CHAPTER

7

How to Monitor & Control a TPM Project

When you are drowning in numbers, you need a system to separate the wheat from the chaff.
—Anthony Adams, Vice President, Campbell Soup Co.

If two lines on a graph cross, it must be important.
—Ernest F. Cooke, University of Baltimore

You can't monitor and control a project by simply reading reports. You have to walk around and personally validate progress.
—Robert K. Wysocki, PhD, President, EII Publications, LLC

CHAPTER LEARNING OBJECTIVES

After reading this chapter, you will be able to:

- Understand the reasons for implementing controls on the project
- Track the progress of a project
- Determine an appropriate reporting plan
- Measure and analyze variances from the project plan
- Use Gantt charts to track progress and identify warning signs of schedule problems
- Use burn charts to compare resource consumption against plan
- Construct and interpret milestone trend charts to detect trends in progress
- Use earned value analysis (EVA) to detect trends in schedule and budget progress
- Integrate milestone trend charts and EVA for further trend analysis
- Build and maintain an Issues Log
- Manage project status meetings
- Determine the appropriate corrective actions to restore a project to its planned schedule
- Properly identify corrective measures and problem escalation strategies

The project plan is a system as defined by the scope triangle. As such, it can get out of balance, and a get-well plan must be put in place to restore balance to the system. The longer the project manager waits to put the fix in place, the longer it will take to restore balance. The controls you will learn are designed to discover out-of-balance situations early and put get-well plans in place quickly.

You can use a variety of reports as control tools. Most can be used in numeric and tabular form, but I suggest using graphics wherever possible. A well-done graphic is intuitive. It does not require a lengthy explanation and certainly doesn't require a lot of reading. Be cognizant of the fact that senior managers don't have a lot of time to dwell on your report. Give them what they need as succinctly as possible. Graphics are particularly effective in that regard. Senior managers generally aren't interested in reading long reports only to find out that everything is on schedule. Although they will be pleased that your project is on track, their time could have been spent on other pursuits that require their attention. When projects are not on schedule, they want to know this as soon as possible and see what corrective action you plan to take or how they can help.

Using Tools, Templates, and Processes to Monitor and Control a Project

I insist on using graphical types of status reports. And they must be intuitive to the recipient—always. Here are some of the reporting tools that I have used over the years:

- Current period reports
- Cumulative reports
- Exception reports
- Stoplight reports
- Variance reports
- Gantt charts
- Burn charts
- Milestone trend charts
- Earned value analysis (EVA)
- Integrated milestone trend charts and EVA
- Project status meetings
- Problem escalation strategies

Establishing Your Progress Reporting System

After project work is under way, you want to make sure that it proceeds according to plan. To do this, you need to establish a reporting system that keeps you informed of the many variables that describe how the project is proceeding as compared to the plan.

A reporting system has the following characteristics:

- Provides timely, complete, and accurate status information
- Doesn't add so much overhead time as to be counterproductive
- Is readily acceptable to the project team and senior management
- Has an early warning system of pending problems
- Is easily understood by those who have a need to know

To establish this reporting system, you can choose from among the hundreds of reports that are standard fare in project management software packages. Once you decide what you want to track, these software tools offer several suggestions and standard reports to meet your needs. Most project management software tools enable you to customize their standard reports to meet even the most specific needs.

Types of Project Status Reports

There are five types of project status reports: current period, cumulative, exception, stoplight, and variance. Each of these report types is described here.

Current Period Reports

These reports cover only the most recently completed period. They report progress on activities that were open or scheduled for work during the period. Reports might highlight activities completed, as well as the variance between scheduled and actual completion dates. If any activities did not progress according to plan, the report should include the reasons for the variance and the appropriate corrective measures that will be implemented to fix the schedule slippage.

Cumulative Reports

These reports contain the history of the project from the beginning to the end of the current report period. They are more informative than the current period

reports because they show trends in project progress. For example, a schedule variance might be tracked over several successive periods to show improvement. Reports can be at the activity or project level.

Exception Reports

Exception reports indicate variances from the plan. These reports are typically designed for senior management to read and interpret quickly. Reports that are produced for senior management merit special consideration. Senior managers do not have a lot of time to read reports that tell them everything is on schedule and there are no problems serious enough to warrant their attention. In such cases, a one-page, high-level summary report that says everything is okay is usually sufficient. It might also be appropriate to include a more detailed report as an attachment for those who might want more information. The same might be true of exception reports. That is, the one-page exception report tells senior managers about variances from the plan that will be of interest to them, and an attachment provides more details for the interested reader.

Stoplight Reports

Stoplight reports are a variation that can be used on any of the previous report types. I believe in parsimony in all reporting. Here is a technique you might want to try: When the project is on schedule and everything seems to be proceeding as planned, put a green sticker on the top-right corner of the first page of the project status report. This sticker will signal to senior managers that everything is progressing according to plan, and they need not even read the attached report.

When the project has encountered a problem—schedule slippage, for example—you might put a yellow sticker on the top-right corner of the first page of the project status report. That is a signal to upper management that the project is not moving along as scheduled but that you have a get-well plan in place. A summary of the problem and the get-well plan may appear on the first page, but they can also refer to the details in the attached report. Those details describe the problem, the corrective steps that have been put in place, and some estimate of when the situation will be rectified.

Red stickers placed on the top-right corner of the first page signal that a project is out of control. Red reports should be avoided at all costs, but can be used as a warning system to get senior management and sponsor attention. Red reports indicate that the project has encountered a problem for which you don't have a get-well plan or even a recommendation for upper management. The sooner

you can detect this and report it, the better for the project. Senior managers will obviously read these reports because they signal a major problem with the project. On a more positive note, the red condition may have occurred for reasons outside the control of the project manager or project team.

Here's an example of when a red condition would be warranted: there is a major power grid failure on the East Coast and a number of companies have lost their computing systems. Your hot site is overburdened with companies looking for computing power. Your company is one of them, and the loss of computing power has put your project seriously behind in final system testing. There is little you can do to avoid such acts of nature.

Variance Reports

Variance reports do exactly what their name suggests—they report differences between what was planned and what actually happened. The tabular version of the report has the following three columns:

- The planned number
- The actual number
- The difference, or variance, between the two

A variance report can be in one of the following two formats:

- The first is a numeric format containing rows that show the actual, planned, and variance values for those variables requiring such calculations. Typical variables that are tracked in a variance report are schedule and cost. For example, the rows might correspond to the activities open for work during the report period, and the columns might be the planned cost to date, the actual cost to date, and the difference between the two. The impact of departures from the plan is signified by larger values of this difference (the variance).
- The second format is a graphical representation (see Figure 7-1) of the numeric data. It might be formatted so that plan data is shown for each report period of the project, denoted with a curve of one color, and the actual data is shown for each report period of the project, denoted by a curve of a different color. The variance need not be graphed at all because it is merely the difference between the two curves at some point in time. One advantage of the graphical version of the variance report is that it shows any variance trend over the report periods of the project, whereas the numeric report generally shows data only for the current report period.

