

Measurements for Support Groups in the Supply Chain

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"Tell me how you measure me, and I will tell you how I will behave. If my measurements are not clear, no one can predict how I will behave – not even me!"

Dr. Eli Goldratt

Introduction

An internal supply chain exists within one organization. An external supply chain includes multiple organizations. This paper discusses the measurements across the broader supply chain, including both internal and external supply chains.

One main purpose of any measurement system in a supply chain is to motivate the parts to do what is good for the system as a whole. In today's global economy, we often find that a measurement system must do more than drive Company A to be better than Company B. Supply chains are now competing with each other to capture markets. Therefore, an effective supply chain measurement system must address how to help the supply chain achieve its overall goals and satisfy the end customers and markets, better than competing supply chains.

This paper explains and also supplements information in the text *The Haystack Syndrome*, by Dr. Eli Goldratt and information in the *Theory of Constraints Self Learning Program* CDs on Finance and Measurement and Distribution (see www.eligoldratt.com).

The Goals of the Supply Chain

For most supply chains, there are three global indicators of how healthy the supply chain is and how much it has improved or deteriorated over time. Selling goods or services from one part of a supply chain to another, without the end consumer having bought, may appear healthy to some parts of the supply chain at a point in time. However, if goods are stuck within a supply chain, and the end consumer does not buy those goods at all or quickly enough, the situation is not healthy.

Therefore, the three indicators are:

- **Throughput** – The rate (usually expressed in dollars or currency) at which the system generates goal units. In a supply chain, the goal unit is expressed as revenue collected from the end consumer minus the cost of raw materials. Note that throughput is not recognized until the end consumer has bought a product. *Conceptually, as long as the end consumer has not bought the product, no one in the supply chain has sold.* Since Throughput represents how much money the supply chain has generated in a given period (after the supply chain has paid outside vendors) it is the goal of the supply chain to increase Throughput, both in volume and in rate per time period.
- **Inventories / Investment** – In a supply chain, it is important to have the right inventory in the right place, matching consumer demand. If there is too much inventory,

the carrying costs increase across the supply chain and obsolescence costs increase. For some supply chains, there is a more serious negative consequence of too much inventory. The greater the inventory in the supply chain, the longer it takes to introduce new products (replacement products) and the greater the potential losses as distributors and retailers initiate discounted prices to get rid of the old products as quickly as possible. This is true of packaging materials as well as product content. If a supply chain has too little inventory, or inventory in the wrong places (not matching consumer demand correctly by geographic location), stock-outs occur and ultimately, sales might be lost to competitors. Therefore, the goal of the supply chain, relative to inventory, is to continue to improve its ability to match supply with end user demand, while decreasing the amount of inventory in the overall supply chain, at least relative to Throughput.

- **Operating Expense** – Each organization in the supply chain incurs operating expenses as it transforms materials into products for the end consumer. Operating expenses consist of salaries, depreciation expense, supplies, etc. – all of those expenses incurred within a fiscal year outside of raw materials, purchased parts or expenses that vary directly with production (those product expenses are included in the Throughput calculation). The greater the operating expenses, the more profit each entity needs to generate in order to cover their overheads and continue to exist. Conversely, the lower the operating expenses, the more flexibility the supply chain has to sell the products at attractive prices to various markets and continue to generate profits for the supply chain. Therefore, the goal of the supply chain is to reduce operating expenses relative to Throughput.

Goals and Measurements of Supporting Departments Within a Supply Chain

In an excellent supply chain, products arrive, with perfect quality, just in time to match end consumer demand at each geographic location. If one department in one company does not do their needed work on time or does the work incorrectly, the supply chain fails to generate the needed Throughput. Further, the worse and the more frequent the failure, the greater the risk of losing customers permanently. Consumers have a limited tolerance level for failure. For certain products, the tolerance implies not just that a product is not available on a shelf, or that a product had to be returned, but for how long the product is absent (the duration of the absence).

In many supply chains, the end product has a high price tag (thousands or hundreds of thousands of dollars), while some components have minimal cost (dollars or even pennies). If the unavailability of a \$1 item from one company is holding up the shipment of a \$25,000 item, the supply chain measurement system must drive the supplier of the \$1 item to treat this shortage valued at the \$25,000.

There are two key measurements to drive any support organization within a supply chain to do what is good for the supply chain as a whole:

1. Throughput \$ Days (Late) – This measurement multiplies the late throughput, valued at the point of end consumer sale, by the number of days that the throughput is late. The objective is 0.

