Florida Association of Public Purchasing Officers

FAPPO

42nd Annual Conference
April 5 – 8, 2009 - Orlando, Florida

Life Cycle Costing –
Principles & Applications

Keith K. Glatz, CPPO, FCPM, FCPA

What We'll Talk About Today

- Introduce the concept of Total Cost of Ownership (TCO) and Life Cycle Costing (LCC)
- Discuss the total cost of ownership for capital acquisitions that have a high initial price tag, or will be expensive to operate or maintain over the life of the asset.
- Introduce the ownership factors that need to be evaluated when formulating a life cycle cost formula, as well as methods for evaluating alternative products.
- What are the most appropriate benchmarks for alternative evaluation
- Factor currently acceptable accounting practices into the evaluation process.

Environmental Scan

- Falling tax revenues mean *long-term* budget shortfalls
- Capital assets need to *last longer*, and be *less expensive to operate* over their useful life
- Environmental concerns require us to find *green solutions* to save energy and minimize our carbon footprint

How Do We Do That?

- Looking more at *best value* solutions instead of simply *low bid* awards
- Best value decisions require us to look at the *Total Cost of Ownership (TCO)* when evaluating facility systems and equipment in order to achieve payback for our purchasing decisions
- We need to apply *value analysis* techniques to measure the relative value attributes that impact TCO

Remember. . .

The cost of ownership of an asset or service is incurred throughout its whole life and does not all occur at the point of acquisition.

Value Analysis

Value Analysis is an organized effort at analyzing the functions of a product or service including specifications, standards, practices, and procedures with the intent to satisfy the required function at the lowest possible cost without impacting functional need and suitability. *NIGP Dictionary, 2008*

Principles of a Value Analysis

- What is function to be performed?
- How is function being performed and at what cost?
- Alternative means and cost
- Compare costs of alternatives
  - Determine the life cycle cost of each alternative
- Decide which alternative provides the most advantageous TCO

What Is Life Cycle Costing (LCC)?

Life Cycle Costing (LCC) is a technique to establish the total cost of ownership over the lifespan of an asset. It is a structured approach that addresses all the elements of this cost and can be used to produce a spend profile of the product or service over its anticipated life-span. The results of an LCC analysis can be used to assist management in the decision-making process where there is a choice of options. The accuracy of LCC analysis diminishes as it projects further into the future, so it is most valuable as a comparative tool when long term assumptions apply to all the options and consequently have the same impact.

LCC

- Life Cycle cost is a Value Analysis technique that calculates the total cost of ownership (TCO) and takes into account operating, maintenance, the time value of money, disposal, and residual value
  - ***LCC a/k/a TCO = (A) + (NPV Ci) – NPV Sn***

  - ***LCC = Life Cycle Cost OR TCO = Total cost of ownership***
  - ***A = Total delivered acquisition cost***
  - ***NPV = Net present value***
  - ***Ci = Operating costs in year I***
  - ***Sn = Salvage value in year n***

Benefits of Life Cycle Costing

- Evaluation of competing options in purchasing;
- Improved awareness of total costs;
- More accurate forecasting of cost profiles; and
- Performance trade-off against cost.

Option Evaluation

- Life Cycle Costing techniques allow evaluation of competing proposals on the basis of cumulative total costs for acquisition and total life operational and maintenance costs. Life cycle costing analysis can apply to most equipment, and many service purchasing decisions

Improved Forecasting

- The application of LCC techniques allows the full cost associated with a procurement to be estimated more accurately. It leads to improved decision making at all levels, for example major investment decisions, or the establishment of cost effective support policies. Additionally, LCC analysis allows more accurate forecasting of future expenditure to be applied to long-term cost factor assessments.

Performance Trade-off Against Cost

- In purchasing decisions initial acquisition cost is not the only factor to be considered when assessing the options. Other factors include:
  - the overall fit against the requirement
  - the quality of the goods and the levels of service to be provided.
- Life Cycle Cost analysis allows for a cost trade-off to be made against the varying attributes of the purchasing options.

Principles of Life Cycle Costing

- **Acquisition costs:** costs incurred between the decision to proceed with the procurement and the entry of the goods or services to operational use
- **Operational and Maintenance costs:** costs incurred during the operational life of the asset or service
- **End life costs:** costs associated with the disposal, termination or replacement of the asset or service. In the case of assets, disposal cost can be negative because the asset has a resale value.

