more visibility into the current problems and issues in operations. By accomplishing these improvements in flow: growth and profitability should follow.

TOC on the other hand, is solely focused on increasing growth and profitability. The approach starts with five focusing steps intended to identify the constraint to growth, determine how to maximize the constraint and then subordinate all other activities to the constraint. It is a top down approach that identifies where and how to focus all performance improvement efforts. From a TOC perspective, cost reduction is viewed as a lower priority for improvement when compared to increasing throughput (sales) or decreasing investment (inventory). Costs are viewed as primarily fixed; therefore, efforts to reduce 'costs' tend to save time or effort in one local area that cannot be translated into 'real' increases in profit.

### 3. Tools And Techniques

The tools and techniques for both Lean and TOC can at times look very similar. Both are striving to increase flow, both seek to identify root causes of problems and both demand the use of 'hard' data for decision making. Where they differ is the practices and activities they are focused on improving. TOC goes after policies first; whereas, Lean looks at physical flow. Keep this focus in mind as you consider their relative tools and techniques.

#### 3.1 Lean Manufacturing Practices

The approach to Lean frequently starts with a physical mapping of the value stream. There are multiple terms and specific formats for completing a map of the value stream, but in general, we are creating a picture of all the steps from our supplier(s) to customer(s). It must delineate value added from non value added steps and bring the key impediments to flow into focus. An example top level flow analysis result is shown in Figure 1.

