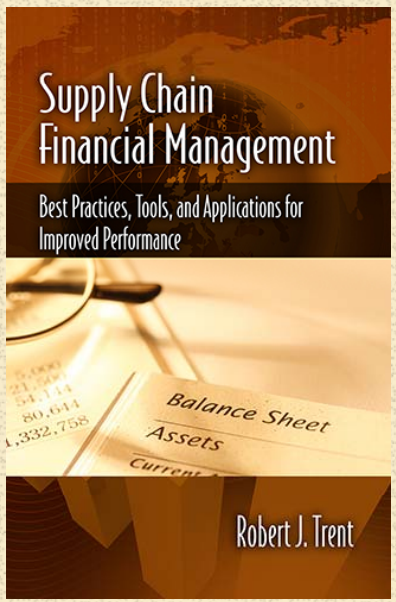


By Robert J. Trent

TOTAL COST OF OWNERSHIP

Session Outline

I. Defining Total Cost of Ownership (TCO)
II. Reasons for Total Cost Systems
III. A Continuum of Measurement Models
IV. Total Cost Models and their Applicability
V. TCO Cost Elements
VI. Challenges Moving Forward
VII. Concluding Thoughts

Total Cost Overview

- What is Total Cost?
  - Total cost includes the expected and unexpected elements that increase the unit cost of a good, service, or piece of equipment
  - Total cost systems attempt to capture these cost elements

II. Reasons for Total Cost Systems

Total Cost Systems Help Us…

- Gain management's attention regarding the true cost of sourcing decisions
- Track performance in real terms over time
- Identify where improvement efforts will have their greatest return

Reasons for Total Cost Systems

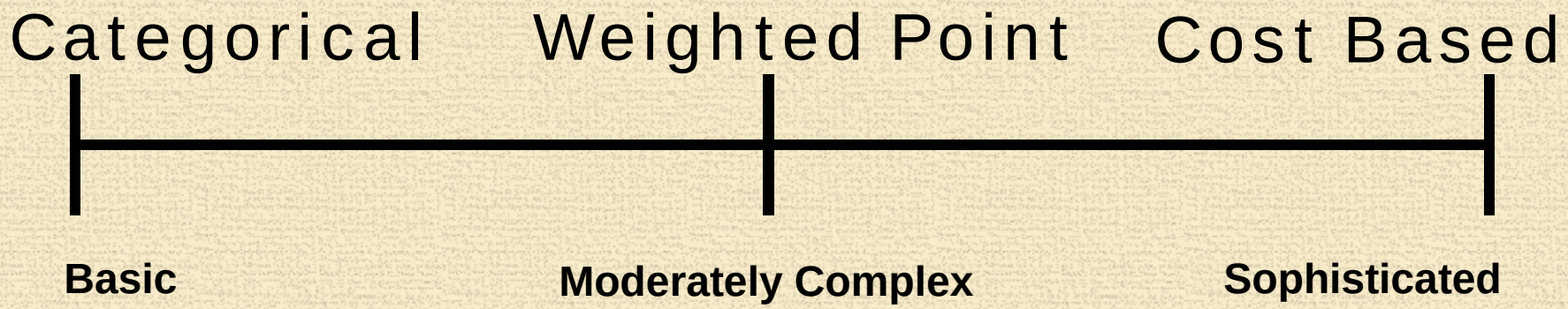
Total Cost Systems Help Us…

- Support better decision making
  - What equipment to purchase?
  - What supplier to select?
  - What supplier to eliminate from the supply base?
  - Where to direct supplier development resources and calculate ROI?
- Avoid a competitive disadvantage
- Appreciate that supply decisions are not just about price

III. A Continuum of Measurement Models

- Categorical models
  - Basic check-offs
- Weighted point models
  - Supplier selection assessments
  - Supplier scorecards
  - Supplier certification
- Cost based models
  - Learning curve
  - Cost-based pricing
  - Target costing
  - Activity-based costing
  - Total cost of ownership

A Continuum of Measurement Systems



Relative Complexity

Categorical

Advantages

- **Easy to implement**
- **Requires minimal data**
- **Requires minimal systems resources to develop or operate**
- **Low-cost to maintain**
- **Good for less critical requirements**

Disadvantages

- **Less reliable**
- **Mostly broad, subjective assessments**
- **Usually manual, although some use spreadsheets**

Weighted Point

Advantages

- **Offers flexibility in assigning weights across categories**
- **Allows ranking of suppliers**
- **Moderate cost to implement**
- **Does not require extensive system support to develop or maintain**

