Outsourcing, More to Consider than Saving a Buck

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Abstract

The decision to outsource manufacturing and other capacities to low labor cost markets overseas is often made with the assumption that cost savings will be automatic. This paper extends a model that considers production costs, additional support overhead, carrying costs of inventory, size and weight of the product, demand per day, safety margin and cost of quality developed by Kumar and Kopitzke (2008) to evaluate off-shoring decisions. The extended model suggests additional tangible and non-tangible areas to consider including overhead, tooling, consignment, VAT, Lean production methods, supply delays, obsolescence, container usage and communications. A specific case involving a Chinese supplier is given.

Introduction

Outsourcing and off-shoring has been promoted as a cure of many high cost woes and is assumed by many to be an easy way to trim costs and increase competitiveness. Many companies have been moving business overseas for functions from manufacturing to design work, editorial work for magazines, finance, accounting, payroll departments, and customer. The drive for continuous improvement related to competitiveness and efficiency is often credited as reason for off-shoring (Sloper, 2008). The off-shore option is a very popular bandwagon for many companies to join, but is it always the correct business decision to make? The move to off-shore has been made by so many companies that the cost savings are always assumed to be there. An implicit assumption is that the value of the firm will increase by pursuing the outsourcing option as well (Young, 2007). However it must be asked, how many companies truly evaluate the total overall cost and risks, quantitatively and qualitatively? In most cases, the direct labor will be substantially less, but what about logistics, effects on inventory, government regulation and taxes, quality concerns, additional overhead needed, and currency exchange rates?

Recent research by Kumar and Kopitzke (2008) proposed a model to help quantify some of these. The article states that the model does not accommodate every element of the total cost of ownership (TCO), but it does provide a simple model for preliminary evaluation. The Kumar and Kopitzke (2008) model considers production costs, additional support overhead, carrying costs of inventory, size and weight of the product, demand per day, safety margin and cost of quality. Our paper will examine additional areas to consider when using a model similar to Kumar and Kopitzke's. An alternative model from a national HVAC manufacturer will also be presented to show even more tools for optimizing the final cost of the product or component.

Quantitative methods provide one approach to the outsourcing decision such as the model proposed by Kumar and Kopitzke. Linear Programming models are another useful method for minimizing production costs (Coman and Ronen, 2000.) Intangible costs are another concern for outsourcing that will be discussed. Quality is a concern that definitely deserves attention, so the cost savings are not erased very quickly by blunders made during ramp up and production. Quality errors can lead to line stoppages, lost sales, obsolescence, and warranty claims if projects are not executed with quality in mind. Some of these instances are measurable, and others are a bit more challenging to quantify. Obsolescence is another real cost that is amplified by the choice to outsource.

A case study involving poor quality will be discussed to illustrate how complex some of the scenarios can become when outsourcing. The concept of outsourcing also counteracts most lean philosophies in practice today (Anderson, 2004). Another minor point is the fact that returnable containers cannot be shipped to and from the suppliers due to the distances involved and detracts from many green initiatives. Even though technology has allowed the pace of globalization to quicken, the fact still remains that communication is key to implementing new suppliers and addressing problems along the way. The ideas and tools presented in this paper will provide more insight on capturing the true total cost of outsourcing.

Scope of Paper

China is the only country discussed in this case study, as well as the total cost models. The total cost models may be modified to use for other countries in some situations. Both cost models that will be discussed serve as good bases for business in other countries, but attention must be devoted to every detail in the model to ensure accuracy. Examples will be presented of actual outsourcing projects that involve Chinese suppliers. Manufacturing is the other area of limited scope. Although many different functions have been outsourced, this paper will focus on manufacturing.

Outsourcing or Off-shoring Costs

Kumar and Kopitzke (2008) provide a solid starting place for collecting quantitative support for an outsourcing decision. Even if the Kumar and Kopitzke model is used without modification, management should consider a number of additional areas that might be impacted by the decision to offshore. The following sections provide a discussion on key elements.

