

# **EFFECTIVE ACCOUNTING IN A LEAN ENVIRONMENT**

**By Gerald Najarian**

Perhaps the most frequently heard question after the ones about setting up flow lines and how one piece production results in greater output is: how do I get the accounting system to help me make the right decisions in a lean environment? To get a good understanding of how we can get the right accounting information in the new world of lean manufacturing, it is necessary to look back at the roots of manufacturing accounting, its evolution to the present and the relationship of accounting to manufacturing processes then and now. Above all, it is important to keep in mind the exhortation of Charles T. Horngren, one of the principal cost accounting thinkers in recent times, who suggested about cost accounting that: “There are plenty of good ideas in both the old and the new. I anticipate a brisk evolution, not an earthshaking revolution.” We are unlikely to have an earthshaking revolution, for accounting managers like manufacturing managers embrace change slowly and usually only when they are convinced of the need for change. So lets, in this article, take the journey from our manufacturing legacy up to the present and relate accounting to the modern era of lean flow, constraints management, and infrastructure factories.

## **COST ACCOUNTING – THE OLD AND THE NEW**

Financial accounting has a long legacy dating back to the Italian Renaissance, but cost accounting is a relative newcomer to accounting appearing with the advent of a significant manufacturing industry in the United States. In fact, cost accounting is a by-product of manufacturing processes and has tended to reflect the processes and economics of the times and the managerial needs of those who had to manage in each era of manufacturing evolution.

At the outset of significant manufacturing, production was organized into large discrete batches and the principal production cost was labor. Materials and overhead were numbers two and three respectively in the cost hierarchy; in fact overhead was a distant third and was treated (correctly) as a function of labor since the only significant purpose of the overhead “force” was the supervision of direct labor in the factory. Cost accounting faithfully mirrored the basic organization and economics of the factory of the time: large and *variable* labor forces organized in functional work centers, long production runs in batches of parts or final assemblies, a bias toward very low overhead costs, and a pecuniary attitude toward raw material prices. Small wonder that cost accounting would set up a system of measurements that would be oriented to maximize work center efficiency and encourage foremen to keep their center running so as not to “waste” any of the variable labor they would otherwise have to lay off. The “standard” cost accounting system asked foremen to hit predetermined standards for labor efficiency and material usage by shop order and similarly asked purchasing managers to do likewise for purchase prices by part number. Such an approach was eminently suited to a manufacturing paradigm that tolerated large queues and substantial inventories of parts and subassemblies for a limited number of end products. Most important to the management of profitability was the practice of assigning overhead to unit product cost on the basis of the product’s labor content. This methodology, known as “absorption” accounting, permitted management to know if each product was carrying its share of overhead “burden” and that all costs were therefore being

covered by the price. The absorption approach made no allowance for modern pricing initiatives to optimize incremental gross margins when factory capacity was available and where pricing below “fully absorbed” costs resulted in an *apparent* loss for the individual product.

When assumptions about cost behavior began to change and incremental cost pricing was recognized as a valid way to increase profits in markets where the fully absorbed cost/price was unacceptable, “direct costing” appeared. Direct costing recognized that overhead applied to individual products made fixed costs appear to be variable costs thereby distorting product profitability analysis. In keeping with its name, it suggested that only *direct* costs be assigned to products and that manufacturing overhead be treated in the same manner as other corporate fixed costs – as a below the gross margin line period cost to be covered by variable gross margin.

Both of these cost accounting approaches have inherent flaws in today’s manufacturing and marketing environment. Absorption accounting presents all costs as variable, which drives aberrant shop behavior; i.e., make parts and products for inventory to absorb costs and avoid variances. This accounting practice distorts profitability by absorbing labor and overhead costs into inventory thereby deferring their recognition as a business cost until the product is sold. Direct costing, on the other hand, recognizes no relationship of period-related cost to products or product lines making period costs irrelevant in the product mix decision. Such presumed irrelevance made SKU proliferation a financially respectable marketing strategy.

The new cost accounting is activity based costing (ABC) and is a variation on both of the old cost accountings. Activity based costing posits that period costs “vary” with cost “drivers” not necessarily related to labor or any other proxy for production volume. It seeks out these cost drivers and uses them as the basis for assigning costs to products/product lines. ABC represents a vast improvement over the old cost accountings by recognizing the underlying economics of cost behavior as represented by cost drivers. Cost drivers, by definition, are the measurable causes of ultimate costs and are therefore useful for connecting costs with products/product lines and for measurement as a means to reduce costs.

