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Theme:
Overcoming The Challenges To Capital Project Delivery In A Recessive Construction Market

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Topic:
Re-Engineering Cost Management of Capital Project for Effective Project Delivery

By

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RE-ENGINEERING COST MANAGEMENT OF CAPITAL PROJECT FOR EFFECTIVE PROJECT DELIVERY

1.1 INTRODUCTION

This paper addresses cost management and its primary significance as a measure of project success. All projects are managed and measured by success criteria of several types, cost being only one of many important metrics—but as a resource cost and as a measure possesses unique attributes which differentiate it from other project measures and requires unique considerations and methodologies in order to provide for its effective management. This paper considers:

- ✓ Cost as the standard measure of project success—having higher visibility and requiring extremely effective methodologies for managing and communication;
- ✓ Cost management vs. cost accounting—requiring different methodologies and a higher level of involvement by the project team;
- ✓ Cost management as a process, not a discipline, requiring the integration of effort and inputs from multiple persons using prescribed methodologies

This paper offers methodologies for:

- ✓ An effective and thorough three-point cost management approach;
- ✓ Managing total cost;

1.2 COST MANAGEMENT, AN OVERVIEW

Projects are described and defined by metrics and measures. Quantitative comparisons signify distinctions between success and failure, good vs. very good or suggest 'go' vs. 'no go' to us. We do not only measure outcomes, but we then compare them against norms established as thresholds of acceptability. Projects are measured using many factors and compared against just as many standards. Safety time and schedule, quality and User Satisfaction are important to projects and are thus measured and compared against either universal/external standards or project specific/internal standards. As project management professionals we are obligated to manage all areas and indices of a project's success. Yet the topic and content of this paper focuses only upon cost. Why? This does not reflect a feeling on the author's part that cost is in itself intrinsically more important or valuable than say quality or time. It is because the author has observed and experienced that cost as a measure and as an indicator is universally

used, easily understood, requiring no specialized knowledge of any kind, and enables a simple common denominator with which to normalize all comparisons. There are also unique attributes about cost as both a measure and a standard that are not shared by other measures. These unique qualities in turn present special challenges in management methodologies.

1.3 COST IS...

1.3.1 The Most Common Measure of Success

All projects are measured against some performance criteria that indicate whether the project is successful or not. There are many criteria, all important, that we regularly incorporate when establishing performance metrics. Time, quality, safety and cost are some of those. Cost however is the measure that is most often presented and is widely understood as an indicator of how well a project is performing, is likely to have performed or has performed.
Even projects driven by other metrics will rationalize strategic decisions on the normal basis of cost. For instance, a project that is schedule driven is usually only this way because the payback or deliverable promised by the project exceeds the savings that might be experienced by extending the execution time. Cost is an easily understood common denominator used to rationalize a decision to, say, incurs the additional costs of accelerating an existing schedule or to accept greater costs in developing a time optimized baseline execution plan 1. Finally, there are many project participants - either directs stakeholders or beneficiaries as well as others having oversight roles at corporate, non-project levels who better relate to and more easily understand cost as a measure and yardstick for performance. Theirs is the world of return on investment, the bottom line, or time to payback indices; the concepts of earned value, SPI, or CPI are lost on them.

This paper does not suggest that cost is the more important metric, only that it is the easiest to comprehend and therefore the most common and that the ability to frame any/all project performance measures within the context of cost should be well within the capabilities of any project management or project controls professional. But beware! This can be a species argument and a misleading justification for spending foolishly. All too often spending decisions are suggested and approved on the basis of buying time when in fact an expedited delivery or accelerated task is not on the critical path and has no discernible benefit to the project. Remember that one of the four goals of cost management is to spend wisely, i.e. to ensure that a unit or more of value is received for every unit of investment.

