

How Lean Accounting Works – Does It Solve the Measurement Nightmare?

By

Debra Smith, Partner Constraints Management Group

Greg Cass, Partner Constraints Management Group

Pete Milroy, Director Constraints Management Systems

How Lean Accounting Works – Does It Solve the Measurement Nightmare?

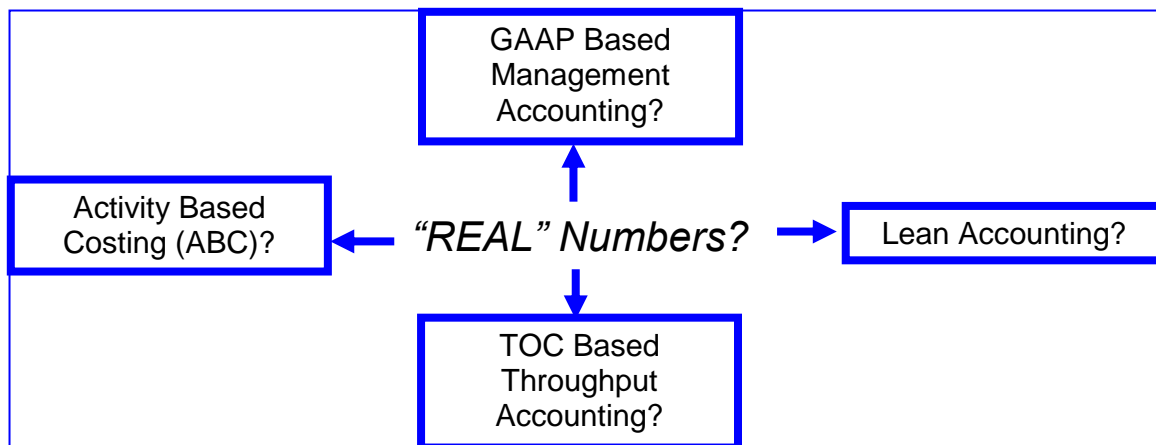
If you ask any financial manager today they will tell you they are under tremendous pressure to help guide their companies. Margins are continually being “squeezed” through aggressive market competition. Operating costs are escalating faster than the market price increases can support. Pressure to out source or move off shore to be more competitive is constant. They face an ever increasing challenge to provide timely relevant information to support critical, strategic decision making. They can’t afford to be wrong.

In the past Financial Managers have totally relied on GAAP based Management Accounting information and this approach has generally acknowledged pitfalls. For an in depth understanding of the subject we suggest reading *“The Measurement Nightmare – How the Theory of Constraints Can Resolve Conflicting Strategies, Policies and Measures”* by Debra Smith.

The PROBLEM with traditional Management Accounting information lies in the following underlying assumptions, most of which are flawed. The following are some examples of traditional thinking:

1. Overhead costs are directly related to the amount of labor required to manufacture the product;
2. Product unit costing must reflect fully burdened labor and overhead;
3. Maximum profitability is attained by the most efficient use of all resources;
4. Low resource utilization is “bad”;
5. Running larger batches will minimize product unit cost;
6. Detailed tracking of cost accounting variances will provide information for cost reductions and/or improvement opportunities;
7. Market pricing should be done based on mark up from fully, burdened unit costs.

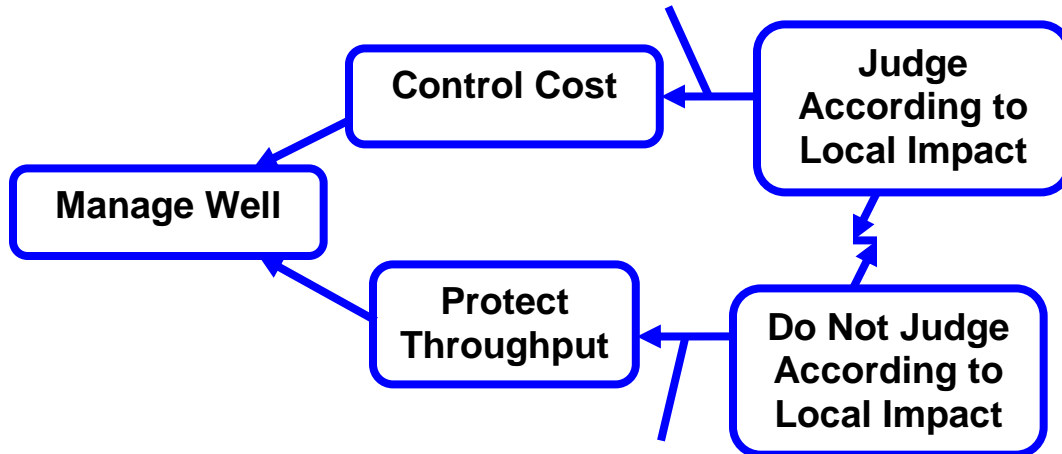
Why is there so much confusion? Because today there are four distinct camps on how to use accounting to make management decisions and the probability of each approach coming up with similar answers is ZERO.



