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

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Supporting TOC implementations worldwide



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About Eli Schragenheim:

Eli used to be a TV director

He supports TOC implementations worldwide through emails and Skype

He is serious about developing the knowledge on how to deal with **common and expected uncertainty**

Also developing the Business Intelligence in the TOC Way

And mainly: **how to improve the capability of any manager in the world who is ready to learn**



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The need

- 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

- 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

- 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

- 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



The current limitations of Throughput Accounting

- 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 **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 ΔT and ΔOE 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 ΔT
 - And the real cost of adding the required capacity for the deal is included in the ΔOE
- 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

- 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

- 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 ΔI
 - 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

- 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

- 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
 - The software calculates the impact on the bottom line considering the new total T, the OE and the impact on the capacity profile



Continuing the decision making process

- 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 ΔT
- 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 ΔOE



Adding capacity

- 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 ΔOE
 - And the resulting decision criterion is ΔT minus ΔOE



Back to the example

- Suppose the following information is calculated:
 - ΔT 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 ΔT to +1%



Continuing the example

- Looking at ways to increase capacity for M2, M3, M4 and M5 would cause ΔOE 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 ΔOE 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

- 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?

- 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