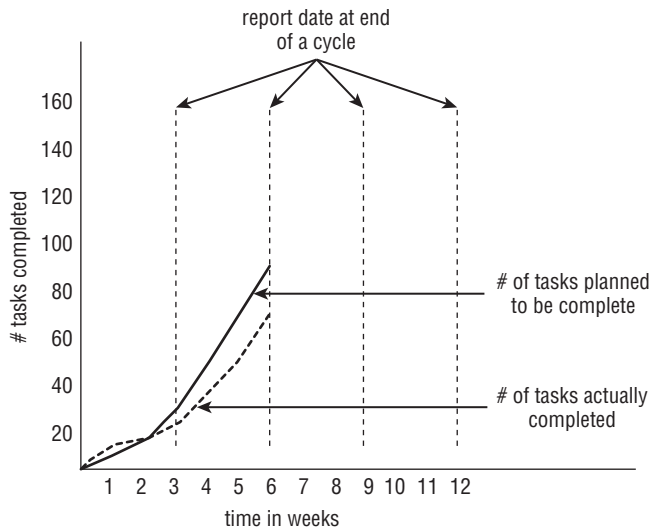

Figure 7-1: A cumulative variance graph

Typical variance reports are snapshots in time (the current period) of the status of an entity being tracked. Most variance reports do not include data points that report how the project reached that status. Those that show trends, as does Figure 7-1, are primitive earned value reports. These are discussed later in this chapter. Project variance reports can be used to report project as well as activity variances. For the sake of the managers who will have to read these reports, I recommend that one report format be used regardless of the variable being tracked. Your upper management will quickly become comfortable with a reporting format that is consistent across all projects or activities within a project. It will make life a bit easier for you, as the project manager, too.

Here are five reasons why you should measure duration and cost variances:

- **Catch deviations from the curve early**—The cumulative actual cost or actual duration can be plotted against the planned cumulative cost or cumulative duration. As these two curves begin to display a variance from one another, the project manager should put corrective measures in place to bring the two curves together. This reestablishes the agreement between planned and actual performance, as described in detail in the "Earned Value Analysis" section later in this chapter.
- **Dampen oscillation**—Planned versus actual performance should display a similar pattern over time. Wild fluctuations between the two are symptomatic of a project that is not under control. Such a project will get behind schedule or overspend in one report period, be corrected in the next period, and go out of control in the next period. Variance reports can provide an early warning that such conditions are likely, giving the project manager an opportunity to correct the anomaly

before it gets serious. Smaller oscillations are easier to correct than larger oscillations.

- **Allow early corrective action**—As just suggested, the project manager would prefer to be alerted to a schedule or cost problem early in the development of the problem, rather than later. Early problem detection may offer more opportunities for corrective action than later detection.
- **Determine weekly schedule variance**—I have found that progress on activities open for work should be reported on a weekly basis. This is a good compromise on report frequency and gives the project manager the best opportunity for corrective action plans before a situation escalates to a point where it will be difficult to recover any schedule slippages.
- **Determine weekly effort (person hours/day) variance**—The difference between the planned effort and actual effort has a direct impact on both planned cumulative cost and the schedule. If the effort is less than planned, it may suggest potential schedule slippage if the person is not able to increase his or her effort on the activity in the following week. Alternatively, if the weekly effort exceeded the plan and the progress was not proportionately the same, a cost overrun situation may be developing.

Early detection of out-of-control situations is important. The longer you wait to discover a problem, the longer it will take for your solution to bring the project back to a stable condition.

How and What Information to Update

As input to each of these report types, activity managers and the project manager must report the progress made on all activities that were open for work (in other words, those that were to have work completed on them during the report period) during the period of time covered by the status report. Recall that your planning estimates of activity duration and cost were based on little or no information. Now that you have completed some work on the activity, you should be able to provide a better estimate of duration and cost. This is reflected in a re-estimate of the work remaining to complete the activity. That update information should also be provided.

The following list describes what should actually be reported:

Determine a set period of time and day of week—The project team will have agreed on the day of the week and time of day by which all updated information is to be submitted. A project administrator or another team member is responsible for ensuring that all update information is on file by the report deadline.

Report actual work accomplished during this period—What was planned to be accomplished and what was actually accomplished are often two

different things. Rather than disappoint the project manager, activity managers are likely to report that the planned work was actually accomplished. Their hope is to catch up by the next report period. Project managers need to verify the accuracy of the reported data, rather than simply accept it as accurate. Spot-checking on a random basis should be sufficient.

Record historical data and re-estimate remaining work (in-progress work only)—The following two kinds of information are reported:

- All work completed prior to the report deadline is historical information. It enables variance reports and other tracking data to be presented and analyzed.
- The other kind of information is future-oriented. For the most part, this information consists of re-estimates of duration and cost and estimates to completion (both cost and duration) of the activities still open for work.

Report start and finish dates—These are the actual start and end dates of activities started or completed during the report period.

Record days of duration accomplished and remaining—First reported is how many days have been spent so far working on this activity. The second number is based on the re-estimated duration as reflected in the time-to-completion number.

Report resource effort (hours/day) spent and remaining (in-progress work only)—Whereas the preceding numbers report calendar time, these two numbers report labor time over the duration of the activity. One reports labor completed over the duration already accomplished. The other reports labor to be spent over the remaining duration.

Report percent complete—Percent complete is the most common method used to record progress because it is the way people tend to think about what has been done in reference to the total job to be completed. Percent complete isn't the best method to report progress, however, because it is a subjective evaluation. What goes through a person's mind when you ask him or her, "What percent complete are you on this activity?" The first thing is most likely, "What percent should I be?" This is followed closely by, "What's a number that we can all be happy with?" To calculate the percent complete for an activity, you need something quantifiable. Different approaches have been used to calculate percent complete, including the following:

- Duration
- Resource work
- Cost

Frequency of Gathering and Reporting Project Progress

A logical frequency for reporting project progress is once a week, usually on Friday afternoon. For some projects, such as refurbishing a large jet airliner, progress is recorded after each shift, three times a day. I've seen others that were of such a low priority or long duration that they were updated once a month. For most projects, start gathering the information around noon on Friday. Let people extrapolate to the end of the workday.

Variances

Variances are deviations from plan. Think of a variance as the difference between what was planned and what actually occurred. There are two types of variances: positive variances and negative variances.

Positive Variances

Positive variances are deviations from the plan indicating that an ahead-of-schedule situation has occurred or that an actual cost was less than a planned cost. This type of variance is good news to the project manager, who would rather hear that the project is ahead of schedule or under budget.

Positive variances bring their own set of problems, however, which can be as serious as negative variances. Positive variances can result in rescheduling to bring the project to completion early, under budget, or both. Resources can be reallocated from ahead-of-schedule projects to behind-schedule projects. Positive variances also can result from schedule slippage! Consider budget. Being under budget means that not all dollars were expended, which may be the direct result of not having completed work that was scheduled for completion during the report period.

CROSS-REFERENCE **This situation is revisited in the "Earned Value Analysis" section later in this chapter.**

Conversely, if the ahead-of-schedule situation is the result of the project team finding a better way or a shortcut to complete the work, the project manager will be pleased. This situation may result in a short-lived benefit, however. Getting ahead of schedule is great, but staying ahead of schedule presents another kind of problem. To stay ahead of schedule, the project manager must negotiate changes to the resource schedule. Given the aggressive project portfolios in place in most companies, it is unlikely that resource schedule changes can be made. In the final analysis, being ahead of schedule may be a myth.

Negative Variances

Negative variances are deviations from the plan indicating that a behind-schedule situation has occurred or that an actual cost was greater than a planned cost. Being behind schedule or over budget is not what the project manager or reporting manager wants to hear. Negative variances are not necessarily bad news, however. For example, you might have overspent because you accomplished more work during the report period than was planned. In overspending during this period, you could have accomplished the work at less cost than was originally planned. You can't tell by looking at the variance report. You will need the details available in the EVA reports

CROSS-REFERENCE **More details are forthcoming on this topic in the "Earned Value Analysis" section later in this chapter.**

In most cases, negative time variances affect project completion only when they are associated with critical-path activities or when the schedule slippage on non–critical-path activities exceeds the activity's slack. Slack is defined in Chapter 5. Minor variances use up the slack time for that activity; more serious ones will cause a change in the critical path.

Negative cost variances can result from uncontrollable factors such as cost increases from suppliers or unexpected equipment malfunctions. Some negative variances can result from inefficiencies or error. I discuss a problem escalation strategy to resolve such situations later in this chapter.