So which approaches are “right” or, conversely which ones are “flawed”?

Activity Based Costing and Traditional Management Accounting share many of the same flawed assumptions stated above and have been discussed at length in numerous books and articles but little has been written comparing Lean accounting and TOC Throughput accounting. This narrows the “confusion” to Lean vs. Throughput Accounting. The conflict between TOC (Throughput Accounting) and standard cost accounting or ABC has been summed up in the “Cost World” vs. the “Throughput World” cloud and is illustrated below.

Local impact is equal to the impact on the whole organization



Local impact is NOT equal to the impact on the whole organization

The intention of this article is to understand and explain which side of this core conflict Lean accounting aligns with, TOC or standard cost accounting.

Let’s start with a quick synopsis of *Throughput Accounting (TA)*:

The measurement and decision-making tools that align analysis with bottom-line results are based around the TOC five step process and buffer management and reporting.

TOC uses simple, common-sense financial categories aligned with generating sales (Throughput), improving cash flow (investment) and providing capacity (operating expense). All measurements and decision-making approaches are based on relevant cash flows. There are no allocations of fixed costs to products for profitability analysis.

The system constraint(s) provide the basis for our understanding of which cash flows are relevant at any given time.

Performance Measurement with Throughput Accounting:

Global performance:	Feb	Mar
○ Total Throughput (TP)* \$\$\$	\$1,000	\$1,100
○ Less operating expense (OE) \$\$\$	<u>700</u>	<u>725</u>
○ Equals net profit \$\$\$ =	300	375
○ With contained investment (I)	\$2,500	\$2,500
○ Productivity Level (T/OE)	143%	152%
○ Inventory Turns (TP/Inv) -	12	13.2

TOC accounting is measured with similar frequency to financial accounting, the primary difference being the valuation of inventory. No overhead is allocated to product for inventory valuation.

*Note: Throughput is defined as net sales less variable costs only.

Decision Making with TA:

Every decision is assessed based on expected:

- Changes in Throughput – ΔT
 - Will we sell more / less if.....?
 - Will we change our raw material costs if.....?
 - Will we change our prices if.....?
- Changes in investment – ΔI
 - Will our inventories go up / down if.....?
 - Will receivables/payables go up / down if.....?
- Changes in operating expense – ΔOE
 - Will our staff levels go up / down if.....?
 - Will we need more / less outside contractor support if.....?

Assessments are NOT made based on costs per part. TOC decision making is driven by the impact on cash flow and the long term strategic implications of the decision using the Thinking Process Tools. A solid decision that improves cash flow may have a short term negative impact to GAAP based net profit. This is a timing issue due to the fact that Overhead has been assigned to individual products held in inventory and when inventory goes down profit goes down by the change in value of the overhead assigned to the shrink in inventory. Conversely, when inventory goes up profit goes up by change in the overhead assigned and carried in the inventory. This allows profit timing to be at best distorted and at its worst manipulated.