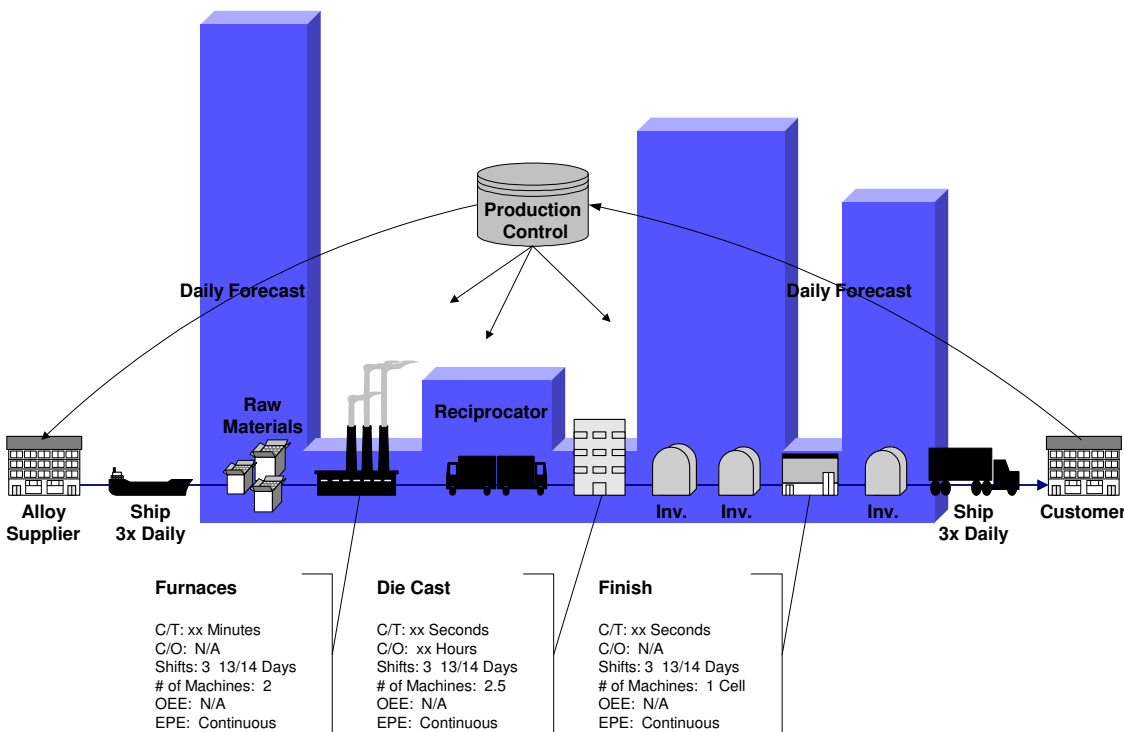


Figure 1. Value Stream Map

The flow graphic is based on step-by-step observations through each operation in the supply chain. The number of steps can vary for each chain, but usually number up to a hundred or more for complex chains. The height of each blue bar indicates the relative time/inventory through the operation. A summary of the steps by each type of operation and whether it is value added is shown in Figure 2, which is a relatively simple flow for a casting operation.

Part Number \_\_\_\_\_ Description \_\_\_\_\_ Date \_\_\_\_\_

Operations		Steps	Quantity	Distance	Time (Hrs)	% Time
Operation VA	○	14			0.812	0.13%
Operation NVA	*	4			0.072	0.01%
Quality	✓	4			0.889	0.14%
Move	⇒	22		28,327	425.33	68.45%
Wait	⌚	3			160.21	25.78%
Store	□	5			34.1	5.49%
<b>Summary</b>		<b>52</b>	<b>-</b>	<b>28,327</b>	<b>621.413</b>	<b>100.00%</b>

Figure 2. Flow Mapping Summary

From the detail and summary flow analysis, we can determine where to focus our improvement efforts and what our objectives (targets) should be. An example improvement could be improving a specific cell's design or flow. The expected benefit being over costs per part, reduced cycle time and/or reduced inventory. Now comes the fun part: how to apply the specific Lean Manufacturing tools and techniques to improve the flow. These techniques range from ways to reduce setup time to workspace organization. An overall graphic of these practices is shown in Figure 3.

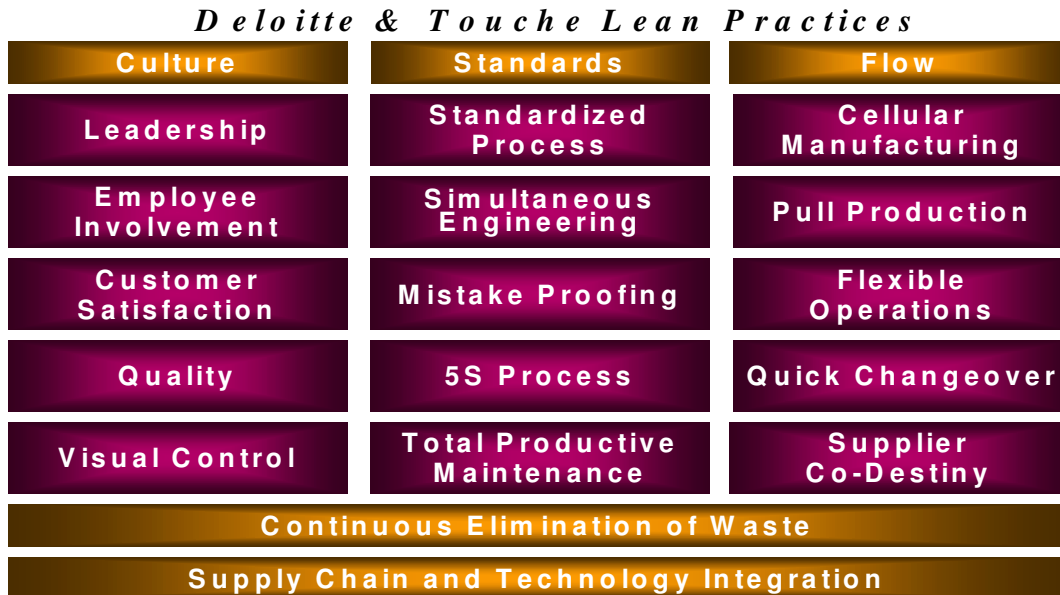


Figure 3. Lean Manufacturing Practices

**3.2 Theory Of Constraints Practices**

The starting point for TOC is the current operational problems and issues management faces. These issues may be from the enterprise level or may begin with a specific plant's operations. The objective is to start with a set of problems that can be traced back to causes, which frequently identifies changes to management policies as well as physical operational processes. An example plant level review called a Critical Reality Tree (CRT) is shown in Figure 4. The orange bubbles are the key operational problems and the blue boxes are different actions that are driven the common core problem: reducing cost per unit as a prime measure.