REPORTING AND DISPARATE PROJECT MANAGEMENT APPROACHES

Not every project will use the same project management approach. That may create reporting problems when project status reports are sent up the food chain to senior managers. You could just let the chips fall where they may and force senior managers to aggregate the data to fit their own needs. I don't see many senior managers agreeing to place that burden on their office staff. Instead a standard reporting format must be established and each project manager must be responsible for reporting status accordingly.

Applying Graphical Reporting Tools

As mentioned earlier in the chapter, senior managers may have only a few minutes of uninterrupted time to digest your report. Respect that time. They won't be able to fully read and understand your report if they have to read 15

pages before they get any useful information. Having to read several pages only to find out that the project is on schedule is frustrating and a waste of valuable time.

Gantt Charts

A *Gantt chart* is one of the most convenient, most frequently used, and easiest-to-grasp depictions of project activities that I have encountered. The chart is formatted as a two-dimensional representation of the project schedule, with activities shown in the rows and time shown across the horizontal axis. It can be used during planning, for resource scheduling, and for status reporting. The only downside to using a Gantt chart is that it does not contain dependency relationships between tasks or activities. Some project management software tools provide an option to display these dependencies, but the result is a graphical report that is so cluttered with lines representing the dependencies that the report is next to useless. In some cases, dependencies can be guessed at from the Gantt chart, but in most cases, they are lost.

Figure 7-2 shows a representation of the Cost Containment Project as a Gantt chart, using the format that I prefer. The format shown is from Microsoft Project, but it is typical of the format used in most project management software packages.

Stoplight Reports

As mentioned earlier in the chapter, stoplight reports are a very effective way to communicate status intuitively without burdening senior managers with the need to read anything. The explanation will, of course, be in the attached report if the managers are interested in reading the details.

Burn Charts

Burn charts are another intuitive tool that displays the cumulative consumption of any resource over time, expressed either as a percentage of the resource allocated to the project or the quantity of the resource. If you are displaying the quantity, there should be a horizontal line showing the maximum quantity of the resource available. Burn charts are very simple, but their management value can be increased by showing the planned resource consumption along with the actual resource consumption, as shown in Figure 7-3. For a more sophisticated display of resource use against the plan, earned value analysis (EVA) would be used.

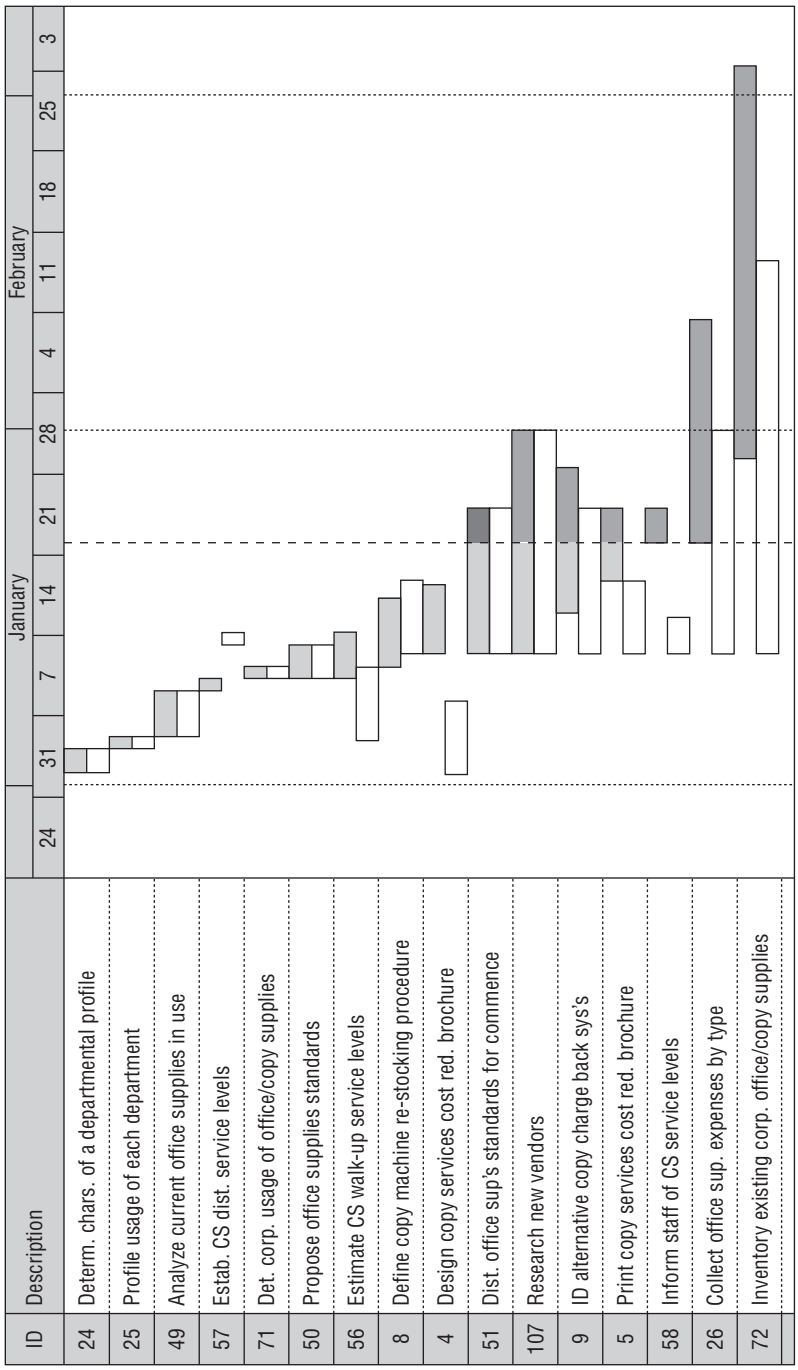

Figure 7-2: Gantt chart project status report

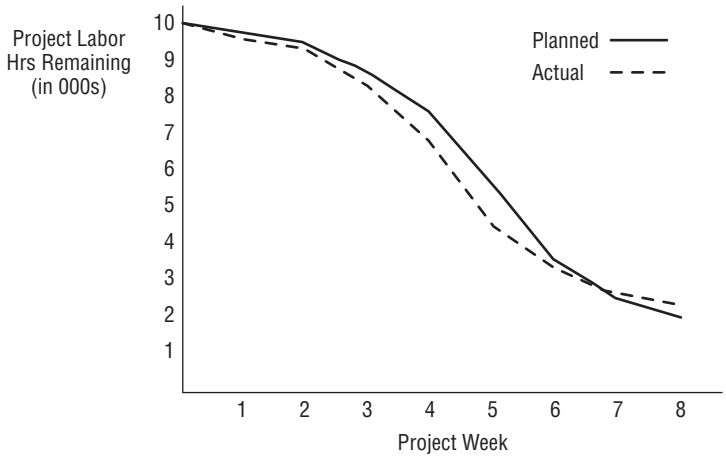

Figure 7-3: A typical burn chart showing planned versus actual labor hour consumption

This is an example of a project that is running pretty close to the planned consumption of labor hours. From weeks 3 through 5 actual labor hours consumed exceeded planned but was corrected the following week.

A burn chart is also used to track costs. Both of these versions of a burn chart are close to the EVA version and could be used as the enterprise converges on a full-blown EVA. The EVA version combines both schedule and cost in one display.

Burn charts have also been used as forecasting tools. Suppose in Figure 7-3 that the vertical axis plotted remaining labor until completion. Trends establish a likely pattern of the future and can be extended out to an estimated project completion date.

Milestone Trend Charts

Milestones are significant events that you want to track in the life of the project. These significant events are zero-duration activities and merely indicate that a certain condition exists in the project. For example, a milestone event might be the approval of several different component designs. This event consumes no time in the project schedule. It simply reflects the fact that those approvals have all been granted. The completion of this milestone event may be the predecessor of several build-type activities in the project plan. Milestone events are planned into the project in the same way that activities are planned into the project. They typically have finish-to-start (FS) relationships with the activities that are their predecessors and their successors.