1.3.2 The Most Finite Resource

Projects are expected to complete within the confines and limitations of the resources allocated to them. A project that has been approved on the basis of a budget estimate is expected to complete having spent no more than that amount. If a project's time management has failed, i.e. too much work remains at the completion of the schedule, then more time is needed to complete the project. While the need for more time may not be acceptable, time is, as a commodity, available. Time itself is infinite. There are always more hours, days, weeks and months that will occur post-deadline and does not require borrowing, issuance of bonds or trading off between other initiatives. While time allotted runs out, time itself continues on and is available. The need for it may well reduce salaries, eliminate bonuses or even ruin careers, but it is available. Money is not infinite - or certainly not within the context of the project or corporate organization. When allotted monies are gone, you must obtain more if you wish to continue the project. You must literally beg, borrow or steal from other project funding opportunities or the project will be forced to a halt.

1.3.3 The Most Competed for Resource

Corporations are forced to make choices when appropriating funds for approved projects. To obtain approval, every project initiative that is presented must make a business case or demonstrate a tangible benefit to the organization based upon the project's deliverable. In the typical corporate scenario, there are many projects worthy of investment and approval, but with a finite availability of money, only selected ones can be funded within a given planning and budgetary cycle. Competition for project funding within an organization is vigorous. In making these choices, management must rely upon the accuracy and relevance of the information and data underlying the cost versus benefit statement. They also need to feel assured that:

- ✓ Projects are not over-funded, denying funding for other projects thus depriving a benefit to the organization.
- ✓ Projects are not under-funded, and inviting a cost-to-complete crisis at a later, more critical time.
- ✓ Projects are insistent about and capable of seeing that there is expenditure quid pro quo—that monies are appropriately spent and receive appropriate value in return.

- ✓ Projects have mechanisms to prevent overspending - not only relative to their budget, but also relative to their need. That is to say, funding that might possibly become excess through value management, reductions in scope, unrealized risk, etc. will be identified and will returned to the organization at appropriate times.

1.4 COST MANAGEMENT VS. COST ACCOUNTING

All organizations identify cost management as a goal and a practice. Managing cost however differs greatly from accounting for them, and while many organizations feel that they are managing costs, they are in fact they are only accounting for them. Such organizations are depriving themselves of the benefits that management processes deliver. Simply stated, cost accounting addresses "how much" and "what for." It is not analytical and merely addresses history or tells us what happened. Cost management focuses upon measuring performance, comparing against expectations and finding reasons for divergence. Cost management also endeavours to predict final outcomes and to provide strategic recommendations for changing or mitigating such. Cost management is forward looking and attempts to answer why, what it means and what can be done about it. Cost management is not good to cost accounting's being bad—they are both different, perform different functions and are both necessary. In fact, cost management cannot be performed without having an adequate cost accounting process in place. The irony is that a larger, disproportionate share of the costs incurred in employing a cost management methodology is in the budgeting, allocation, recording and reporting of costs—the accounting side. Whereas employing the processes to effect a complete management capability requires little added cost.

1.5 COST MANAGEMENT OBJECTIVES

There are four objectives in cost management:

- ✓ Spending timely—Ensure that money or resources are expended in accordance with the project or corporate capital expenditure plan;
- ✓ Spending wisely—Ensure that monies are well-spent, i.e. that a planned unit of gain is achieved for each unit of expenditure;
- ✓ Spending correctly—Ensure expenditures only for those things for which we are obligated;
- ✓ Spending perceptively—Ensure that spending versus achievement variances are identified, analyzed, corrected or trended so that early warnings can enable timely actions.

