

Could Your Organization Use a Competitive Advantage?

Total Cost of Ownership (TCO) and Lean Might Help

By Drew Locher

My Introduction to Outsourcing

It was nearly 7:00 PM on this evening in 1985, and I was waiting in the machine shop for attendees to arrive to a meeting that I had scheduled. It was an eerily quiet shop filled with what was for the time state-of-the-art precision machine equipment. For several weeks leading up to the meeting, I had heard from multiple people about a second shift in the machine shop that was eliminated. People explained how many parts were now being supplied by outside suppliers instead of being fabricated in-house: “They say it is cheaper to purchase them, when they did the ‘Make/Buy’ analysis.” The attendees to the soon-to-convene meeting were the various Cost Account Managers who dutifully conducted these analyses on a part-by-part basis. I had reviewed several of these analyses, and I had a few questions. Now, I was knowingly stepping out of my area, a manager with an engineering background questioning accounting analyses, but something just didn’t seem right. I understood labor and material costs. In each analysis, however, I noticed what was referred to as a “burden rate.” For each dollar of labor, a factor of nearly four was added. It was explained to me that that was how overhead expenses were accounted for in the analysis.

This large factor was not uncommon for an Aerospace business with thousands of engineers, government liaisons, and large administrative staffs in its employ. I understood we had significant overhead expenses, but the vast majority of them would remain unchanged if we purchased all of these parts instead of producing them in-house. The only overhead really impacted would be utilities and the second shift supervisor’s salary. Engineers would still have to support the design and fabrication of the parts, but now they would have to travel to suppliers and incur the associated costs. “Yeah, I see what you are saying, but that is how corporate told us to do it” (with regard to the Make/Buy analysis), they replied after hearing my question regarding burden rates. This would be my first foray into the world of “outsourcing.” I would have many opportunities in the years to come to work on outsourcing issues with organizations in many industries and products. This includes “offshoring,” which began in the 1990s with companies choosing to source parts and products from low-wage suppliers from this hemisphere and halfway around the globe.

For the most part, companies have been performing such analyses incorrectly for decades, and continue to do so today. Variations of burden rate costing act to inflate the actual cost. This can lead to erroneous sourcing decisions. I have seen this for castings and

forgings, even furniture and garments. In some cases, “re-shoring” was accomplished when the proper analysis was completed. That analysis is today called “Total Cost of Ownership.” Unfortunately, many more companies chose to “stay the course” in spite of that, and not veer from what was a huge decision at the time to source globally. Typically, major investments had already been made: foreign offices to oversee suppliers in far-away lands, substantial transfer costs, and inventory build-ups to cover the lengthy lead times involved when bringing parts and products from the other side of the globe. Total Cost of Ownership analysis should be done periodically as various costs can change over time. The “decision point” can move as transportation costs increase, or as labor and other costs increase in low-wage countries.

Inventory – one of the “lean wastes.” There is the one-time investment to initially build up the inventory. The cost of carrying inventory is also a consideration in a Total Cost of Ownership analysis. Traditionally, organizations use a far lower figure than what it really is – 10 to 30% lower – depending on the industry. A calculation of the amount of inventory required to maintain particular levels of customer service can be made. Such calculations are done when implementing pull systems at a point within or throughout a supply chain.

Pulling it Together

Numerous people have told me over the years that *pull systems* really brought together for them a lot of the *operational excellence, world class, or lean* concepts. They are all about Flow. Where we can’t flow, we do the next best thing: pull. There is a misunderstanding among some that offshoring is a lean concept. Nothing is further from the truth. Shorter lead times, less but uninterrupted inventory supply, greater supplier reliability – these are lean concepts. Offshoring is counter to all of them.

The calculation of required inventory is an algebraic equation, which, in its simple form, is:

Inventory (max) = Lead Time + Safety Stock + Order Quantity

The equation, in some form, can be used at any point of the supply chain. A manufacturer uses it to calculate the amount of finished product it must maintain to keep customers satisfied. The same manufacturer can use it to determine the amount of purchased material it needs to stock.