Disadvantages

- **Often focuses on standard performance categories**
- **Qualitative ratings may be in consistent between raters**
- **Usually requires manual data collection and input**

Cost Based

Advantages

- **Provides a total cost approach**
- **Identifies specific areas of supplier non-performance**
- **Allows objective assessment of cost elements**
- **Offers greatest potential for long-range improvement**

Disadvantages

- **Usually requires a cost accounting system**
- **High development costs**
- **Cross-functional support required to capture data**
- **Often relies on average rather than actual costs**

IV. Total Cost Models

We will focus on three important TCO models

- Total Landed Cost Models
- Supplier Performance Index Models
- Life Cycle Cost Models

Total Cost Models

- Total Landed Cost Models
  - A totally landed cost model is ideally suited for use when evaluating suppliers prior to making purchase decisions for materials and services
  - Landed cost is the sum of all costs associated with obtaining a product
  - Whenever we see the word “landed” we can assume we are likely dealing with total cost estimates or calculations that involve international shipments
  - Total landed cost models should also be used when doing business with suppliers on an ongoing basis

Total Cost Models

- Total Landed Cost Models
  - A potential issue with total landed cost models involves whether to include only costs that the buyer incurs or whether to include all the costs incurred from the point of origin to the point of destination
  - Spreadsheet software is ideal for developing total landed cost models
  - Should present cost build ups in a common unit of measures (cost per pound, for example)

Cost Element	Explanation of Cost Calculations	Cost per Pound	Cumulative Percent
Fishmeal unit price	Supplier quoted unit price per pound	$.29	59.2%
Ocean shipping	$2,500 per container/40,000 lbs per container	$.062	12.6%
Tariffs and duties	15% x unit price ($.29)	$.043	8.8%
Transfer charge from U.S. port to warehouse	$350 per container/40,000 lbs. per container	$.009	1.8%
Warehouse storage charge	$6.50 per pallet/2,000 lbs. per pallet	$.003	.6%
Warehouse handling fee	$6.25 per pallet/2,000 lbs. per pallet	$.003	.6%
Inventory carrying charge	40,000 lbs held in inventory each month x unit price ($.29) = $11,600 inventory value; $11,600 x 24% inventory carrying charge = $2,785 annual carrying charge; $2,784/480,000 lbs annual demand = $.006 carrying charge per lb.	$.006	1.22%
Local freight from warehouse to plant	$275 per container/40,000 lbs. per container	$.007	1.43%
Receiving and quality control	$4 per pallet/2,000 lbs. per pallet	$.002	.41%
Product loss before production	3% loss x unit price ($.29). This reduces the annual available fishmeal for use during production to 465,600 lbs.	$.009	1.8%
Production yield loss	2% x 465,600 lbs = 9,312 lbs. lost during production; 9,312 lbs. x $.29 unit price = $2,700.48 yield loss; $2,700.48/465,000 lbs = $.006 per lb.	$.006	1.22%
Administrative Overhead	17% x unit price ($.29)	$.05	10.2%
Estimated Total Cost		**$.49**	**100%**

Total Cost Models

- Supplier Performance Index (SPI) Models
  - The SPI is one of a number of models that attempt to capture the true cost of doing business with a supplier on a continuous basis
  - The SPI is a total cost model that presents its output in the form of an index or ratio. It assumes that any quality or other infraction committed by a supplier during the course of business increases the total cost (and hence the total cost performance ratio) of doing business with that supplier

Total Cost Models

- Supplier Performance Index (SPI) Models
  - The SPI calculation for a specific period is a straightforward formula:
    - SPI = (Cost of material + Non-conformance Costs)/(Cost of material)
  - Assume a supplier delivers $280,000 worth of parts to a company in the 2nd quarter of a year. The supplier is also charged with $13,500 in total nonconformance costs
    - The supplier's SPI for the 2nd quarter is 1.05, or (($280,000+$13,500)/$280,000)

Total Cost Models

- Supplier Performance Index (SPI) Models
  - How do we interpret the SPI ratio?
    - SPI of 1.05 means the total cost of doing business with this supplier is five percent higher than the unit price. If the unit price of a supplier's good is $127.24, then the estimated total cost of that item is really $133.60 ($127.24 x 1.05)
  - Because the SPI is a standardized metric, and this is one of its virtues, it allows comparisons between suppliers
  - Should only compare suppliers within the same commodity group

