

# Never say I know



**Developing a  
complete and  
effective TOC  
decision support  
process  
based on Throughput  
Accounting**

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# The need

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- ⦿ How decisions regarding new opportunities in the market are made today?
  - Fully based on the **intuition** of Sales and top management?
  - Based on the cost-per-unit?
  - Based on T/CU?
  - Based on detailed calculations of both the financial and the capacity aspects?
    - Considering that capacity aspects might impact the financial results.
- ⦿ How many market opportunities are not even checked because they are out of the boundaries of the current intuition and thus look risky???

# For example

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- ◎ A large potential client gives you an offer for monthly delivery of several products. The snag is that the client is ready to pay 15% less than your normal price.
  - Overall the monthly total quantity would add 13% to the revenues and require, on average, 15% of the total available capacity
  - A detailed capacity calculations revealed that from the five critical work centers the additional capacity is:
    - M1 needs 7% to process the everything for the new offer.
    - M2 needs 21%, M3 needs 11%, M4 needs 18% and M5 needs 6%.
    - Currently M3 is the weakest link. Currently it is loaded to 93% of its available capacity.
- ◎ **What additional information you need to make the decision?**

# Back in 1983

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- Goldratt created huge controversy in APICS when he said:

## **Cost Accounting is Enemy no 1 of Productivity**

- The statement, even though backed up by logic and examples, created huge resistance
- Because, product costing was, and still is, **the most common way to make decisions**, especially in manufacturing
  - It has somewhat less obvious impact in services, but if you look hard enough – it is there as well

# The ultimate flaw of all Cost Accounting

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- ◎ All cost accounting methods assume that any utilization of capacity carries the cost of maintaining that capacity
- ◎ The hidden (flawed) assumption of cost-accounting is:  
**It is possible, at least in the long time period, to match capacity to demand**
- ◎ Three reasons why the assumption is invalid:
  1. In order to have predictable performance most resources must have excess (protective) capacity
  2. Purchasing capacity is possible only in certain **sizes**
    - that could be quite large
  3. Market demand changes faster than the ability to change the capacity levels

# Throughput – what the organization strives to generate as much as possible

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- ⦿ Throughput, T, is defined as the rate at which the organization generates goal units
- ⦿ The deeper interpretation of T is the measurement of **added value** created by the organization
- ⦿ When the organization is for-profit then the definition of T is money and then the definition becomes:

**The revenues minus the truly variable costs (TVC) per single sale**

- ⦿ This definition of T makes it similar to the definition of contribution, but there is one critical difference:
  - Usually the direct labor is NOT part of the truly variable costs!

# The cost of generating T

- ⦿ While T measures the flow of value generated into the organization – it is NOT the PROFIT
  - Even when we measure the T of a specific delivery – the T is just the amount of added-value due to the delivery
- ⦿ **I** for “Investment”: The capital that has been invested in the infrastructure to enable it to generate T
  - “The money tied up in the organization”
- ⦿ **OE** measures the expenses that are not included in the TVC
  - Expenses/costs that serve the needs of more than a single sale
- ⦿ I and OE are always expressed in money
  - Even when the T, for not-for-profit organization is expressed as another entity

# The basics of the TOC decision support

- There are cases where a decision might impact both the T and the OE, as well as impacting the 'I'
- The TOC decision criteria is:

$$\Delta P = \Delta T - \Delta OE \text{ must be positive}$$

- Note, the above term is 'holistic' in the sense that it expresses the delta-profit for the whole organization
  - It includes all the direct and indirect impact of the decision on the bottom line
- When the 'I' is also impacted by the decision, then  $\Delta T - \Delta OE$  per period represents the resulting payments and they must compare to  $\Delta I$



# The basics of the TOC decision support

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- ◎ The impact of a decision on  $\Delta T$  is:
  1. The direct T generated by the subject of the decision that is added to the total T
  2. T that might be lost (or gained) due to the above decision
- ◎ When a capacity resource constraint (CCR) is active, then T is lost due to the capacity limitations of the CCR
- ◎ In this case, the **T per constraint unit** is a relative measure of the exploitation of the CCR
  - This is called **T/CU**
- ◎ The **T/CU** is used to measure the effectiveness of the product mix and whether it could be improved