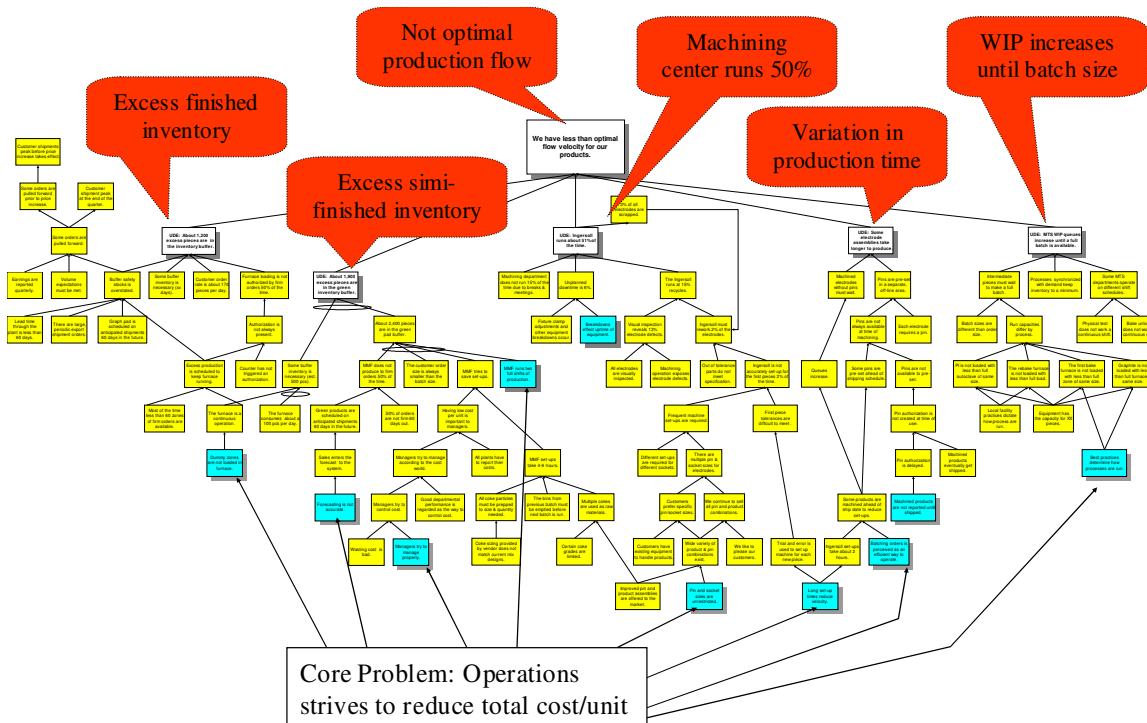


Figure 4. Sample TOC “Plant Level” Critical Reality Tree

Once TOC has identified the core problem and conflict restricting growth and profitability, then a number of thinking processes are utilized to assist management in resolving the conflicts. These thinking processes provide an approach to raising and resolving conflicts rather than attempting to reach a compromise. For example, we typically seek a balance between setups, inventory and impacts to customer service. Both Lean and TOC seek to reduce setups, but only TOC focuses on why we have a conflict and how to resolve it. Attempting to reach ‘balances’ or ‘compromises’ from a TOC perspective is sub optimal and is caused by our inability to address and resolve the conflict.