Overhead

Overhead has always been a cost factor, but global operations add a level of complexity to the cost equation. Kumar and Kopitzke (2008) listed China overhead in the cost model to be 10%. Expense reports for personnel and sourcing can certainly place dollar values on doing business in China, but what about the support people who are already in China. For example, many large air conditioning manufactures like Carrier/United Technologies, York/Johnson Controls, and Trane/Ingersoll Rand have offices in China that employ people to serve in a liaison capacity. These overseas offices will often do sourcing, negotiating, supplier quality work, and many other functions that are not tied to product cost and may or may not show up in the overhead. Salaries of these individuals are allocated, but companies are not in agreement on how to apply these numbers to actual components. (Girish and Parrikar, 2007; Ray & Sarkar, 2008.)

Tooling and Setups

Product price is always a key number in the outsourcing decision, but whether or not the tooling and/or setup fee is in that number is very critical to know. A request for quote (RFQ) is not always explicit in how much the true price is. If the tooling is included in a piece price for 1000 pieces, then the company requires an accurate way to know when they are about to use the 1001st piece. Some companies prefer to own the tooling, but this makes less sense when dealing with overseas vendors due to logistic challenges when moving the tooling from one place to another. If the company chooses to invest capital and share the tooling cost this is another avenue that could have obstacles down the road. Tooling and process setup fees can be handled with capital expenditures or can be written off as expenses, but the point here is to know exactly what is being quoting.

Inventory

Carrying cost for inventory was discussed in (Kumar and Kopitzke p. 121) and was listed at 30%. An area that was not discussed was consignment. What if the supplier is going to own the material until the manufacturer pulls it from the consignment area? In other words, the supplier has agreed to fill the entire pipeline from China and carry that cost right up to near the point of use for the end user. Companies often fail to look at the extra carrying cost at their consignment warehouses. It is customary for a consignment warehouse to charge customers for the following:

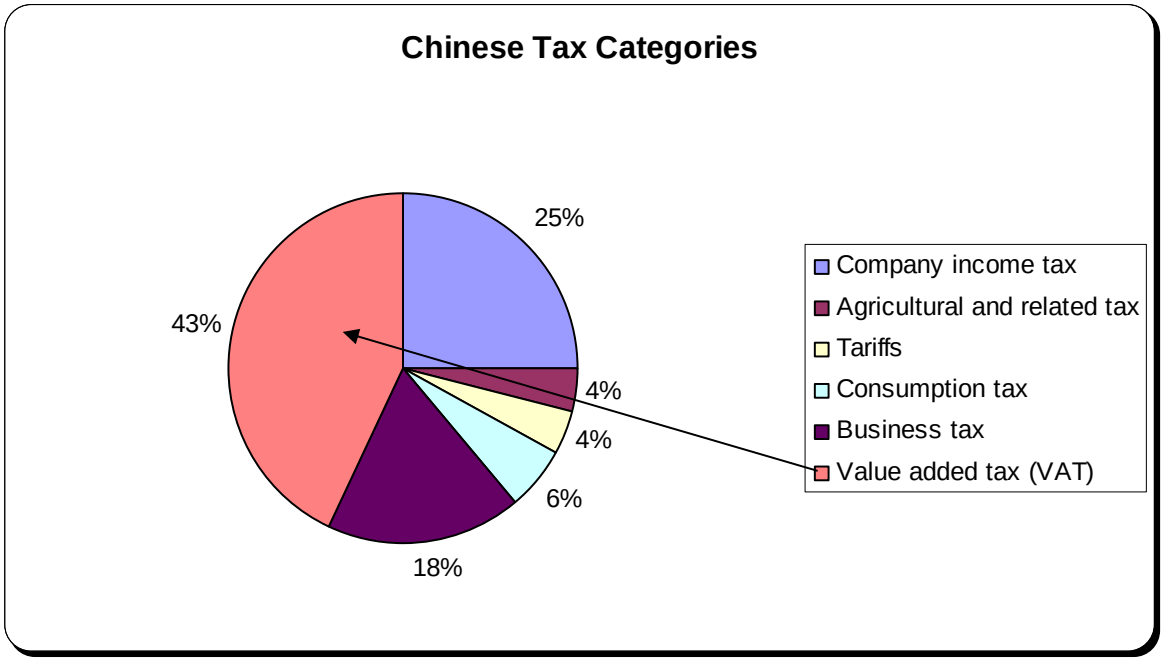
- Price per pallet of material stored
- Price per pallet to move material to the customer

This is indirectly a part of the carrying cost for inventory. In all likelihood extra inventory is required for a variety of reasons. Additional safety stock is carried to react to changes in customer demand since the lead time for material is so long. Second, the material may be quoted on a container size that far exceeds what you really need. In obsolescence situations, pallets may be moved excessively just to be able to use this inventory.