Figure 7-4 shows a milestone trend chart for a hypothetical project. The trend chart plots the difference between the planned and estimated date of a project milestone at each project report period. In the original project plan, the milestone is planned to occur in the ninth month of the project. That is the last

project month on this milestone chart. The horizontal lines represent one, two, and three standard deviations above or below the forecasted milestone date. All activities in the project have an expected completion date that is approximately normally distributed. The mean and variance of an activity's completion date are a function of the longest path to that activity from the report date. In this example, the units of measure are one month. For this project, the first project report (at month 1) shows that the new forecasted milestone date will be one week later than planned. At the second project report date (month 2 of the project), the milestone date is forecasted on target. The next three project reports indicate a slippage to two weeks late, then three weeks late, then four weeks late, and finally six weeks late (at month 6 of the project). In other words, the milestone is forecasted to occur six weeks late, and only three more project months remain in which to recover the slippage. Obviously, the project is in trouble. It appears to be drifting out of control, and in fact it is. Some remedial action is required of the project manager.

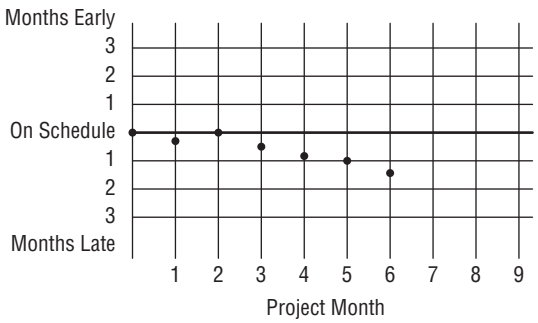

Figure 7-4: A run up or down of four or more successive data points

STANDARD DEVIATION

The variance and standard deviation of a set of data points measure the spread of the data points around the average value of the data points. The formula for calculating standard deviation of a set of *n* data points $x_1, x_2, \ldots x_n$ is as follows:

$$\text{Variance} = \Sigma ((x_i - xm) / xm)^2$$

Standard Deviation = Square root of the variance, where *xm* is the average of the *n* data points.

If you want to learn more about these two metrics, refer to any elementary materials on statistics.

Certain patterns signal an out-of-control situation. These patterns are shown in Figures 7-4 through 7-7 and are described here:

Successive slippages—Figure 7-4 (shown previously) depicts a project that is drifting out of control. Each report period shows additional slippage since the last report period. Four such successive occurrences, however minor they may seem, require special corrective action on the part of the project manager.

Radical change—Figure 7-5 shows the milestone to be ahead of schedule, but it also reports a radical change between report periods. Activity duration may have been grossly overestimated. There may be a data error. In any case, the situation requires further investigation.

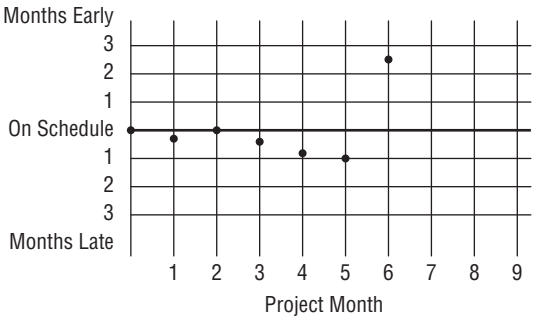

Figure 7-5: A change of more than three standard deviations

Successive runs—Figure 7-6 signals a project that may have encountered a permanent schedule shift. In the example, the milestone date seems to be varying around one month ahead of schedule. Barring any radical shifts and the availability of resources over the next two months, the milestone will probably be reached one month early. Remember that you have negotiated for a resource schedule in these two months, and now you will be trying to renegotiate an accelerated schedule.

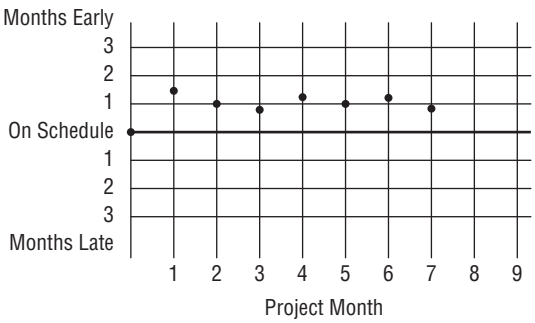

Figure 7-6: Seven or more successive data points above or below the planned milestone date

Schedule shift—Figure 7-7 depicts a major shift in the milestone schedule. The cause must be isolated and the appropriate corrective measures taken. One possibility is the discovery that a downstream activity will not be required. Perhaps the project manager can buy a deliverable, rather than build it, and remove the associated build activities from the project plan.

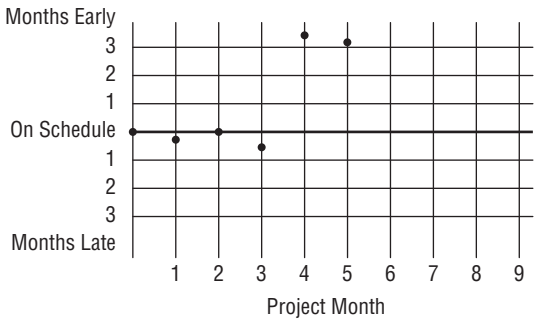

Figure 7-7: Two successive data points outside three standard deviations from the planned milestone date

Earned Value Analysis

Earned value analysis (EVA) is used to measure project performance and, by tradition, uses the dollar value of work as the metric. As an alternative, resource person hours/day can be used in cases where the project manager does not directly manage the project budget. Actual work performed is compared against planned and budgeted work expressed in these equivalents. These metrics are used to determine schedule and cost variances for both the current period and the cumulative to-date period. Cost and resource person hours/day are not good, objective indicators with which to measure performance or progress. Unfortunately, there is no other good objective indicator. Given this, you are left with dollars or person hours/day, which you are at least familiar working with in other contexts. Either one by itself does not tell the whole story. You need to relate them to each other.

One drawback that these metrics have is that they report history. Although they can be used to make extrapolated predictions for the future, they primarily provide a measure of the general health of the project, which the project manager can correct as needed to restore the project to good health.

Figure 7-8 shows an S-curve, which represents the baseline progress-curve for the original project plan. It can be used as a reference point. That is, you can compare your actual progress to date against the curve and determine how well the project is doing. Again, progress can be expressed as either dollars or person hours/day.

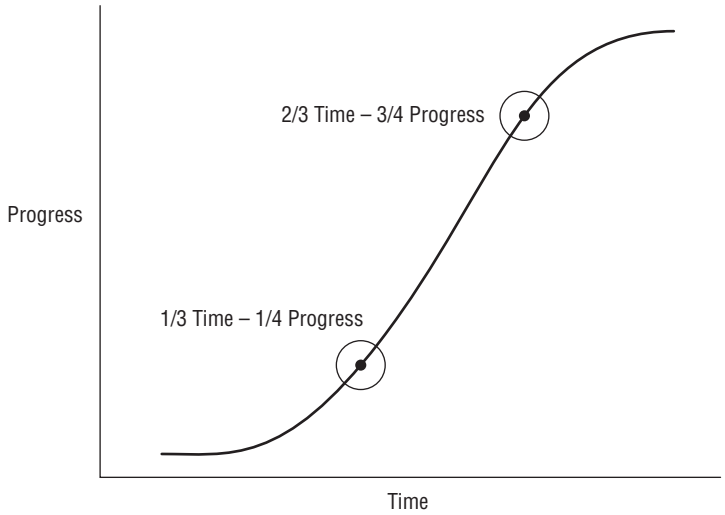

Figure 7-8: The standard S-curve

By adding the actual progress-curve to the baseline curve, you can see the current status versus the planned status. Figure 7-9 shows the actual progress-curve below the planned curve. If this represented dollars, you might be tempted to assume the project is running under budget. Is that really true?