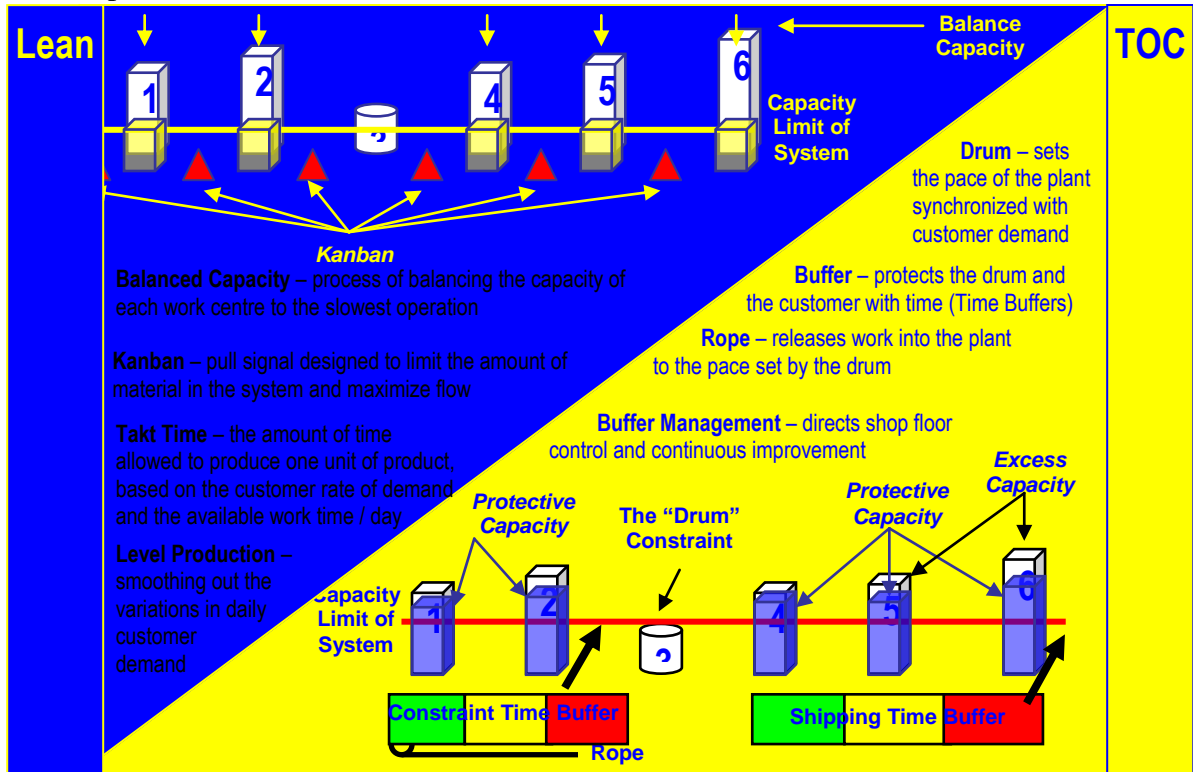
As long as the change in Throughput dollars is greater than the change in operating expense ($\Delta T - \Delta OE$), the profit and cash flow of your organization will increase. The critical TOC assumption is that the increase in T is limited by the constraint resource(s). As long as $(\Delta T - \Delta OE) \div \Delta I$ (Investment) is > 1 , the return on investment (ROI) is positive. For decisions with multi-year impact on T, I, and OE, we suggest using discounted cash flows to aid in these assessments

Product Profitability with TA:

Products generate Throughput only when they are sold. Throughput equals the selling price less any totally variable costs. The rate at which a product generates profit is determined by the Throughput per unit, divided by the time on the constraint. TOC has clearly demonstrated why gross profit margin, contribution margin and all traditional measures of product profits mislead decision-makers about which products to emphasize in the market in order to increase organization profitability.

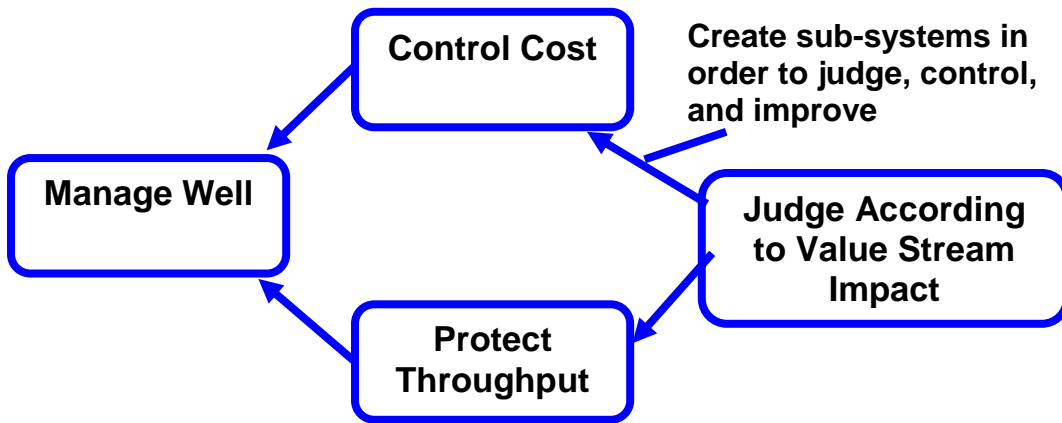
The following is a visual comparison of Lean and TOC's different terms and approach to operations management. This article is not intended to compare the operations

management difference but the visual is important to understand that TOC and its accounting practices are based on the impact of decision making regarding the impact on the system Constraint(s). It is this ability to focus and reliably predict bottom line changes from different decisions that gives TOC the ability to be incredibly effective in both executing operations and directing process improvement that truly increases both bottom line performance and return on investment.