Value Added Taxes (VAT)

The value added tax is a much overlooked subject when outsourcing to China is being considered by companies. Without going into complex formulas, the value added tax is an amount of money subsidized by the Chinese government for products made in the country of China. The Chinese company and government both profit from this joint venture. This value added tax is applied every time a manufactured piece has value added to it. For example, a Chinese steel mill produces product and sells it to a Chinese manufacturer. The manufacturer adds value by making a component and then sells it to an exporter. At each step where value is added, financial compensation is awarded. The problem is that many RFQ's do not specify whether or not this tax is in the price. According to www.starmass.com, 2007 tax breakdowns are listed on the following page.

Figure 1



VAT is a major portion of the economy. Price negotiations can become complex if all the background of the VAT is not known. Complexity can also increase rapidly when the VAT rates and classifications are constantly changing. The fact that a supplier can sometimes negotiate with the Chinese government after prices are quoted to customers casts even more doubt on these rates. The Chinese government has made constant changes to encourage or discourage exporting of particular items over the years.

Landed Cost Model

A United States producer of HVAC units has been sourcing globally for a number of years. Table 1 shows an example of a defrost control board shipping from Hong Kong to Texas. This landed cost tool is helpful for evaluating the cost of the component when it arrives into the U.S. One of the first key entries into the excel spreadsheet is the harmonized number. The Harmonized Tariff Schedule of the United States (HTS) was enacted by Congress and made effective on January 1, 1989, replacing the former Tariff Schedules of the United States. The HTS comprises a hierarchical structure for describing all goods in trade for duty, quota, and statistical purposes. A complete schedule for harmonizing factors can be obtained by searching the following website: http://www.usitc.gov/tata/hts/bychapter/index.htm

Once a harmonized factor is determined, the other inputs such as shipping container dimensions, unit pricing, and import duties, can be placed into the spreadsheet. The container types are twenty and forty feet standard containers and a forty feet high capacity container. As you can see from the example, the outputs are not linear. For example, inland freight only increases from $1200 to $1500 when the container size is doubled. At the bottom of the spreadsheet the logistic cost is detailed as a percentage of the FOB to destination. Again, the relationship is not linear. When the container size is doubled the logistic cost percentage only goes from 3.21% to 2.04%. Also notice the duty cost per unit is the same for both. The twenty-two days for cycle time listed at the bottom is actual transit time only. Sourcing managers using the spreadsheet agree the actual total number of days from supplier to customer is much greater.

Landed Cost Tool- US import

Version May 09 2005

06/18/2009

Full Container shipment

Description of component	Harmonized number		
Defrost Control Board (C140501G46)			
Inco-term with supplier			
FOB port of export:	**Shanghai**		
Unit Price of component:	$ 5.57		
Import duty in percentage:	6.20%		
Final destination:	Tyler, TX 75707		
Type of container	20 ft std	40 ft std	40 ft HC
Total quantity in a container (confirmed by supplier):	20480	46080	
Optional - Shipping dimension of component provided by supplier:			
Length (inch)	19.724		
Width (inch)	16.339		
Height (inch)	8		
Weight (lbs)	11		
Quantity in box/pallet (pcs):	80		
Estimated quantity in a container:	44,000	96,000	115,200
Total weight in a container (lbs):	6,050	13,200	15,840
Product Pricing in container:	$ 113,990	$ 256,477	$ -
Insurance:	$ 293	$ 655	$ 7
Port of Import:	Longbeach		
Ocean Freight Cost up to Port of Import:	$ 1,800	$ 2,290	$ 2,600
Transit Time to Port of Import:	16 days		
Logistic Cost under CIF Westcoast per Unit:	$ 0.10	$ 0.06	#DIV/0!
Logistic Cost % of FOB Value per Unit:	1.84%	1.15%	#DIV/0!
Inland Freight from "Port of Import" to Destination:	$ 1,200	$ 1,500	$ 1,700
US Dest Logistics Charges:	$ 100	$ 100	$ 100
US Import Duty:	$ 7,067	$ 15,902	$ -
Harbor Maintenance Fee (HMF):	$ 142	$ 321	FALSE
Merchandise Processing Fee (MPF):	$ 239	$ 488	FALSE
US Customs Brokerage Fees:	$ 85	85	85
Transit Time from Port to Final Destination:	6 days		
Total Landed Cost at destination per Unit:	$ 6.10	$ 6.03	#DIV/0!
Total Duty Cost per Unit:	$ 0.35	$ 0.35	#DIV/0!
Total Logistics Cost per Unit:	$ 0.19	$ 0.12	#DIV/0!

