Cost Management for Project Managers

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Introduction

Warning: there is no silver bullet within the pages of this paper. If you are expecting a solution to all estimating problems, or perhaps a solution to controlling all costs in all projects, you will be disappointed.

This paper will give you some insight into the financial considerations of the enterprise manager. One objective of this paper is to allow you to better align your project cost-management with the enterprise financial management. We will also give you five rules to improve project estimates. You will be better able to guide subject matter experts and functional managers to provide you with improved estimates. Further, you will be provided with a performance assessment matrix with generalized performance margins and with suggestions for improving the definition of the quality of performance in project management. You will be better able to interpret earned value results of project performance.

Understanding these suggestions will not guarantee project management success. Practice in the use of these concepts, rules, and interpretive tools will simply increase your probability of success.

Financial Management

Of the three overlapping circles of management – business, project, and product management – the initiation phase of the project management life cycle commences with the transmission of vision from the business manager to the project manager. The enterprise vision in each instance must contain the necessary elements for the project manager to define the project scope in time, cost, and objective terms. The project scope must align with the enterprise vision. This does not mean that the project will take on the enterprise responsibilities. For example, an enterprise vision that one can reduce engineering division costs by 10 percent by implementing three-dimension CADD (computer-assisted design and drafting) translates to a project goal of provide 3-D CADD.

Since this paper addresses only the cost management aspect of project management, our continued discussion of enterprise vision addresses only the financial management component.

From the outset, it is important to understand the investment implications of the project. One important aspect is the relationship between $1 today and $1 in the future. Consider the following example from an enterprise perspective: Your company is contemplating investing $1 million in a vision that is expected to pay out $200,000 per year for nine years. Should your company authorize the necessary project? At first glance, yes, since the total inflows of $1.8 M at $200K per year is greater than $1 M outflow. However, the $1 M is paid out immediately, and the $200K per year is received in the future. Further, while the immediate investment is known with some certainty, the return can only be estimated. In addition, the return is paid in dollars of a different value. Before deciding, we need to know the relationship between a dollar today and a dollar in the future.

This relationship is called the time value of money, and refers to the condition that a dollar today is worth more than a dollar promised. In the simplest approach, you could earn interest while you wait, allowing your dollar in hand to grow with minimal effort. A decision to risk that dollar involves, in part, consideration of the rate of appreciation without risk.

Time value of money tables simplify the calculations. A future value table shows the future value of $1 invested at various percent for various periods of time. Present value tables show how much we must invest today at a certain percent to earn a particular return in the future.

Present value tables are used to evaluate projects. With an estimate or limit for the project investment and an estimate of the future return, we can discount the cash flows back to “present value.” By comparing this discounted
cash inflow to the cash outlay, we can determine if the result of the project might earn the return we desire. In other words: Should we risk this much; how much to get something that we do not have but believe will give us a return that we could not get elsewhere? No wonder they want to cap the project expenditure.

The enterprise manager in similar fashion can apply other methods such as Net Present Value (NPV), Internal Rate of Return (IRR), Benefit Cost Ratio (BCR), and Payback Period. Mathematical analysis of expenditures and expectations is however only a guide to an investment decision and not the decision itself. The precise nature of results of the quantitative analysis can obscure errors made in the formulation of the original problem. Care must be taken to apply the procedures consistently to all alternatives. Further, it is extremely important that the project expenditures be accurately identified and entered into the enterprise computations even if this involves making detailed project plans and estimates before making an enterprise decision.

Having the project horse before the enterprise cart – a valid analogy given that the enterprise manager is riding the cart driving the horse that is pulling the cart – occurs less often than it should. Frequently, enterprise managers will expect given project budgets to be met by the project plans. Central to this belief is an expectation that estimates will meet expectations.

**Project Estimating**

Whether the project manager creates the project plan before the enterprise investment decision or as a consequence, the central cost management component of the plan is the estimates. Estimates are predictions for three plan parameters: How long? How many? How much? Estimates are not required if we have no need of knowing how long, how many, or how much. The WBS is the foundation for estimating. If there is no WBS, we cannot create estimates. On top of that, people produce estimates and people make mistakes. Yes, the estimating process is subject to error.

Project managers do not estimate; they manage the estimating process. Though the project manager owns the project management work package ‘prepare estimates,’ it is as guardian of the process. Project managers plan, direct, organize, staff, control, and coordinate the creation of estimates.

They plan by determining the who, what, where, when, why, and how of the estimate creation activity. They direct by delivering their plan. They organize by marshalling the necessary non-personnel resources: the room, the WBS, historical information, and perhaps, tools including software. They staff by marshalling the necessary personnel resources: the functional managers who will eventually provide the resources to do the project work, the subject matter experts who are most familiar with the project work, and the administrative support. They control the creation of estimates by monitoring progress, measuring progress against the plan, and managing change. They coordinate the creation of estimates by ensuring that the effects of competing demands are minimized.