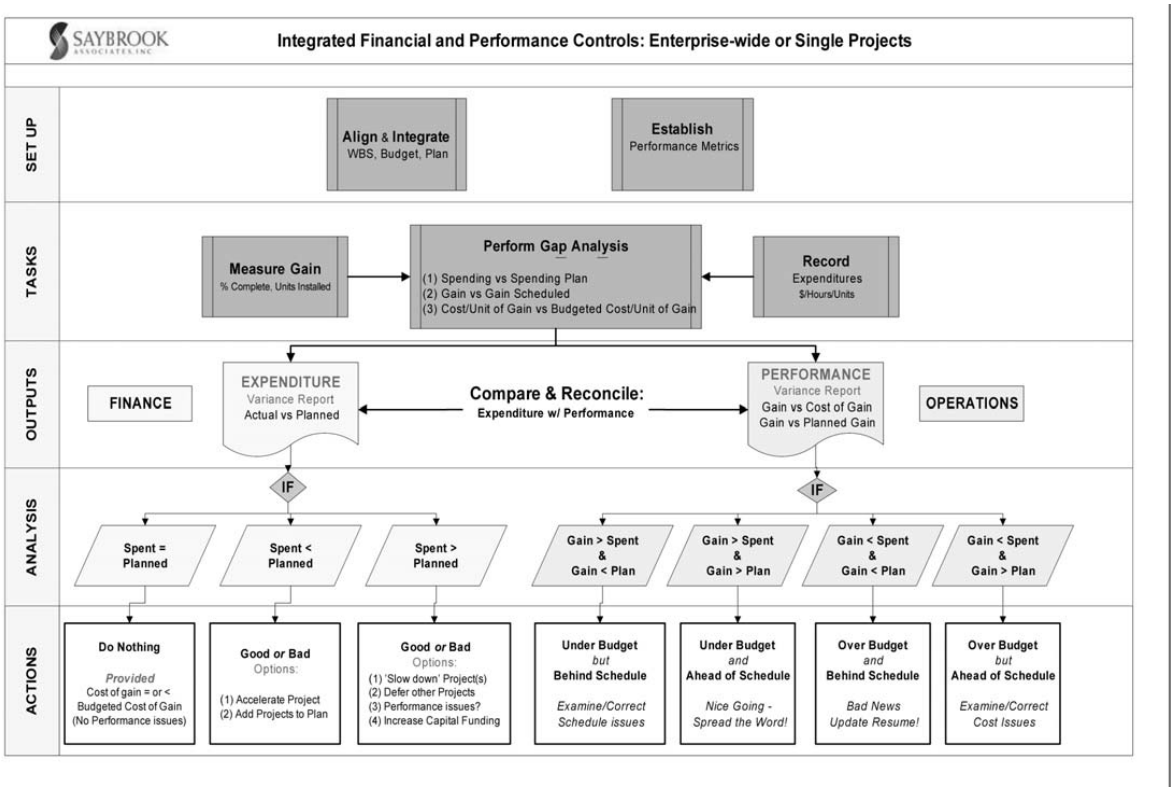

Figure 1—Spending Timely and Spending Well—Both Required.

1.6 EFFECTIVE COST MANAGEMENT IS…

1.6.1 A process rather than a discipline

The function of cost management is often regarded as a discipline or as a position within a project structure and assigned to individuals rather than to teams. Cost management requires processes and methodologies that can only function with information development and knowledge hand-off and enhancements. This is made possible through the deployment of assignment, collection, assessment, analysis, and strategic decision making processes. Cost management is a management function and responsibility and must be performed by teams using recordable and repeatable methodologies.

1.6.2 The integration of processes and knowledge from multiple functional roles

Effective cost management requires involvement and interaction between many individuals at different levels having different roles and skills. It demands that all persons employing

management methodologies interact in a synergistic fashion. Cost management practice areas are too often compartmentalized and singularly tasked, allowing only minimal information exchange or knowledge enhancement between silos. In your organization, is estimating performed as a stand-alone function, or is there participation with and knowledge integration with those developing the execution plan and strategies? Do value management initiatives include facility operations and maintenance personnel as participants or only project personnel? Does the project manager regard cost management as the team's responsibility and ensure the integration of cost management thinking and action into the ongoing project operations, or do they abrogate that responsibility to the cost engineer and limit their involvement to being attendees only during monthly or quarterly cost review sessions?