## **MANUFACTURING COSTS IN THE MODERN ERA**

When we look at the modern manufacturing enterprise what is most noticeable is its similarity to a service business. Most of the emphasis is on customer service, rapid response to shifting customer tastes, customized methods of ordering, and of course, custom products. We still manufacture products and have to make a profit certainly but we are now organizing production in new ways – “lean flow” now being the approach most amenable to the provision of service and the concomitant management of inventories for high fill rates and minimum investment. Perhaps most striking is the cost structure of the modern manufacturer. The factory of today is a fixed cost infrastructure; bricks and mortar, a labor force who run machines often in U shaped cells, and a substantial management function none of which varies with the momentary ups and downs of production. These factories resemble banking institutions established to provide service in a defined market. The service, of course, is conversion of raw materials into products that the customer wants in a short period of time much like a fast food restaurant does. The few remaining costs that truly vary directly with the production curve are materials, utilities and subcontract costs. The balance of the costs (direct labor and overhead) in a modern

manufacturing enterprise are related to the passage of time rather than to the amount of volume imposed on a plant. The costs of labor and overhead will of course bear some relationship to the production load in the long run in the fashion of step costs and are now being characterized as having the properties of “non-matching variability.” Non-matching variability means that such costs should change when large changes in volume are experienced *but they must be managed* in order to change. In contrast, real variable costs will *automatically* change when volume changes no matter what the magnitude.

What all this means for the lean manufacturing executive is that the management of cost has a new dimension - the containment of spending for infrastructure costs through the traditional budgetary mechanisms and the optimization of profitable throughput without cost micro-management and allocation.

### **THROUGHPUT ACCOUNTING – THE NEW MANAGEMENT ACCOUNTING**

There will always be uses for the old and the new accounting. However, when modern manufacturing executives consider accounting in a lean flow factory with a period cost infrastructure and a relatively few variable costs, they will be seeking a way to account for costs and profits in a fashion which reflects these new economics. The new management accounting for the modern flow factory is “Throughput Accounting.” Throughput Accounting is an analytical approach to understanding how a manufacturing company earns money based on the management of constraints. It is based on the Theory of Constraints developed by the noted author of “The Goal” which suggests that: constraints determine the performance of any system, all systems have constraints otherwise they would all run smoothly, and managers should therefore focus on managing constraints not cutting costs. Throughput Accounting focuses management on the “goal” which is to make money and therefore seeks answers to three main questions through three significant measures:

<b>Question</b>	<b>Measure</b>
How much money is generated?	Throughput (T)
How much money is captured?	Inventory (I)
How much money is spent?	Operating expense (OE)

The three questions seem obviously relevant to the financial success of an enterprise. The measures associated with them, however, require some interpretation, so let's take a closer look at each one of them.

**Throughput.** Despite a name that connotes production and might suggest sales dollars, throughput is neither. Throughput is a measure of money generated in the form of what is also called contribution margin; i.e., revenue generated in excess of that money spent specifically in generating that revenue. Throughput reflects only truly variable costs such as materials, subcontract costs, freight in and out, sales commissions, and possibly utilities.

**Inventory.** Also a bit misleading when thought of in the traditional context, inventory in throughput accounting is not just “inventory” but is rather all of the assets of the enterprise.

Assets are identical to those in conventional accounting with the exception of traditional inventories; these carry no costs (i.e., labor and overhead) other than those incurred to purchase them because adding such costs to inventory adds no value to the company.

**Operating Expense.** Operating expense is all of the costs of the enterprise except the variable costs incurred to generate revenue - those used to arrive at throughput. These are monies expended to turn inventory into throughput and might be considered similar to “conversion costs” as that term was once used to describe labor and overhead in heavy industry cost accounting.

The priority in throughput accounting is to present data in such a fashion as to encourage managers to increase throughput, lower inventory and to contain operating expense. As with any new approach in business some controversies have arisen as corollaries to throughput accounting and it’s priorities. Such controversial notions as eliminating the term “product cost” and eliminating absorption accounting are hardly in the mainstream of management accounting thinking and present a real challenge to conventional management wisdom. Going beyond the controversies however, throughput accounting provides a valuable analytic method with which to optimize product mix decisions.