Total Cost Models

- Supplier Performance Index (SPI) Models
  - The SPI has a couple of issues that could make its use problematic unless the user takes these issues into account
    - First, the SPI does not directly present the unit price of a good
    - Because the SPI is an index that starts with a baseline ratio of 1.0, price tends to "get lost in the shuffle"
    - Second, the base SPI calculation also has a built–in bias against suppliers that provide deliveries with a lower total value
    - This requires the calculation of a "Q" adjustment factor

Supplier Performance Index with "Q" Adjustment

	Supplier A	Supplier B	Supplier C
1st quarter deliveries	15	15	15
Total value of deliveries	$7,500	$15,000	$30,000
Average delivery	($7,500/15) = $500	($15,000/15) = $1,000	($30,000/15) = $2,000
Non-conformance charges	$1,500	$1,500	$1,500
1st quarter SPI	($7,500+$1,500)/$7,500 = 1.20	($15,000+$1,500)/$15,000 = 1.10	($30,000+$1,500)/$30,000 1.05
Average shipment from all suppliers	$2,700	$2,700	$2,700
Q adjustment factor	$500/$2,700 = .185	$1,000/$2,700 = .37	$2,000/$2,700 = .74
Adjusted SPI	1.04	1.04	1.04

Adjusted SPI for Supplier A = $7,500 + ($1,500 x .185)/$7,500 = 1.04
Adjusted SPI for Supplier B = $15,000 + ($1,500 x .37)/$15,000 = 1.04
Adjusted SPI for Supplier C = $30,000 + ($1,500 x .74)/$30,000 = 1.04

Total Cost Models

- Life Cycle Cost Models
  - Life cycle cost models may be what comes most readily to mind when thinking about total cost analysis
  - Companies should compare the assumptions made during the development of life cycle estimates with actual data as they become available
    - For example, was the MTBF estimate correct?
  - Life cycle costs apply whether equipment is sourced domestically or internationally

Total Cost Models

- Life Cycle Cost Models
  - The flow through of a life cycle is essentially one of buying, shipping, installing, using, maintaining, and disposing
  - The more complex life cycle cost models can include net present values of future benefit streams (this is beyond the scope of our discussion today)

Total Cost Models

- Life Cycle Cost Models
  - Let's review an example of a capital expenditure project
    - A company wants to purchase 1,000 personal computers
    - The computers will have a useful life of three years
    - The company has received and collected cost data for two competing suppliers
    - Our calculations will arrive at an unadjusted total cost

Life Cycle Cost Data

	Supplier A	Supplier B
Unit Price		
Quoted price	$1,200	$1,310
Software license A	$275	$200
Software license B	$152	$160
Software license C	$85	$80
Acquisition costs		
Shipping cost	$58	$79
Supplier negotiation and contracting costs	$15,200 (total cost)	$17.500 (total cost)
Usage Costs		
Installation	$210	$185
Equipment support (increase 3% per year)	$25 per month	$29 per month
Network support (increase 3% per year)	$35 per month	$45 per month
Electricity usage (increase 4% per year)	$9 per month	$7 per month
Warranty coverage and other repair costs	$65 per year	$45 per year
Opportunity cost—lost productivity due to estimated downtime	15 hours per year per PC @$45 per hour	11 hours per year per PC @ $45 per hour
End of Life		
Salvage value	$75	$92

All figures are per computer unless otherwise noted

Life Cycle Total Cost for Supplier A

	Present	Year 1	Year 2	Year 3
Unit Price				
Quoted price	$1,200,000			
Software license A	$275,000			
Software license B	$152,000			
Software license C	$85,000			
Acquisition costs				
Shipping cost	$58,000			
Supplier negotiation and contracting costs	$15,200			
Usage Costs				
Installation	$210,000			
Equipment support		$25,000	$25,750	$26,523
Network support		$35,000	$36,050	$37,132
Electricity usage		$9,000	$9,360	$9,734
Warranty coverage and other repair costs		$65,000	$65,000	$65,000
Opportunity cost—lost productivity due to estimated downtime		$675,000	$675,000	$675,000
End of Life				
Salvage value				($75,000)
Total Costs	**$1,995,200**	**$809,000**	**$811,160**	**$738,389**