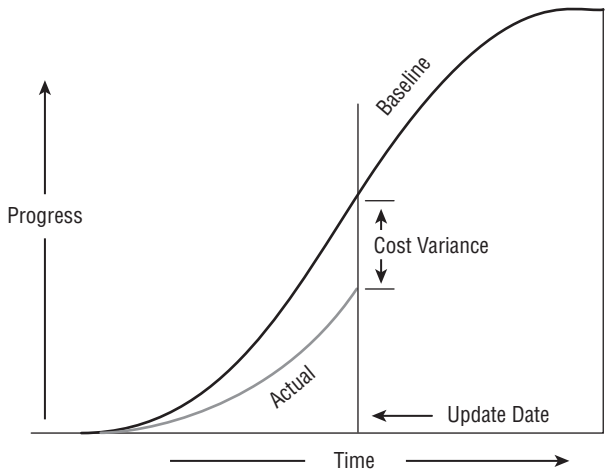

Figure 7-9: Baseline versus actual cost curve illustrating cost variance

Projects rarely run significantly under budget. A more common reason for the actual curve to be below the baseline is that activities that should have been done have not been, and thus the dollars or person hours/day that were planned

to be expended are unused. The possible schedule variance is highlighted in Figure 7-10.

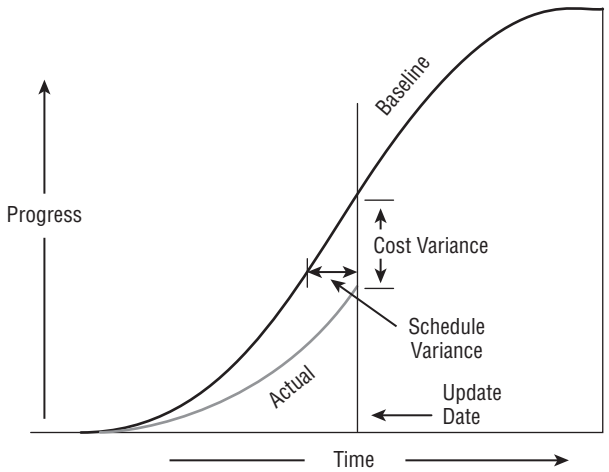

Figure 7-10: Baseline versus actual cost illustrating schedule variance

To determine actual progress schedule variance, you need some additional information. EVA comprises three basic measurements: budgeted cost of work scheduled, budgeted cost of work performed, and actual cost of work performed. These measurements result in two variance values: schedule variance and cost variance. Figure 7-11 is a graphical representation of the three measurements.

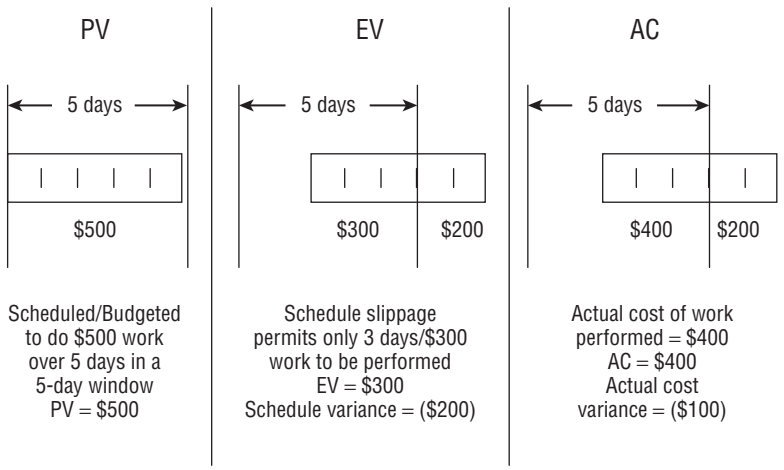

Figure 7-11: Cost and performance indicators

The figure shows a single activity that has a five-day duration and a budget of $500. The budget is prorated over the five days at an average daily value of $100. The left panel of Figure 7-11 shows an initial (baseline) schedule with the activity starting on the first day of the week (Monday) and finishing at the end of the week (Friday). The budgeted $500 value of the work is planned to be accomplished within that week. This is the planned value (PV). The center panel shows the actual work that was done. Note that the schedule slipped and work did not begin until the third day of the week. Using an average daily budget of $100, you see that you were able to complete only $300 of the scheduled work. This is the earned value (EV). The rightmost panel shows the actual schedule, as in the center panel, but now you see the actual dollars that were spent to accomplish the three days' work. This $400 is the actual cost (AC).

The PV, EV, and AC are used to compute and track two variances. The first is *schedule variance* (SV). SV is the difference between the EV and the PV, which is –$200 (EV – PV) for this example. That is, the SV is the schedule difference between what was done and what was planned to be done, expressed in dollar or person hours/day equivalents. The second is *cost variance* (CV). CV is the difference between the EV and the AC, which is $100 in this example. That is, (EV – AC) the cost of the work completed, was overspent by $100.

EVA TERMINOLOGY

For those who are familiar with the older cost/schedule control terminology used in PMBOK Guide, 1st edition (1996), I have used the new terminology introduced in PMBOK Guide, 2nd edition (2000), and still used in the current PMBOK Guide, 5th edition (2012). The old terminology corresponds to the new terminology as follows:

- ACWP is the actual cost (AC).
- BCWP is the earned value (EV).
- BCWS is the planned value (PV).

Management might react positively to the information previously shown in Figure 7-9, but they might also be misled by such data. The full story is told by comparing both budget variance and schedule variance as shown in Figure 7-12.

To correctly interpret the data shown previously in Figure 7-10, you need to add the EV data shown in Figure 7-11 to produce Figure 7-12. Comparing the EV curve with the PV curve, you see that you have underspent because all of the work that was scheduled has not been completed. Comparing the EV curve to the AC curve also indicates that you overspent for the work that was done. Clearly, management would have been misled by Figure 7-9 had they ignored the data in Figure 7-11. Either one by itself may be telling a half-truth.

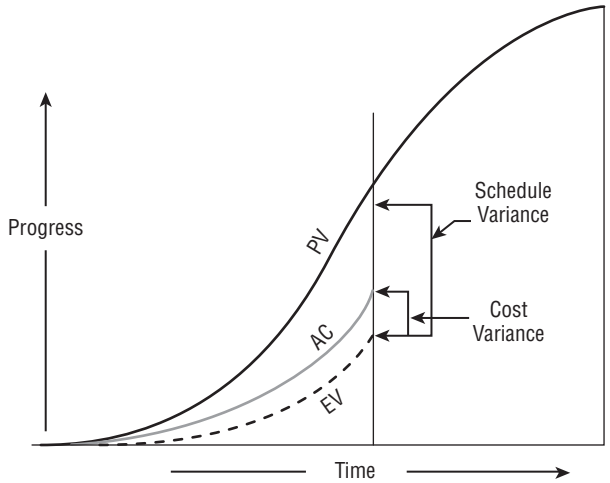

Figure 7-12: The full story

In addition to measuring and reporting history, EVA can be used to predict the future of a project. Take a look at Figure 7-13. By cutting the PV curve at the report date height from the horizontal axis, which has been achieved by the EV, and then pasting this-curve onto the end of the EV curve, you can extrapolate the completion of the project. Note that this is based on using the original estimates for the remaining work to be completed. If you continue at the same rate you have been progressing thus far, you will finish beyond the planned completion date. Doing the same thing for the AC shows that you will finish over budget. This is the simplest method of attempting to "estimate to completion," but it clearly illustrates that a significant change needs to occur in the way this project is running.