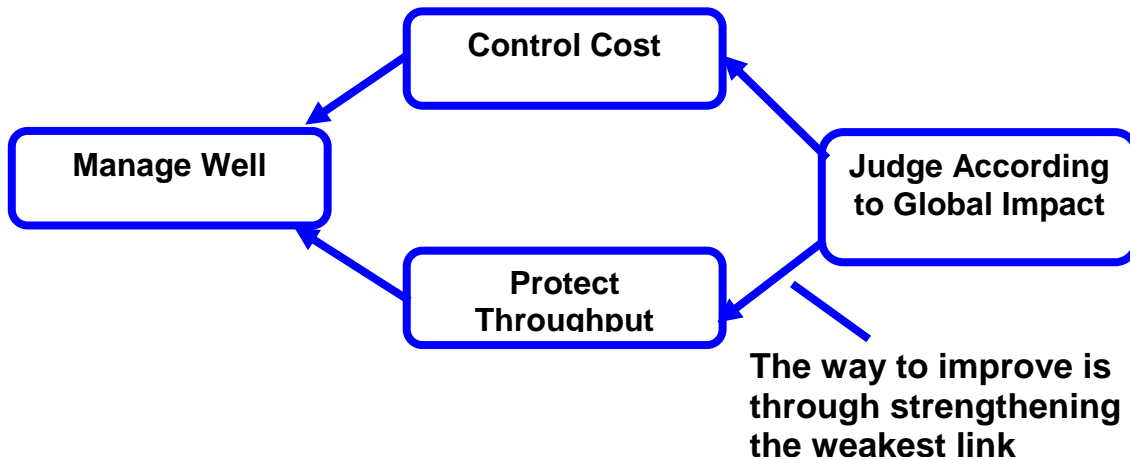


In the classic measurement conflict between the Cost World which judges profitability according to the local impact of an action and the Throughput world which judges according to global impact, Lean attempts to resolve the conflict through the use of value streams. They divide the business into value streams in order to judge, control, and improve the system through local sub-systems. It is TOC's constraint focus that allows TOC to predict the global change by focusing on and measuring the actions impact on the constraint which governs the output (revenue generating ability) of the whole system.

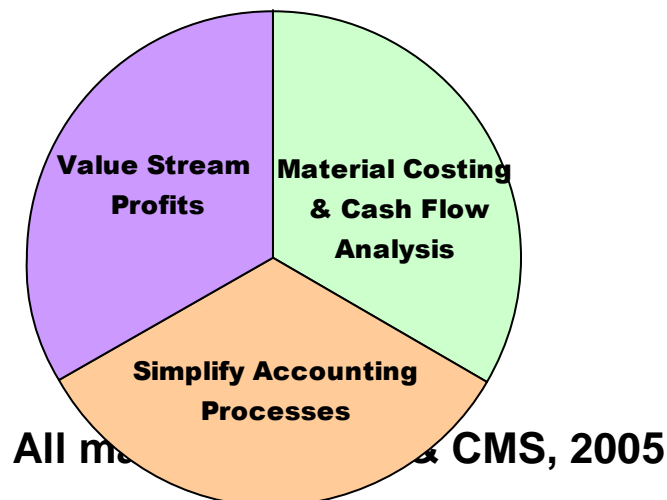
Lean addresses the cost versus Throughput world conflict by judging action according to Value Stream focused on reducing cost. This approach is in essence no different than traditional cost accounting's approach of judge according to local optima, as this paper will demonstrate.



TOC resolves the conflict through the assumption that the way to judge, control and improve the system is through exploiting the weakest link to fulfill market demand of the highest Throughput dollar opportunity. *TOC focuses on exploiting the use of capacity to generate Throughput dollars rather than minimizing the cost of capacity to increase profit.*



The first step in understanding where and how Lean accounting fits in the Cost World conflict is to understand the three building blocks of Lean accounting, Value Stream profits, material costing and cash flow analysis and simplifying accounting processes.



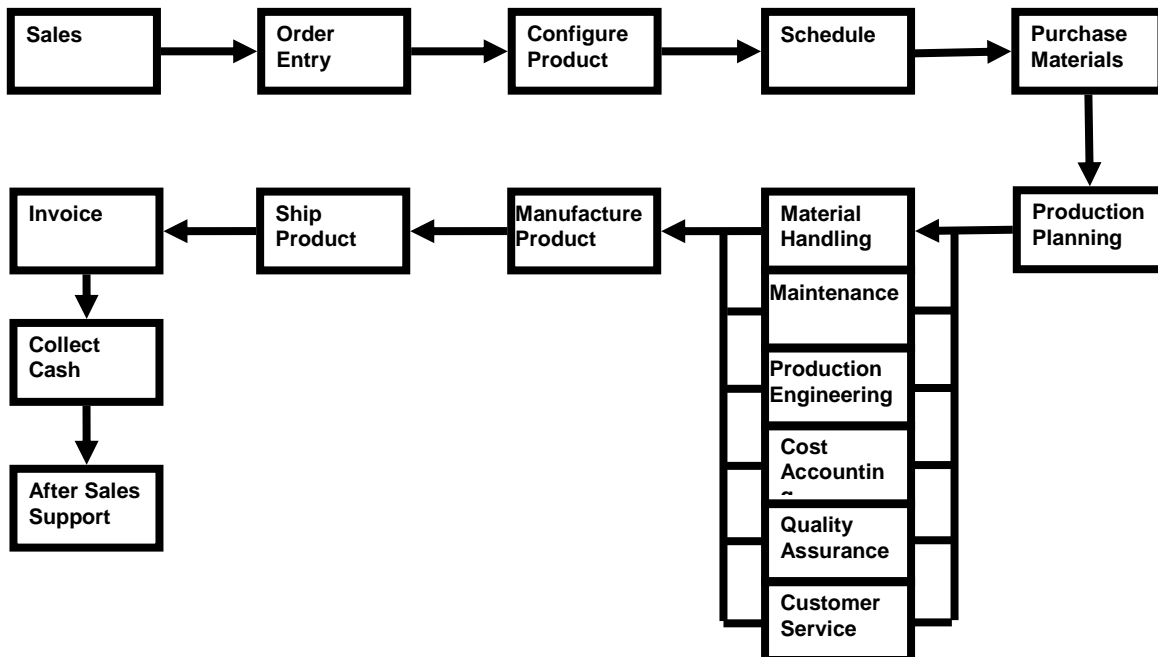
Lean designates all activities into two categories or work; value added and non value added. According to “**The Boeing Production System, Lean Manufacturing Pocket Guide, 1999**” value added activity are defined as follows:

- An activity that adds value to the form, fit or function of a product or service, or an activity for which the customer is willing to pay
- Those activities that take time, resources, or occupy space, but do not add value to the product
- Necessary:
 - Inspection; financial analysis;
- Unnecessary (examples of non-value added activities):
 - Walking; rework; extra handling; searching for tools; fine tuning; unnecessary motion; transportation; setups

Womack and Jones define value Streams as the set of all the specific actions required to bring a specific product through the three critical management tasks of any business:

1. *Problem solving*,
Sales, Design, Engineering
2. *Information management*,
Logistics & Materials Management
3. *“Physical transformation”*.
Production, Maintenance, Quality

Below is an example of a generic Value Stream



According to Maskell and Baggaley, value stream costing can only be effective if the following is in place:

1. Reporting must be by value stream, not departments;
2. People must be assigned to value streams with little or no overlap;
3. There should be few (or no) shared services departments and few monuments (major resource used by multiple Value Streams);
4. Production processes must be reasonably under control and low variability;
5. Inventory must be reasonably under control, relatively low and consistent.

Value Stream Costing example:

Knit athletic wear - Oct. 04	Material	Sub-contract	People	Operating Costs	Other	Total
Design		\$ 4,000	\$ 6,000			\$ 10,000
Purchasing			\$ 2,000			\$ 2,000
Fabric finishing	\$ 50,000		\$ 6,000	\$ 5,000		\$ 61,000
Cut/sew	\$ 20,000		\$ 10,000	\$ 3,000		\$ 33,000
Garment finishing	\$ 15,000		\$ 5,000	\$ 7,000		\$ 27,000
Warehouse			\$ 2,000	\$ 1,500		\$ 3,500
Shipping			\$ 1,000	\$ 1,500		\$ 2,500
Quality Assurance			\$ 1,000		\$ 1,000	\$ 2,000
Manufacturing Engineering			\$ 4,000		\$ 1,000	\$ 5,000
Maintenance		\$ 5,000	\$ 4,000	\$ 15,000		\$ 24,000
Accounting			\$ 2,000			\$ 2,000
Information Systems		\$ 1,000	\$ 2,000			\$ 3,000
	\$ 85,000	\$ 10,000	\$ 45,000	\$ 33,000	\$ 2,000	\$ 175,000

Value Stream Measures example:

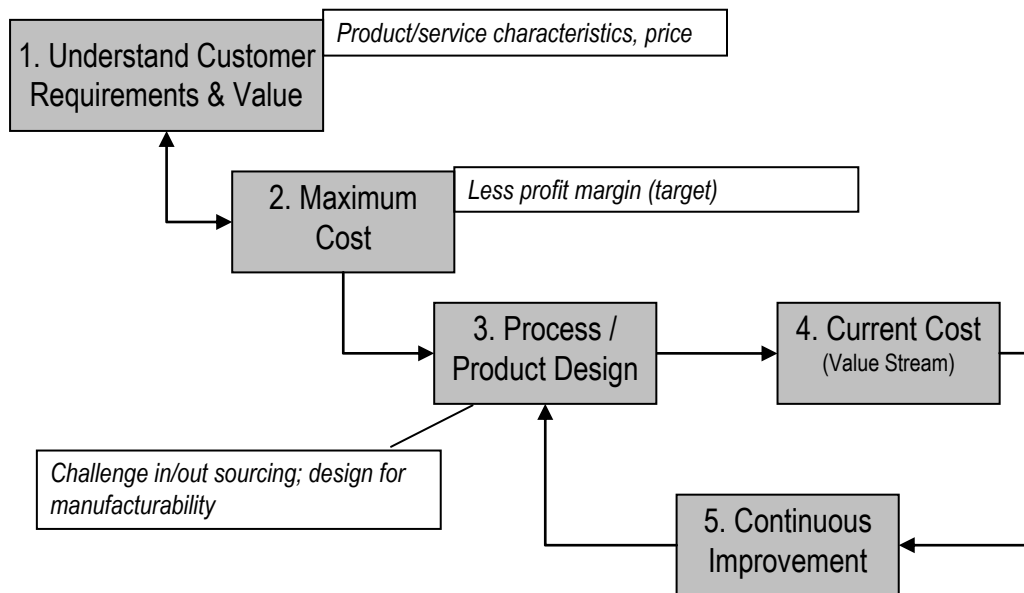
Knit athletic wear - Oct. 04			
Sales			\$ 205,000
Material			\$ 85,000
Conversion Costs			
Sub-contract	\$ 10,000		
People	\$ 45,000		
Operating Costs	\$ 33,000		
Other	\$ 2,000	\$ 90,000	
Total Expenses			\$ 175,000
Value Stream Profit			\$ 30,000
Inventory Level			\$ 50,000