They lead their people to the successful completion of this work. They communicate the requirements, the process, the plan, and the progress. They motivate others. They solve problems as they arise.

There are five rules of estimating that will help the project manager obtain better estimates:

The first rule is the rule of clarity – the “level of detail” rule. This rule states that the smaller the unit of work being estimated, the better the estimate is likely to be. In addition, this rule can apply to the degree of precision in the wording of the work package statement. The more precise the statement, the better the understanding of the work and, consequently, the estimate is likely to be. Both size and precision are levels of detail. If no WBS, then no work packages, and no estimates. If there is a WBS, but insufficient in clarity or in detail, then inaccurate estimates will result.

The second rule is the rule of cooperation – the “ownership of estimates” rule. This rule states that those answerable for results must provide or approve the estimates. It is preferable that the resource who will perform the work and the functional manager who will provide that resource provide or at least approve the estimates. If there is no involvement now, then there will be no buy-in, and no cooperation later.
The third rule is the rule of compromise – the “time/cost/resource trade-off” rule. Of all, this is conceptually the simplest of the rules – you can reduce time by paying more for additional or better resources. In practice, it is the most complex. There may well be an infinite number of ways in which this rule can be implemented, and each instance will include contradiction, uncertainty, and compromise.

The fourth rule is the rule of consideration – the “human productivity” rule. This rule states that people are not 100 percent productive 100 percent of the time. To each base estimate, the project manager must add non-productive elements such as time lost to project overhead, time for rework, and time lost to the overhead demands of the corporation. It would be inconsiderate to schedule work without consideration of the non-productive demands.

The fifth rule is the rule of consistency – the “distribution of estimates” rule. This rule states that the best estimates are those that most closely match what has been and what will be reality. Consistency is sought in validity and reliability. People who provide estimates have individual tendencies – often seen in historical records – to make worst or best case assumptions when estimating. Only in the best of circumstances will estimates approach the ideal. The best a project manager can hope is that the estimators will be consistent and that we – if we know the estimator well enough – will be able to compensate.

Whether the planning is conducted in advance of or following the enterprise decision to proceed, the project manager will commence the execution phase with approved plan in hand. Now begins the concurrent supervisory activity of project control.

**Controlling Costs**

Control is a management function and therefore legitimate project management work. The project manager must look inside the project to determine progress, measure variance, predict outcomes, report status, manage change and judge outcomes. To control is to supervise. To supervise is to observe, to react, and to evaluate. Both formal and informal control mechanisms exist for this purpose.

Earned value (EV) is a powerful formal quantitative control mechanism. Through the use of EV, one can detect and even predict problems earlier, minimize speculation, evaluate status, and report progress. Earned value is a control mechanism that requires only a plan and actuals.

There are two Earned Value indices that are of particular value to project managers. The first is the Cost Performance Index (CPI). The CPI is the ratio of budgeted to actual costs for work performed. Specifically, one can determine the relationship between estimated and actual costs. The second is the Schedule Performance Index (SPI). The SPI is the ratio of work performed to work scheduled. The SPI is an efficiency rating for work accomplished up to the time of the measurement.

Either index may be used to predict future time and cost if performance continues at current levels. When CPI is used in this manner, the new prediction of total project cost is called Estimate at Completion (EAC).

Given that the budgeted cost of work scheduled (BCWS) or Planned Value (PV) is the product of our estimating processes, then what do the indices and derived values mean?

CPI decreases as actual cost of work performed (ACWP) increases using the formula: \( \text{CPI} = \frac{\text{BCWP}}{\text{ACWP}} \). When the actual cost of work exceeds the budgeted cost of the same work, our cost performance is less than one. CPI is an index and has no units because it is derived by dividing units expressed in currency by units expressed in currency.

SPI decreases as budgeted cost of work performed (BCWP) or Earned Value (EV) decreases using the formula: \( \text{SPI} = \frac{\text{BCWP}}{\text{BCWS}} \). Given that our opportunity to set BCWS ended with the planning phase, then SPI varies according to the amount of work performed during execution. SPI is an index and has no units because it is derived by dividing units expressed in currency by units expressed in currency.

If we accept that an initial categorization of the CPI or SPI can be less than one, equal to one, or greater than one, then we can create a simple three by three matrix to aid our analysis of any earned value result. That is, we can label...
the columns as CPI<1, CPI=1, and CPI>1, and the rows as SPI<1, SPI=1, and SPI>1, to form a nine-element matrix of all possible outcomes.

It remains only to label and describe these nine outcomes to have achieved an initial understanding of our earned value result at a given reporting point during a project under our control.

In labelling such a matrix, there will be agreement on seven of the nine elements. These are:

- Where CPI and SPI are both less than one, we recognize worst-case performance.
  - This occurs in one case. This is the case of over promise and under deliver.