1.6.3 Performed by people, not products

There is no software or tool that manages cost. Tools can simplify or facilitate the tasks of recording and reporting cost, but the process of managing cost is dependent upon properly estimating, allocating, measuring and analyzing cost performance. Management requires that information be analyzed and acted upon. Analysis of alternatives, “what-if” comparisons and recommendations based upon strategic thinking can only be performed by project controls professionals.

1.7 THREE POINT COST MANAGEMENT APPROACH

1.7.1 The Cost at Completion Triangle

This graphic represents a fixed volume of cost, measured in money, resources or even time that the project represents as sufficient for execution and to provide all project deliverables. As with any geometric shape, the volume can only remain constant if the boundaries remain fixed. The suggested approach is to consider and develop strategies with which to manage each of the points of the triangle, and then implement process that support those strategies.

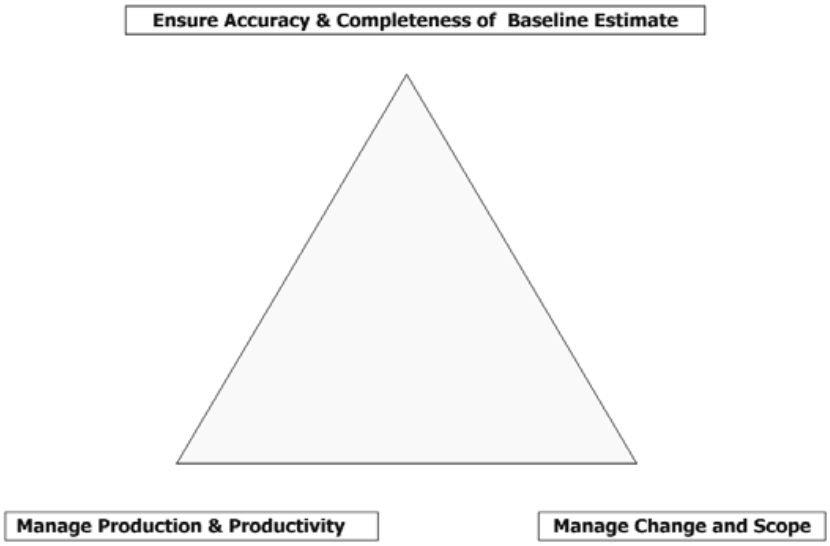

Figure 2—Manage the Points, Contain the Cost.

1.7.1.1 Point 1: Ensure the Accuracy and Completeness of the Baseline Estimate

Nothing is worse than managing to the wrong number! Projects are threatened or have failed because of the inability to meet expectations imposed by estimates that are incomplete, contain invalid assumptions, are erroneous or contain no provision for surprises or unknowns. Mistakes can and do happen of course, but unfortunately they are often discovered well past the point of no return. At that point, there may be few with options for recovery short of assaults upon scope integrity and functionality - perhaps disguised as value management, or establishment of a contentious environment in which of all information, directives or requests are interpreted as change, resulting in the seemingly endless war of claims. The best way to solve a problem is to prevent it - simple processes can and should be deployed during the development phases of the estimate and continue through the delivery of the completed definitive or baseline estimate. Some strategic processes include:

- ✓ Review and validate the basis of estimate (BOE);
- ✓ Perform risk analysis, develop mitigation strategies and create appropriate contingencies, reserves and allowances;
- ✓ Perform value management reviews - initial and at appropriate project stages.

Review and validate the basis of estimate (BOE) - There are many possible errors in preparing an estimate that can understate or overstate the capital or resource requirements for the project. Some actions and steps to either ensure greater accuracy or to detect errors include:

- ✓ Scope review - all present and accounted for?
- ✓ Thorough understanding of scope and project deliverables - are there clearly communicated criteria and expectations? Other agendas?
- ✓ Benchmarking - How does project compare with similar industry projects? With similar company projects?
- ✓ Integration with project execution plan - does the estimate incorporate time requirements and special execution strategies that might be decided upon external to the estimating team, or is the estimate just a summation of take-off quantities extended by pricing unit rates?
- ✓ Accuracy of take-offs and extensions - Has an audit been performed?

