



Introduction & Purpose of Course



This course is intended to define the basic elements of an effective [performance measurement system](#). An important part of project management is the art of making tradeoffs -- trading off cost, schedule and technical performance in an effort to get the best product at the lowest cost in the shortest time. Performance measurement, on the other hand, is the art of determining, organizing and presenting cost, schedule and technical performance information in a way that contributes to making those tradeoffs.

Good performance measurement requires the effective integration of cost, schedule and technical information and the management systems that generate that information. Unfortunately, many management systems used on large projects are not well integrated because they were developed independently of each other to satisfy specific needs. For example, the accounting system is designed primarily to keep track of expenses and payments, to meet payrolls, calculate taxes, etc.

Cost information is primarily oriented to organizational elements. The scheduling system, on the other hand, is designed to support work planning and control, and is oriented to project tasks. Technical management is focused on specifications, performance characteristics and technical goals, and is a product of the system engineering process.

More information on the basics of EV is available in an EV Basics Tutorial. Click [here](#) to view the PowerPoint tutorial. A narrated version of this presentation is available at the following web site; [EV Basics](#).

Performance Measurement System

Performance Measurement System as used in the text refers to an organization's internal management control system that includes an objective of providing decision makers with specific performance information regarding progress and expenditures against a stated execution plan.



Need Objective Performance Data

Given a project where some tasks are on schedule, some are ahead of schedule and some are behind schedule, overall project status is virtually impossible to determine. It is no wonder that many project managers are literally "flying by the seat of their pants" without a good feel for where the project stands at any given point in time.

This may not be too serious on small efforts, but on large projects, a manager is constantly working a myriad of problems and cannot keep track of or figure out the cost and schedule impacts that individual problems are having on the project. A systematic, organized process for collecting performance information and presenting it in a clear manner on a regular basis is essential to the project management process.

For more information on the basics of EVM, view the optional PowerPoint presentation from page one of this lesson.



Performance Measurement

Pulling essential cost, schedule and technical information together in a meaningful, coherent fashion is always a challenge facing the project manager. If this cannot be done, management information will be fragmented, will not contribute effectively to project management, and may actually mislead the manager by presenting a distorted view of project status.

In the simplest terms, **performance measurement** is the comparison of actual performance against a baseline plan. The baseline used for performance measurement should be a single, integrated plan, because the analysis of cost performance must include schedule considerations and the evaluation of schedule performance must include technical performance considerations.

At the conclusion of this lesson you will be able to define the basic elements of performance measurement.



Figure 1-1: Project Cost Report



Figure 1-1 illustrates the difficulty in trying to understand cost performance separately based on a commonly used "budget versus actuals" presentation.

In addition to the audio, the next page provides an expanded explanation of this chart.

[D](#)

Long Description

Figure 1-1: Graph of project cost report - dollars vs. time. The budget cost curve goes from zero cost at zero time up to target cost at the end of project time. The actual costs curve goes up from zero at time zero to some value at time now. At time now the actual costs are lower than the budget costs, and the difference is called the variance.



Earned Value Needed

At first glance, it would appear that the project is in good shape from a cost standpoint. The chart (Figure 1-1 on the previous page) seems to indicate that cost performance is better than planned and that an underrun is likely. Suppose, though, that the project is behind schedule. When this fact is taken into consideration it is not clear that the variance between budget and actual costs represents good cost performance or simply the fact that work is not getting done. The problem with the chart is that it compares apples and oranges. It compares the actual cost of work performed (ACWP) to the budgeted cost for work planned, or scheduled (BCWS). What is missing is the budgeted cost for work performed (BCWP) commonly referred to as "earned value".

Earned Value Terms

[Scope, Schedule, and Budget](#)

[BCWS, BCWP, ACWP](#)

[Key Data Points](#)

Scope, Schedule, and Budget

The 3 components of a project plan:
Work Scope, Schedule, Resources

EARNED VALUE gives us the ability to quantify project status by

- + Comparing the value of work completed to the value of work scheduled, and
- + Comparing the value of work completed to the actual costs incurred.

BCWS, BCWP, ACWP

The Plan = BCWS = Budgeted Cost for Work Scheduled*

BCWS = Budget; both terms refer to the sum of all the budgets for all the work scheduled to be accomplished within a given period.

Also called the Performance Measurement Baseline (PMB)

Also known as "S" for "Scheduled" resources

Work Completed = BCWP = Budgeted Cost for Work Performed

BCWP = Earned Value; both terms refer to a measurement of the value of the work completed.

The value of the work performed, or earned, when compared to the original plan.

Also Known as "EV" for "Earned Value" of work completed

Actual Costs = ACWP = Actual Cost of Work Performed

ACWP = Actual Costs; both terms refer to the costs actually incurred and recorded in accomplishing the work performed within a given time period.

Also known as "A" for "Actuals" = resources expended to do the work.

Key Data Points

How much work is planned? BCWS

How much work is done? BCWP

How much did it cost? ACWP



Fig. 1-2: Cost/Schedule Performance



When earned value is taken into consideration, the cost picture clears up because the cost and schedule components can be addressed separately. Figure 1-2 illustrates the variance attributable to cost performance and the variance attributable to schedule performance.