Spreadsheets like this are helpful for evaluating shipment sizes and determining the landed cost for each container. However, the most cost effective quantity is rarely the optimum amount.

The Effect of Lean Production Methods

Up to this point, this paper has examined tangible costs that can be relatively easily evaluated compared to intangible costs. Factors that cannot be measured directly must still be taken into account when making a sourcing decision. For example, buying a component does not exactly follow the lean philosophy that most manufacturers are embracing at the current time. In a typical "lean" class, instructors talk about developing suppliers as an extension of your own organization. (Anderson, 2004) Why would a company sacrifice a short term cost reduction for a longer term supplier partnership? Obviously the answer is complex and could be the entire subject of another paper.

Toyota has set the standard for manufacturing for many years now, and a visit to San Antonio will reveal their assembly plant is surrounded by suppliers of all sorts. Why do they set

up shop like that instead of shipping components and subassemblies across the water like the masses? The Toyota Way Fieldbook by Liker and Meier (2006) gives some insight to this question. According to the authors, supplier partnering consists of the following characteristics:

- Mutual understanding and trust – do you understand the supplier's capability and is there mutual trust?
- Interlocking Structures – is there a seamless connection between your processes and the supplier's processes?
- Control Systems – do you measure their performance and relay that information back?
- Compatible Capabilities – are you working together to develop innovative products and services?
- Information Sharing – do you meet or have conference calls on a regular basis?
- Joint Improvement Activities – are the supplier quality engineers knowledgeable enough to train the suppliers?
- Kaizen and Learning – do suppliers come to your plant to participate in Kaizen events?

Lean is not only about eliminating waste. Lean is about connecting all your systems including the suppliers. Toyota's actions say that they are investing in partnership activities to stay globally competitive without sacrificing quality or innovation. Outsourcing from China could easily counteract any lean progress in U.S. manufacturing.

Supply Delays and Obsolescence

Each supplier has its own set of challenges to supply the customer consistently with quality products. Problems can arise internally or even upstream at the sub supplier. These supply delays and interruptions can play havoc on a manufacturing operation by causing one or more of the following:

- Production has to shut down
- Production has to adjust the schedule
- Production has to request to run under a deviation
- Production loses units (does not meet demand) due to a supplier issue

If a supplier is located in China it makes all of these situations much more challenging. The effect of some of these situations can be lessoned by carrying more inventory as a buffer, but what if that inventory is bad? There are not many contingency plans that can offset poor quality. Even though most companies have liaisons, account representatives, and quality personnel equipped to handle these situations, the urgency is sometimes lacking due to a variety of reasons such as:

- They are addressing multiple issues simultaneously (not just yours)
- Like it or not, you may not be a preferred customer
- The solution of overtime, air freight, or other means may get opposition from their management due to the cost
- The solutions are minimal when the situation calls for fast parts coming from overseas
- It is challenging to feel the same sense of urgency from thousands of miles away

As stated earlier, contracts can help eliminate some of obstacles by laying groundwork for expected Parts per Million levels and delivery schedules. Another related issue to supply

delays is obsolescence. Manufacturing is subject to a barrage of never ending changes and improvements to the final product. These changes must often be managed manually to ensure that obsolete inventory is used up. At a high volume assembly plant this is a huge undertaking. For example, if there are multiple parts in a subassembly that all change at the same time, effort must be extended to make sure these parts can be used before the change date, or else used after the change date under an approved deviation. In some cases, this is not possible and it is usually discovered during a physical inventory. Obsolete inventory is a real problem and obviously has a negative effect on the bottom line. In the case of an overseas supplier, the inventory levels are almost always higher than they would be with a domestic supplier.

