Total Cost of Ownership

Total cost of ownership (TCO) is an assessment of all costs, direct and indirect, involved with an item over the useful life of that item. Most frequently, TCO is used at the beginning of the purchase process to evaluate which is the most cost-effective choice. When TCO is calculated at the time the selection decision is being made, many of the included costs are estimated, because they have not yet been incurred.

Calculating the total cost of ownership can give an organization more detailed information with which to make the purchasing decision. Most purchasers know that quoted purchase price is not the only cost involved in obtaining and using an item. Inclusion of all other known cost factors allows a more complete picture to emerge.

Note: The total cost of ownership can be applied to the cost of any purchase. In "a manufacturing environment it is most commonly applied to the purchase of inventory and MRO (maintenance, repair, and operating) materials". In the service industry environment, TCO is often applied to the purchase of any supply item or capital purchase. Those working in service industries should readily be able to use and adapt the information and calculations detailed in this issue of NAPM InfoEdge to their own particular requirements.

Know What to Include

Many cost factors are known to end users or to others in the organization and may not be known to purchasing. A complete picture of the total cost of ownership can be compiled through a team effort that includes, at a minimum, purchasing plus the end users, your technical experts, and finance. Other departments or representatives may be included, such as legal, production, supply management, transportation, and import/export, depending on the purchase being made. It is important that all involved parties have the chance to participate in order to obtain a useful result.

Note: In smaller organizations where it is not practical to form a team, gather the necessary information from individuals in functions indicated above. Get as much information and assistance as you need to make the TCO decision.

Establish a Framework and Define Assumptions

At the beginning of the process of determining the total cost of ownership, establish a framework and define the assumptions that will guide the work, including:

- Definition of what is needed and who will use it
- Estimate of how long the item will be in use
- Assumptions for quantities or usage rate
- Definition of the process for defining the areas of cost to be included
- Definition of the process for calculating cost figures for these areas
- Estimates of the costs for all involved areas of the business (such as the cost of carrying inventory, if the item is an inventory item)

Separate Inventory from Capital Purchases

The areas of cost will be different for inventory items versus capital equipment. Inventoried items are of lower dollar value per unit, and there are usually many units involved. Inventory items also are moving through the business; they are being regularly turned over. Capital equipment is stationary and may be in place for a long time. Typical areas included in the total cost of ownership for each of these include:

Inventory

- Cost of non-delivery
- Cost of non-quality
- Cost of transportation and packaging
- Cost of carrying inventory
- Production-related costs
- Administration costs per part number
- Availability/flexibility
- Technical assistance

Capital Equipment

- Structure of payments over time
- Estimated useful life of new equipment
- Trade-in value of old equipment
- Residual trade-in value of new equipment
- Cost of site modification
- Packing and crating costs
- Cost of transportation
- Cost of rigging and installation
- Technical assistance at start-up
- Operator training
- Cost of service and maintenance
- Cost of supplies and spare parts

In addition to cost factors for inventory and for capital equipment purchases, another set of cost factors applies to any purchase from a foreign source. These factors include:

- Cost of packaging/crating for international shipping
- Transportation to seller's port
- Port-of-origin handling costs
- Export taxes and fees assessed by the government of origin
- Certificate of inspection
- Ocean shipping costs
- Marine insurance premiums
- Port-of-entry handling costs
- Customs brokerage fees
- Customs duties
- Inland transportation costs
- Financial transaction charges (such as bank charges for letters of credit)
- Currency fluctuation/hedging
- Communications expenses (international telephone, fax, postage)
- Additional levels of inventory
- Increased administration and legal time
- Metrication costs (English-metric conversion)
- Cost of translation, if needed
- Travel expenses, if needed

Understand the Basis for Calculation
Usually, TCO data is used to better select suppliers or items to be purchased. If you are using your calculations to make relative comparisons between supplier A and supplier B or item X and item Y, you can be somewhat freer in determining costs. Estimates are acceptable as long as they provide a valid basis for comparison. Two criteria are important in calculating relative costs:

1. The formula makes sense. It is relevant to the factor valued and can be calculated.
2. The formula can be applied across suppliers and used to validly differentiate them (see box on page 6).

If you are using the total cost of ownership to make capital allocation decisions, there will be more stringent restrictions on your assumptions and more urgency to use only verifiable dollar figures. Your numbers may be required to be absolutely accurate, not just relatively accurate.

The degree to which you can use relative versus absolute cost data should be defined as one of your starting assumptions. For example, determine if your organization will accept relative data, such as delivery performance measurements, as a valid cost factor even though you may not know the exact cost of a missed delivery. If so, then include relative data in your assumptions.

If your organization is reluctant to accept nonmonetary factors, then calculate both sets of factors and subtotal them separately so that the difference between each is clear. Ask anyone skeptical of the process if he or she will accept that these issues are costing the organization money (most people will agree to this proposition).

Then ask whether or not it is better to be approximately right by including estimates or relative numbers or *absolutely wrong* by omitting these cost factors altogether.

Ownership costs can be divided into three categories: incurred costs, performance factors, and policy factors.