Lead time is the time from when replenishment for an item is identified as needed to when the material is available for

consumption. Clearly, offshore suppliers have longer lead times than local suppliers. Safety stock includes an amount of inventory to buffer supplier reliability issues. Longer supply chains tend to have greater reliability issues. Safety stock is also used to buffer short-term demand increases. A desired service level is agreed upon and is factored into the statistical-based safety stock calculation. Higher service levels, 98% instead of 95%, for example, require more inventory to better insure uninterrupted service. Now, we cannot buffer for all possible occurrences, such as rare global events, but we can buffer for more common factors.

Order quantity is interesting. Its value can be a simple “minimum order quantity” that a supplier requires. For a manufacturer that is stocking finished goods to service its customers, it is a more involved calculation. It takes into account the demand on the equipment or process that makes the product. It factors in planned and unplanned downtime of the equipment or process as well as quality performance. And very importantly, it factors in set-up or changeover time. Together, a capacity-based order quantity can be calculated. Something similar might be used by suppliers to determine the minimum order quantity they require of their customers. I’ve worked with manufacturers who partnered with their suppliers to teach them to calculate minimum order quantities as well as the improvement opportunities that become apparent during the analysis.

Order quantity is a function of: scheduled hours, demand, planned and unplanned downtime, quality, changeover time.

The calculation determines how many changeovers are possible in a period of time (day, week, month, year), which in turn determines the order quantity. Frequent changeovers allow for *smaller* order quantities and *less* inventory. They can also help reduce lead time as the supplier can be more responsive. Of course, the opposite is true as well. Infrequent changeovers result in larger order quantities, more inventory, and greater lead time, thereby requiring still more inventory to maintain service levels. Order quantity can have a significant impact on inventory.

That last point needs to be further explored. How can we find the capacity to do more frequent changeovers? Where are we losing available time, and how can we regain time? Well, various lean tools can really help.

Lean Provides Some Solutions

A closer examination of what determines order quantity for a part or product shows the improvement opportunities available. Let’s begin with unplanned downtime. Effective Total Productive Maintenance (TPM) practices can increase equipment availability. For reliability issues, it can also reduce the amount of safety stock needed to buffer. TPM consists of: preventive maintenance, operator assisted or autonomous maintenance, predictive maintenance, and productive maintenance. Many organizations are just scratching the surface with regard to their equipment reliability practices. Short term thinking is often the culprit. Organizations lose sight of the *value* of the equipment time and choose to forego short-term investments to improve and maintain reliability.

How is your equipment reliability? Are you making a sufficient investment in TPM?

Quality. Producing bad parts or products consumes capacity just like producing good ones. If poor quality performance exists, it must be addressed. Basic quality Management principles, standardized work and proper training through Training Within Industries (TWI) Job Instruction (JI) can be part of the solution. Poor equipment reliability may also be a source of the quality issues, so TPM could help with that as well. The cost of poor quality includes any scrapped materials as well as the *value* of the lost time, along with other factors. It can be a significant contributor to lost equipment availability and, in turn, the need for larger order quantities and more inventory.

How is your quality performance? Have you applied quality management principles to address them?

“Changeover time” is the time from the last good piece in the previous setup to the first good pieces from the new setup while meeting speed and quality expectations. It includes bringing equipment up to required temperatures, trial processing, and adjustment of the new setup, as well as any inspection and test time. Often 50% of total changeover time involves trial processing and adjustment. Quick Changeover (QCO) concepts such as “externalization” and “5” can provide solutions. Reductions in changeover time of up to 75% have been seen, with 40% being typical. This allows for a corresponding and often proportional reduction in order quantity and inventory.

What is the frequency and typical duration of your changeovers? Are you applying QCO concepts where you can?

TPM, QCO, and quality management principles can affect the amount of inventory an organization must carry in order to maintain acceptable service levels for customers. A company can also work with its suppliers, teach them the principles, and share in the benefits.

Increasing Your Value Proposition

Organizations that understand Total Cost of Ownership, along with lean concepts such as pull systems can increase its value proposition to existing and prospective customers. Beyond simply supplying a part or material, organizations can explain the full value it is offering in terms of inventory, reliability, service, and quality. Organizations can determine that value in real economic terms that will get customers’ attention. By doing so, it can provide a company with a real competitive advantage, and in this day and age, every company is looking for an advantage. ■



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