Perform risk analysis and develop mitigation strategies

Success metrics are assumption-based—no matter how carefully or thoughtfully developed. Measures of cost or time performance and success are based on criteria that have been created for the project. These criteria assume that certain things are correct, that certain things will happen and/or that certain things will not happen.

For instance, we assume that certain benchmarks or historical productivity rates are repeatable, or even correct, or that key vendors will comply with our delivery requirements, or even remain in business, or that labour unrest will not occur. Risk is in the possibility that reality will trump reasonable expectations and leave us unprepared for the impacts not budgeted. A risk management process will:

- ✓ Identify risks and threats,
- ✓ Assess the probability of occurrence,
- ✓ Gauge the severity of impact should they occur,
- ✓ Estimate the cost of mitigation, avoidance, transfer or elimination.

Ensure inclusion of appropriate contingencies, reserves and allowances

The costs of mitigation, avoidance, transfer or elimination can be incorporated into the estimate. Risks whose impact cannot be quantified can be included as part of a rational basis for contingency development. Contingency is established to mitigate or eliminate the adverse impacts of the unforeseen or under-predicted events. Allowances are not risk-based. They provide funding for project elements and events that are anticipated and within the scope of the project, but cannot be quantified as the project or design development is in its early stages and will continue to evolve. Management reserve funds are common to project management.

These funds are usually typified as discretionary funds that may be applied by the appropriate level of management for any purposes that they choose.

Setting contingencies - Care must be exercised when setting contingencies for risks. It is important that contingencies be sufficient to cover the extent and probable impacts of risk. It is equally important that contingency does not exceed needs. Over budgeting of contingency have two undesirable effects:

- ✓ The company is deprived of funds that might be better used in other ways or for other projects;
- ✓ Unspent contingency monies will find their way to funding scope changes, enhancements, and other elements that should properly be purchased with allowance or reserve resources.

Risk changes with time and completion progress. The available contingency should reflect these changes by readjustments through periodic reassessment and quantification of risk.

Initiate and Incorporate the Value Management Process

Optimizing the value received relative to the investment made - The primary goal of the value management (VM) process is in optimizing value, not cutting costs! Optimizing value implies the achievement of greater benefit per unit of cost, not just a lower total estimate cost. While costs can be reduced through the VM process, it is really as a result of identifying and removing features or functions whose cost is greater than the benefit they provide or as a result of substituting features or functions having equivalent value but lower cost. Conversely, a VM implementation might result in an increase in the project estimate if added features convey a benefit greater than their cost. One risk that must be managed during the VM process is the temptation to eliminate or reduce scope for the simple sake of reducing costs. This can result in cost reductions but may not be cost savings, particularly if compromising the scope reduces desired features or functions of the project—or if life-cycle costs, or total cost, increase irrespective of a one-time, front-end reduction. Another risk is the assumption by many that greater quality means increased value. This is not true—quality greater than quality required does not equal greater value, only greater cost. The first step in implementing a VM process is the development of a project value hierarchy. This will clearly prioritize benefits, establish rules of engagement and define the tie-breaker to be relied upon when considering trade-off, trade-up and trade down options.

Successful implementation of the VM process requires:

- ✓ A project value hierarchy;
- ✓ Early engagement of the process—when the cost of change is lowest, therefore optimizing the cost to benefit ratio;
- ✓ Participation by the all project stakeholders—so that benefit, value and total cost considerations can be fully vetted;
- ✓ Consideration of total cost;
- ✓ Distinction between cost transfers or deferrals and cost savings;
- ✓ Real estimates of costs and benefit;
- ✓ Review of processes as well as product;
- ✓ Focus on value—not cost;
- ✓ Support and acceptance of conclusions by team. With following outcomes to be expected:
- ✓ Optimized value relative to investment;
- ✓ Increased benefits from project components or processes;
- ✓ Removal of unnecessary features, functions and costs;
- ✓ Without compromise of project scope and benefits;
- ✓ With full stakeholder backing and ownership of solutions.

