



**THEORY OF CONSTRAINTS**  
INTERNATIONAL CERTIFICATION ORGANIZATION

2018 TOCICO Webinar

# Back to Basics TOC: Throughput Accounting

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Date: March 17, 2018



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# Cost Accounting History

- “Cost Accounting: The Number One Enemy of Productivity”.
  - Eli Goldratt at 1983 National Association of Accountants (now the Institute of Management Accountants).

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## Cost Accounting: The Number One Enemy of Productivity

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Eliyahu M. Goldratt, Ph.D.

**S**tandard cost accounting is a tool financial people use daily, but they know precisely the value of these principles and their tradeoffs. The problem arises when these

# Cost Accounting History

- Earlier Foundations (Pre-1900):
  - Pricing Rail Movements
  - Pricing Textile Products
- Major developments in the use of cost accounting are attributed to General Motors.
  - Result of increasing product diversity.
  - What are the products with the highest cost (i.e. where do I focus my cost-cutting efforts?)

# Many Uses of “Cost”

- Product Cost
  - The operating expense of a product, based on an allocation.
- Cost to Operate
  - The expense required to operate (a company, machine, etc.).
- Cost to Purchase
  - The amount we need to pay in order to acquire the item.
- Cost when Selling
  - The price our will customers will need to pay to acquire the item from us.

# Cost per Unit

- Development of cost accounting led to the concept of a “cost-per-unit”.
- Cost-per-unit (CPU) has three main components:
  - Direct Materials
  - Direct Labor
  - Manufacturing Overhead
- Most commonly the cost-per-unit concept is applied to products.

# Arguments Against CPU

- Cost per unit (CPU) is developed and utilized as if though it represents the true “costs” the organization incurs to produce a unit.
- Managers then take this false notion and make decisions with it.
- This simply is not true.

# CPU – Direct Materials

- Materials are variable with production on a 1 for 1 basis.
- Materials are directly traceable to products.
- We **MUST** have a unit of materials to produce a unit of a product or service.
- Direct Materials **SHOULD** be associated with the cost to produce a product.

## CPU – Direct Labor

- CPU assumes Direct Labor is variable with the unit of production.
- Direct Labor is in fact arbitrarily allocated to products.
- Why arbitrarily? The reality is that Direct Labor is not directly tied to unit production in the same way materials are.
- Direct Labor **SHOULD NOT** be associated with the cost to produce a product for these reasons.



## CPU – Overheads

- Again, CPU allocates Overheads to products or services and treats the Overheads as variable.
- Overheads are fixed in the short-term.
- Overheads may change, but in a step-function fashion; overheads are not continuously variable as materials are.
- Overheads **SHOULD NOT** be associated with the cost to produce a product for these reasons.

# Cost per Unit Distortion

- The allocation process leads managers to believe “bigger is better.”
  - More units = lower unit costs.
- Despite “unit costs” decreasing, costs in total do not.
- How can this be? It is due to a mathematical illusion, not as a result of our operating effectiveness.

# Cost per Unit Distortion Example

- Assume company Cost-A-Lot pays \$500,000 of direct labor expenses each month.
- In Month 1 the company produces 10,000 units.
- In Month 2, it produces 20,000 units.
- Calculate the labor cost per unit and total labor costs each month.

# Cost per Unit Distortion Example

	Month 1	Month 2
<b>Total Labor</b>	\$500,000	\$500,000
<b>Units</b>	10,000	20,000
<b>Cost Labor Per Unit</b>	\$50.00	\$25.00
<b>Total Labor Expenses</b>	\$500,000	\$500,000

# Cost per Unit Distortion

- The reality is that it is not somehow “cheaper” to produce our products.
- We are more profitable because we are generating more margin by selling more units.
- At most times, changes in production do **NOT** affect our non-variable costs of Direct Labor or Overheads, thus they are not relevant in most decisions.

# CPU Summary

- Cost accounting systems distort reality and decisions made with cost-per-unit information.
- Cost accounting systems are easily manipulated.
- **Where the time goes, so to do the costs.**
- So if cost accounting is wrong, how do we fix it?