Along with the thinking processes to resolve conflict, TOC brings a number of ‘applications’ to address many aspects of enterprise transformation. Each ‘application’ relates to a specific functional area and how conflicts restrict growth and profitability. The thinking processes (CRT, five focusing steps, etc.) approach to resolving conflicts remains the same, but the underlying core conflict(s) tend to be different. Conflicts are different in each organization and are manifest in various core problems, but they can be illustrated in the eight functional areas shown in Figure 5.

Function	Conflict	Application
Operations	Throughput versus reduce costs	Focus on throughput, profitability will follow
Measures	Cost accounting versus profitability/cash	Performance measures based on T-OE and I
Project Management	Complete each project task on time versus complete the entire project on time	Manage project buffers, not individual task buffers

<b>Function</b>	<b>Conflict</b>	<b>Application</b>
<b>Supply Chain</b>	Reduce supplier prices versus reduce total supply chain costs	Link suppliers' conflicts with internal core problem
<b>Marketing</b>	Price based on our cost versus customer value	Negotiate agreements to resolve customer's conflict
<b>Sales</b>	Sell based on price/ terms versus customer core conflict	Sell conflict resolution
<b>Human Resources</b>	People as emotional beings versus thinking machines	Use TOC thinking processes
<b>Strategy</b>	Product & market investments versus flexibility	Strategies to open up market constraints

Figure 5. TOC Conflicts And Applications

These TOC 'applications' provide some of the common conflicts and directions for applying the thinking processes for each function. TOC requires initial change from managers and executives: willingness to use the thinking processes to gain consensus on the core problem, conflicts and what will change prior to determining solutions. These applications enable the organization to quickly assess their issues, formulate specific action plans/benefits and align management on a game plan for implementation. In this way, the overall alignment of the senior executive group can be accomplished in focused sessions within several weeks.

### 3.3 Differences Between Lean And TOC

With Lean Manufacturing, we start with the physical flow and identify problems to address. This provides a very tangible view of the waste within our value stream and enables support to change, because the problems and opportunities are so obvious. Lean provides specific tools, solutions and training to address many of the physical flow constraints: setup time reduction techniques, pull techniques to link operations, housekeeping (5S), and many other aspects of a well functioning physical flow. While TOC has general solutions in each functional area, they lack some of the tools and techniques that Lean brings. TOC can leverage nearly all of the Lean capabilities to improve physical flow, the main difference being that TOC specifies WHERE to focus and HOW to subordinate non- constraints.

Where Lean struggles is involving the entire enterprise in a holistic change. An example is the typical issue of performance measures, especially around labor or unit costs, which drive operations to overproduce. Lean raises the issue, but has no construct for resolving the cost reduction versus throughput conflict. In fact, Lean reinforces the cost reduction mentality by focusing on 'wastes' to be eliminated and costs saved as the main objective.

On the other hand, TOC focuses on holistic change first and foremost. It searches for the 'sacred cows' to slay that aligns executives with the change process. This is a fundamental difference: Lean changes the floor first and then seeks to align executives; whereas, TOC has the approach and tools to align executives first. Additionally, TOC enables change across all functions enabling growth in sales and profit as the primary objective. Cost reduction, especially when aimed at the shop floor with Lean, invariably leads to the need to 'protect jobs' (people are smart enough to know cost reduction frequently means them). It can become difficult for a Lean initiative when your employees realize that cost reduction means them and at some point no matter what you say about job security, the profit motive will kick in and them out. TOC recognizes the nature of people and costs to move the focus to growth in sales and reduction in investment.

## 4. TOC Leadership

Many enterprises invest time and effort solving symptoms and not their core problems. This is why investments in equipment, information systems, training, etc. just have not paid off. Oh, we find ways to justify to ourselves that these investments were worthwhile, by showing lower UNIT costs, increased LABOR efficiency or better machine UTILIZATION. But in the final analysis (reports to owners or Wall Street) our overall growth and profitability have not improved. If growth and profitability are not increasing, then the investments are not returning. In fact, our ROI may be decreasing due to the added investments!

