

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Introduction to Project Tracking and Reviewing

Once a project has advanced to the phase of performance, the consistent and constant flow of information on the true status of the project is essential. During performance, the project team's and, specifically, the project manager's focus now shifts from - discovery to tracking and reviewing what was said would be done. This information is generally provided in the form of:

- Written status reports.
- Updates to the schedule -- plan versus actual.
- Financial Analysis, including the comparison of actual costs versus planned costs and variance measurements.
- Exception Report.

Most of the methods for acquiring information pertaining to the project comes from the project team and from the processes used to keep the plan current. This section deals specifically with the elements of tracking and monitoring. The purpose is to track all four of the major project variables - performance, cost, time, and scope.

Reviewing, which goes hand-in-hand with tracking and monitoring, is discussed in the *Project Reviewing* section. Other critical management processes during performance are: change, issue, and risk management. These processes are also addressed other sections.

The Project Plan as the Road Map

To begin the tracking process, a starting place is needed. The project plan serves as this place. Even an imperfect project plan is useful because it can serve as a place to start. The recommendations contained in this document serve as the minimum set of planned elements that are to be tracked and monitored over the lifetime of the project. This list should be augmented and tailored for each specific project.

It should be noted that part of the planning was to acknowledge which elements were to be tracked and how often they were to be tracked. Thus, the planning process dovetails with the tracking process to provide a practical, workable method to evaluate where a project stands at a given point in time with regard to the initial baselined plan.

The concept of a "perfect" plan and final fixed strategies is an illusion and not what determines project success. Plans are living documents that change as the environment of the project changes. In the new world of information technology, success is dependent on strategies, project resources, and people. Focus should be on monitoring and directing these dynamic elements and not on hard-and-fast precepts. The project manager must be able to produce a product based on the project plan.

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

The Project Plan as the Baseline

The key elements in the project plan that are needed for tracking include:

- Scope of Work.
- Project Functional Specifications and other documents.
- Success factors.
- Work Breakdown Structure (WBS) -- activity list and activity network.
- Work packages, if developed. Many project teams will develop work packages for critical path tasks to develop an additional level of detail.
- Budgets and Estimates, along with the assumptions on which they were based.
- Master and supporting schedules.
- Financial and funding plans.
- Quality and Configuration Management Plans.
- Stakeholder Analysis, including senior management and clients.

Even very large projects can be controlled if adequate time is spent planning and decomposing activities. The best way to simplify a complex project is to disconnect its parts so the parts do not get out of control and have adverse effects on each other.

Why Tracking and Monitoring?

The management functions of tracking and monitoring are indispensable to the effective and efficient control of the project. In this methodology, tracking is defined as the fact-finding processes, and monitoring is the analysis of these facts. Both are needed for the management of the project.

Control processes are established not to determine what has happened, but rather to predict what may happen in the future if the present conditions continue.

Each project team consistently compares planned and actual performance to answer the fundamental question:

How is the project doing?

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Information generated during the tracking and monitoring processes forms the basis for reaching a judgment about the project status and whether corrective action is required. It also allows the project team to answer these specific questions:

General

- Where is the project on schedule, cost, technical performance, objectives, and goals?
- What is the status of activities that were to be completed?
- How does this status impact future project activities?
- What is going right on the project?
- What is going wrong?
- What opportunities are emerging?
- Are the project stakeholders comfortable with the results of the project?

Organization

- Is the project team an effective and suitable organization?
- Does the project manager have adequate control and authority?
- Have key roles been defined in the project?
- Are the project team personnel innovative and creative by suggesting project management improvements?
- Does the project team get together on a regular basis to see how things are progressing?
- Does the project have an efficient method for handling change requests?
- Does the project team seek the advice of stakeholders on matters of mutual concern?

How and What is to be Tracked?

A key management issue in every project is to develop processes that provide critical information **without** becoming a burden and taking on a life of their own. Many think this is only an issue in large projects, but small projects share equally in the problem because they typically lack the necessary resources to do many of the management functions.

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Just as in the planning process, the project manager walks a fine line to achieve the correct level of detail. However, the level of project reporting detail has a more pervasive impact since these processes tend to span a longer period of time and consume more resources.

As a general rule of thumb, most tracking material should be by-products of execution of the project. The level of detail about the project should decrease as the information is moved up through the project organization.

For example:

A two-page status report from each of the major project teams within the software area should be reduced to a two-page report from the full software area that is given to the project manager. In turn, the project manager takes reports from all the major activity areas and reduces the report down to one executive report of five to ten pages. This process can be automated through enterprise tools or by simply using word processing and electronic mail. It can even be a manual process.

As such, “how and what is to be tracked” is a very important question and one not to be taken lightly. The project manager should first focus on putting in place the most critical parts of tracking and monitoring, and then add additional items to track as necessary, based on the complexity of the project.