# CPU Summary

- **Unfortunately, there is no fix.**
- It is not a matter of more precise allocation, various methods of allocation, activities vs products.
- None of that is in the direction of the solution.
- Allocation = Distortion, thus we know the solution must not allocate.
- **TOC's approach is new from the ground up.**

# Throughput Accounting

- Throughput Accounting was developed in the early 1990s by Eli Goldratt to address the issues of cost accounting.
- Explained in *The Haystack Syndrome* and incorporated into later versions of *The Goal*.
- Experiences of implementing TOC at companies would create friction with the accounting systems, thus the need to address the accounting systems.
- “Tell me how you measure me and I’ll tell you how I behave.” – Eli Goldratt



# Basics of Throughput Accounting

- There are three main components to Throughput Accounting:
  - Throughput (T)
  - Inventory or Investment (I)
  - Operating Expenses (OE)
- All other aspects of basic financial accounting concepts remain the same.
- It is not the mechanics that are as important so much as the insights drawn from the different presentation of the accounting information.

# Basics of Throughput Accounting

## Throughput

- The rate at which the system produces goal units.
- In business, this is the rate our system produces net, new dollars (euros, pesos, *money* essentially).
- Throughput can also be viewed as the value our organizations generate.
- Throughput can be mathematically defined as:  
Revenue-Totally Variable Costs(TVCs) = Throughput

# Basics of Throughput Accounting

## TVC - Totally or Truly Variable Costs

- These are costs that vary totally, on a 1-for-1 basis with production.
  - Also can be thought of as the costs that would be saved if we did not make any products.
- Examples:
  - Material, Outside Processing, Freight In/Out, Commissions

# Basics of Throughput Accounting

## Inventory (or Investment)

- The money the system invests in purchasing things the system intends to sell.
- Throughput Accounting defines inventory in the same basic categories of Raw Materials, Work-in-Process, and Finished Goods.
- The distinction is the value given to inventories.
- In Throughput Accounting, inventories are carried at their TVC value...typically just material cost and freight in.

# Basics of Throughput Accounting

## Investment (or Inventory)

- Originally the definition of I was just Inventory.
  - Expanded over time to be Investment as well.
- Suppose a new sales strategy required a company to support more credit sales.
  - Thus the company will *invest* working capital into Accounts Receivable to capture the Throughput from the initiative.
- Can be used to calculate ROI for a project or initiative.

# Basics of Throughput Accounting

## Operating Expenses

- All the money the system spends in turning inventory into Throughput.
  - Operating Expenses are the total expenses other than TVCs a company has in any period.
- This includes, wages, salaries, depreciation, interest, overheads, etc.
  - Labor is included here unless it is paid on a piece-rate basis.
- Essentially, Throughput Accounting treats all costs other than TVCs as a period cost.

# Basics of Throughput Accounting

- With just T, I, and OE decisions gain a tremendous amount of clarity.
  - How much investment is required for X initiative?
  - How much OE will we *really* save.
    - For example, to save labor, we must actually have fewer people working at the company.
- We realize substantially all of our products will generate positive Throughput.
  - The question becomes which product mix generates the highest level of Throughput?

# Basics of Throughput Accounting

- The paradigm shift with Throughput Accounting occurs when we understand the reprioritization of T, I, and OE.
  - Historically prioritized as: OE, I and then T.
  - Throughput Accounting flips the priorities:
    - T, then I, and lastly OE
  - If this is true, where do managers focus today?
  - What story are our financial statements telling us?



# Making Decisions with T, I, & OE

- To begin make decisions utilizing Throughput Accounting, you only need to know the T, I, & OE between the alternatives.
- Delta T, I, & OE is an extremely powerful, easily understood, and quickly implemented tool to make good decisions.

# Five Major Financial Decisions

- Company-wide Decisions
- Business-unit Decisions
- Product-level Decisions
- Investment Decisions
- Make vs Buy Decisions

# Company-wide Decisions

- Company-wide decisions are monitored and measured on the financial statements.
  - Are we achieving our goals?
    - If so, why? If not, why not?
  - Where should we focus our efforts?
  - What are the weak areas to be improved?
- ...There's only one problem: the financials do not answer these questions!

# Company-wide Decisions

- The cost allocation process creates distortion of the actual results of the company.
- It does this by allocating costs to inventories.
- In doing so, the allocation process essentially defers expenses from one period to the next.
- The allocation process behind cost accounting methods takes expenses off of the income statement and parks them on the balance sheet until later.