So we must make substantial change and address the core problems. The example CRT in Figure 4 above shows how many of the observable problems (orange bubbles) were ultimately caused by activities (blue boxes ) driven to improve the cost/unit performance measure. These observable problems are what we frequently try to solve. But when these relationships are not identified and addressed, we restrict management’s ability to do their real job: manage well and solve core business problems (improve the business: profit and growth).

So, how do you identify conflicts across the organization or supply chain? Ask some of your managers what decisions they face on a daily basis. Odds are many attempt to balance some trade-off or negotiate a suitable solution to some dilemma. Sample questions and topics to discuss are in Figure 6. These questions should provoke a response or stir discussion.

<i>Function</i>	<i>Sample Questions and Discussion Points</i>
<i>Operations</i>	Do you attempt to optimize the trade-off of cost (efficiency), inventory and shipments (throughput)?
<i>Measures</i>	Can some results look good even though profit or ROI looks bad?
<i>Project Management</i>	Are most tasks completed on time while projects take too long or are late?
<i>Supply Chain</i>	Can suppliers’ contracts be readily compared to insure you are receiving the lowest prices?
<i>Marketing</i>	Is gross margin a key benchmark of customer profitability?
<i>Sales</i>	Do discussions with customers center around price, delivery and quality?
<i>Human Resources</i>	Have your people at times hesitated to provide feedback or input on new ideas and initiatives?
<i>Strategy</i>	Is growth and profitability subject to the swings of the business cycles for your industry?

Figure 6. Functional Conflicts Identifier

Each ‘yes’ answer to questions in Figure 6 indicate an strategic, organizational or performance measure conflict. What the conflict is and how to resolve is fundamental to the success of Lean or any other initiative which seeks to increase flow and profit. Why these conflicts are an issue is like comparing two track and field events: the 100 yard hurdles to the 100 yard dash. Clearly the 100 yard dash contestant will win a race between the two, even if you matched the Olympic gold medallist hurdler and a rather mediocre sprinter. Conflicts are like the hurdles added to the race: they slow production flow and ultimately profit and growth.

## Conclusions

If you agree there are conflicts across your supply chain, then TOC is the approach to align people, organizations and initiatives. Once aligned, then and ONLY then can Lean tools and techniques bring the MOST value. TOC recognizes the value of the training investment, flow improvement techniques and problem solving approaches within Lean; therefore, a current Lean improvement initiative need not start from scratch and start over. What our Lean leaders and initiatives must recognize is the limitations of those techniques to identify and resolve the real CONSTRAINTS to improving growth and profitability: organizational conflict.

The TOC versus Lean versus WHATEVER debate may be a red herring for frustration obtaining results. If you seek the ONE right tool to solve ALL of your problems, then you are looking for nirvana. What TOC can provide is an ALIGNMENT of your organization around GROWTH and PROFITABILITY. Cost reduction is helpful in the short run, but there are limits to how much cost any organization can take out. TOC can drive more profitability improvement, because TOC aligns measures/organizations rather than demanding compromises that limit improvement efforts.

## Biographical Sketch

Kirk Zylstra is a Deloitte & Touche consulting partner who leverages Lean Manufacturing and TOC practices for customer facing, supply chain business processes and manufacturing operations. Kirk’s background includes over

20 years of consulting and hands-on manufacturing industry experience. Currently, Kirk's clients are implementing Lean Manufacturing and TOC concepts across their entire value chain. He works on overall manufacturing improvement design, business case development, implementation assessments and implementation support. He has a mechanical engineering degree from Purdue University and an MBA from Indiana University. He can be reached at (206) 233-7469 or via email at [KZYLSTRA@DELOITTE.COM](mailto:KZYLSTRA@DELOITTE.COM).

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