Theory of constraints will really improve your competitiveness

Rafael Cruz
Profesor asociado

Abstract

The Theory of Constraints (TOC) is a new management philosophy created by Eliyahu M. Goldratt to help an enterprise reach its goal. In order to accomplish this objective a company must change the paradigm of costs and follow two fundamental techniques: the five focussing steps and the thinking process. In this series of three articles we present the fundamental concepts of the TOC and the five focussing steps technique.

Sinopsis

La Teoría de Restriciones (TOC por sus siglas en inglés) es una filosofía gerencial desarrollada por Eliyahu M. Goldratt con el objetivo principal de ayudar una empresa a alcanzar su meta. Para lograr este objetivo la teoría establece la necesidad de cambiar el paradigma de costos y el uso de dos técnicas fundamentales: los cinco pasos de optimización ("five focussing steps") y el proceso decisional ("thinking process"). En esta serie de tres artículos presentaremos los conceptos fundamentales de TOC, así como también la técnica de los cinco pasos de optimización.

Introduction

Companies all over the world are talking about productivity, competitiveness and quality. Three letter acronyms such as JIT, TQC, TPM and TQM are the «buzzwords» of the nineties. Are these so called new

management philosophies helping our companies reach their GOALS?

Most of these techniques and «philosophies» base their improvements in cost reduction procedures or on eliminating «non-value added» activities. But, can any company reduce costs or eliminate non-value added activities indefinitely? Obviously not. As stated by Goldratt in his Theory of Constraints (TOC), any improvement process will follow either a green curve or a red curve (fig. 1).

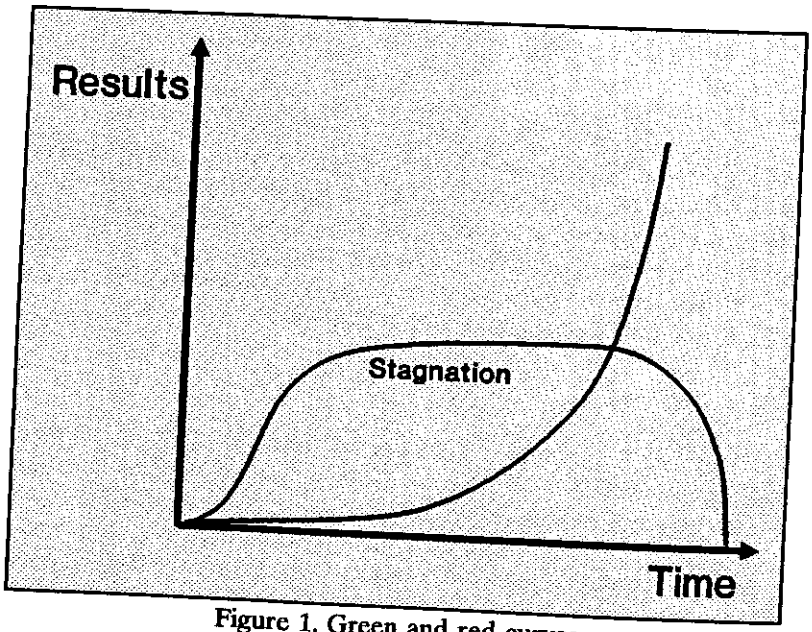

Figure 1. Green and red curves

The green curve represents results obtained through cost reduction programs or elimination of non-value added activities. This curve shows that a company can go only so far this way. After a while there is a period of stagnation, and finally there will be no more improvements to make. You are stuck!

On the other hand, results obtained through the application of TOC are represented by the red curve. As you can see, it has no limit. Your commitment defines how far you will go.

In order to achieve its objective of helping companies meet their GOAL, TOC uses new management techniques developed by Goldratt and the Avraham Y. Goldratt Institute. These techniques are **The five focussing steps, Drum-buffer-rope, and The thinking process.**

The five focussing steps

The five focussing steps is a basic technique that helps to establish an overall procedure to tackle the operational problem of identifying and exploiting the constraints, and subordinating the whole system to such constraints.

The five focussing steps are:

1. Identify the system's constraints

Let us start by asking: what is the element that limits the throughput of the whole system. This limiting element is what we call a constraint. TOC indicates that this constraint can be a physical constraint (i.e. capacity, materials, market, etc.), or a policy constraint (i.e. allowing supervisor to freely schedule the jobs in their departments).

When TOC talks about identifying the system constraints, it is also telling us that capacity constraints are not the only company constraints. We can also find materials, managerial, market, behavioral and logistical constraints. This means that, thanks to TOC, we have an expanded search area. Therefore we must devise new ways to find these old, but just recently identified, constraints.

2. Exploit the constraints

Now you are going to tell me: "Only a fool will know that he has a constraint and will not exploit it". So all of you out there are exploiting your

constraints, right? How well are you doing that? How do you achieve this objective?