# Example 1

- These two companies have the same revenues.
- They also have the same expenses.
- Their results are identical in reality.
- But they **report** drastically different results.
- Why?

# Example 1 – P&L

	Inventories-R-US, Inc.		TA, INC.	
	Year 1	Year 2	Year 1	Year 2
<b>Revenues</b>	500,000	750,000	500,000	750,000
<b>Cost of Sales – DM</b>	(100,000)	(150,000)	(100,000)	(150,000)
<b>Cost of Sales – CC</b>	(50,000)	(50,000)	0	0
<b>Gross Margin</b>	350,000	550,000	400,000	600,000
<b>SG&amp;A Expenses</b>	(200,000)	(200,000)	(400,000)	(500,000)
<b>Net Profit</b>	<b>150,000</b>	<b>350,000</b>	<b>0</b>	<b>100,000</b>

**DM** = Direct Materials, aka Raw Materials

**CC** = Conversion Costs, which is allocated Direct Labor and Overheads

**SG&A** = Selling, General, and Administrative expenses



# Example 1 – Balance Sheet

	Inventories-R-US, Inc.		TA, INC.	
	Year 1	Year 2	Year 1	Year 2
<b>Cash</b>	100,000	100,000	100,000	100,000
<b>Inventory (in total)</b>				
<b>Raw Materials</b>	75,000	150,000	75,000	150,000
<b>Conversion Costs</b>	150,000	400,000	0	0
<b>Total Assets</b>	425,000	750,000	175,000	250,000
<b>Total Equity</b>	425,000	750,000	175,000	250,000

**DM** = Direct Materials, aka Raw Materials

**CC** = Conversion Costs, which is allocated Direct Labor and Overheads

## Example 2 – P&L

	Inventories-R-US, Inc.		TA, INC.	
	Year 2	Year 3	Year 2	Year 3
<b>Revenues</b>	750,000	900,000	750,000	900,000
<b>Cost of Sales – DM</b>	(150,000)	(180,000)	(150,000)	(180,000)
<b>Cost of Sales – CC</b>	(50,000)	(650,000)	0	0
<b>Margin***</b>	550,000	70,000	600,000	720,000
<b>Operating Expenses</b>	(200,000)	(250,000)	(500,000)	(600,000)
<b>Net Profit</b>	350,000	(180,000)	100,000	120,000

**DM** = Direct Materials

**CC** = Conversion Costs, which is allocated Direct Labor and Overheads

**SG&A** = Selling, General, and Administrative expenses





## Example 2 – Balance Sheet

	Inventories-R-US, Inc.		TA, INC.	
	Year 2	Year 3	Year 1	Year 2
Cash	100,000	100,000	100,000	100,000
Inventory				
Raw Materials	150,000	50,000	150,000	50,000
Conversion Costs	400,000	100,000	0	0
Total Assets	750,000	250,000	250,000	150,000
Total Equity	750,000	250,000	250,000	150,000

**DM** = Direct Materials

**CC** = Conversion Costs, which is allocated Direct Labor and Overheads

# Company-wide Decisions

- The allocation of expenses to the balance sheet each period distorts results.
- Whether or not cost accounting or Throughput Accounting reports higher or lower earnings depends on changes in inventory levels.
  - Inventories rise, cost accounting reports higher profits
  - Inventories drop, cost accounting reports lower profits
- This distortion through allocation means managers cannot determine the real results of actions.

# Business-unit Decisions

- As companies grow in scope and complexity different lines of operation may develop.
- The question of how business units are performing then arises.
- Often to assess this, corporate overheads are allocated to the business units.
  - Revenue or Gross Margin allocation
  - Time-based allocation
  - Other methods (evenly, activity-based, etc.)

# Business-unit Decisions

- This allocation of corporate overheads distorts reported performance of the business units.
  - These are not costs controlled by the business units and they have no authority to cut the costs.
  - The allocation methods are arbitrary and subjective.
  - Leads to massive infighting among the heads of the business units.

# Business-unit Decisions

- A second way cost accounting allocations affect business units is through transfer prices.
- The cost accountants develop product costs of products made in “Business Unit 1 (BU1)” that are used by “Business Unit 2 (BU2)”.
- After this calculation, the fighting begins.