Returnable Containers

Companies today are paying close attention to every possible way for improving the bottom line. One method that has become popular over the last decade is returnable containers. In some cases there are large dollar amounts involved with these types of projects. Some of the larger companies have packaging engineers dedicated to designing breakdown packaging to be sent back and forth between the customer and the supplier. From a logistics point of view, if these containers can be disassembled so the freight company can haul other loads along with the returnables going back, this can be profitable for both parties involved. This is also viewed as a good "green" strategy by customers and consumers. Returnables are just another small step in the ongoing quest of improving efficiency and eliminating waste. Outsourcing to China closes this door completely due to the high cost of freight going back and forth. A feasible way to return containers to China has not yet been developed, so the end result is excessive amounts of waste including wooden pallets and cardboard.

Communication

Communication barriers can sometimes be a critical factor in solving technical issues. A national HVAC company recently chose a Chinese company, to provide a steel nut with a corrosion resistant zinc coating. The compressor nuts began to fail shortly after the new supplier was brought on board. The failure mode was distortion of the nut when torque was applied which led to the nut actually breaking. In summary, the nuts were distorting so much they would either become lodged in the socket or simply crack and provide a leak path for refrigerant to escape. Daily conference calls were held to attempt in solving this issue. The calls were held at 7 AM Central Standard Time which converts to 8 PM China time. Mechanical and chemical properties were often discussed to understand the difference between 1018 American steel and Chinese #20 steel. The print for the part listed numerous ESTM and ASTM specifications that the Chinese parts seemed to meet, but the failures were still occurring.

The conversations were often spent explaining processes, applications, and critical features of the part they were supplying. Interpretation and translation from English to Chinese is very time consuming and challenging to say the least. The lack of understanding and communication played a vital role in no root cause being found. In the meantime, a previous domestic supplier also in Texas was contacted to start supplying the parts again so manufacturing could continue to produce products. The Chinese company did not sense the urgency of the problem and could not react quickly enough to solve the problem. Testing went on for several weeks in both countries but a root cause was not determined. The previous supplier's parts, which were made with American 1018 steel, performed flawlessly. A decision was made to abandon the Chinese company and go back to the trusted supplier for just a slight cost increase.

Conclusions

Although outsourcing to China has been popular for several years now, many companies are beginning to do more quantitative analysis to determine if the cost savings are real. There are many overhead items that cost money but are not tied directly to the final cost used to calculate the savings. It is crucial to understand exactly what the quote includes from the suppliers. Tooling, process, and setup fees are sometimes buried in the fine print and are not recognized until it is too late. Inventory is another factor that can be measured with dollars.

Even if a company has a consignment warehouse, there are still hidden costs that exist to handle and move this extra material from point to point. The value added tax is an overlooked and misunderstood subject that deserves more investigation on each and every quote. This tax is set and maintained by the Chinese Government and can have a drastic effect on the bottom line. The harmonized number is yet another form of tax that must be known for cost comparisons. A landed cost model was shown that included this number as part of the calculations. Outsourcing from China is definitely not the textbook way to go according to lean manufacturing consultants and professors. The added logistic challenges of delivering quality components over 8,000 miles away do not coincide with building partnerships and relationships with suppliers.

Although supplier delays and interruptions were written in the intangible section, these items are becoming more measurable as tools are developed. For instance, one HVAC company has derived an equation for the cost of poor quality (COPQ). If the supplier does not hold a PPM level as stated in the contract, the supplier will pay the customer back according to how high the PPM level was for a certain period of time. The great distance between the U.S. and China makes it impossible to have any type of returnable containers. The value of communication was shown through a case study on a Chinese manufacturer. A lack of understanding of functionality of the part being supplied led to a loss of business. Since this episode and others, the value of work done by supplier quality engineers on the qualification processes has been elevated and acknowledged by upper management. Future areas for research might include:

- More development of models to narrow down the cost even more
- Research on Value Added Taxes to determine past trends, predict trends, and examine strategies being used by the government to control exporting
- A paper to illustrate the difference in value stream maps when an overseas supplier is chosen versus a domestic supplier
- A specific case study involving one particular component being outsourced from start to finish

A cost savings must be carefully weighed according to many tangible and intangible factors. The recent article by Kumar and Kopitzke is a good building block to begin to understand the positive and negative benefits of outsourcing to China, but this research provides additional areas to help make the sourcing decision.

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