

Introduction to the Theory of Constraints

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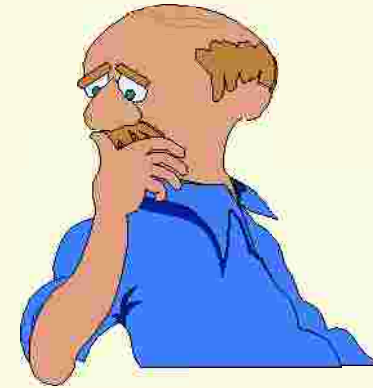
CIRAS (Center for Industrial Research and Service)

Iowa State University Extension

Theory of Constraints



Where is Herbie?



How Do We
Manage Him?



Do we really want or need another new theory?

“The significant problems we face today can not be resolved at the same level of thinking we were at when we created them.”

Einstein

What is the Theory of Constraints?

“The core idea in the Theory of Constraints is that every real system such as a profit-making enterprise must have at least one constraint”.

What is TOC? (continued)

“There really is no choice in the matter. Either you manage constraints or they manage you. The constraints will determine the output of the system whether they are acknowledged and managed or not”

Noreen, Smith, and Mackey, The Theory of Constraints and its Implications for Management Accounting (North River Press, 1995)

How does TOC help companies?

1. Focusing improvement efforts where they will have the greatest immediate impact on the bottom line.
2. Providing a reliable process that insures Follow Through!

Finding the Focal Point

Before a company can properly focus, one necessary condition is that they answer the following question:

4 What is the Goal of a for profit enterprise?

A spiral-bound notebook with a light yellow page and a brown cover. The spiral binding is on the left side. The text is written in a brown serif font.

The Goal?

4 To make more money now and in the future!

The Goal (continued)

Some would argue that the goal of their company is to...

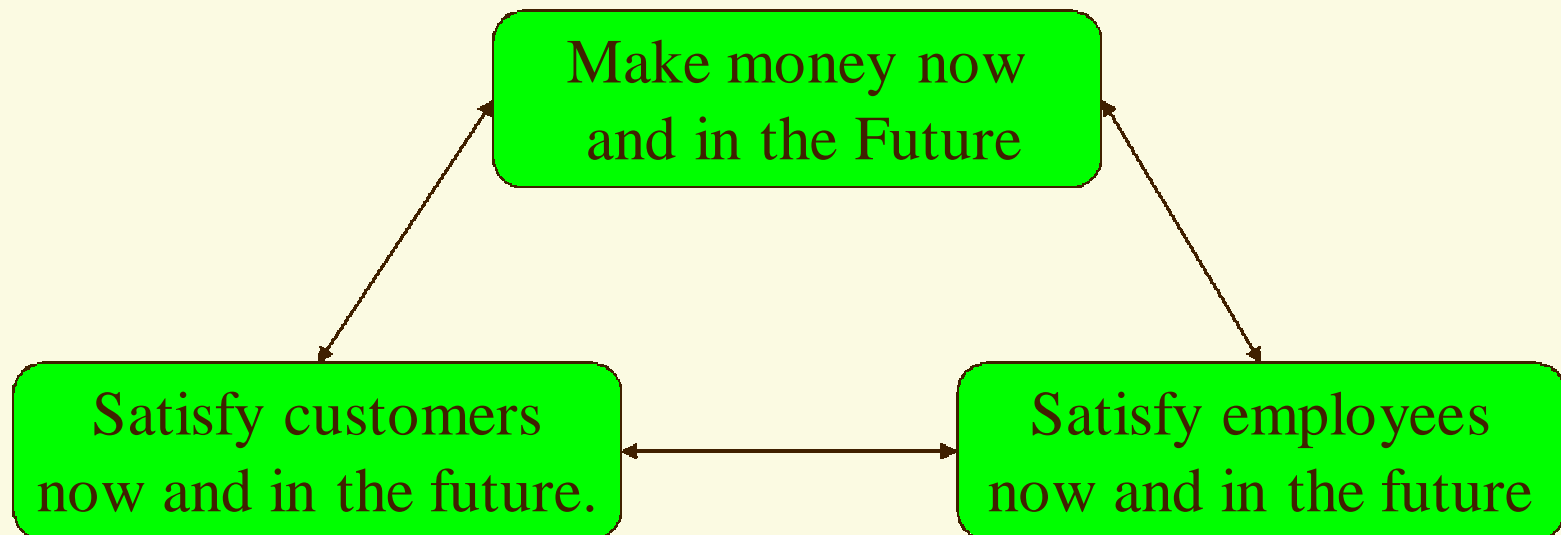
4 To satisfy customers now and in the future!

