

## **Three-questions accounting: this proposed new name for Throughput Accounting shows that we have to answer three important questions to see if a decision is good for a company.(Management Accounting)**

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There has been quite a lot of discussion regarding the **Theory of Constraints'** (TOC) approach to management accounting, which has become known as Throughput Accounting (TA). Some people have called it a new paradigm in management accounting, but others have said that it's simply a new way of showing old cost accounting concepts, such as variable costing.

In these discussions, four main criticisms have been leveled at Throughput Accounting: (1) TA is basically the same thing as variable costing, (2) it is valid only when there's a production bottleneck, (3) it regards operating expenses as fixed, and (4) it is only a short-term decision tool. But these criticisms are based on confusion about TA's methodology and how it works. Throughput Accounting is only concerned with the relevant costs and revenues associated with a decision. Here I hope to expose any misunderstandings so that we can have a healthy debate based on what TA really is, not on misinterpretations of what it is.

Bridge between decisions and profitability

Before I address the misunderstandings, let's define what a management accounting system should do.

A manager's responsibility is to make decisions that will take an organization toward achieving its goal. Management accounting is a bridge between these actions decisions and that goal. Basically, management accounting is trying to provide managers with the answer to a simple question: "If I take this action make this decision, will it increase my organization's performance in relation to its goal?"

But if we don't know the organization's goal, we can't evaluate whether a decision or action is good or not, and we can't devise a proper management accounting system.

In the case of the organizations that I'll talk about here, the goal is to make money now and in the future. Thus, our management accounting system has to help us answer the question: "If I take this action make this decision, will my company's profitability increase?"

The performance measurements used to assess a company's profitability are net profit (NP) and return on investment (ROI). They show the position of the company in relation to its goal, but they aren't very useful for making day-to-day decisions. Management accounting has to make this connection so that the managers can know what course to take.

Today most companies use some sort of cost accounting system as their management accounting. Part of the logic behind cost accounting methodologies is that when we reduce the cost of a product we are increasing the company's profitability. This is one way that cost accounting creates the bridge between our decisions actions and the company's profitability.

But Throughput Accounting doesn't allocate costs to products. It creates the bridge by answering three questions, each one related to a TA measurement:

- (1.) What will be the impact of our decision on the amount of money the company generates?
- (2.) What will be the impact of our decision on the amount of money we spend to operate the company?
- (3.) What will be the impact of our decision on the amount of money captured in the company?

Here are the formal definitions of the three measurements (throughput, investment, and operating expense).

## Throughput

Throughput (T) is the rate at which the system generates money. This is fresh money that comes into the company-it's all the money that comes into the company minus what's paid to vendors. This is the money the company generated-the money paid to vendors is money generated by other companies.

The formula to calculate throughput per unit is:

$Tu = P - TVC$  where: Tu = Throughput per unit of product P = Price per unit of product TVC = Totally variable cost

As you can see, throughput has two sides: revenue and totally variable costs. The use of the words "variable" and "cost" may be confusing because of the measures used in cost accounting. The fundamental element here is the word "totally"-totally variable in relation to units sold. A totally variable cost is the amount incurred when one more product is sold. The obvious example is raw material costs: For each extra unit sold, the company incurs the value of the raw material of that product. Other things also may be classified as TVC, depending on the nature of the operation. If the cost variation is directly proportional to the variation in production volume, then it is a TVC and should be subtracted from the product's selling price to calculate its throughput.

Both products and companies can have throughput. A product's throughput is its price minus its totally variable cost. A product's contribution to the company's throughput is its throughput multiplied by the number of units sold. Consequently, a company's throughput is the summation of all the products' throughput. Throughput is the only one of the three measurements that is identified with individual products.

## Operating Expense

Operating expense (OE) is all the money the system spends in turning investment into throughput. As I mentioned earlier, there is no allocation of costs to products. As Eliyahu M. **Goldratt** said in his book *The Haystack Syndrome*, "Operating Expense (OE) is intuitively under-stood as all the money we have to pour into the machine on an ongoing basis to turn the machine's wheels." Here we include wages for the company's CEO, direct labor, rents, depreciation, etc. **TOC** doesn't classify expenses as fixed, variable, indirect, or direct, so OE is all other costs except totally variable costs. The increases and decreases in OE are analyzed on a case-by-case basis, taking into account their impact on the bottom line.