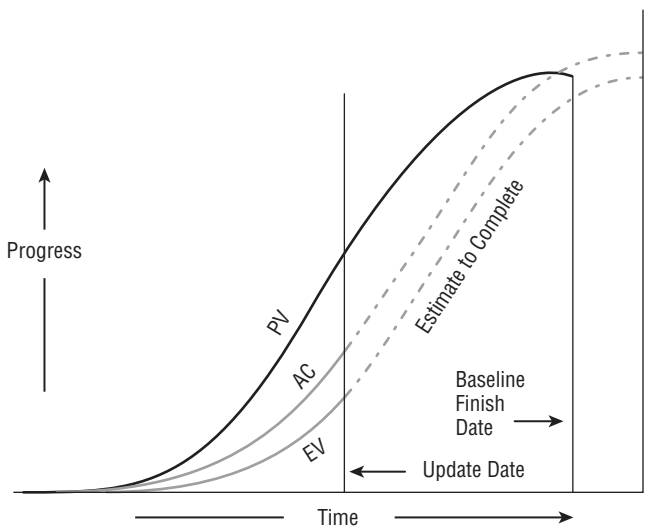

Figure 7-13: PV, EV, and AC curves

The three basic indicators yield an additional level of analysis for you. *Schedule performance index* (SPI) and *cost performance index* (CPI) are further refinements computed as follows:

SPI = EV / PV

CPI = EV / AC

Schedule performance index—The SPI is a measure of how close the project is to performing work as it was actually scheduled. If you are ahead of schedule, EV will be greater than PV, and therefore the SPI will be greater than 1. Obviously, this is desirable. Conversely, an SPI below 1 indicates that the amount of work performed was less than the work scheduled—not a good thing.

Cost performance index—The CPI is a measure of how close the project is to spending on the work performed to what was planned to have been spent. If you are spending less on the work performed than was budgeted, the CPI will be greater than 1. If not, and you are spending more than was budgeted for the work performed, then the CPI will be less than 1.

Some managers prefer this type of analysis because it is intuitive and quite simple to equate each index to a baseline of 1. Any value less than 1 is undesirable; any value over 1 is good. These indices are displayed graphically as trends compared against the baseline value of 1.

Integrating Milestone Trend Charts and Earned Value Analysis

Both milestone trend charts and earned value can easily be accommodated within the project life cycle. All of these metrics can be used to track practice-level improvements resulting from a process improvement program. After all, they are where the rubber meets the road.

NOTE **This section is adapted from an earlier book of mine,** ***Effective Software Project Management*** **(Wiley, 2006).**

Integrating Earned Value

At each report date, tasks that are open for work or were scheduled to be open for work can be in one of the following three situations:

- They are complete and hence have accrued 100 percent value.
- They are still open for work and hence have accrued a percentage of value equal to the proportion of subtasks completed.
- They are still open for work, and no subtasks are completed; hence, they have accrued 0 percent value.

Add all of the accrued values since the last report date to the cumulative project total. Display that data on the baseline S-curve.

Integrating Milestone Trend Data

At each report date, the task managers of tasks that are open for work or were scheduled to be open for work should update the project file. The update information will indicate the following:

- The task is reported as complete as of a certain date.
- A certain percentage of the task work is complete (same as the earned value report mentioned previously) and an updated estimate to completion is given.
- No progress is reported.

If project management software is used, the software produces an updated project file with new forecasted dates for the milestones you are tracking. The presentation of the SPI and CPI data over time can be represented using the same format that was used to report milestone trend data. Three examples follow.

Figure 7-14 depicts a common situation. Here the project has gotten behind schedule (denoted by the "S" in the figure) but is under budget (denoted by the "C" in the figure). That is probably due to the fact that work that was scheduled has not been done and hence the labor costs associated with those tasks have not been incurred.

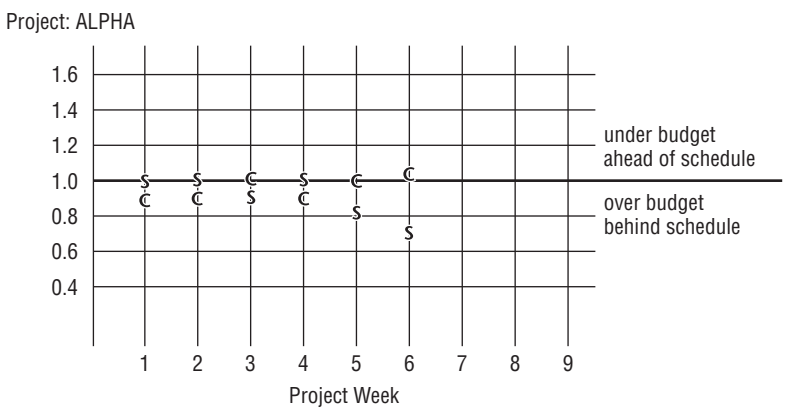

Figure 7-14: A project that is under budget and behind schedule

On rare occasions, you might experience the situation shown in Figure 7-15. The project is ahead of schedule and under budget. Less costly ways were found to complete the work, and the work was completed in less time than was planned.

If this should ever happen to you, relish the moment. Take whatever kudos your client or management cares to heap on you. You deserve their accolades. They don't happen often.

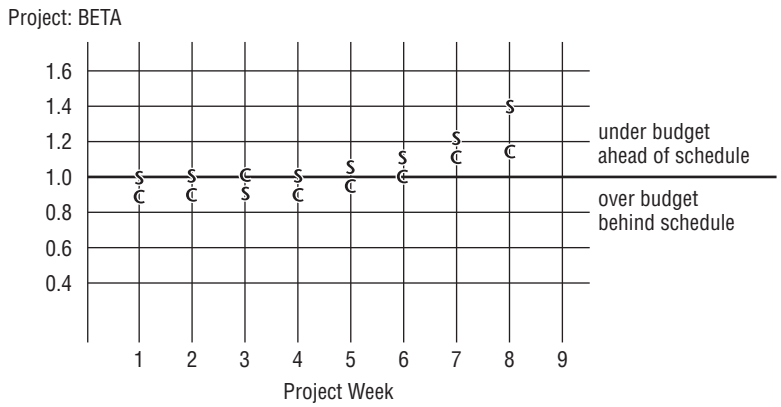

Figure 7-15: A project that is under budget and ahead of schedule

Figure 7-16 is the worst of the worst. Nothing more needs to be said.

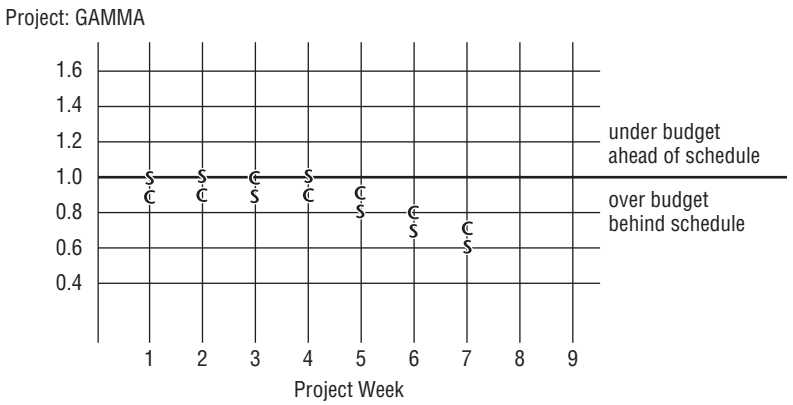

Figure 7-16: A project that is over budget and behind schedule

The same approach can be used to track a project portfolio over time, as shown in Figure 7-17.

The graph shows the SPI values of the individual projects that comprise the portfolio. This is also a useful graphic for summarizing the practice changes from your process improvement program. If a clear trend is visible at the portfolio level, it is indicative of a successful transition from process to practice.

