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LIFE-CYCLE COSTING

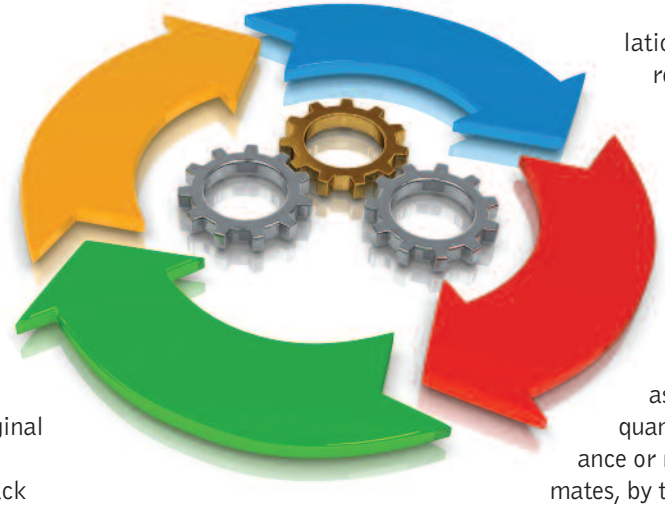
BY ROBERT J. ABBOTT

For most of us, the purchasing process is relatively simple: Find the lowest cost for the desired item, make the purchase and then move on to the next task. However, the purchase price may only be the first installment of that cost.

Too frequently the simple, short-term view of looking at the price only results in a purchase that ends up costing much more over a period of time than the original price tag. What's more, the entity doing the buying may be pulled back to revisit that purchase multiple times if the item fails prematurely, turns out to be less efficient than expected, requires more time to install or maintain than anticipated, or some other, unanticipated problem comes up.

In the 1960s, life-cycle costing (LCC) became popular as a means to evaluate the true cost of something over its entire useful lifetime. LCC seeks to quantify all costs associated with ownership. In addition to the initial cost, LCC commonly attempts to weigh factors such as the cost to install, maintain, repair, operate, replace, even dispose of an item, and depending on how comprehensive the analysis is intended to be, the list can include many more factors. As this shows, the final cost of an item is almost always much more than its purchase price.

But alas, LCC is not a precise process—its calculation can become so complex that it involves factors as scary as scientific calculations using probability theory, risk assessments and statistical analysis. The degree of use depends on how precise the LCC calculation must be. This is probably one of the reasons LCC fell out of favor. However, that attitude is changing; in this time of tight budgets and the need to wring every bit of value out of each dollar spent, there's renewed interest in LCC.



Fortunately, LCC as a concept can be applied without having to deal with much of the complexity, which is what this article seeks to do. Those who want to complete a "true" life-cycle cost analysis, the way such analyses have traditionally been done, can find ample source material on the Internet to help them and provide guidance. Those who choose this path can search some of the following terms:

- Life-cycle cost
- Life-cycle cost analysis
- Life-cycle cost summary
- Life-cycle cost calculator
- Water distribution life-cycle cost
- Water system life-cycle cost

However, before deciding to engage in this comprehensive LCC analysis with all its complexities, the following concepts about LCC should be understood:

LCC is not an exact science. Despite the many scientific principles and calculations that can be involved, the result itself is almost always only an estimate. That's because the only part of the LCC equation that is well-known and clearly defined is the procurement cost. All other data is estimated or assumed, with no guarantees that one factor will behave exactly the same as another when trying to quantify things such as performance or repair histories. LCC estimates, by the very nature that they are *estimated*, lack hard accuracy.

A detailed LCC analysis can require costly procedures to obtain needed data. The more accurate the LCC calculation needs to be, the more cost and time involved to develop the input data.

Although LCC can call for volumes of data, typically only limited data will exist.

LCC for a given item that comes from different sources, such as from a seller versus an end user, can differ significantly. This is because each party has a bias when selecting or establishing the input data.

"Something" is almost always better than "nothing."