## Investment

Investment (I) is all the money that's trapped inside the company. The company's buildings, land, computers, furniture, machines, trucks, inventories (raw material, work-in-process, and finished goods), and the like are classified as investment. This measurement might be mistaken for the conventional accounting measurement of assets, but they actually differ drastically when referring to work-in-process and finished goods inventory. The value ascribed to the work-in-process and the finished goods inventory is their TVC. One of the objectives here is to eliminate the generation of "apparent profits" due to the cost allocation process.

Throughput Accounting says that the three measurements are sufficient for us to build the bridge between NP and ROI and the managers' daily actions. These formulas show this bridge:

Net Profit = Throughput - Operating Expense  
Return on Investment = (Throughput - Operating Expense)/Investment

With these three measurements (T, I, and OE) you can determine the impact a decision has on your company's bottom line. Any decision that has a positive impact on ROI is a decision that moves the company toward its goal. You don't need to calculate NP or ROI for the entire company--you can calculate the incremental NP and ROI. If they are positive and if the ROI is equal to or greater than a predetermined ROI, the decision is good.

**Goldratt** also said, "In evaluating any action, we must remember that we have three measurements, not just one. Otherwise, extremely devastating actions will be taken. This means that the final judge is not the measurements themselves but the relationships between these measurements." This is exactly what TA tries to do and why it doesn't allocate costs to products. TA uses the relationship among its three measurements to evaluate the impact a decision will have on the company's profitability. You don't need to calculate the cost of products to measure the impact of a decision on the company's NP and ROI.

How throughput accounting can help

Now let's look at two simple examples that show how TA can help managers make good decisions (decisions that will increase the company's profitability).

Example A: Increasing a Local Efficiency

Let's analyze the situation of company XYZ. The demand for its products has gone down, which has caused it to have idle capacity in all of its resources, and it is starting to lose money. Almost all organizations have been here at least once. One of the most common decisions companies ponder in this situation is how to reduce the cost of some of the products they are producing. The logic is that if a company reduces the cost per unit of some of its products, its profitability will increase.

XYZ is thinking of investing \$1,000 to increase the efficiency of an activity where a family of products is produced. By doing so, it will be able to reduce the direct labor in that activity and transfer a worker to another activity. That is, with this investment the activity will be able to process its products with less effort, so the products' cost will go down.

Using TA to evaluate this decision, let's answer the three questions:

(1.) What impact will this decision have on the company's throughput?

As this company already has idle capacity everywhere, increasing the efficiency of one activity won't have an effect on throughput. Nor will transferring a worker someplace else. Thus, the company's total throughput will stay the same.

But this doesn't mean that the company's profitability will stay the same. Remember, we have to answer all three questions in order to know what the impact on the company's profitability will be. The net profit formula is  $T - OE$ . If T hasn't changed, we can still increase NP by decreasing OE. So let's answer the second question.

(2.) What impact will this decision have on the company's operating expense?

Here we have to see if we'll be able to reduce the company's operating expense by increasing the efficiency of this activity. Will we fire anyone because of this decision? Will we reduce the rent on one of our facilities because of this? Things like that.

In this case we didn't fire anyone, but we transferred a worker to another activity, so the company's operating expense won't be reduced. Yet we can't forget that we need to invest \$1,000 to have the increase in efficiency, so OE goes up because of the depreciation of this investment. Suppose the depreciation rate is 10% a year. OE goes up by \$100 a year. This already points out a paradoxical situation where we reduce the cost of some products while we increase the company's total cost at the same time.

If throughput will stay the same and operating expense will increase by \$100, XYZ's annual net profit will decrease by \$100. The company's loss would increase. But let's answer the last question to see what the impact on the company's profitability will be.

(3.) What impact will this decision have on the company's investment?

Will XYZ be able to sell an asset (like a warehouse or a machine) because of this decision? Even though more idleness will be associated with the activity, we won't be able to reduce the activity's capacity because we can't sell less than 100% of the asset. If this is the case, the company's investment will increase \$1,000.

Thus, our net profit will fall by \$100, and our investment will increase by \$1,000. This is clearly not a good decision.

## Example B: Reducing Cost per Unit

Another improvement some companies try to make in such a situation is to use their resources to the maximum so that they can have a lower cost per unit. That is, they will produce everything they can so that they can spread their manufacturing costs among as many units as possible. This will certainly reduce the cost per unit and reduce idleness, but will it increase the company's profitability? Let's use TA to see.