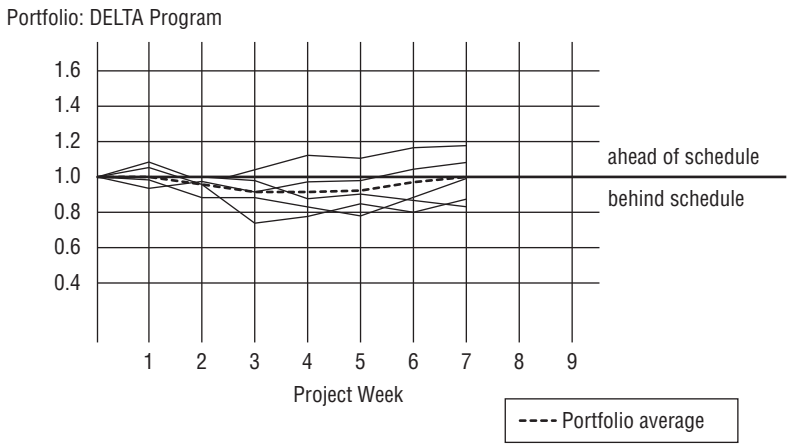

Figure 7-17: Adapting the life cycle for a project portfolio schedule

Managing the Scope Bank

The Scope Bank was introduced in Chapter 6. I now want take a more detailed look at exactly how it can be used as a monitoring and control tool. As part of the Launching Phase, you established the scope change management process. The Scope Bank was an integral part of that process. Recall that in setting up the Scope Bank, an initial deposit of some number of days was made. Ten percent of the total labor days would be a reasonable deposit. Make sure the client understands that when this time is used to accommodate approved scope changes, any further changes will add to the project completion date. Your job as project manager is to make sure that this time is managed effectively. The job of the client is to make sure that this time is spent in the best way possible to improve the business value of the final deliverables. Change requests and other suggestions will be submitted, and at the appropriate time, decisions will be made on which ones will be implemented and when. The time needed to analyze the requests and the time to implement the requests is taken from the balance of time in the Scope Bank.

Sooner or later, the balance of time in the Scope Bank will be zero. That means no more change requests can be accepted or acted upon without a compensating deposit being made in the Scope Bank. That deposit will come from the labor time required to implement functions and features not yet integrated in the solution. In order to make that deposit, the client must prioritize the functions and features not yet integrated in the solution with the new change requests. Some of the functions and features of lesser priority than the requested changes will be removed from the solution and become the source of the deposits.

As long as you make it clear to the client at the outset of the project how the Scope Bank is defined and managed, there should be no problems with its

implementation. It is important that you keep the client up to date on the status of the Scope Bank.

Building and Maintaining the Issues Log

The Issues Log is a dynamic document that contains all of the problems that have arisen during the course of the project and have not yet been resolved. The resolution of these problems is important to the successful continuation of the project. The Issues Log contains the following information:

- ID number
- Date logged
- Description of the problem
- Impact if not resolved
- The problem owner
- Action to be taken
- Status and date
- Outcome

If a Risk Log is maintained, it is often integrated into the Issues Log. At each project status or team meeting, the Issues Log is reviewed and updated.

Managing Project Status Meetings

To keep close track of progress on the project, the project manager needs information from his or her team on a timely basis. This information will be provided during a project status meeting. At a minimum, you need to have a status meeting at least once a week. On some of my major projects, daily status meetings were the norm for the first few weeks, and when the need for daily information wasn't as critical, I switched to twice a week and finally to weekly status meetings.

Who Should Attend Status Meetings?

To use the status meetings correctly and efficiently, it's important to figure out who should be in attendance. This information should be a part of your communication plan.

When choosing who should attend, keep the following points in mind:

- At first your status team may include only those team members who are needed in the Planning Phase. If the other team members don't need to know the information, don't make them come to a meeting and sit there

without a good reason. You are going to distribute meeting minutes anyway, so the team members who aren't needed at the actual meeting will be informed about what transpired.

- There will be times in a status meeting when two team members get into a discussion and the other people in the meeting aren't needed. If this happens, ask them to conduct a sidebar meeting so that your own status meeting can continue. A *sidebar meeting* is one in which a limited number of people need to participate, and problems can resolved more effectively away from your status meeting. Having everyone in the room listen to these sidebar topics isn't useful.

When Are Status Meetings Held?

Usually, status meetings are held toward the end of the week. Just make sure it's the same day each week. People get used to preparing information for a status meeting if they know exactly when the meeting will occur.

What Is the Purpose of a Status Meeting?

You hold a status meeting to get information to the whole team. On large projects, the participants in the status meeting may be representatives of their department. You can't have all the people on a 250-person project team come into a meeting once a week, so make sure that someone is there to represent the rest of the people in their section. The purpose of the meeting is to encourage the free flow of information, and that means ensuring that the people who need to have information to do their jobs get the information at the status meeting. Remember once again that you are going to distribute minutes of the meeting later, so that will take care of the people who aren't in attendance.

TIP **The size of the project may determine the length of the status meeting, but in general one hour should be sufficient. This is the maximum, and an entire hour should not be necessary at every project status meeting. Good judgment is needed here—don't waste people's time.**

What Is the Status Meeting Format?

Although the format of status review meetings should be flexible, as project needs dictate, certain items are part of every status meeting. I recommend that you proceed in the following top-down fashion:

1. The project champion reports any changes that may have a bearing on the future of the project.
2. The client reports any changes that may have a bearing on the future of the project.

3. The project manager reports on the overall health of the project and the impact of earlier problems, changes, and corrective actions at the project level.
4. Activity managers report on the health of activities open or scheduled open for work since the last status meeting.
5. Activity managers of future activities report on any changes since the last meeting that might impact project status.
6. The project manager reviews the status of open problems from the last status meeting.
7. Attendees identify new problems and assign responsibility for their resolution (the only discussion allowed here is for clarification purposes).
8. The project champion, client, or project manager, as appropriate, offers closing comments.
9. The project manager announces the time and place of the next meeting and adjourns the meeting.

Minutes are part of the formal project documentation and are taken at each meeting, circulated for comment, revised as appropriate, distributed, and filed in the electronic project notebook. Because there is little discussion, the minutes contain any handouts from the meeting and list the items assigned for the next meeting. The minutes should also contain the list of attendees, a summary of comments made, and assigned responsibilities.

An administrative support person should be present at the project status review meetings to take minutes and monitor handouts. This responsibility might also be shared by the project team members. In some organizations, the same person is responsible for distributing the meeting agenda and materials ahead of time for review. This advance distribution is especially important if decisions will be made during the meeting. People are very uncomfortable when they are given important information for the first time and are immediately expected to read it, understand it, and then make a decision about it.

The 15-Minute Daily Status Meeting

These short status meetings were originally introduced as a tool to monitor and control APM, xPM, and MPx projects. For small projects (teams of less than 10 members), the entire project team meets frequently (every morning for about 15 minutes in the team war room, for example). For larger projects, the task leaders should meet every morning. These are stand-up meetings where status is reported. Each attendee who has a task open for work should report. Open for work means the task start date has passed and the task is not yet complete. In their reports, the meeting attendees state where they are with respect to the time line (ahead, on target, or behind) and by how

many hours or days. If they are behind, they should briefly state whether or not they have a get-well plan and when they expect to be back on schedule. If anyone in the meeting is able to help, they should say so and take that conversation offline. Problems and issues are not discussed in the daily status meeting except to add them to the Scope Bank and Issues Log. Their resolution or further clarification should be dealt with by the affected parties offline. Do not use team time to discuss things that are of interest to only a few members.