# The distinction between TOC and marginal costing

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- ◎ Marginal costing is a costing methodology that looks for the net contribution (T) to base a short-term decision
  - Let's ignore possible differences in treating direct labor as TVC
  - There are two clear differences in approach:
    1. Marginal costing do not **actively look for capacity profiles** and they lack the tools for that
      - Which means they do not look for the possible loss of existing sales or the real costs of purchasing quick capacity
    2. TOC uses T as **a key measurement** which the organization likes to maximize
      - Thus, reducing prices is very carefully checked because their direct impact on T is significant
      - Salespeople should be measures according to the real delta-T they generate and not according to sales

# The current limitations of Throughput Accounting

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- The current spread understanding of TA is based on the following logical statement:

Product mix decisions are impacted by the capacity availability of only **ONE** critical resource (the CCR)

- Really?
- Technically TOC never said there is only ONE constraint
  - It only claimed that having more than one **interacting constraints** cause unstable performance
- When we contemplate a “large decision” we need to consider the option that another resource would become either **an interactive constraint** or even **a bottleneck**

# The problematic nature of T/CU

- Throughput per constraint-unit (T/CU) expresses the profitability of a product/deal relative to others
- However, this is true only when the following two necessary conditions apply:
  1. There is an **active internal constraint and only one**
  2. **The decision** under consideration **is relatively small** and thus would not cause another constraint to emerge
- Thus, in most cases we cannot use T/CU as a simple tool to determine whether a certain deal, client or market segment are worth to go after
- The dependable tool is to calculate the resulting

$$\Delta T - \Delta OE$$

# Estimating $\Delta T - \Delta OE$

- ◎  $\Delta T - \Delta OE$  of a specific deal is the result of the change in the bottom line when we add the deal to all the other current sales
  - Both  $\Delta T$  and  $\Delta OE$  represent the total changes to the T and to the OE as a result of adding the deal under consideration
    - This means that T lost due to lack of capacity taken by the deal is included in the  $\Delta T$
    - And the real cost of adding capacity required for the deal is included in the  $\Delta OE$
- ◎ In order to calculate the  $\Delta T - \Delta OE$  we need to consider all the current T, generated by the current sales, the current level of OE and the capacity status of all resources

Can we do it?

# Updating a key TOC paradigm

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- ⦿ Instead of checking the capacity of just **one resource**, let's treat a small group of **critical resources** and watch their **capacity profile**
  - The total load of all the demand versus the available capacity
  - A critical resource is a resource that might become a capacity constraint if and when the product mix changes in a certain way
  - Only few critical resources exist in any organization
  - We'd need good enough data of those few resources to support fair assessment of the required capacity for a certain product mix
- ⦿ We assume we are able to roughly assess the required protective capacity of the weakest link and then the protective capacity of the other critical resources that ensure smooth operations

# Some new insights

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- ◎ Many decisions could be justified based on its impact on the bottom line (T-OE) – **simulating the impact of the decisions as being added to the current state of sales**
- ◎ For that we need the support of an IT structure
  - The IT should have the current **sales profile** for the considered period – calculating the total T to be generated when we simply continue what we do now
  - The IT support should consider the **capacity profile** for the critical resources supporting the sales profile
    - Making sure the minimum protective capacity is available
  - We need **to consider the cost of adding capacity**
    - Taking into account the **minimum chunk of capacity that can be purchased** within the realistic time frame

# Creating the platform of decisions

- ◎ **Computers should not make the decisions for us!**
  - We need the intuition and knowledge of the key people
- ◎ The process involves the top management team gathered to make periodical decisions using computerized support
  - The decisions involve priorities on product mix, pricing and capacity management
  - The software should be able to process various “what-if” scenarios in seconds and come up with T-OE and  $\Delta I$ 
    - Based on the sales profile provided for checking
  - Generates the resulting capacity profile of the critical resources along their deviations from the protective capacity limit
- ◎ The top management team should include, at the very least, the head of Sales and the head of Operations



# Products and T-generators

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- ◎ The term “Product” has two different perspectives:
  1. The outcome of operations: it requires capacity from various resources and also truly-variable-costs (TVC), namely the cost of materials
  2. Whatever is sold by the organization. It could be any “package” of products, plus additional services.
- ◎ I call “Product” to any output of Production
- ◎ I call “T-generator” what is eventually sold
  - Each T-generator has a price tag
  - And a list of the products that comprise the T-generator