Operational Measures	Oct. 04		
Knit Active Wear	Current	Last	Δ
Order Lead Time	16	18	(2)
First time through	61%	57%	4%
On-time Delivery	83%	75%	8%
Space used	36,000	38,000	(2,000)
Sales/person	\$ 21,000	\$ 19,500	\$ 1,500
Avg. Cost / unit	\$ 11.50	\$ 11.75	\$ (0.25)
OEE	31%	32%	-1%

Value stream target costing is a perfect extension of Lean manufacturing principles. Through segmenting and dedicating resources to limited products and functions, the assumption is the most efficient value stream can be created. We can then optimize each local sub-system (value stream) to create the most efficient system overall. The total cost of a value stream is divided

by overall unit output to get a cost per unit. This cost per unit becomes the basis for driving continuous improvement in order to match or go below the target cost. The Process of on-going improvement under lean is driven by value stream cost reduction, as opposed to Throughput opportunity that will be gained by the effort or the expenditure.

The diagram illustrates how value stream costing is used to establish the gap between the targeted cost to achieve the targeted margin and focus improvement process efforts to reduce the cost of the product by reducing the cost of the value stream.



Lean uses target costing to define what an acceptable margin will be for a product and then targets continuous improvement events to drive down the cost of the value stream to achieve the targeted cost. In this approach Lean clearly aligns with the traditional “Cost World” approach and philosophy where the goal is to minimize the cost of capacity. This is a very different operating philosophy from the “Throughput World” approach and philosophy where the goal is to maximize the use of capacity to exploit Throughput dollars opportunity.

Lean Value Stream Costing vs. TOC product profitability analysis:

Lean Value Stream Costing requires that the actual costs of the value stream resources be directly assigned to the value stream. Ideally they are not allocated, however in reality this is rarely possible. To avoid allocation would mean that all resources are dedicated, and to run an effective system some redundant and common resources are necessary. While TOC and Lean are in agreement on the concept of excluding allocated costs from product costing, Lean’s solution is to segment and dedicate all resources to one value stream or another, which may result in either underutilized redundant investment or reduced Throughput (sales) for an organization – totally contrary to the goal of making money.

TOC does not even attempt to associate expenses with the products a company sells. Product profitability analysis involves measuring the Throughput different products generate (sales less totally variable costs) and dividing it by the capacity consumed of the constraint. Effort (cost) expended anywhere else in the system is considered irrelevant in judging product profitability.

In order judge systems overall, TOC typically categorizes products into similar “families” based on their routings through the constraint(s) or not (free product). TOC based Profit and Loss statements are generated by “family” with non-direct costs displayed in aggregate against the contribution dollar total for all product families. The major differences are based on the TOC 5 step continuous improvement process which clearly leads companies to NOT separate any resources by Value Stream or Cells. The TOC philosophy is “Segment your market, not your resources”.

TOC’s focus on Throughput generation directs companies to constantly look for opportunities to use existing resources, regardless of notions of efficiency. Lean’s focus on waste elimination directs companies to trim internally, usually impairing the ability of the organization to respond to new opportunities – a very different focus from TOC.

Lean vs. TOC Process of Continuous Improvement:

Lean Value Stream use a “Targeted Cost” concept to return the desired return on the products assigned to the value stream. The Lean process improvement efforts are directed at continually reducing the “Current Cost” to meet the “Targeted Cost” levels. This is further confirmation of Lead Accounting being deeply embedded in a cost world focus.

The Theory of Constraints uses Buffer Management as a focus tool for identifying the highest priority areas for process improvement. The focus is to exploit capacity at constraint resources to attain additional Throughput with no or little additional investment or cost. Buffer management also points to non-constraint resources that consistently cause high levels of disruption (variability) at the constraint as areas where the greatest process improvement opportunities exist. These are always based on the regaining lost Throughput opportunity.