Problem Management Meetings

Problem management meetings provide an oversight function to identify, monitor, and resolve problems that arise during the life of a project. Every project has problems. No matter how well planned or managed the project is, there will always be problems. Many problems arise just as an accident of nature. Consider the following scenario as an example: One of your key staff members has resigned just as she was to begin working on a critical-path activity. Her skills are in high demand, and she will be difficult to replace. Each day that her position remains vacant is another day's delay in the project. It seems like an impossible problem. Nevertheless, you (as the project manager) must be ready to take action in such cases. The problem management meeting is one vehicle for addressing all problems that need to be escalated above the individual for definition, solution identification, and resolution.

This is an important function in the management of projects, especially large projects. Problems are often identified in the project status meeting and referred to the appropriate team members for resolution. A group is assembled to work on the problem. Progress reports are presented and discussed at a problem management meeting. Problem management meetings usually begin with a review of the status of the activity that resulted in the problem, followed by a statement of the problem and a discussion to ensure that everyone has the same understanding of the problem. At that point, the meeting should move into the problem-solving process that was discussed in detail in Chapter 6.

Defining a Problem Escalation Strategy

Something has happened that put the project plan at risk. Late shipments from suppliers, equipment malfunctions, sickness, random acts of nature, resignations, priority changes, errors, and a host of other factors can lead to problems that affect deliverables, deliverable schedules, and resource schedules. The project team owns the problem and must find a solution.

This situation is very different for the project manager than the case of a change request. When a change request has been made, the project manager has some leverage with the client. The client wants something and might be willing to negotiate to an acceptable resolution. That is not the case when a problem arises on the project team. The project manager does not have any leverage and is in a much more difficult position.

When the unplanned happens, the project manager needs to determine who owns the problem and the extent of the problem, and then take the appropriate corrective measures. Those measures often include helping the owner of the problem find an acceptable solution following the escalation hierarchy discussed later in this chapter. Minor variations from the plan will occur and may not require corrective measures. There are degrees of corrective measures available to the project manager: In trying to resolve a problem, the project manager begins at the top of the escalation hierarchy and works down the hierarchy, examining each option until one is found that solves the problem.

There are three levels of escalation strategy: project team–based, resource manager–based, and client-based.

Project Manager–Based Strategies

If the problem occurs within a non–critical-path activity, it can be resolved by using available slack, which is defined in Chapter 5. One example is to reschedule the activity later in its ES–LF window or extend the duration to use some of the available slack. Note that this strategy does not affect any other activities in the project. By using slack, you affect the resource schedule for all activities that have this activity as a predecessor. Another approach is to continue the schedule compression techniques employed in defining the original project plan. This strategy can affect resource schedules just as in the prior case. The last option open to you is to consider the resource pool under your control as the project manager. Can some resources be reassigned from non–critical-path activities to assist with the problem activity?

Resource Manager–Based Strategies

After you have exhausted all the options under your control as the project manager, it is time to turn to the resource managers for additional help. This help may take the form of additional resources or rescheduling of already committed resources. Expect to make a trade-off here. For example, you might be accommodated now, but at the sacrifice of later activities in the project. At least you have bought some time to resolve the downstream problem that will be created by solving this upstream problem. If you have other projects that you are currently managing, some trades across projects may solve the problem.

Client-Based Strategies

When all else fails, you will have to approach the client. The first option would be to consider any multiple-release strategies. Delivering some functionality ahead of schedule and the balance later than planned may be a good starting point. The last resort is to ask for an extension of time. This may not be as unpleasant as it seems because the client's schedule may have also slipped and the client may be relieved to have a delay in your deliverable schedule, too.

The Escalation Strategy Hierarchy

The problem escalation strategy presented here is based on the premise that you, as the project manager, will try to solve the problem with the resources that you control. Failing to do that, you can appeal to your resource managers. As a last resort, you can appeal to the client.

One thing to note here that is very different from the change request situation discussed previously is the leverage to negotiate. As mentioned, you, as the project manager, have leverage when the client has requested a change, but no leverage when you have a project problem to solve. The client has nothing to gain and is therefore less likely to be cooperative. In most cases, the problem can be reduced to how to recover lost time. The following six outcomes are possible to this problem situation:

No action required (schedule slack will correct the problem)—In this case, the slippage involved a non–critical-path activity and it will self-correct.

Examine FS dependencies for schedule compression opportunities—Recall that you originally compressed the schedule to accommodate the requested project completion date by changing FS dependencies to SS dependencies. You should use that same strategy again. The project schedule will have changed several times since work began, and there may be several new opportunities to accomplish further compression and solve the current problem.

Reassign resources from non–critical-path activities to correct the slippage—Up to a point, you control the resources assigned to this project and others that you manage. You may be able to reassign resources from non–critical-path activities to the activities that have slipped. These non–critical-path activities may be in the same project in which the slippage occurred or they may be in another project that you manage.

Negotiate additional resources—Having exhausted all of the resources that you control, you need to turn to the resource managers as the next strategy. To recoup the lost time, you need additional resources. These resources may come in the form of added staff or dollars to acquire contract help.

Negotiate multiple release strategies—This strategy involves the client. Just as in the case of a change request, you can use a multiple-release strategy to your advantage. An example will illustrate the strategy: The project manager shares the problem with the client and then asks for the client to prioritize the features requested in the project plan. The project manager then offers to provide the highest-priority features ahead of their scheduled delivery date and the remaining priorities later than the scheduled delivery date. In other words, the project manager gains an extended delivery schedule, but gives the client something better than the original bargain offered—namely, something ahead of schedule.

Request a schedule extension from the client—This is the final alternative. Although it's similar to the multiple-release strategy, it offers the client nothing in trade. The slippage is such that the only resolution is to ask for a time extension.

You, as the project manager, should try to solve the problem by starting at the top of this list of six outcomes and working down until a solution is found. By using this approach, you will first try to solve the problem with resources that you control, then with resources that the resource managers control, and finally with resources and constraints that the client controls.

Gaining Approval to Close the Project

The client decides when the project can move to the Closing Phase. This is not an arbitrary decision, but one based on the acceptance criteria initiated during project planning and maintained throughout the project. Whenever a scope change request has been approved, the acceptance criteria are updated to reflect that.

In most cases, the acceptance criteria are nothing more than a checklist that reflects the client requirements. After all of the items have been checked as satisfactorily completed, the project is ready to move to the closing activities.

Putting It All Together

Monitoring and controlling the progress of a project won't happen just because the team is committed to the project. There must be an organized oversight process put in place and understood by the client, senior management, the project manager, and all the team members. As you have seen, there are reports for all of these audiences. You have also seen that the extent to which progress reports are necessary and the amount of effort to generate them requires a reasonable balance between effort and value. Requiring too much reporting takes away from the time available to work on the project. Requiring too little reporting

puts the project manager at risk of not being able to complete the project within time and cost constraints. You have also seen that there are both numeric and graphic reporting formats. Some managers prefer numeric data, whereas others prefer graphic data. The reporting system you choose must meet the needs of both types of managers.

Discussion Questions

1. What are the advantages and disadvantages of confirming the accuracy of status reports filed by your team members?
2. You correctly defined and introduced the Scope Bank to your client, who initially agreed to use it. However, the client seems to have forgotten their agreement. The Scope Bank needs a deposit in order to process a new change request, and the client insists on integrating the most recent change request without removing any functions or features not yet integrated into the solution. You are at an impasse. How will you resolve the stalemate?

PIZZA DELIVERED QUICKLY (PDQ)

The project work is soon to begin, and you are conferring with your team members to decide on reporting requirements and frequency. Take into account the stakeholders in this project and what their needs might be. Refer back to the case study background statement in this book's "Introduction" for the input you will need to answer the following questions:

3. Who are the people that you need to hear from to determine whether they are satisfied with your progress on this project?
4. How will you get information from your team and distribute it to the other stakeholders for this project?