(1.) What impact will this decision have on the company's throughput?

If the company produces more than it can sell, this won't increase its throughput. Therefore T will stay the same.

(2.) What impact will this decision have on the company's operating expense? If XYZ produces more than it can sell, its OE will go up because its inventory will increase, and, consequently, its carrying costs will go up. Here we have the same phenomenon of decreasing the cost of products and increasing the company's total cost at the same time.

(3.) What impact will this decision have on the company's investment?

Its investment will go up because the company will increase its inventory of finished goods and work-in process in order to keep its resources busy and distribute its manufacturing costs among more products.

T will stay the same, but OE and I will increase. Therefore, we can say that this decision will reduce the company's profitability even though it has reduced the cost per unit. This example illustrates how allocating costs to products will many times lead to wrong decisions.

## Basic misunderstandings

Now that you've seen a basic overview of TOC's management accounting system, let's address some of the most common misunderstandings surrounding it.

Throughput Accounting is the same as variable costing.

Variable costing calculates the contribution margin of products, which is usually the price minus direct materials and direct labor costs. It also considers all other costs as fixed and thus is considered a short-term management tool.

The contribution margin calculation is quite similar to TOC's throughput measurement. The difference is that TOC doesn't state a priori what should be included in the throughput calculation. What it says is that throughput is price minus totally variable costs. What a TVC is will depend on the company's reality. Direct materials are the most common example, but, in some circumstances, direct labor can be a TVC if it is paid per part produced.

The biggest differences are that variable costing considers other costs as fixed and TA doesn't and that TA looks at the impact a decision will have on its three global measurements. Direct costing doesn't look at the impact a decision will have on the company's throughput.

There is a physical constraint.

Some critics of TA say that one of its assumptions is that there is a physical constraint--a bottleneck--for each product. This misunderstanding probably comes from the fact that **TOC** started as a production scheduling methodology that focused on identifying and exploring bottlenecks. But **TOC** has evolved, and one of its basic assumptions is that every company has at least one constraint. The constraint doesn't need to be a physical one, like a bottleneck--it can be a marketing constraint, i.e., the company doesn't have enough demand for its products.

With or without a physical constraint, TA looks at the impact a decision will have on its three global measurements. Answering the three questions will still show the impact a decision will have on the company's profitability, with or without a physical constraint.

Operating expense is a fixed cost.

"In this view, operating expenses are unrelated to decisions made about products sold and customers served; some would call them fixed costs." So said Robert S. Kaplan and Robin Cooper in their book *Cost & Effect*. This is probably the most common criticism about Throughput Accounting. That is, many people believe one of TA's basic assumptions is that most costs are fixed. This is part of the same misunderstanding that confuses TA with variable costing.

**TOC** doesn't assume that operating expenses are unrelated to decisions made about products sold and customers served. First of all, as we've seen, **TOC** doesn't assume that operating expense is fixed. It assumes that it isn't totally variable and that the time to analyze increases or decreases in OE is when we make decisions because decisions make costs vary. We have to analyze each decision by considering its impact on the three measurements of throughput, investment, and operating expense.

Again, Throughput Accounting's main objective is to answer all three questions. If TA assumed that OE was fixed, it wouldn't have to answer the question: "What impact will the decision have on the company's OE?"

TA is for the short term only.

Because of the misunderstandings regarding TA and variable costing and the assumption that OE is fixed, many people say that TA is good for short-term decisions but not for long-term decisions.

TA can be used for both. Whenever we are answering the three questions, we are, at least implicitly, determining a time frame for the analysis. Thus, all we have to do to use it for long-term decisions is to answer the three questions with a longer time horizon in mind. Example: What is the impact this decision will have on the company's T, OE, and I in the next five years?

But we need to know where the company does and doesn't have flexibility to increase volume and or variety of products. This is something that **TOC** and Lean are quite good at, and neither of them allocates costs to products to do this.

WHAT'S IN A NAME?

One way of helping to defuse these misunderstandings is to change the name of the methodology. The name Throughput Accounting makes you think that it focuses only on throughput and disregards other important variables--that is, it assumes expenses are fixed. This name was probably given as a counter position to cost accounting and to emphasize that throughput is the most important avenue for improvement.