The minimum tracking and monitoring components are:

- Status – current activities and planned activities.
- Comparing the planned schedule to the actual progress and determining the current position. This analysis may be done at the top levels of the Work Breakdown Schedule for reporting, but may also be done at the actual task level for determining work activities. Key items are:
 - ⇒ Activity planned and actual start/finish dates.
 - ⇒ Project actual start/finish dates.
 - ⇒ Impact on overall schedule.
 - ⇒ Workarounds or corrective actions currently in place to adjust schedule variance.

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

When Should Tracking be Done?

- Comparing the planned budget with the actual expenditure. The tracking and monitoring processes should generate:
 - ⇒ Actual expenditures to date.
 - ⇒ Estimate to Complete.
 - ⇒ Estimate at Completion.
 - ⇒ Burn Rate (in either hours or dollars).
 - ⇒ Adjusted baseline, planned expenditure (This would require approval and would be a by-product of a full replanning activity. The original baseline should still be kept).
- Technical performance and quality indicators from each developmental stage of the project.

The frequency of the various tracking and monitoring activities will vary with the specific element and the amount of detail needed and should complement the various reviewing processes of the project.

The frequency of tracking activities should be noted on the master schedule for the project and possibly summarized in a project tracking matrix.

A sample matrix for a project is provided below. Provided in this sample are the actual tracking elements, the recommended frequency, possible automated tools to be used, and some general tracking remarks. The use of a matrix provides a means to clearly communicate and track project activities.

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Project Tracking Matrix

| Tracking Activity | Recommended Frequency | Automated Tools** | • Remarks |
|---|--|--|---|
| Updated Project Milestone Schedule | Monthly Qtrly, Milestone, or Phase Completion Reviews | MS Project Timeline FastTrack | <ul style="list-style-type: none"> • GANTT chart preferred • Save copy of previous month's chart • Include task completion dates |
| Updated Work Product Identification | Monthly Qtrly, Milestone, or Phase Completion Review As deliverable dates change | Automated project database | <ul style="list-style-type: none"> • Provide updates to database manager |
| Updated Estimate at Completion (EAC) | Weekly or bi-weekly for Status Reports As required when ahead or behind schedule Qtrly, Milestone, or Phase Completion Reviews | MS Project (Estimating add-in) Excel Lotus | <ul style="list-style-type: none"> • Get task leaders to cost out subtasks • Include project costs to date |
| Updated Detailed Financial Status | For Qtrly, Milestone, or Phase Completion Reviews As required when ahead or behind schedule | Visibility MS Word | <ul style="list-style-type: none"> • Labor hours awarded vs. labor hours expended • Dollars awarded vs. dollars expended |
| Updated Planned vs. Actual Spending Profile | Weekly or bi-weekly for Status Reports | Excel Lotus | <ul style="list-style-type: none"> • Visual overview for upper management |
| Updated Staffing Profile | Monthly For Qtrly, Milestone, or Phase Completion Reviews As work product deliverable dates change | MS Project | <ul style="list-style-type: none"> • Are there unacceptable peaks and valleys? |
| Updated Resource Loading | Monthly Qtrly, Milestone, or Phase Completion Reviews As deliverable dates change | Excel | <ul style="list-style-type: none"> • Validate need for resources |
| Updated Risk Identification | As required Quarterly as part of Risk Management | MS Word Automated project database | <ul style="list-style-type: none"> • Update risk matrix • Is risk mitigation required? • Has a risk materialized? |
| Updated Work Packages | As required when work package is completed, rescheduled, or changed | MS Word Automated project database | <ul style="list-style-type: none"> • When requirements change • Change Control List for Details |
| Updated Project Requirements | As required when requirements have been approved for change | MS Word Automated project database | <ul style="list-style-type: none"> • Contract modification • Change Control List for Details |
| Updated Miscellaneous Items | As required or weekly/bi-weekly status meetings | MS Word Automated project database | <ul style="list-style-type: none"> • As defined during tracking and monitoring processes |
| Updated Quality Project Plan | As required Quarterly For Qtrly, Milestone, or Phase Completion Reviews | MS Word MS Project MacProject | <ul style="list-style-type: none"> • Use baselined plan |
| Updated Configuration Management Plan | As required when ahead or behind schedule Monthly For IPR | MS Word MS Project MacProject | <ul style="list-style-type: none"> • Use baselined plan |
| Updated Action Items | As required For weekly/ bi-weekly status meetings | MS Word Automated project database | <ul style="list-style-type: none"> • Tracked until resolved • Issue Resolution List for details |
| Updated Corrective Action Items | As required For weekly/bi-weekly status meetings | MS Word Automated project database | <ul style="list-style-type: none"> • Tracked until resolved |

**** The state organization should use tools that have been defined within their organization as standard and/or which best meet the automated support requirements of the project.**

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Activity and Schedule Tracking

A large part of the tracking and monitoring process is knowing the project's progress. The only way to determine this is to:

- Review what activities were planned.
- Determine that the work has been done to complete these activities.
- Analyze whether the level of work is consistent with the level of effort that had been planned.
- Compare this to the planned start and finish dates.
- Determine if adjustments are needed for this activity in terms of start and finish.
- Analyze if any required adjustments impact other tasks.