1.7.1.2 Point 2: Manage Production and Productivity

Project execution costs will be affected by variances or gaps in production goals as well as by productivity assumptions in the performance of the project tasks. Shortfalls in accomplishing the planned units of work per unit of time will either delay the project incurring additional costs associated with such extension of time or necessitate the addition of resources with the added costs associated with acceleration. Productivity variances will require greater-than-budgeted units of input per unit of output and will either require additional time to complete, i.e. prolong the schedule or will necessitate additional resources with the added costs associated with such. The crux of managing production and productivity is in having the capability to identify variances early enough so as to allow corrective action. Note the operative words are identify and early and apply to both production and productivity! Although most projects have established methodologies for planning, measuring and analyzing production—few projects have any established process for measuring and analyzing productivity. Both processes are necessary for effective project, and cost, management and control.

The earned value solution—Earned Value analysis is one methodology that enables the simultaneous analysis of production and productivity. It also provides an immediate assessment of predicted outcomes at completion, early warning, while displaying in one view a three-way comparison between what was planned, what was achieved and how efficiently. The definition of earned is simple: when a task or portion of a task is accomplished, the resources, cost or time, are earned. Earned equals budget times percent complete, and earned' is independent of expenditure. Earned value is the analytical technique that measures results relative to effort and allows us to manage cost and time on the basis of performance. The ability to view schedule/budget/cost simultaneously and to immediately detect variances provides us with the capability to trend or predict outcomes at completion and to receive early warnings that enable actions in time to make a difference. I do not feel that projects can be successfully executed without the use of the earned value methodology. The irony is that it is resisted by many because it is thought to be overly analytical, complex, difficult to use and requiring significant investments in resources. In fact it requires no additional information than is already generated on most projects and requires very little additional effort.

Steps for the successful implementation of earned value:

- ✓ Develop performance standards, basis of estimate;
- ✓ Develop work breakdown structure (WBS);
- ✓ Allocate cost/time budgets to appropriate WBS level;
- ✓ Collect actual expenditures—cost, time, other;
- ✓ Measure accomplishment, percent or units;
- ✓ Measure/compare performance—Actual versus planned versus earned;
- ✓ Keep it simple and make it easy to use! Measure percent complete or work accomplished at the task level, but estimate, allocate and collect costs at a higher WBS level!

1.7.1.3 Point 3: Manage Scope and Control Change

Change, scope creep, modifications, revisions—dreaded words and certain budget breakers on any project! Unfortunately, we can't run from it, we can't ignore it, and we most certainly can't prevent—but we can manage it!

The first step in managing change is to understand why it happens. The notion of change being intrinsically bad is an incorrect one. Events that are external to the project such as evolving technology, changing business models, swings in world market conditions, may

necessitate the seizing of opportunities with which to reconfigure, readapt or enhance the project. Remember the concepts of total cost and benefit and that it's not just about the project's capital budget. Our challenge is to manage change by identifying and classifying proposed change by driver or root cause and to demonstrate the added cost and/or benefit in adopting the change. There are some change issues that are simply beyond the purview of project team to accept or reject. In these instances our obligation is to ensure what we do the following:

- ✓ Validate change—verifying that it is not already within scope or range of project expectations;
- ✓ Ensure the change is needed or is beneficial;
- ✓ Is obtained or implemented at the right price, in the right time, in the easiest way;
- ✓ Is documented and we can demonstrate its driver, its benefit, and its cost;
- ✓ Has been reviewed and approved by appropriate levels;
- ✓ Has an identified and approved funding source from contingency, management reserve, budget transfers or offsets, etc.