The Lean improvement process tools work very well within the focus context of TOC. In fact they are invaluable.

Financial Measures – Lean versus TOC

These examples of Lean Measures are from Practical Lean Accounting; p. 27; Maskell & Baggaley, 2004:

Strategic Issues	Strategic Measures	Value Stream Measures	Cell/Process Measures
Increase cash flow	Sales Growth	Sales per person	Day-by-the-hour production
Increase sales and market share	EBITDA	On-time delivery	WIP levels
Continuous improvement	Inventory days	Lead time	First-time through

culture			
	Customer satisfaction	Average cost per unit	Operation Equipment Effectiveness (OEE)
	Sales per employee	AR days outstanding	

TOC Measures:

Strategic	Operational	Tactical
Cash Flows	Throughput	Throughput Dollar Days
Return on Investment	Investment; T/I	Inventory Dollar Days
Sales Growth	Operating Expenses; T/OE	Lead Time Performance
EBITA	Profit Velocity	Schedule Adherence
Market Share	Buffer Management	On Time Performance

The key differences between these two measurement frameworks can be traced to the operating paradigms, cost world vs. Throughput world. Under the Lean “scorecard” framework, the measures encourage cost and waste reduction across all areas of the organization. They can drive significant conflicts for supervisors and managers when the requirements of customers run counter to the requirements of a measure such as sales per person, or OEE.

Measures are treated with extra care under Throughput accounting, as TOC practitioners understand deeply the damage that conflicting measures can cause. The measures TOC practitioners choose are always prioritized based on Throughput first, and Investment second. Cost measures are used only at an overall system level, as shop floor actions should never be influenced by cost considerations, only Throughput considerations. For a thorough discussion on the measurement conflict refer to

Material Costing & Cash Flow Analysis:

Lean’s view on Material Costing and Cash Flow Analysis are in line with TOC. Lean Accounting generally recognizes the same problems with standard costing & activity based costing that TOC has exposed, including:

- Allocations of labor & overhead to the product will never be “correct”.

- Allocation processes erroneously attempt to convert known fixed costs into unit costing.
- Allocations can promote behaviors that are counter to lean operating practices.
- Decision making requires examining the relevant cash flows.

Lean vs. TOC Capital Asset Expenditure:

Both Lean and TOC reject the traditional Capital Asset Expenditure model that use the projected cost savings (these include the overhead allocation savings assigned to the allocation driver e.g., labor hours, machine hours, etc.) on discounted cash flow and return on investment. The typical justifications for capital expenditures are the “efficiencies” that will result from the investment that justify the pay back on the investment. Both Lean and TOC look at capacity considerations as a critical element of the capital investment justification.

The differences are:

Lean organizations typically follow an approach that additional capacity should be added in small increments.

- Intent is to add capacity in “just in time” increments, as needed.
- Avoid large investments in equipment that Lean calls “monuments” (counter to Value Stream concept).

The Theory of Constraints uses Buffer Management to determine requirements for capital acquisitions:

- The rigorous discipline of following the 5 step TOC improvement process to insure that capital spending is done only after the current system has been fully exploited;
- Justification for capital spending is based on additional Throughput opportunities linked to the organization’s identified constraint(s) which must include the market opportunity.

Lean vs. TOC Outsourcing Decision:

Both Lean and TOC reject the traditional approach to outsourcing that compares full product standard cost to the alternative cost to outsource.

Companies are under the “belief” they are saving money from out sourcing when in fact they have not reduced their overhead expenditures or labor costs. This creates even higher burden rates for non-outsourced products creating a vicious cycle of more and more products being “cheaper” to outsource.

Where TOC and Lean organizations differ is in how they evaluate different processes based on a matrix comparing Customer Value (Low to High) with Cost (Low to High).

Outsourcing is typically recommended for processes where “Cost is High & Value is Low”. Using Value Stream Costs calculated on a unit basis has the same, potential negative effect as companies using full standard costing in outsource decisions. Any allocated costs that are part of the decision to outsource that do not truly disappear with the product outsourced become a higher burden rate for the remaining products.

The Theory of Constraints uses the buffer management system to identify processes for potential outsourcing. The justification for outsourcing is based only on comparison of internal variable product costs (cash outflow) with outsource costs balanced against additional

Throughput opportunities (the cash inflow) of the capacity that is created when the product is offloaded to outside vendors. TOC looks to outsourcing as an opportunity to generate more Throughput dollars when offloading the constraint resource and allow more market demand to be fulfilled. Again, this highlights the difference in the basic underlying assumption between “Cost World” thinking and “Throughput World” thinking.