Despite these realities, including LCC concepts in the procurement process can result in a more cost-effective purchasing decision. Even when a comprehensive analysis is not done, it is good practice to inject LCC into the discussion for no other reason than to push the various purchasing influences towards a team-like approach to the procurement process. In other words, considering only the initial cost without LCC:

- Designers or engineers might cut back on an item's performance variables to meet a capital budget

Figure 1. LCC Evaluation Matrix

Brand	Product	Perceived Product Quality	Perceived Brand Quality	Price	Perceived Product Reliability	Brand Sales Support	Brand Engineering Support	Local Stock	Parts Availability	Availability (delivery)	Ease of Application	Ease of Maintenance	Document Support	Warranty	SCORE POINTS	Key products
Supplier A	1	3	3	2	3	3	3	3	3	3	3	3	3	3	38	X
	2	3	3	1	3	3	3	3	3	3	3	3	3	3	37	
	3	3	3	2	3	3	3	3	3	3	3	3	3	3	38	
	4	3	3	1	3	3	3	3	3	2	3	3	3	3	36	X
	5	3	3	2	3	3	3	3	3	3	3	3	2	3	37	
	6	2	3	3	2	3	3	3	3	2	2	3	3	3	35	
																74
Supplier B	1	2	2	3	2	2	3	3	3	3	3	3	2	2	33	X
	4	3	2	3	3	3	3	3	3	3	2	3	3	2	36	X
	6	2	2	2	2	3	3	3	3	3	3	3	3	2	34	
																69
Supplier C	1	2	2	3	3	2	2	2	2	3	2	1	3	2	29	X
	4	2	2	3	2	2	2	2	2	3	1	1	3	2	27	X
																56

Scoring criteria: Among best=3 Average=2 Among worst=1 Not Known=2*
*It may be best to avoid criteria for which there's an unknown for any of the suppliers or products as it can "hide" something that if known could tip the decision.

MAGIC MATRIX

One of the most daunting parts of the life-cycle cost evaluation process, besides having to gather masses of data, is organizing and comparing that data in a way that will lead to meaningful and usable conclusions. Normal LCC data manipulation can be quite complex and probably exceeds many professionals' training levels. Complicating the situation further is the reality that much of the data that needs to be compared isn't available as data at all. Instead, many important factors in LCC conclusions are subjective evaluations resulting from experiences with each potential supplier and product.

Enter the Magic Matrix. Actually, this matrix isn't magic at all, but it might feel that way because of its simplicity. For most of us, the resulting conclusions we can draw are good enough to provide the basis for making an educated decision.

CONSTRUCTING THE MATRIX

A typical LCC decision matrix will have suppliers and/or products on one axis, with the various criteria that affect the cost of ownership on the other matrix. Notice in the example (Figure 1) that many of the latter do not necessarily translate to a cost that can readily be defined, yet a shortcoming in any of these areas can result in significant expenditures of time to rectify or address a problem.

The matrix in Figure 1 is just one example; the criteria used will vary widely—chosen based on each supplier's strengths/weaknesses, as well as the product's traits that can be rated. Anything that involves a direct cost or an expenditure of time should be included. In Figure 1, we've created a manageable scale: the scoring criteria are: Among best = 3; Average = 2; Among worst = 1; Not known = 2. A score of 2 is given for an "unknown" because it is neutral and neither gives an advantage nor penalizes that supplier or product. Depending on how important the ultimate decision will be, it might be best in some circumstances to remove criterion if one of the suppliers or products cannot be given a rating in a particularly important area.

RATE AND EVALUATE

The last step in this process is to assess the ratings and total the scores. For those who are buying on price, Supplier B or C in our example would probably win. But look further. When all criteria for the key products are totaled and compared, Supplier A might be the better choice.

In the end, it's still an individual choice. While this process might seem an oversimplification, it does give the decision-maker a lot more to go on than simply a low bid.

constraint that only considers initial cost.
- The purchasing department might focus on the lowest cost thinking as the desired goal, when in fact operating and other costs might mushroom once a less capable item is put into service.
- The operations department might assume an item will perform at 100% of its capacity and last forever when in fact almost nothing lasts that long.
- The maintenance department might plan an optimistic maintenance or repair program to reduce preventive maintenance costs and meet short-term management goals.