Life Cycle Total Cost for Supplier B

	Present	Year 1	Year 2	Year 3
Unit Price				
Quoted price	$1,131,000			
Software license A	$200,000			
Software license B	$160,000			
Software license C	$80,000			
Acquisition costs				
Shipping cost	$79,000			
Supplier negotiation and contracting costs	$17,500			
Usage Costs				
Installation	$185,000			
Equipment support		$29,000	$29,870	$30,766
Network support		$45,000	$46,350	$47,741
Electricity usage		$7,000	$7,280	$7,572
Warranty coverage and other repair costs		$45,000	$45,000	$45,000
Opportunity cost—lost productivity due to estimated downtime		$495,000	$495,000	$495,000
End of Life				
Salvage value				($92,000)
Total Costs	**$1,852,500**	**$621,000**	**$623,500**	**$534,079**

V. TCO Cost Elements

- A cost element is a discrete cost category that may require cost data
- Cost data can be reactive, current, or forward looking
- One study has identified over a dozen total cost categories with over 125 separate cost elements embedded throughout these categories
- The Four A's of total cost data

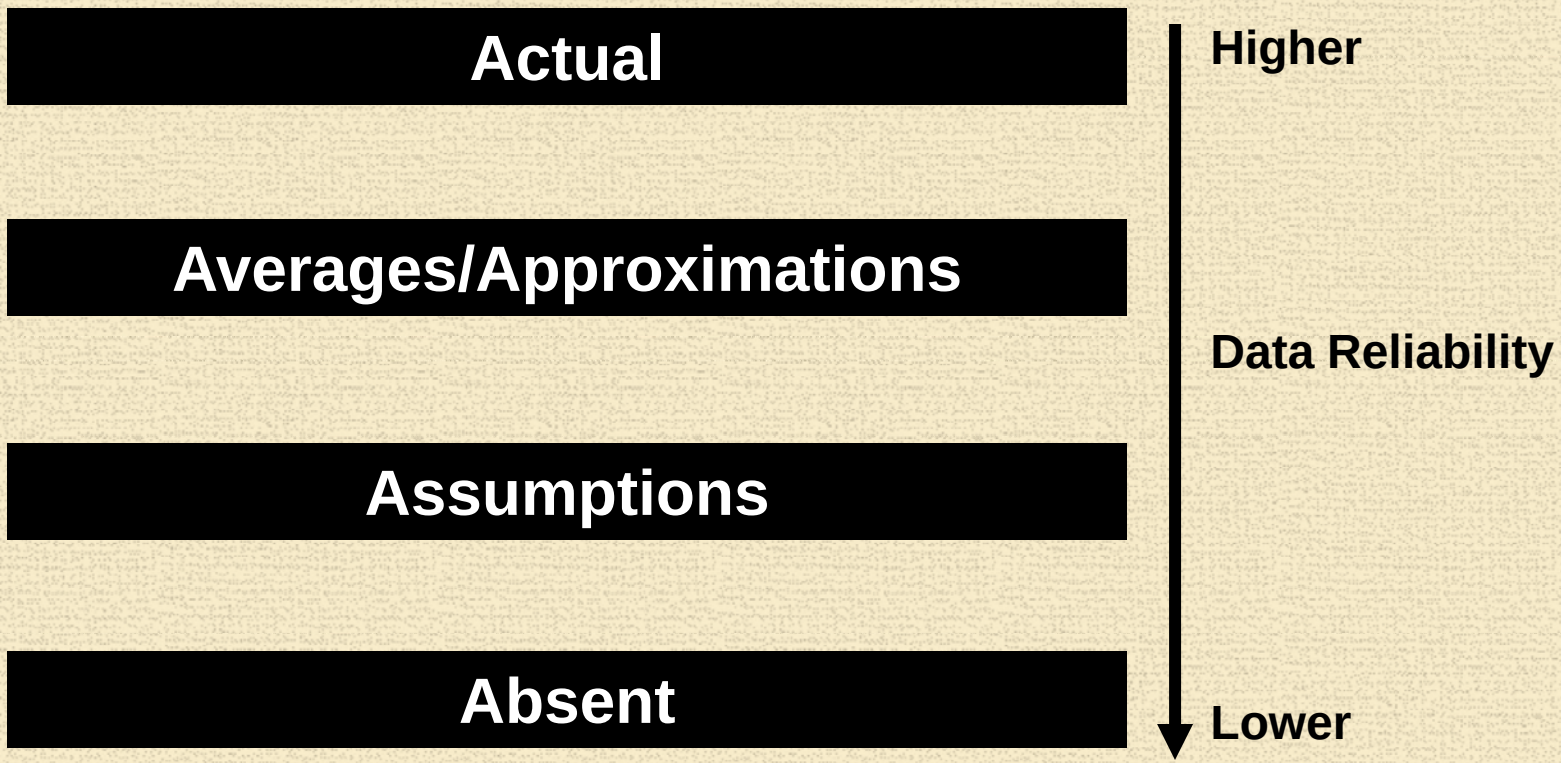
TCO Cost Elements

Cost Element	Percent of Firms
Material/component price	88%
Logistics and transportation	72%
Exchange rate differentials	59%
Supplier payment terms	50%
Country specific costs (VAT, customs, etc)	41%
Cost of quality	41%
Inventory charges	41%
Product qualifications	34%
Overhead and administrative costs	34%
Increased procurement staff costs	31%
Material handling and warehousing	28%
Tooling cost	25%
Packaging cost	22%
Customer service cost	19%

