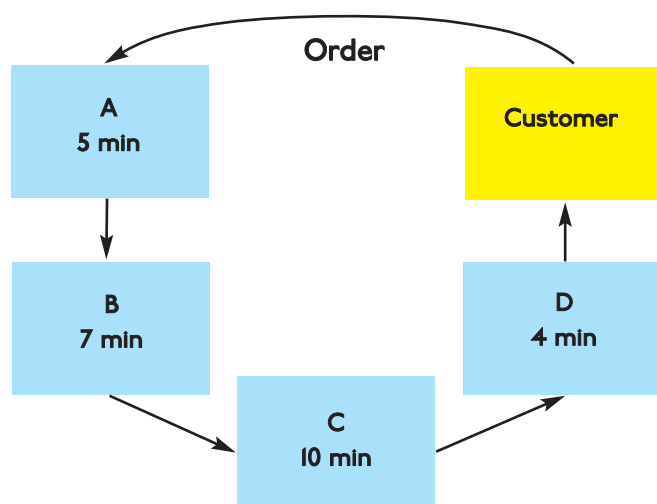


Theory of Constraints

The Theory of Constraints (TOC) was introduced to a wide audience in Dr. Eliyahu M. Goldratt's book "*The Goal*." In this introductory book, we are shown that any system is a series of processes. In order to maximize the throughput (output) of a system, we must identify and improve the constraint (slowest process) in the system.

The following example demonstrates this:



In this example, the system will be capable of producing one product every 10 minutes. The only way to improve the throughput is to improve the constraint, which is operation C. If additional work is released to the system based on the availability of operation A (which is what happens in most organizations), throughput will not change, but work-in-process and lead-time will grow. Also, improvements made at any operation other than C will not affect the throughput of the system and will have little impact on the productivity of the system.

To improve a system, these focusing steps are applied:

1. **IDENTIFY** the system constraint(s).
2. Decide how to **EXPLOIT** the identified constraint(s).
3. **SUBORDINATE** everything else in the system to step #2.
4. **ELEVATE** the system's constraint.
5. **GO BACK** to step #1.

Dr. Goldratt demonstrated the application of these focusing steps by telling the story of a marching Boy Scout troop whose constraint was a boy named Herbie. The troop was able to increase throughput (marching rate) by reducing Herbie's backpack load (exploit the constraint) and placing

Herbie at the front of the marching line (subordinate everything to the constraint). In many organizations, people frequently ask, "Where is Herbie?"

Beyond Herbie

At first brush, TOC seems to be limited to the focusing steps described above. However, dig a little deeper and you will find that TOC is a general business philosophy with tools to fundamentally improve production, distribution, supply chain, marketing, strategy, project management, and thinking skills. At its heart, TOC is about identifying and breaking the fundamental conflicts, policies, and assumptions that are limiting the overall effectiveness and success of an organization. The following sections introduce some additional TOC concepts.

Business Measurements

Organizational (and individual) behavior is greatly influenced by the measurements used. Measurements provide the common language for a company and communicate priorities. The following are some key definitions and measurements used to promote TOC thinking:

Constraint (C) = Anything that limits or prevents higher system performance relative to the systems goal.

Throughput (T) = Money generated by the system
 = Gross Revenue - Totally Variable Costs (Purchased Materials, Commissions, freight)

Inventory (I) = Money captured within the system
 = All Assets (at depreciated cost) + All Parts (at purchased cost)

Operating Expense (OE) = Money spent to turn inventory into throughput (all expenses related to time)
 = Payroll + Supplies + Overhead
 = All Costs - Totally Variable Costs

In general, the objective is to increase throughput without increasing inventory or operating expense. While lowering inventory and/or operating expense are beneficial, this should never be done at the expense of lowering throughput. In a typical organization, improving a constraint by 10% will improve net income by 2% due to operating expense reduction. However, if operating expense is left the same and throughput is increased instead, net income will improve by 67% (see Impact of Cost Cutting table on page 5).

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Theory of Constraints



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Using this fundamental approach, here are some key business measurements using the variables defined above:

Net Profit = Throughput - Operating Expense

Productivity = Throughput / Operating Expense

Return on Investment = Net Profit / Inventory

Inventory Turns = Throughput / Inventory

Use of these measurements focuses an organization on throughput, which is limited by the current constraints. This has a profound affect on business strategy, tactics, and the day-to-day decision processes. Many organizations use TOC as an umbrella to coordinate and prioritize their tactical improvement initiatives (such as Lean and Six Sigma) because it focuses these initiatives on improving processes that will result in the greatest impact on the company.

Types of Constraints

Constraints can be categorized as follows:

Policy Constraints - Rule, measurement, or condition that dictates organization behavior. This is the most common type of constraint (90%). This is also called a management constraint.

Resource Constraints - Machines, people, skills, materials, and market (10%).

Usually, the reason for a resource shortage has to do with the policies related to the utilization and acquisition of the resource, not a constraint directly related to the resource itself. Most organizations have excess capacity. If an organization has any excess work in process or finished goods, it has excess resource capacity and does not have a resource constraint. Most organizations believe they have resource constraints when in fact they have policy constraints. This belief leads to the use of

inappropriate improvement methods and poor results.

The TOC Thinking Process

If constraints limit throughput, and if most constraints are policy constraints, then we frequently need to eliminate or improve policy constraints to increase throughput.

This statement is an example of the application of the TOC thinking process. This process applies structured if / then logic usually found in the hard sciences to business systems and organizations. The TOC Thinking Process can be used to identify and correct policy constraints. This is the process Dr. Goldratt used to develop the various TOC tools and philosophies. A Jonah is someone who has been trained and certified by the Avraham Y. Goldratt Institute in the TOC Thinking Process.

How can Insyte Help?

Insyte Consulting can assist your organization with TOC. Whether you want a full implementation tailored to your company or just need help with an identified constraint, our certified Jonah and staff of experts will work with you to improve the throughput and success of your organization. Contact us at 716.636.3626 for more information. ❖

See How Your Company Compares

The Excel worksheet featured to the left is available for you to “see the impact on your company of cost cutting versus increasing throughput.”

1. Visit www.insyte-consulting.com
2. Click on the Highlights tab and select Impact of Cost Cutting versus Increasing Throughput.
3. Enter your information into cells with blue text.

Impact of Cost Cutting versus Increasing Throughput

		Improve Constraint by 10.0%	
	Portion of Direct Labor that the Constraint Utilizes	Option A Reduce Labor at Constrained Operation	Option B Increased Throughput to Constraint Capacity
	Baseline		
Sales	100.0	100.0	110.0
Overhead	40.0	40.0	40.0
Direct Materials	30.0	30.0	33.0
Direct Labor	20.0	19.8	20.0
Cost of Sales	90.0	89.8	93.0
Net Income	10.0	10.2	17.0
Net Income Increase from Baseline		2%	67%