- Where one index is less than one and the other is equal to one, we recognize poor performance.
  - This occurs in two cases.

- Where one index is less than one and the other is greater than one, we recognize OK performance.
  - Performance is not poor, but not good. This occurs in two cases.

- Where one index is equal to one and the other is greater than one, we recognize good performance.
  - This occurs in two cases.

Argument, if any, will center upon the labelling of the two remaining elements.

- Where CPI and SPI are both greater than one, we become suspicious.

Under budget and ahead of schedule is a suspect result. A very good project manager employing unexpectedly more productive workers at unexpected lower cost could achieve this result. It could also be achieved by an unscrupulous project manager using worst-case estimates in order to perform better than planned. This latter is the case of under promise and over deliver.

This is the condition that project managers describe as padding estimates to create contingency. You will recall that there is no sixth rule of estimating called the rule of contingency. Contingency is owned by the business manager and cannot be created by the project manager. Estimates tell us how long, how much, and how many. The enterprise manager and project manager want reliable estimates. Better estimates contribute to better cost management particularly when you measure actual performance against the plan, and particularly if you believe that on cost and on time is excellent performance.

- Where CPI and SPI both equal one, there is project management excellence.

On cost and on time is excellent performance. It can only be achieved through good project management including valid and reliable estimates. This is the case of delivering as promised.

Exhibit 1 displays the Performance Index Matrix with labels.

<table>
<thead>
<tr>
<th>CPI&lt;ONE</th>
<th>CPI=ONE</th>
<th>CPI&gt;ONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPI&lt;ONE</td>
<td>worst case</td>
<td>poor</td>
</tr>
<tr>
<td>SPI=ONE</td>
<td>poor</td>
<td>excellent</td>
</tr>
<tr>
<td>SPI&gt;ONE</td>
<td>OK</td>
<td>good</td>
</tr>
</tbody>
</table>

Exhibit 1 – Performance Index Matrix

Our initial analysis of the indices has involved only nine elements derived from three categories. Suppose our performance index (PI for short as it does not matter which index we are reviewing) is 1.01 or 1.10. Are these values different? What is the entire range of possible values? When should we become concerned?
We can achieve a PI value of 2.00 if and only if our estimates are in error by 100 percent. For example, an estimate of 100 and an actual of 50 will produce a CPI of 2.00. To achieve a value of 4.00, actuals must be one-quarter of estimated. To achieve a value of 0.25, actuals must be four times estimates. At some point, these values stray beyond the boundary of rational expectation.

Can we set a rational expectation of accuracy for our estimates? If yes, but not precisely, we could set performance bands that we could use to trigger a previously agreed response. Suppose we set a rational expectation of accuracy for our estimates at plus or minus 25 percent. We would not take any action as long as the PI remained within the range 0.75 through 1.25. We might set secondary bands that would trigger some escalation if the PI escapes our primary 0.75 and 1.25 limits. For example, if PI enters the zone between 0.50 and 0.75 or between 1.26 and 1.50 we will engage a Level II Performance Review (or some such similarly titled action).

Should our bands be the same throughout the project? Probably not. We have more time to respond to a PI of 1.60 at the end of the first reporting period than we do at the end of the second last reporting period. Probably, our take-no-action tolerance – our primary band – should narrow as the project progresses.

Is it possible to set likely values for these bands that will apply to all projects? Not a chance. The reliability of estimates for R&D work packages must be different from that for construction work packages. Furthermore, greater tolerances are probably prudent within organizations that use no rigor or have only recently introduced rigor in their application of project management. As historical results are gathered and as estimating processes improve, then the bands can be tightened.

Is it possible to set bands with enterprise and project management agreement? Absolutely – and such should be done in every case. Excellence and failure then become criterion-referenced, defined in advance, and measured objectively using standard industry tools. Everyone now knows in advance what to expect and in arrears what actually happened.

**Conclusion**

There are those among you who will have expected a silver bullet within the pages of this paper. Perhaps you were expecting a solution to all estimating problems; or perhaps a solution to controlling costs in all projects. It did not happen. Project management is situation dependant. It will ever be so.

This paper should have given you some insight into the financial expectations of the enterprise manager. Your perspectives and your mechanisms are different. Perhaps you will be better able now to align project cost management with enterprise financial management.

This paper has presented some rules to improve project estimates. You and the enterprise manager expect and deserve accurate estimates. Perhaps you will be better able now to guide subject matter experts and functional managers to provide you with improved estimates.

This paper has outlined a performance assessment matrix with generalized performance margins and with suggestions for improving the definition of the quality of performance in project management. You and the enterprise benefit from agreed upon definitions and expectations for performance measurement. Perhaps you will be better able now to interpret the Earned Value results of project performance.

Success is only aided by these tools and not guaranteed. Full and open communication, agreement on expectations, diligence in application, and objective interpretation of quantified results will contribute further to the success of project cost management. Practice will improve the probability of your success.

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