# The decision making process

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- ◎ The reference for decisions is the current state:
  - The predicted sales in the next period without taking any new initiatives
    - This is a forecast based on the sales of last period possibly with some modifications
    - The software should calculate the total T for it
    - The level of total OE is given by Finance
  - The capacity profile for the predicted sales
    - The total load, given the amount of sales, for each of the critical resources
- ◎ Every new idea is checked by adding or changing some T-generators relative to the reference
  - Where the software calculates the impact of T and on capacity

# Continuing the decision making process

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- ⦿ The capacity profile for the critical resources points to deviations from the minimum protective capacity
  - We use two parameters for the minimum protective capacity
    1. % of the protective capacity for the weakest link
    2. % of the protective capacity for the rest of the critical resources
- ⦿ When the additional idea does not penetrate into the protective capacity then the obvious criterion for including the new idea is having positive  $\Delta T$
- ⦿ What if there is penetration into the protective capacity level?
  - One option is to reduce the sales of something else that is included in the updated reference
  - Another option is to add capacity, which would add  $\Delta OE$

# Adding capacity

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- ◎ Capacity can be added in several ways
  - Overtime, additional shifts, outsourcing and purchasing more units of the resource
- ◎ Every mean of adding capacity can be done only in multiples of certain minimum quantity
  - So, every addition of capacity could be more than what is required for the idea under consideration
  - Which then opens the door for more ideas that might use that capacity
  - Eventually it is the changes of capacity that generates  $\Delta OE$
  - And the resulting decision criterion is  $\Delta T$  minus  $\Delta OE$

# Back to the example

- ◎ Suppose the following information is calculated:
  - $\Delta T$  of the monthly delivery of the offer is +10% before considering giving any other current demand
  - The load before the offer on the five work centers are:
    - M1: 78%, M2: 84%, M3: 93%, M4: 79%, M5: 85%
  - Adding the offer without giving up any demand would load the critical five work centers to:
    - M1: 85%, M2: 105%, M3: 104%, M4: 97%, M5: 91%
  - The minimum protective capacity levels we assume we need are 5% for the CCR and 10% for non-CCR
  - Suppose reducing other demand to bring the capacity profile to the accepted levels would reduce the total  $\Delta T$  to +1%

# Continuing the example

- Looking at ways to increase capacity for M2, M3, M4 and M5 would cause  $\Delta OE$  that is equivalent to 9% of the current T.
- Eventually we could find a way to reduce some demand of 2% of the current T, while increasing capacity to cause  $\Delta OE$  up by the equivalent of 3% of the current T.
  - This would mean that  $\Delta T - \Delta OE = +5\%$  of the current T
  - So, under this information we should accept the offer and get +5% addition to the profit before tax!
  - If now, before the offer  $T - OE = (5\%$  of the current T), then we actually have doubled the profit!

# Dealing with uncertainty

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- ◎ Uncertainty impacts especially the Profile of Sales
  - Because we naturally consider forecasted sales
- ◎ Uncertainty also impacts the assessment of capacity
  - Not always we have very deterministic numbers for capacity
  - The minimum level of protective capacity of the “weakest link”, ensuring reliable delivery, is also impacted by uncertainty
  - And the minimum protective capacity for other critical resources
- ◎ Direction of solution: a process of running **two different scenarios** at each such meeting:
  - A **reasonable optimistic scenario** and a **reasonable pessimistic** one
  - The two scenarios would point to different preferred decisions
  - Then the final set of decisions would be determined, taken the risk and opportunities into account

# What value we'd achieve?

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- ◎ Encourage Sales and Operations to check many additional ideas, including some that look risky until they are properly checked
  - Matters like selling most of the production through promotions deserve to be properly analyzed
- ◎ Raising TOC to the daily attention of top management
  - The platform is a necessary complimentary part of the S&T
    - Analyzing the various market segments and justifying the growth
- ◎ Creating hand-shake between Sales and Operations
  - Creating the platform where Sales and Operations fully understand each other
- ◎ Leading the whole organization to handle uncertainty