**PRODUCT MIX OPTIMIZATION WITH THROUGHPUT ACCOUNTING**

To illustrate how throughput accounting casts decisions about product line and product mix in a new light, lets walk through an example that shows the difference between throughput accounting analysis and conventional margin analysis in a hypothetical product cell situation.

In our hypothetical cell, there are four workstations (resources) that produce two different products. There are 9600 minutes of each resource available each week. What follows is a picture of the cell.

<b><u>Product X</u></b>		<b><u>Product Y</u></b>	
\$900	Selling price	\$1,000	
200	Unit demand	100	
30	Minutes: Station A	20	
30	Minutes: Station B	60	
30	Minutes: Station C	10	
30	Minutes: Station D	10	
\$450	Raw Material Cost	\$400	

Under throughput accounting (and the theory of constraints) we identify the constraint resource and try to maximize throughput per unit of that resource. To identify the constraint resource, we construct a table of the resources and the amounts of each resource that the two products will consume and the express the consumption as a percentage of resource capacity, in this case 9600 per station.

<u>Resource</u>	<u>Product</u>	<u>Resource Usage Calculation</u>	<u>Total Min.</u>	<u>Capacity Utilization</u>
A	X	30 min./unit X 200 units = 6,000	8,000	83%
	Y	20 min./unit X 100 units = 2,000		
B	X	30 min./unit X 200 units = 6,000	12,000	125%
	Y	60 min./unit X 100 units = 6,000		
C	X	30 min./unit X 200 units = 6,000	7,000	73%
	Y	10 min./unit X 100 units = 1,000		
D	X	30 min./unit X 200 units = 6,000	7,000	73%
	Y	10 min./unit X 100 units = 1,000		

With 9,600 minutes of each resource available the resource that exceeds its capacity is the constraint. In this case, the constraint is workstation B.

The decision as to the amounts of each product to be made and eventually sold is dependent upon their respective dollar values of throughput per unit of time through the constrained resource. The product with the greater dollar value of throughput per unit of time through the constrained resource is inherently the more profitable as the following two tables will show. The first table presents the calculation of the minute value of the constraint.

<u>Product</u>	<u>Selling Price</u>	<u>Less: Var. Cost</u>	<u>= Throughput Per Unit</u>	<u>Minutes of The Constraint</u>	<u>= Minute Value of The Constraint</u>
X	\$ 900	\$ 450	\$ 450	30	\$ 15
Y	\$1000	\$ 400	\$ 600	60	\$ 10

In spite of the higher value of throughput per unit for product Y, the product that most profitably “exploits” the constraints is product X. Since we can only use part of the constrained resource (B), we should use it to make the full demand for product X and make only as many as can be made of product Y. In this case sixty units can be made to fill out the balance of resource B’s capacity, well short of the total demand for Y of one hundred units.

Now, lets compare the profit contribution following throughput accounting in which we produce as much as we can of the product with the higher minute value of the constraint against conventional analysis which tells us to make as much as we can of product with the higher unit gross margin.

<u>Conventional Analysis</u>				<u>Throughput Accounting</u>			
<u>Product</u>	<u>Through Put Per Unit</u>	<u>Volume</u>	<u>Margin \$</u>	<u>Product</u>	<u>Through Put Per Unit</u>	<u>Volume</u>	<u>Margin \$</u>
X	\$ 450	120	\$ 54,000	X	\$ 450	200	\$ 90,000
Y	\$ 600	100	\$ 60,000	Y	\$ 600	60	\$ 36,000
			\$ 114,000				\$ 126,000

As can be seen from this analysis, profitability of the enterprise has a very different look when seen through the prism of the Theory of Constraints and the “new management accounting”, Throughput Accounting. In fact, for lean manufacturing, in which manufacturing is carried out in product cells and in which the bottleneck paces the operation, Throughput Accounting is the only way to maximize profitability.

### **FINALLY, A PEEK AT THE FUTURE**

As more and more companies adopt lean manufacturing, the way in which financial results are optimized and priorities are ordered will be affected by the accounting analysis supporting basic decisions. The most fundamental of these decisions, is that of the question of product mix with omnipresent capacity constraints. The Theory of Constraints asks that we recognize that there is always a constraint, to recognize it and “exploit” it and make business decisions to optimize profits with the constraint in mind. The decision to exploit an internal constraint while proceeding to break the constraint requires a new kind of accounting thinking and a new way to communicate real manufacturing economics to managers. Throughput Accounting represents the new thinking and the new communication style.

### **About The Author**

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