Acquisition Costs

- Acquisition price
- Procurement costs
- Implementation and acceptance
- Transition from incumbent supplier(s)
- Changes to business processes
- Transportation and handling

Acquisition Costs -- continued

- Site preparation costs
- Licensing fees
- Cost of supplies & operating manuals
- Cost of future upgrades

Ongoing Operational Costs

- Retraining
- Operating Costs
- Contract and supplier management costs
- Maintenance contracts
- Repairs

End of Life Cycle Costs

- Residual value (Negative cost)
- Storage and warehousing costs (prior to disposal)
- Disposal / auction costs
- Environmental impact concerns
- Transportation costs
- Spare parts and Supplies (May be negative)

Life Cycle Cost Methods

- LCC is based on the premise that to arrive at meaningful purchasing decisions full account must be taken of each available option.
- All significant expenditure of resources which is likely to arise as a result of any decision must be addressed.
- Explicit consideration must be given to all relevant costs for each of the options from initial consideration through to disposal.

Cost Breakdown Structure

A successful life cycle cost analysis requires a quantifiable breakdown of individual costs that directly impact the asset throughout its life

Operating Cycle Costs

- Determining the operating cycle of the asset
  - Types of operation
  - Routine maintenance
  - Overhaul sequence

Factors that Impact Costs

- Important to Identify and quantify the factors that affect costs:
  - power consumption and rates at various levels of operation
  - labor requirements and rates
  - maintenance requirements and rates
  - Average time between failures
  - Time between overhauls
  - Average down time costs

Current & Future Information

- Need to know CURRENT rates and prices
- Project costs to a future date at which they will be incurred
- Adjust costs for expected inflation or deflation
- Consider the estimated salvage value/residual
- Complete your life cycle cost matrix

Adjusting for the Time Value of Money

- Discount all future costs and benefits to their present values using present value analysis (You may wish to involve your Finance Director or Accountant in this area)
- Add all costs and benefits to obtain the total life cycle cost, expressed in present value terms. (Note that all costs are brought back to year one by using present value factors directly related to the jurisdiction's cost of money)

Justifying Your LCC

- Prepare a business case which shows competing alternatives, presented in a simple, easily understood format.
- The case should present:
  - Net present value
  - Simple payback method
  - Sensitivity Analysis
  - Internal rate of return
  - Discounted payback period
  - Risk analysis

End of Life Cycle Considerations

- Consider the costs of revenue associated with disposal of the asset when it is no longer needed
- Is there a residual value (revenue opportunity), or will there be a cost to remove the item?
- Will there be hazardous waste considerations under the Federal Compensation and Liability Act (CERCLA)?

Some Pragmatic Examples

Example1. Purchase of Water Coolers – a simple comparison

Simple Water Cooler Analysis

Factors to consider:

- Purchasing 100 hot/cold water units:
- Delivered Acquisition Costs:
  - Vendor 1: **$191** Vendor 2: **$179**
- Electricity Consumption
  - Vendor 1: **1.20 kWh / day** Vendor 2: **2.19 kWh/ day**
- Maintenance Costs: $20 /yr - either unit (nominal)
- Cost of electricity ($/kWh) plus water: $0.095
- Useful Life: 10 years for either unit
- Discount Rate (NPV): 4% (considers 3% annual inflation for 10 years)

LCC Comparison

	Vendor 1	Vendor 2	Difference
Annual Operating Costs for 100 units			
Energy cost	$4,170	$7,610	$3,440
Maintenance Cost	$0	$0	$0
Total	**$4,170**	**$7,610**	**$3,440**
Life Cycle Costs*			
Operating costs (energy and maintenance)	$33,820	$61,722	$27,902
Energy costs	$33,820	$61,722	$27,902
Maintenance costs	$0	$0	$0
Purchase price for 100 unit(s)	$19,100	$17,900	-1200
Total	**$52,920**	**$79,622**	**$26,702**
Simple payback of initial additional cost (years)†	**0.3**		

Purchasing Alternative

Life Cycle Costing can be used to determine the best alternative method as well.

2. Example 2 – Purchase of a new roof. Which TYPE of roof is better?

LCC Roof Comparison

Type	A Avg. Life (Years)	B Initial Installed Cost Sq ft	C Annual Maint.. Cost Sq ft	D (A x C) TOTAL Life Maint / Sq ft.	E Disposal Cost /Sq. ft	F (B+D+E) Total cost /Sq. ft	G Total Cost for 100,000 Square Feet
Asphalt-organic felt BUR	14.7	2.27	0.12	1.76	0.86	4.89	$489,400
Coal-tar organic felt BUR	23.0	2.97	0.14	3.22	1.10	7.29	$729,000
Asphalt-glass felt BUR	16.7	2.28	0.12	2.00	0.81	5.09	$509,400
Coal-tar-glass felt & pitch	21.9	3.23	0.10	2.19	1.12	6.54	$654,000
EPDM	14.2	2.21	0.10	1.42	0.98	4.61	$461,000
Sheet metal	25.1	4.94	0.11	2.76	1.27	8.97	$897,100

- 100,000 square foot roof
- Assumes normal freeze/thaw cycles
- All costs shown per Square Foot

THANK YOU!

Questions or Comments?