- Incurred costs. These are either known or can be estimated to a reasonable degree of accuracy. Incurred costs include areas such as transportation costs, spare parts and supplies, quoted price, brokerage fees, and customs duties.

- Performance factors. These include areas such as delivery performance, quality, and requirements for service or maintenance. Performance factors are relative data. As long as the data is valid for relative comparison, it is less important that it be an absolute cost figure.
- Policy factors. These encompass all issues your organization chooses to incorporate to reflect business or social policy directives. Typically a supplier or item either does or does not meet the policy criteria. The factor is a yes/no factor, and establishing a dollar value for it rests with the policy makers within your organization. Issues such as recycled content of materials, minority and women-owned suppliers, and consensual reciprocity fall into this category.

For social policy factors, and other so-called "soft issues," the question the organization must answer is, "How much more would we be willing to pay for the privilege (or issue) being considered?" You can include any soft issue in TCO as long as you are willing to put a value on it. Your value can be arbitrary, as long as it is consistent across suppliers and its relative weight makes sense to you.

TCO Calculation in Five Easy Steps

Here are the steps to determining total cost of ownership:

1. **Form a team (or gather data from others) that includes purchasing, the end users, technical experts, and finance. Add others as appropriate.**
2. **Define the ground rules for the process and your assumptions.**
3. **Define the areas of cost, both current and anticipated, relevant to the purchase.**
4. **Determine reasonable methods* for calculating the costs.**

5. **Add all the relevant costs.**

Make your decisions based on your calculations of total cost.

*** "Reasonable" is a relative term. It is intended to provide latitude within the TCO process. You should be able to create your own methods for calculating cost factors. This requires examining all the issues involved in your TCO decision and deciding which method(s) are most appropriate for you. All of the calculations in this issue of NAPM InfoEdge are examples, and reflect this principle.**

REASONS TO IMPLEMENT TCO

Some of the many reasons to implement TCO are to:

- **Institute a "best practice" (moving toward a systems approach)**
- **Analyze the impact of change**
- **Support the assumption that lowest price does not always realize the best result**
- **Improve quality, information flow, decision making, and/or the business process**
- **Obtain best value for customers**
- **Improve competition by understanding what drives cost**
- **Justify changing suppliers Source: Total Cost Modeling in Purchasing, Center for Advanced Purchasing**

Studies, 2004

HOW TCO SUPPORTS THE ORGANIZATION

TCO should fit into the goals of the organization in its entirety. TCO can further these goals by:

- Supporting an overall total quality focus
- Aiding the purchasing function's efforts to improve purchasing processes
- Helping define the organization's reengineering needs
- Increasing competitiveness by encouraging the purchase of "best value" items, and reducing costs
- Providing access to supplier TCO data to all who work with suppliers
- Freeing up purchasing to work with the organization's more strategic objectives

Source: Total Cost Modeling in Purchasing, Center for Advanced Purchasing Studies, 2004

British Petroleum Exploration: A Case Study

MRO (maintenance, repair, and operating supplies) is fertile ground for TCO. Most items in this category are expensed, and total dollar spending is often significant. MRO is also a prime area for including the cost of doing business (including the costs of transactions) because there are many ways to set up resupply systems to reduce these costs. Activity-based costing includes methods for determining the actual cost of work, including the administrative process. If your organization uses activity-based costing methods, then the transaction costs will be readily available and can be included in the TCO calculations.

British Petroleum Exploration (Alaska) used activity-based costing methods to determine the total cost of their MRO procurement process from acquisition through payment. The organization wanted to find more cost-effective methods of procurement and wanted an internal sales tool to help justify their integrated supply program. They were also interested in benchmarking their results against those of other similar operations. Some cost factors were already established within their accounting practices. The costs of capital, taxes, and obsolescence were extracted from financial data.

To determine internal administration costs using activity-based costing

methods, they:

1. Used a team to define the tasks and establish the process flow
2. Identified what percentage of people's time these tasks occupied (for MRO only)
3. Allocated a percentage of each area's budget corresponding to the percentage of people's time consumed

By the end of their analysis, they had identified the following areas of cost and the percentages of resources each consumed:

1. Cost of capital 8.11% of inventory value
2. Property taxes 1.45% of inventory value
3. Obsolescence 3.20% of inventory value
4. Electronic materials requisition 1.52% of area budget
5. Manual orders 1.77% of area budget
6. Purchasing process 14.06% of area budget
7. Inbound logistics 11.54% of area budget
8. Delivery 1.78% of area budget
9. Receiving/issuing 8.88% of area budget
10. Storage/surplus 22.40% of area budget
11. Invoice processing 5.98% of area budget
12. Administration/supervision 5.64% of area budget

Their analysis revealed that for every dollar spent for MRO materials, an additional 73 cents was spent for the resources and administrative expenses required to support the purchase, plus 13 cents spent to pay additional costs of inventory. This data gave them the information they needed to educate their internal customers and elicit support for conversion to a more integrated supply process. They were also able to compare the effectiveness of their operations with that of other companies in the same field.