# Business-unit Decisions

- Should BU1 or BU2 manager decide the profit margin on the product?
- If BU1's price is too high for BU2, should BU2 be allowed to buy from cheaper outside suppliers?
- If BU2 is not willing to “pay” for BU1's product at the transfer price, can BU1's manager sell to external parties?
- Thus the efforts are directed to optimizing each BU, not the company as a whole.

# Product-level Decisions

- Cost accounting's predominant driver in product-level decisions is cost-per-unit (CPU).
- As discussed, there are numerous, significant flaws in the concept of CPU.
- In Throughput Accounting, the focus is on generating Throughput, not saving costs.
- The priority system is rearranged and the focus and nature of decisions is greatly changed.

# Product-level Decisions

- The allocation process creates the flawed CPU concept, which distorts product profit margin.
- Thus our product mixes are wrong.
  - Need to reevaluate product mixes.
- All products generate Throughput (a positive value).
- Product mix changes can have significant, short-term positive impacts on profitability.



# Product-Level Example

- A company has two products P and Q.
- The following is a summary of the products:

	Product P	Product Q
Selling Price	\$90.00	\$100.00
Raw Materials	(45.00)	(40.00)
Direct Labor	(10.00)	(8.33)
Manufacturing Overhead	(27.50)	(22.92)
<b>Product Profit</b>	<b>\$7.50</b>	<b>\$28.75</b>

- Obviously from above, we see that cost accounting would say Product Q is the most profitable to produce.

# Product-Level Example

- Below is the production capability for one week.
- You can only produce one of the following product mixes in a week:

	Maximize P	Maximize Q
Product P	100	60
Product Q	30	50

- We must calculate the difference between the alternatives by using Delta T, I, and OE.

# Product-Level Example

Before we proceed, let's ask ourselves the following question:

- What would cost accounting suggest our product mix be?
- Cost accounting would suggest maximizing production of Product Q, since it has the highest product profit.

# Product-Level Example

	Maximize Product Q		
	Units	Price	Revenue
Product P	60	\$90	5,400
Product Q	50	100	5,000
Total Revenue			\$10,400
Product P	60	45	\$(2,700)
Product Q	50	40	(2,000)
Total Materials			\$(4,700)
<b>Throughput</b>			<b>\$5,700</b>

# Product-Level Example

	Maximize Product P		
	Units	Price	Revenue
Product P	100	\$90	\$9,000
Product Q	30	100	3,000
Total Revenue			\$12,000
Product P	100	\$45	\$(4,500)
Product Q	30	40	(1,200)
Total Materials			\$(5,700)
<b>Throughput</b>			<b>\$6,300</b>

# Product-Level Example

	Maximize P	Maximize Q	Delta
Delta T	\$6,300	\$5,700	+600
Delta OE	-	-	-
<b>Delta Net Profit (NP)</b>	<b>\$6,300</b>	<b>\$5,700</b>	<b>+600</b>
<b>Delta Investment</b>	-	-	-
ROI	N/A	N/A	N/A

**The answer is obvious:  
Maximize Production of Product P!**

# Inventory or Investment Decisions

- Traditional cost accounting systems rely upon cost savings to determine ROI, payback period, and are used as justification for investments.
  - Acceptable payback periods can range from 5-10 years.
  - ROI above 10% are considered outstanding.
- Investing from a Throughput Accounting perspective takes on an entirely different approach.
  - A payback period of 2 years would likely be unacceptable.
  - ROI below 20% would likely be unacceptable as well.

# Inventories Example 1

- Our company could sell all Ps and Qs if we hold \$20,000 more in inventories.
- We also need to hire a worker for \$19,200 annually to manage the new inventories.
- Our Company's hurdle rate is 20% annual ROI.
- There are 48 working weeks in our year.
- Assuming we picked the Maximize P product mix, should we hold the higher inventories?