Or to..

4 Provide satisfying jobs now and in the future!

The Goal (continued)

TOC recognizes that only the “owners” of a company can choose THE goal. However, once chosen, the other 2 become conditions necessary to achieving the goal.



The Goal (continued)

That is...

4 If your goal is to satisfy customers, it is absolutely necessary that you make money and that you satisfy employees...

4 Likewise, if your goal is to satisfy employees, you also have to make money and satisfy your customers...

...or you won't be in business in the future!

The Goal (continued)

The choice is yours, choose any of the three as the goal of your organization.

For the duration of this presentation, we will assume that the goal is:

- 4 To make more money now and in the future!



Measuring Progress

Once the Goal is identified, one necessary condition to success in achieving the goal is to identify which measurements will be used to judge progress.

What measurements should we use?

Conventional Wisdom

- 4 Net profit?
- 4 Efficiency?
- 4 Utilization?
- 4 Return on Investment?
- 4 Cash Flow?

“Are you using the right measurements?”

Jonah in The Goal

What measurements should we use? (continued)

TOC Wisdom

4 Throughput

4 Inventory

4 Operating Expense

Throughput (“T”)

The rate at which the system generates **money** through sales. (Or, the **money** coming into the organization.)

4 Building inventory is not throughput

4 Only \$ generated by the system get counted; e.g., raw materials and purchased parts are not throughput.

4 $T = \text{Selling Price} - \text{Materials}$

Inventory (“I”)

All the **money** the system has invested in purchasing things which it intends to sell.

- 4 Inventory is a liability (not an asset)
- 4 Raw materials, work in process, finished goods and scrap are “I”

Operating Expense (“OE”)

All the **money** the system spends in order to turn inventory into throughput. (Or, the **money** coming into the organization.)

- 4 All employee time is “OE” (direct, indirect, operating, etc.)
- 4 Depreciation of a machine is “OE”
- 4 Operating supplies are “OE”

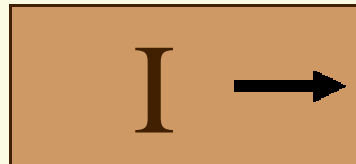
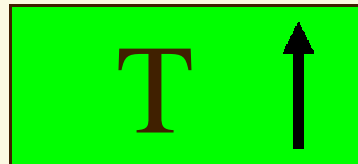
Financial Links

“Wait a minute” someone exclaims. “If I monitor Throughput, Inventory, and Operating Expense in the short term, how can I **be sure** that I will have a Profit, with a reasonable Return On Investment in the long term, and maintain a positive Cash Flow?”

Financial Links (continued)

Question 1: If we can increase “T” while maintaining level “I” and level “OE, what will the impact be on Net Profit, ROI and Cash Flow?

If...



Then...



Financial Links (continued)

Question 2: If we can decrease “I” while maintaining level “T” and level “OE”, what will the impact be on Net Profit, ROI, and Cash Flow?

If...

T →

I ↓

OE →

Then...

NP →

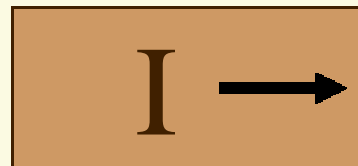
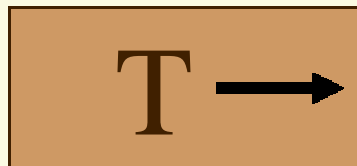
ROI ↑

CF ↑

Financial Links (continued)

Question 3: If we can decrease “OE” while maintaining level “T” and level “I”, what will the impact be on Net Profit, ROI, and Cash Flow?

If...



Then...



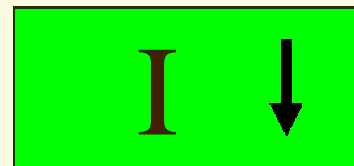
Financial Links (continued)

4 So the answers to these 3 questions show unquestionable that by determining the impact that an action will have now on Throughput, Inventory, and Operating Expense we will know the future impact on Net Profit, ROI, and Cash Flow.