I believe Three-Questions Accounting (3Q Accounting) is a better name because it shows that we need to answer the three questions to judge if a decision is good for a company. And this is exactly what **TOC**'s management accounting system does.

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Throughput Accounting at FIAMA

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By using Throughput Accounting, FIAMA is operating with new and more flexible commercial policies, which allows it to compete with its Asian competitors in the world market. To develop these new policies, the company didn't have to use the cost of products or their margins. The focus of its decisions was always the impact on the bottom line, using TOC's three measures: throughput, operating expense, and investment. Let's take a look.

FIAMA is a family textile business that was founded in Brazil on May 30, 1961, as a printing service provider. After a few years it expanded, specializing in the manufacture of artistic and decorative fabrics. Its slogan is "Expression in Fabrics."

Over the years the company has increased and modernized its industrial complex, investing in the weaving, printing, and finishing areas. In 2002, FIAMA received Brazilian and British NBR ISO 9001:2000 certification for its Quality Management System. This increased its market credibility even more.

The company's main markets are hotels, retail, wholesale, furniture, and decorators, and it sells through its chain of distributors in Brazil, Mercosur, the U.S., and Europe.

One of the company's core products is Chenille, a yarn that's used in the production of fabrics for decoration, such as upholstery, curtains, and bedspreads, and which is made in a process that uses two or more yarns to make one single yarn, the Chenille.

The Chenille production process at FIAMA goes through five steps:

- (1.) Purchase of yarns;
- (2.) Production of the Chenille on the Chenille machine;
- (3.) Production of the fabric in the weaving area;
- (4.) Dyeing, printing, and finishing; and
- (5.) Shipping.

The company has estimated that to meet an increased demand for its fabric, it would have to produce 21,000 kilos of Chenille (about 94,500 linear meters of fabric) monthly, but it doesn't have enough capacity to produce this amount. The Chenille machine has a capacity of 13,000 kilos per month.

Because the company wanted to take advantage of this opportunity to increase its sales, it analyzed two alternatives to outsource part of the Chenille production process.

The first alternative was to outsource step 2, that is, buy the yarns and outsource the production of the Chenille yarn. The second alternative was to buy the Chenille yarn already made (outsource steps 1 and 2). Whichever alternative it selected, the company would still handle steps 3, 4, and 5.

## Analyzing the alternatives

FIAMA used Throughput Accounting to analyze both alternatives, estimating the impact each one would have on throughput, operating expense, and investment. Chenille yarn is used in many of the company's products, but to keep FIAMA's data confidential and to simplify the explanation of the concepts in this article, I created an average Chenille product on which to base the analysis.

Table 1 shows the impact of these two alternatives on throughput.

## Impact on OE

Whatever the outsourcing alternative chosen, the company won't need to hire anyone. As a matter of fact, the company estimates that it still won't be using all of its available capacity in the other steps of the process. Therefore, there should be no big increases in operating expenses. To be conservative, the company estimated an R\$15,000 month increase in OE for both alternatives. (R\$ is the symbol for the real, the Brazilian currency. There are more or less 2.1 reais for one U.S. dollar.)

## Impact on Investment

The company estimated that there would be no significant impact on investment.

## Answering the Questions

Table 2 shows the impact the two alternatives would have on the company's profitability.

As you can see, both alternatives increase the company's profitability. But alternative 1 is better because it has a lower TVC and thus a higher throughput per unit. Therefore, the company should use alternative 1 to outsource part of the Chenille production. FIAMA should use alternative 2 only if alternative 1 can't supply all 36,000 meters needed.

Table 1: Impact on Throughput

### Average Product

	CURRENT	ALT. 1	ALT. 2
Price/meter	R\$10.26	R\$ 10.26	R\$ 10.26
TVC/meter	R\$ 5.56	R\$ 7.39	R\$ 8.38
Throughput/meter	R\$ 4.70	R\$ 2.87	R\$ 1.88
Extra production (meters)		36,000	36,000
Extra throughput/month		R\$103,320	R\$67,680

R\$ is the amount in Brazilian reais.

Table 2: Impact on Company's Profitability

	ALTERNATIVE 1	ALTERNATIVE 2
Impact on Throughput	R\$103,320	R\$67,680
Impact on OE	R\$ 15,000	R\$15,000
Impact on Net Profit	R\$ 88,320	R\$52,680

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