Proposed or requested changes can be categorized into three types: “got to haves,” “Should haves,” or “Want to haves.” Category three can become category two through value analysis—or even category 1 via organizational politics, but in many instances these are requests for extra and additional features that might benefit one or even several users but do not contribute value to the project or its deliverables. Change management now evolves into expectation management. As project management professionals we are wired to say yes, we are after all the can-do-profession. We must, however, be successful in three areas of expectations. Establishing expectations and delivering expectations are process based and can be performed with developed methodologies. Managing expectations is much more difficult, often requiring us to act contrary to our nature, and is a personal skill not easily learned!

Steps for successful change management:

- ✓ Set and communicate expectations—detailed scope document distributed to all stakeholders;
- ✓ Proposed change review process—review against scope, category cause/reason, benefit/cost analysis from total cost perspective;
- ✓ Gatekeeper process—yes/no, appropriate approval;
- ✓ Scope control equals expectation management;

- ✓ Identified funding source;
- ✓ Funding/impact adjustments;
- ✓ Learn to say no—whenever appropriate.

1.8 TOTAL COST—THINKING BEYOND THE PROJECT

1.8.1 Project Success: Successful Execution vs. Successful Project

We must distinguish between a successfully executed project and a project that is successful! Projects are not approved and funded on the basis of their estimated costs and/or execution plans—they are approved only because the value of their benefit(s) is greater than the sum of the costs. Likewise, project sponsors are ensured by and rewarded based upon the successful delivery of the promised benefits for which the project was initiated.

Because the project team is gauged mostly by compliance with execution metrics, cost, etc, it is easy for our involvement within a project to obscure our view of a bigger corporate picture. Irrespective of that, it is important to remember that the corporation has needs that must be served as well as the project. Our roles as project management professionals often lead us into conflict regarding the calculation and analysis of costs versus benefits. Organizational expectations, project team versus corporate staff, or functional role constraints, owner's representative versus CM at risk, will have influence upon and will affect our viewpoint and decisions regarding appropriate actions in managing project costs. The CM at risk or CM having shared participation cost savings/cost overruns has every incentive to promote the deferral of costs to cost centers beyond the capital center-recommending, for example, lower-priced mechanical equipment that might result in lower 1st costs but increase maintenance or energy costs. Likewise, facilities personnel charged with successfully operating and maintaining the completed project will have a similar bias toward obtaining the easiest and least costly operating conditions, without consideration for inordinately high 1st costs bearing little additional value. Our responsibilities as project management professionals require that we think beyond just the capital or any single expense component. We need to consider the optimal balance between first costs and life-cycle costs and to provide dispassionate, objective analysis to owners or investors with recommendations based upon the best possible solutions. We are familiar with the “pay me now or pay me later” concept—we must realize the for the “pay me more/less now or pay me less/more later” concept as well.

1.9 CONCLUSION

Cost is the universal and most highly visible performance metric for indicating project success. Cost is also the most competed for corporate resource. Cost is considered as a finite resource. As such, we as project management and project controls professionals must be willing to expend the effort and intelligence necessary to properly manage it.

Often mistaken for or confused with cost management, cost accounting differs greatly. Cost accounting provides a record and history of expenditures but does not by itself manage and control final cost at completion outcomes. While providing a necessary and beneficial function, it is best used as a platform for effecting a cost management process.

Cost management should be regarded as a process requiring the integration of separate discipline methodologies and the involvement of many persons who are both part of, and external to the project team.

Meaningful cost management requires thinking and acting outside the project. This implies that cost and benefits be considered in total and not limited to a project's capital budget, that organizational requirements be considered, and that the competing goals between projects and corporate entities be optimized and aligned.

Effective cost management requires the implementation of methodologies and steps that are repeatable from project to project and can be integrated with organization goals.

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