Adapted from John Ferreira and Len Prokopets, "Does Offshoring Still Make Sense?" *Supply Chain Management Review*, January/February 2009, p.24.

TCO Cost Elements

The Four A's of Total Cost Element Data



TCO Cost Elements

- As it applies to total landed cost models, cost elements are often divided into categories that reflect a logical progression of material as it moves downstream through the supply chain…

TCO Cost Elements

Within country of manufacture—unit price of materials, storage, labor, quality, overhead, obsolescence, packaging, risk or disruption, exchange rates, inventory carrying charges

In transit to country of sale—transportation charges, fuel surcharges, insurance, port charges, handling, security, banking fees, broker fees, potential detention charges, duties, handling agency charges, inventory carrying charges

Within the country of sale—local transportation and handling, storage fees, taxes, safety stock, inventory carrying charges, yield, productivity implications, maintenance, quality, overhead allocation, payment terms

TCO Cost Elements

- Developers of life cycle cost models often allocate their cost elements across four broad categories that reflect usage over time:
  - **Unit Price**—This is the price paid including purchase terms
  - **Acquisition Costs**—This includes all costs associated with delivering equipment, such as buying, ordering, and freight charges to the customer
  - **Usage Costs**—Includes all the costs to operate the equipment, including installation, energy consumption, maintenance, reliability, spare parts, and yield and efficiency during production
  - **End-of-Life Costs**—Includes all costs incurred when removing equipment from service less any proceeds received for resale, scrap, or salvage

TCO Cost Elements

- The hidden costs are a real issue in some international TCO models…

  Internal expenses—the higher skills, communication, and time required to evaluate and work with foreign suppliers are not free

  Supplier health—gaining visibility into the financial stability of foreign suppliers is not always easy

  Post-contract lull—failing to monitor supplier and contract performance after signing an agreement can result in "cost creep" or even performance failure

TCO Cost Elements

- The hidden costs are a real issue in some international TCO models…

  Duty and tariff changes—employing resources to determine correct duties and monitor changes adds to total cost

  Contract non-compliance—internal non-compliance with a foreign contract reduces the total anticipated savings

  True inventory costs—while everyone agrees that longer pipelines increase inventory carrying charges, few companies fully account for these charges in their cost models

TCO Cost Elements

- The hidden costs are a real issue in some international TCO models…

  Cost volatility—managing changes in shipping costs and currency values adds an element of complexity

  Technology—extended supply changes require greater tracking capabilities

  Quality breakdowns—managing quality problems offshore can be more costly and complex to resolve, including the impact on corporate bran equity

Adapted from D. Hannon, "9 Hidden Costs of Global Sourcing," *Purchasing*, March 2009, www.purchasing.com.

VI. Challenges Moving Forward

- Ability to capture hidden costs
- Making total cost measurement systematic
- Providing the resources and infrastructure to support the development and continuous use of total cost systems
- Knowing when and where to apply total cost measurement
- Accepting that close enough may have to be good enough when measuring total cost

Challenges Moving Forward

- Tendency to focus on the tool rather than the measurement process
- Identifying and then gaining access to the necessary data
- Lack of standardized TCO modeling across the company (everyone taking their own approach)
- A continued focus on price measurement in procurement
- Lack of cost accounting and other IT systems that provide needed total cost data

Concluding Thoughts

The bottom line regarding total cost of ownership systems…

- Everyone wants them but few have them
- The information is "out there," but with so many cost variables to consider, the job of consolidating this information economically into a useful package can be intimidating

Concluding Thoughts

The bottom line regarding total cost of ownership systems…

- TCO is part of the next frontier of leading supply management practices that includes early supplier involvement, supplier development, and global supply management
- The pressure to reduce costs is relentless and severe, making TCO a necessity

Concluding Thoughts

The bottom line regarding total cost of ownership systems…

- TCO systems have interesting parallels to forecasting systems