2. Inventory \$ Days – This measurement multiplies the value of the inventory within the supply chain (at raw material cost) by the number of days that the material is held within the supply chain at any level. The objective is to reduce, without negatively impacting Throughput \$ Days (late).

Throughput \$ Days (Late)

For example, assume that each organization within a supply chain gets a daily or weekly report showing Throughput \$ Days (late) from the next link down in the supply chain. Such a report tells each organization the magnitude of a problem order to the supply chain and how to prioritize their actions.

Company A manufactures a \$1 shear pin that is used in the manufacture of a transmission by Company B. Company B ships their transmission to Company C, a major automotive manufacturer. If Company A is 1 day late with an order of 100 shear pins, they might ordinarily look at this order as unimportant, since it only represents \$100 to them. However, each shear pin is holding up a \$25,000 sale at the end consumer level, representing \$20,000 Throughput to the entire Supply Chain. Company A receives a report showing \$2,000,000 Throughput \$ Days for the shear pins ($100 * \$20,000$). Now, Company A understands the importance of this order and how to prioritize their efforts.

If the same order is late for a second day, the report would show \$4,000,000 Throughput \$ days ($100 * \$20,000 * 2$). The amount will continue to increase until this order is satisfied.

Another example deals with quality problems. If company A, in the above example, ships the shear pins on time, but a quality problem shows up in the automotive manufacturer on the day the shipment is due, the transmissions are returned to Company B. Company B now has \$2,000,000 Throughput \$ days assigned to them – the order is now late. It is a hot potato for them. They examine the transmissions and determine the problem is with the shear pins. The Throughput \$ days are now assigned to Company A, and will stay with them until the problem is resolved.

If the problem requires another 2 days to resolve, and company A ships the corrected shear pins to company B, the order now, which is now 3 days late, has an assigned Throughput \$ days of \$6,000,000 ($3 \text{ days} * \$2,000,000$). It is an even hotter potato for Company B.

Similarly, if the problem resides with a materials or packaging supplier to Company A, the procurement department in Company A has the hot potato until the problem is resolved.

By combining both dollars and days in this measurement, the supply chain is more likely to retain customers by avoiding long stock-outs and long repair periods for quality problems. In order for Throughput \$ days to be effective, the members of the supply



chain must agree to use this measurement to drive priorities throughout the supply chain.

Inventory \$ Days

This measurement is secondary to Throughput \$ Days late. Therefore, it is very important that reductions in supply chain inventory do not cause problems in missing orders. Some inventory is necessary in the supply chain as protective capacity against Murphy – fluctuations and problems in transportation, manufacturing and end customer demand.

By making this a supply chain measurement, rather than an individual entity measurement, the behavior within the supply chain drives a holistic result. For example, the correct distribution of inventory within most supply chains is to hold the most inventory where the forecast is most accurate and the fluctuations are smallest. This implies that most inventory should be held at or close to the manufacturer, with smaller inventories at the distributor and smallest inventory at the source closest to the end customer.

Today, many organizations within a supply chain try to reduce their inventory investment by pushing the inventory on to the next link in the supply chain. They can then claim this as a “sale” on their books. However, this behavior hurts the performance of the supply chain in terms of both total inventory carried within the supply chain and stock-outs.

Therefore, as with the Throughput \$ Days measurement, agreement is needed across all supply chain organizations to look at the overall inventory rather than an individual organization’s inventory.

Conclusions

There are two key measurements in any supply chain - *Throughput \$ Days* and *Inventory \$ Days*. These measurements can be effectively used within a supply chain to cause any part of the supply chain to behave according to what is good for the supply chain as a whole. To work, these measurements must be agreed to by all members of the supply chain. Further, when applied with correct and timely reporting, the two measurements will cause appropriate behavior to deal with late orders, quality issues, rework, obsolescence, introduction of new products and many other supply chain challenges. Any supply chain can easily suffer from the silo mentality, where each organization tries to optimize its own results at the expense of other partners in the supply chain. By putting holistic measurements into place and gaining the agreement of all member organizations to abide by them, the result is a supply chain with a better chance of winning in the long term against competing supply chains.

IDEA’S WAY OF THINKING

- Neither an accurate forecast nor changing vendors is required for success
- There is a way to both increase sales and reduce inventory
- Supply chains sell less when clogged with inventory
- In the long term, unless the supply chain sells more no link can sell more

IDEA’S METHOD

- Verify the existence of inventory imbalances and the benefits of moving from a “Push” to a “Pull” system
- Gain top management buy-in to the assessment and support of the approach
- Build knowledge and understanding across the supply chain, at all levels
- Utilize systems that deliver actionable information, integrated with existing software