Financial Links (continued)

Question 4: What about Inventory? Because it has no direct impact on Net Profit, it would seem to be less powerful at impacting the bottom line.

Even though when...



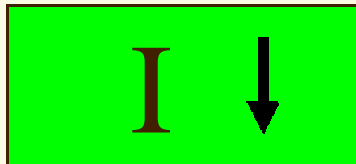
There is no Direct impact on...



Financial Links (continued)

However, reducing Inventory levels does also reduce some operating expenses.

If...



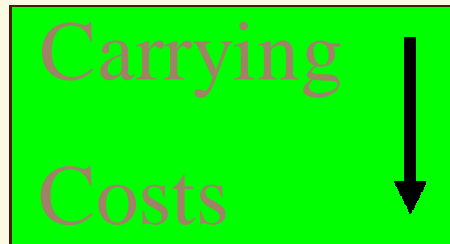
Then...



Financial Links (continued)

And...

If...



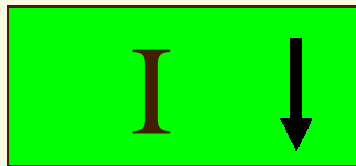
Then...



Financial Links (continued)

Therefore, there is an indirect link...

If...



Then...



And since we already saw that a reduction in inventory causes a direct increase in ROI and Cash Flow, we can see that reducing inventory has a significant financial impact.

Financial Links (continued)

- 4 Throughput, Inventory, and Operating Expense are valuable operational measures that can be used to guide our decisions.
- 4 The next question must be: Which of these 3 is the most important -- or do they all have equal weight?

Where should we focus?

Increasing Throughput

Decreasing Inventory, or

Decreasing Operating Expense?

The “Cost World”

- 4 Decreasing “OE” is definitely #1 because we have relatively high control of our expenses.
- 4 Increasing “T” is always important, but it ranks #2 because we are at the mercy of the marketplace and have less control over sales.
- 4 Inventory tends to fall into a “grey area” that we don’t know exactly what to do about; it is a “necessary evil” that must be lived with to protect sales.

The “Throughput World”

- 4 Increasing “T” is unquestionable #1 because it has the greatest potential impact on the bottom line.
- 4 Decreasing “I” is #2 because excess WIP and finished goods jeopardize future throughput.
- 4 Decreasing “OE” is #3 because significant reductions (workforce reductions) usually jeopardize future throughput.

TOC Question...

How do you manage a company in a world where increasing Throughput is the #1 priority, reducing Inventory is #2, and reducing Operating Expense is a tactic only after serious efforts at #1 and #2?

Chain Analogy

A company can be compared to a chain. The activities businesses perform is really a “chain” of dependent events. That is to say that we don’t ship parts until they are packaged, and we don’t package parts until they are manufactured, etc.

Chain Analogy (continued)



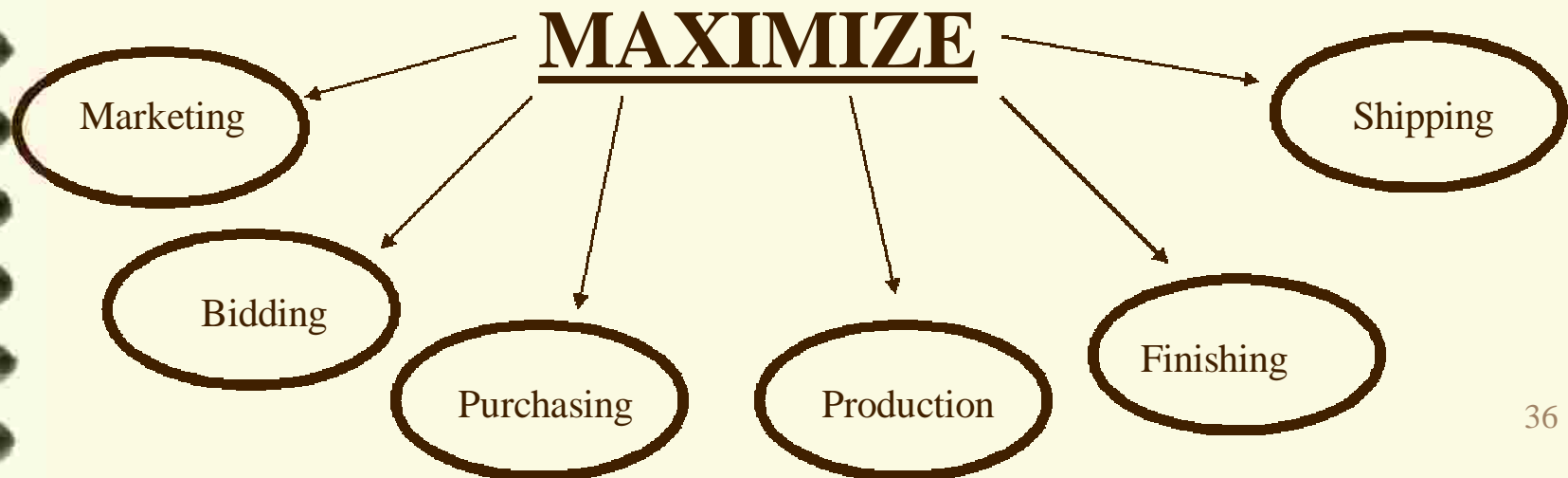
Chain Analogy (continued)