If the constraint is a machine, you want to use it 100% of its available time. First, under no circumstance should the constraint stop when it is scheduled to work. You must avoid all logistic and operational errors that could cause this to happen. Also, reduce the non-scheduled downtime through Total Productive Maintenance (TPM). Second, try to reduce the set-up time using the Single Minute Exchange of Die (SMED) system. Third, evaluate all parts being processed by the constraint to determine if they can be transferred to another non-constraint resource. Fourth, you use it only to manufacture those products that will increase your company throughput (actual sales). Those with the highest contribution margin (calculate margin using TOC). Fifth, you make sure that all materials or components to be processed by the constraint are 100% good. Otherwise you are throwing away precious constraint time. You must also watch out so that none of the materials/components processed by the constraint get damaged in any of the following operations. Sixth, only schedule those materials/components that will contribute to the company throughput. Anything else will become either WIP or finished good inventory. In those cases where the constraint is a company policy, you can break it (eliminating the policy) and go straight to step 5.

3. Subordinate everything else to the above decision

This step indicates that the system must run guided by the constraint schedule, and all non-constraint resources must be subordinated to the constraint. We do not want the constraint to stop at all (every minute lost for the constraint is a minute lost forever).

Work in process inventory is controlled regulating the material that goes into the system . This is accomplished through a gating operation. No material will enter the system until called for.

4. Elevate the system's constraint.

Elevating means increasing the processing capacity of the constraint. This can be done in ways such as:

A. Eliminating stops due to labor breaks.

B. Engineering improvements.

C. Subcontracting additional capacity from outside vendors.

D. Acquisition of new or used equipment.

5. If in the previous step a constraint has been overcome, go back to step one, but do not allow inertia to cause a system's constraint.

Elevating the constraint could take us to a point where this process is no longer limiting the throughput of the system, the constraint has been broken. If this is the case, we must go back and check where is the constraint now. We should never take anything for granted. Reevaluate the whole system after you change it. Do not let previous knowledge dictate your decisions.

Example

Let's use Goldratt's **P & Q** example to demonstrate the use of the five focussing steps technique. Figure 1 shows the general information corresponding to our example. Let us go over this information so that we can follow the example. We have two products, **P** and **Q**. The weekly market for this two products is 100 units per week for P, and 50 units per week for Q. Our customer will buy our products as soon as we can deliver them. Each unit of the two products is manufactured in our facilities. Our plant has only one **A** machine, one **B** machine, one **C** machine, and one **D** machine. Our plant operates 2,400 minutes a week (5 days x 8 hours/day x 60 min/hour, no lunch or coffee breaks). There are no breakdowns and our suppliers deliver defect free materials and components exactly when we need them. We have an excellent manufacturing process and we have zero defects. The selling price is fixed for each product and is **$90 per unit** for **P** and **$100 per unit** for **Q**. The product demand is known to the unit. Market potential is **100 units per week** for **P** and **50 units per week** for **Q**. Market potential means that the market is willing to buy these amounts if we can deliver them. But they also will accept whatever we can supply, but if production exceeds market potential for any product, the difference will not be sold and will stay as finished good

inventory. Figure 2 also shows the engineering information about the manufacturing process. Product **P** is made assembling a purchased part to two other components that are produced from raw material 1 (**RM1**) and raw material 2 (**RM2**). On the other hand, product **Q** is the result of assembling two components manufactured in house from raw material 2 (**RM2**) and raw material 3 (**RM3**). The time required by each resource to process the material or assemble the components is indicated in the boxes in figure 2. Remember that you have only one of each of the resources (A,B,C, and D).

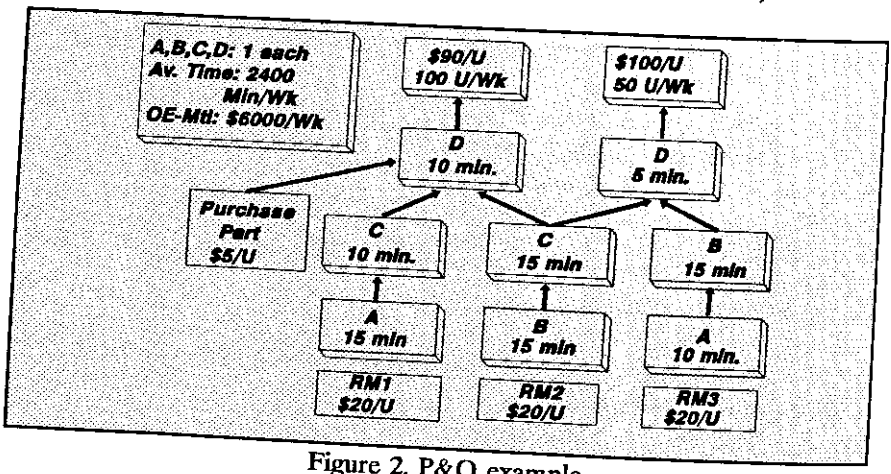

Figure 2. P&Q example

That's it! I would like you to determine the maximum net profit (or loss) this company is capable of making per week. Remember what we mentioned before about constraints and how to maximize throughput. In our next article we will go through a step-by-step analysis of this example. We will see why most of our companies are no longer competitive in world markets and what we need to do to regain leadership.