Lean vs. TOC Sales and Marketing Strategy:

There are sales and marketing strategy similarities between Lean & TOC. Both practices recognize that pricing must be market driven (not driven from build up of standard costs as most companies continue to do). Both Lean and TOC organizations focus on the value created for the customer and/or the market place in development of pricing strategy.

One of the major differences in approach Lean’s to Sales and Marketing Strategy is Lean uses the Value Stream Costing model to support product pricing decisions. The model is applied to the Value Stream as a whole, not to individual products.

Like TOC individual product pricing decisions are made relative to incremental cash flow and consideration of available capacity.

The TOC approach considers both strategic and short term execution in analyzing market opportunities. The TOC “Market offer” utilizes the TOC Thinking Process (TP) tools to develop unique and difficult to match market offers that are never “price based”. Product pricing decisions are based on concept of “Pricing Indifference” modeling. Product pricing based on actual cash flow contribution per time unit of the constraint are used for short term profit execution opportunities. They provide clear pricing guidelines for Sales and product emphasis direction.

Lean does not have a Sales & Marketing Strategy as much as an understanding that price is not necessarily a function of cost. TOC takes this much further through the invalidation of the marketing conflict (the belief that we cannot significantly increase the market’s perception of value). This constitutes a strategy approach, or at least a direction that ensures the long term market strategy of a company is not in conflict with short term profit taking based on either free product and or Throughput profit opportunities from a directed change in product mix, Lean doesn’t have a framework for considering these and as such is forced down the path of focusing on cost reduction rather than maximizing Throughput opportunities to impact profit..

Simplify Accounting Processes

Lean Accounting Processes appear to have no contentious issues with TOC.

- One-day financial close; quarterly close
 - No accruals
 - Cash basis accounting
- General ledger simplification & reorganization
- Pay on receipt of materials

The only comment we would make is that although these are all good things to have, they don’t bring any significant bottom line benefit to the organization. They do however distract managers from what should be their main focus – Throughput generation. There is a very

important role for management accounting in the Theory of Constraints and this is not it. Lean directs people to improve irrelevant processes; TOC directs people to focus on the driving as much Throughput through the constraint as possible. This is where accountants should be focused.

The Bottom Line on Lean Accounting and TOC is that with Lean there is no recognition of a system constraint. In TOC the constraint provides certainty around changes in T, I, OE and defines the relevant cash flows and market opportunities. Lean lacks the profit velocity measure that provides the valuable link between sales, design, engineering, and operations.

Lean facilitates the segmentation and dedication of resources that lead to redundant capacity and limit the ability to exploit common resources. Again, “Segment the market, not your resources” is a basic premise of TOC.

Value Stream improvement efforts are prioritized based on gap between average cost and target cost. TOC’s Buffer management highlights the issues that are the greatest risk to Throughput, competitive advantage factors (on-time-delivery, flow and variation at critical resources). These are all viewed under the microscope of Throughput market opportunity and as such the greatest risk/opportunities for the business thus the most important issues. Lean lacks the focusing tools which can result in irrelevant process improvements that contribute nothing to cash flow, ROI or market opportunity.

Conclusion

Lean Manufacturing has generated significant interest in recent years as a method to improve competitiveness. Practitioners have understandably run into conflicts with traditional management accounting practices like GAAP and Activity-Based Costing. These practices can motivate behavior and action that lose companies money. Our conclusion is that the solutions Lean Accounting have arrived at only delay the resolution of the measurement conflict, they do not address them. When reviewing the “Cost World Conflict” it is our conclusion that Lean Accounting does not solve the conflict. Whereas TOC FOCUSES ON EXPLOITING THE USE OF EXISTING CAPACITY TO GENERATE THROUGHPUT DOLLARS to solve the conflict Lean Accounting remains focused on MINIMIZING THE COST OF CAPACITY TO INCREASE PROFIT on the Cost World side of the Conflict. By continuing to measure and judge according to local improvements, Lean Accounting practitioners will institute changes in their organizations that will waste capacity and miss Throughput opportunities.

Lean Accounting References:

- Who’s Counting?; Jerrold Solomon, 2003
- Practical Lean Accounting; Brian Maskell, Bruce Baggaley, 2004
- Real Numbers; Jean Cunningham, Orest Fiume, 2003
- Toward a New Model of Accounting in the Era of Lean; Gerald Najarian, APICS magazine, April 2004
- Lean Manufacturing Accounting Series; Quarterman Lee, Strategos Inc., February 2004

- *Throughput Accounting References:*
- The Measurement Nightmare: How the Theory of Constraints Can Resolve Conflicting Strategies, Policies and Measures; Debra Smith
- Theory of Constraints and Its Implications for Management Accounting; Eric Noreen, Debra Smith & James Mackey
- Throughput Accounting; Thomas Corbett
- The Theory of Constraints and Throughput Accounting; Monte Swain, Jan Bell and Shahid Ansari