[D](#)

Long Description

Figure 1-2: Graph of Cost/Schedule Performance. This has a curve added to the previous figure. In between the budget curve and the actual costs curve is a curve for Earned Value. It also goes from zero at time zero and goes to a value at time now. The difference between the earned value and the actual costs at time now is called the cost variance. The difference between the budget and the earned value at time now is the schedule variance.



About Figure 1-2: Cost/Schedule Performance

The chart now shows that the project is both behind schedule and underrunning cost, and the cost underrun is only about half that depicted in Figure 1-1. Earned value is the key to understanding project status because it represents the amount of work performed. In developing an estimate of final project cost, earned value also provides the point of departure for determining the amount of work remaining.

As with cost performance measurement, schedule performance cannot be fully evaluated by itself. Technical problems, such as test failures or performance shortfalls, are responsible for most schedule and cost problems; consequently technical performance cannot be ignored or problems may not surface until too late to take effective action. However, most cost and schedule control systems operate on the assumption that technical requirements are being met when credit is taken for work accomplished. This is not always the case and an "early warning" system of technical performance measurement helps to identify potential schedule and cost problems and their impact on project objectives.

Schedule reports do not always present a clear picture of project status even though a variety of indicators may be provided, such as tasks completed, milestones accomplished, tasks ahead of schedule, tasks behind schedule, float available, etc. In many cases, however, there is no "bottom line" that indicates the project is "x" number of days ahead or behind schedule.



Figure 1-3: Project Schedule

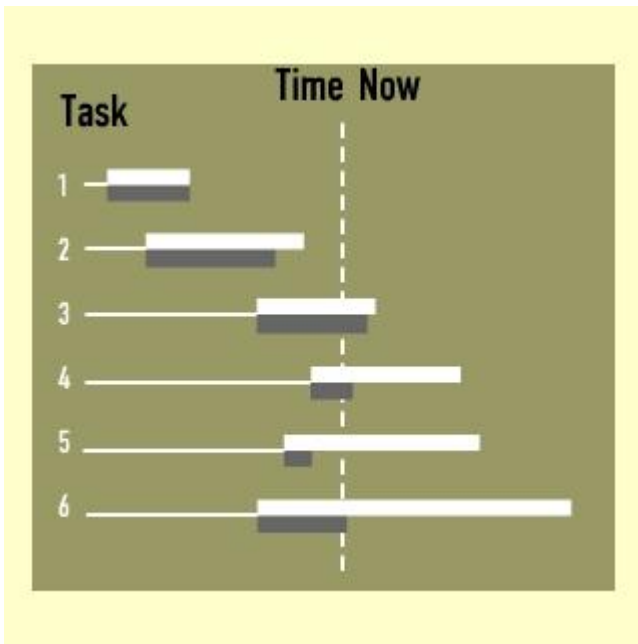


Figure 1-3 illustrates a situation where some tasks are on schedule, some are ahead of schedule and some are behind schedule, making overall project status virtually impossible to determine.

[D](#)

Long Description

Figure 1-3: Horizontal bar chart of Project Schedule. Six tasks are numbered on the left side with split horizontal bars for each task extending to the right. At time now, some tasks are completed and some are in progress. The split bars compare for each task the planned schedule and the actual.



About Figure 1-3: Project Schedule

One problem is that firm schedule baselines can be difficult to maintain. Replanning activities tend to eliminate schedule variances by continually rescheduling project activities, including the work that has fallen behind schedule. Without a stable baseline, meaningful performance measurement cannot take place and performance trends cannot be ascertained.

The same comment pertains to budget discipline. If budgets are to be used for measuring cost performance, the budget assigned to a task cannot be arbitrarily changed whenever it becomes apparent that the budget cannot be met. Even worse, if the added budget should be "borrowed" from downstream work, this "robbing of Peter to pay Paul" can delay visibility of cost problems until too late to do anything about them other than to go get more money. Chasing baseline changes is not a substitute for performance measurement.

Given the types of problems described above, it is no wonder that many project managers are literally "flying by the seat of their pants" without a good feel for where the project stands at any given point in time. This may not be too serious on small efforts, but on large projects, a project manager is constantly working a myriad of problems and cannot keep track of or figure out the cost and schedule impacts that individual problems are having on the project. A systematic, organized process for collecting performance information and presenting it in a clear manner on a regular basis is essential to the project management process.

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Introduction Knowledge Review

What is the definition of performance measurement?

- The comparison of actual performance against an integrated baseline plan consisting of integrated cost, schedule, and technical goals.
- The comparison of actual costs against a baseline consisting of independent aspects of cost, schedule and technical goals.
- The analysis of cost performance independent of schedule performance considerations and technical performance issues.
- The analysis of technical performance against a stable baseline independent of schedule performance and cost considerations.

Correct. The definition of performance management is: The comparison of actual performance against an integrated baseline plan consisting of integrated cost, schedule, and technical goals.



End of Lesson

You must click the **Next** button in order to receive credit for this lesson.