Including LCC principles in discussions and planning can push out each party's cost horizon and encourage a more realistic assessment of potential costs over a longer period of budget years.

WHAT'S MY REAL COST?

Even before you enter the purchase price for an item on a purchase order, you need to consider at least some of the following factors that can bring on added expense:

The supplier's reputation for *service* before, during and after the sale. A problem at any of these points in the procurement process that is not addressed in a timely manner can result in unexpected project delays, system downtimes, penalties, claims and other things that can bring on added cost.

The *availability* of a supplier's local representation to address problems during installation or while the product is in service. Again, a supplier who is not available when needed can mean undue delays. Additional damage to systems or property may result if a failure is not corrected as quickly as possible by someone located nearby.

Availability of *local stock*, especially repair parts and accessories. Without this availability, downtimes can be extended, cutting into production revenue or increasing maintenance costs.

Supplier's *financial* viability, which provides assurance of long-term support and honoring warrantees. Evaluating agents, representatives or any other entity that stands between operations and the manufacturer can have a detrimental effect on whether or not a warranty will be honored by that manufacturer. Often an item purchased outside a manufacturer's authorized distribution channel will be refused warranty service or cause additional cost for repair or replacement.

Quality and *professionalism.* How the entire supply channel supporting an item acts can have an enormous effect on the level of customer service and support provided the end customer, especially over the long term.

The manufacturer's *commitment* to a market segment. If the manufacturer's focus is on another market or geographic area and its staff is not versed in the concerns and needs of the purchaser, the best product may not be selected.

Many of the foregoing considerations cannot be assigned a dollar value. Yet if a shortfall occurs in any one of them, it is almost assured that an unintended cost results. The old adage, "Pay me now or pay me later" tends to ring true in such circumstances, as does "if it sounds too good to be true, then it probably is."

Note that the foregoing considerations do not do much to help a purchaser arrive at a meaningful cost comparison for one item versus another. However, constructing a matrix to rate all the brands to be considered, and then placing the items in order of likelihood that item will cost more over the long haul, gives a sense of true cost.

In constructing such a matrix, brands being considered could be one axis, while the other axis might list key words that represent each parameter to consider. In addition to the parameters suggested above, the list also might include:

- Supplier's reputation for products/services that last or perform with minimal attention.
- Supplier's reputation for products/services that are easy to install or apply with minimal training.
- Supplier's reputation for products/services that save energy or lead to more efficiency in an application.
- The degree to which the product/service is proven in years of field use—or lacking this, the reputation of the supplier's products/services to last for extended periods of time relative to other brands.

After creating such a matrix, the next step would be to assign a number for each brand/parameter combination, such as "1" if the judgment on that consideration is low likelihood, poor or some other negative." If "1" is the negative number, "3" might be high, excellent, very likely or similar. Then, "2" would be used for neutral performance or when a conclusion cannot be reached (though using that number should be kept to a minimum because it injects a degree of "benefit of a doubt" that might penalize other brands.) The last step would be to add up the numbers for each brand and arrange the brands from the highest score to the lowest.

Notice the initial cost is not factored into such a matrix. This is because an inferior product can sometimes hide behind a low initial cost. By including the initial cost in the matrix, whether that price is high or low, an otherwise high-scoring product could be penalized or a low-scoring one could be given an undeserved boost. Instead, an item's purchase price should be evaluated in light of its ranking in the matrix.

The resulting matrix and scores can provide a procurement team a means to conduct more meaningful and insightful discussions to arrive at the best purchasing decision. While this approach might not have the precision and mathematical complexity of a true LCC analysis, its validity as a decision-making tool is much closer to evaluating the true cost of a product than initial cost alone. **VM**

ROBERT J. ABBOTT is director of corporate marketing communications, Mueller Co., Chattanooga, TN. Reach him at RAbbott@muellercompany.com.