Conventional Wisdom believes that...

- Improvement of any link is an improvement to the chain.
 - Global improvement is the sum of the local improvements.
 - Primary Measurement: Link Weight
- Result: Every link wants/needs more resources all the time

Chain Analogy (continued)

“Take actions that will maximize any/all local operations.” (i.e. Fight constantly for scarce resources.)



Chain Analogy (continued)

Throughput World Approach believes that...

4 Most improvement of most links do not improve the the chain.

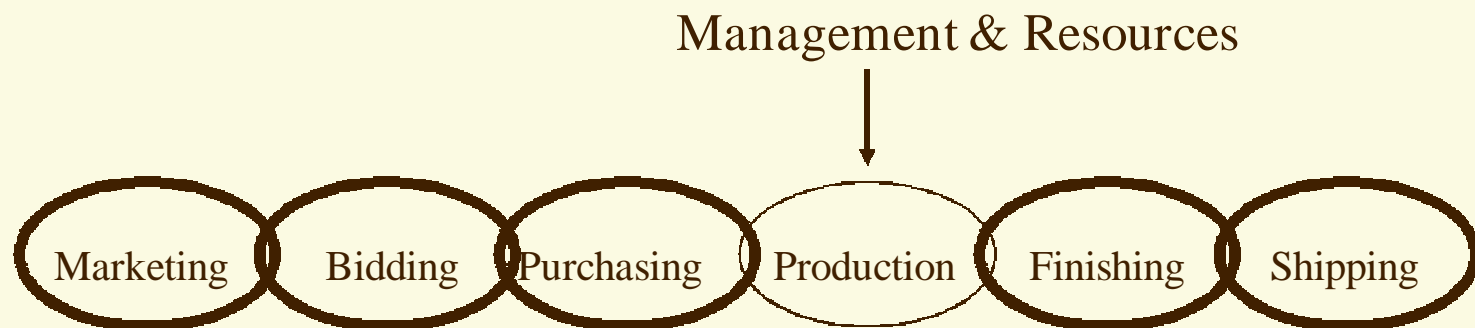
4 Global improvement is **NOT** the sum of the local improvements.

4 Primary Measurement: Chain Strength

Result: Resources are channeled to the weakest link (aka: Herbie, the constraint, “CCR”).

Chain Analogy (continued)

“Think Globally. Take only those local actions that will strengthen the chain.”
(i.e. Focus scarce resources on the constraint.)



TOC Summary

The theory of Constraints is about 2 things

4 Focus

4 Follow Through

TOC Summary: Focus

- 4 A company must first know its Goal
- 4 Then it must identify the thing(s), the constraint(s), that are limiting the level of achievement of that goal.

TOC Summary: Follow Through

The Process Of On Going Improvement

1. *Identify* the constraint
2. *Exploit* it
3. *Subordinate* all other operations to the necessity to exploit the constraint.
4. If after #2 and #3 more capacity is needed to meet market demand, *Elevate* the constraint.
5. *Go back* to #1, but don't let inertia become the system's constraint.

End of TOC Slide Presentation

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