

Life cycle view

by Michel Theriault

Are your buildings costing more than they should?

INITIAL COSTS REPRESENT only 15 percent of a building's total cost, according to the National Research Council. Public sector organizations that ignore this fact when developing a building waste an opportunity to minimize the other 85 percent of their costs.

While minimizing the initial capital cost of your building – the most visible part of the public procurement and decision making process – seems right, it's costing you a lot more over the life of the building. The high cost of bad decisions is seen only after the building is occupied.

The procurement of public buildings is unique. In essence, they are designed, built, occupied, operated and ultimately disposed of or completely renovated after a long life. Unlike a commercial property, which often includes a short-term financial view, this involves the full life cycle of a building. Decisions related to the design and construction have long-term cost impacts to public sector

organizations – the longer you own a building, the higher the impact of inefficient operating costs.

The problem is that there is no accountability for the impact of design and construction on the ongoing costs to operate the building, including energy, security, janitorial, landscaping, staffing and other costs.

There are three real issues that create this extra cost to the public sector:

- pressure during procurement phase to reduce initial capital cost;
- procurement methodologies reward low initial cost; and
- effective mechanisms to reduce total cost exist but are not being used.

Visibility into the total cost of ownership is one way to address the issue. Justification and decisions should be based on the total cost of ownership, not just initial costs.

Implement techniques that drive down the total cost of the building, not just the ini-

tial cost. Use effective financial analysis to illustrate the benefits and shift the behaviour of decision makers.

By estimating the total cost of operating over the life of the facility based on a more efficient design and the implementation of key techniques, and by using this information as part of the budgeting and decision making process, you are more likely to arrive at a better decision – one that may include more up-front funding to design and build a more efficient building.

The easiest way to reduce total costs is to build operating efficiency into the design and construction of the building using existing techniques, many of which are well developed but not always used. The caveat is that these techniques may extend the total project time, will introduce increased consulting/professional fees up-front and may result in design changes that increase initial costs. Build these techniques into the initial schedule and budget and then use the results, along with the related financial analysis, to justify increased construction costs that reduce ongoing costs.

The design of the building has an impact on ongoing costs. There are many disciplines involved in the design; however, they are usually led by architectural considerations first, followed by the design of systems by mechanical, structural and electrical engineers etc.

A team approach involving and including the full range of disciplines at the commencement of the project and throughout the design enables better integration of the disciplines and ensures the best solutions drive the design rather than the design driving the solutions.

Green buildings are expected in the current economic and political climate, especially for public facilities. Using green standards and initiatives typically results in slightly higher initial cost but they result in lower ongoing energy costs. This is not only politically and socially correct, it contributes to a lower total cost of ownership.





The increased costs of a green building, especially when it is LEED certified, are usually easier to justify and get approval for. Some levels of government are already mandating or encouraging green buildings. Keep in mind that while formal standards and initiatives such as LEED carry the green label, other techniques should also be used to reduce costs. When justifying the increased cost, be sure to take the full benefits of energy reductions from all initiatives into account under the banner of green initiatives.

Rarely are facility professionals consulted during the design phase of a new project, to provide input on the design and provide guidance to minimize future operational costs. Since the ongoing costs are up to 85 percent of the total cost of ownership, this is a significant oversight.

If you have adequate internal operations resources with the time and experience necessary, this is a low cost method to improve results. You may need to augment internal resources with external resources or consultants for certain areas. For instance, involving service providers for janitorial, grounds, maintenance, guard services and other services will provide invaluable guidance on design elements that can reduce operational costs.

Examples include designs that enable easy access for maintenance, surfaces with low maintenance and janitorial costs, physical design and technology that reduce the need for guards, adequate space that is efficiently located for maintenance and janitorial services to reduce labour needs and modern building automation that enables efficient ongoing management and maintenance of systems, including energy conservation.

Since operations and maintenance staff can be a significant operational cost, design and equipment selection that can reduce staff requirements should be included.

As always, the earlier decisions and initiatives are taken during the design phase, the easier they are to include in the final design. Include the facility operations input from the start.

The life cycle costing analysis takes four key cost components into account to determine the lowest total cost of design alternatives. It's a well established economic analysis that takes a component by component approach to the initial cost, maintenance costs, energy costs and replacement or renewal costs of the equipment over the life of the

building. The analysis is rigorous, taking into account the time value of money and inflation to develop a net present value for the total cost of the components over their entire life cycle.

This technique enables effective decisions related to design and equipment selection alternatives and options, ensuring the best choices for total cost of ownership, not just initial construction costs. This technique provides the information and evidence you need to influence decision making if the final design exceeds budget but demonstrates the lowest total cost of ownership.

This technique can be used for a design/build tender to achieve the lowest total cost rather than the lowest initial construction cost. By requiring lifecycle costing analysis by a third party as part of each submission and using the results as a basis for final selection, rather than just the initial cost, you can make the best financial decision.

This tool is closely related to life cycle costing and they often work together. Unlike life cycle costing, value engineering goes beyond purely financial analysis and assesses the design, including materials, equipment and functional requirements. The intent is to eliminate or modify elements of the design that are either not required to achieve the functional requirements or add unnecessary costs.

This isn't engineering in the same sense as mechanical, structural or electrical engineering for building systems. It is engineering in the broader sense, including not only quantifiable elements such as equipment and materials, but also non-quantitative aspects such as productivity, aesthetics, occupant comfort, performance and functionality.

Generally, value engineering will drive the design and equipment selection alternatives, and life cycle costing will then analyze the total economic impact of those decisions.

Even if the design reflects the best value in initial cost and total cost of ownership, the actual implementation of the design during construction needs to be validated against the design specifications. Studies indicate that the payback on commissioning costs for energy alone is 4.8 years by ensuring the systems actually operate as designed. While financial analysts may feel this payback is too long, they need to consider the cumulative benefits over the life of public facilities.

Commissioning is a quality assurance process that verifies that the systems installed during construction meet the original design criteria through testing and documentation. This process is conducted by third party commissioning consultants throughout the construction process.

Commissioning can be conducted on a system by system basis or a total building commissioning. The level depends on the mandate given to the commissioning consulting and the costs you are willing to incur and should start as soon as possible during the construction phase.

A total building approach includes a broader range of systems on an integrated basis, not on a system by system basis and is the preferred approach to ensure the lowest total cost of ownership. Commissioning should include functional performance testing as well as documentation of the design intent, operating parameters and sequences. This can also include developing system operations manuals to provide guidance on efficient operations for the facility staff. The commissioning consultant should be involved in the design phase of the project so they are fully aware of the design intent and can develop their commissioning plan with full knowledge of the system design decisions.

To get the best value from the commissioning process, facilities operations staff should be involved in the commissioning and receive training on the systems during the construction phase. Since the cost of operations is the largest part of the total cost of ownership, providing operational staff with the knowledge they need to operate the facility efficiently in accordance with the design intent is critical.

Building public facilities presents a unique opportunity to focus on the total cost of ownership rather than simply the initial cost. The very long life and public ownership of a typical public sector facility makes this stewardship even more important. ■■■

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