# Inventories Example 1

	Maximize Product P		
	Units	Price	Total
Product Q – Additional Weekly Revenue	20	\$100	\$2,000
Product Q – Additional Weekly TVCs	20	40	(800)
Product Q – Add'l Weekly Throughput			<b>\$1,200</b>
Working Weeks in Year			48
Annual Throughput Generated			<b>\$57,600</b>
Delta Operating Expense (OE) – Worker Exp.			<b>\$19,200</b>

# Inventories Example 1

	Make Investment	Don't Make Investment
Delta T	\$57,600	-
Delta OE	(19,200)	-
<b>Delta Net Profit (NP)</b>	<b>\$36,400</b>	-
<b>Delta Inventories (I)</b>	<b>20,000</b>	-
<b>ROI (NP/I)</b>	<b>182%</b>	<b>N/A</b>

**Yes! We should hold higher inventories. It will increase our bottom line by \$36,000 and the project has a 182% ROI.**

# Investment Example 1

- Our company could sell all Ps and Qs if we sold to customers on credit.
- The Accounts Receivable balance would grow \$30,000.
- Our bad debts expense will increase \$24,000.
- There are 48 working weeks in our year.
- Our Company's hurdle rate is 20% annual ROI.
- Assuming we picked the Maximize P product mix, should we sell on credit terms?

# Investment Example 1

	Maximize Product P		
	Units	Price	Total
Product Q – Additional Weekly Revenue	20	\$100	\$2,000
Product Q – Additional Weekly TVCs	20	40	(800)
Product Q – Add'l Weekly Throughput			<b>\$1,200</b>
Working Weeks in Year			48
Annual Throughput Generated			<b>\$57,600</b>

# Investment Example 1

	Sell on Credit	Don't Sell on Credit
Delta T	\$57,600	-
Delta OE	(24,000)	-
<b>Delta Net Profit (NP)</b>	<b>\$23,600</b>	-
<b>Delta Investment (I)</b>	<b>20,000</b>	-
<b>ROI (NP/I)</b>	<b>118%</b>	<b>N/A</b>

**Yes! We should sell on credit. It will increase our bottom line by \$23,600 and the project has an annual ROI of 118%.**

# Make vs Buy Decisions

- The same impact transfer pricing has on business units is felt in make vs buy decisions.
- The reason is that cost accounting allocations create a “product cost” which is over-inflated and over burdens components or products with costs that have been arbitrarily assigned.

# Make vs Buy Example

The following shows a comparison between a product produced inside and a vendor's quote for the product. Should the company make or buy the product? The company needs 10,000 units of Part #507.

	Part#507 – Make	Part#507 – Buy
Cost	\$150.00	\$87.67
Materials	\$35.00	Unknown
Labor	60.00	Unknown
Overhead	\$55.00	Unknown

# Make vs Buy Example

Cost accounting would suggest we outsource and buy the part from the vendor. Throughput Accounting would suggest producing the product internally.

	Part#507 – Make	Part#507 – Buy
Cash outlay (TVCs)	\$35.00	\$87.67
Units needed	10,000	10,000
Total cash outlay	\$350,000.00	\$876,700.00



# Make vs Buy Example

	Make Product	Buy Product	Delta
Delta T	\$(350,000)	\$(876,700)	526,700
Delta OE	-	-	
<b>Delta Net Profit (NP)</b>	<b>(350,000)</b>	<b>(876,700)</b>	<b>526,700</b>
Delta Investment (I)	-	-	-
ROI (NP/I)	N/A	N/A	N/A

**We should make the product internally. It will increase our Throughput and our bottom line by \$526,700 as compared to purchasing the part from the vendor.**

# Throughput Accounting Decisions

- Unique to Throughput Accounting decisions is the fact that Global AND Local decisions are linked.
- Only Throughput Accounting has the ability to tie a local decision to the global well being of the company.
- By looking at T, I, & OE to make decisions, this essentially recasts the financial statements.
- Alignment between the various levels can be achieved by marrying local actions to global outcomes (as measured on the financial statements).

# Making Decisions with T, I, & OE

- How do T, I, & OE compare to other methods?
- **There truly is no comparison.**
- All the other methods are tinkering with “product costs”, which we now know simply do not exist.
- The other methods create a distortion of reality as they are built on some form of cost allocation.

# Making Decisions with T, I, & OE

- Other methods are focused on more precision or simply rearranging the allocation calculation.
- It's not a matter of what's being allocated or how its done. It's simply a matter of common sense.
- If making a product doesn't cause us to incur the cost, then we can't say it's that product's cost.
- Allocation always creates distortion.

# Additional Applications

- New Categories of Decisions
  - Strategic
  - Tactical
  - Financing
- Budgeting and Projections
- External Financial Reporting
  - GAAP or IFRS vs Throughput Accounting
- Throughput-based ERP Solutions

# Bios & Contact Information

2018 TOCICO Webinar

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