There are numerous ways to collect, analyze, and present this information. Two methods are presented here. For large, complex projects that have an involved activity network, additional levels of analysis and mathematical models would be needed. These tools should be used first to generate the project schedule during planning and should then continue to be used to track the schedule.

Regardless of the tool, the first task is to update the activity list and then the schedule. For actual scheduling techniques, the reader should refer to *the Development of a Project Schedule section*, or refer to the state organization's procedures documenting schedule standards.

As can be seen in the Activity Tracking Table shown later in this section, a number of key tracking and monitoring activities are reflected. Included in the activity tracking table are:

- **WBS number.** This should be the activity's WBS number that was assigned during plan development or the number assigned at replanning.
- **Activity Description.** This is a brief narrative on the activity.
- **Dependency.** This would apply if the project reflects activity dependency, meaning one task cannot start and/or finish without the completion of another task. For this example, Task 2.2 cannot start until Task 2.1 has been finished. Task 2.3 cannot start until Task 2.2 has been finished and Task 2.4 cannot start until Task 2.3 has been completed. In some instances, the dependency may be a

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

“finish dependency” in that a particular task can be started independent of another task, but it cannot be completed until a specific task is finished. This would be true in some of the documentation or training activities where completion of the material is dependent on completion of a particular implementation activity.

- **Owner.** This should be the person who is responsible for updating the status on the task. It may or may not be the actual task manager.
- **Planned Schedule.** This information was generated as part of Project Planning. It would represent what was originally thought to be the number of days an activity would take, as determined by the date that the master activity list was generated. The second element of the activity in a bigger project schedule would show when the task would start and end, based on the duration.
- **Duration.** For the purposes of scheduling, duration should be in days, not hours. Hours are more of a financial element since they reflect the level of commitment and not the time. In other words, the purpose of the information in this table is not to show the number of people and hours being spent on a task (effort), but the actual time it will take.
- **Actual Schedule.** This information is completed as the activities are completed. Note that some of the 2.0 activities have no information filled in. This is because these tasks have not yet been completed. The current example shows that the design team is on Task 2.2.1.
- **Target schedule** is the planned schedule, plus the actual, with adjustments based on new project knowledge. In this example, the design of the project was to take 90 days. The current tasks have taken 15 days more than had been anticipated. During the planning phase, the project manager allowed a few days “float” in the design as a reserve for schedule risk.

During the process of establishing the project target, the project team now reviews the outstanding tasks and determines:

- Can the 15-day schedule slippage be made up in the other tasks? If so, where?
- Can the other tasks still be completed in the length of time planned? If so, where are additional adjustments required?

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

In this example, one of the two activities could be completed in less time, and one activity would require more.

To complete the projection for tasks that have not been started:

- Try to preserve “float” wherever possible.
- Ensure that logical discrepancies do not occur by overriding dependencies.
- Work up to the task level from the details; this will eliminate being over optimistic. If an automated planning tool is being used on the project and a critical path has been established, the system will prevent the user from overriding the dependencies in the schedule.

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Activity Tracking Table

| WBS | Activity Description | Depend | Owner | Planned Schedule | | | Actual Schedule | | | Target Schedule | | |
|-------|---------------------------------|--------|-------|------------------|---------|------|-----------------|--------|------|-----------------|--------|------|
| | | | | Start | Finish | Dur. | Start | Finish | Dur. | Start | Finish | Dur. |
| 2.0 | DESIGN | 1.0 | Brown | 4/1/96 | 7/1/96 | 91 | 4/1/96 | 7/1/96 | 91 | 4/1/96 | 7/1/96 | 91 |
| 2.1 | Prepare Preliminary Design | | Brown | 4/1/96 | 5/1/96 | 30 | 4/1/96 | 5/1/96 | 45 | 4/1/96 | 5/1/96 | 45 |
| 2.1.1 | Develop Enterprise Architecture | | Brown | 4/1 | 4/10 | 10 | 4/1 | 4/10 | 10 | 4/1 | 4/10 | 10 |
| 2.1.2 | Prepare Data Flow Diagrams | | Brown | 4/10 | 4/20 | 10 | 4/10 | 4/20 | 10 | 4/10 | 4/20 | 10 |
| 2.1.3 | Prepare Logical Data Module | | Brown | 4/20 | 5/1 | 10 | 4/20 | 5/1 | 25 | 4/20 | 5/1 | 25 |
| 2.2 | Prepare Detailed Design | 2.1 | Brown | 5/5 | 6/1/96 | 26 | 5/15 | | | 5/15 | 6/5/96 | 21 |
| 2.2.1 | Prepare Physical Data Model | | Brown | 5/5 | 5/25 | 20 | 5/15 | 5/31 | 15 | 5/15 | 5/31 | 15 |
| 2.2.2 | Prepare Data Dictionary | | Brown | 5/25 | 6/1 | 6 | 5/31 | | | 5/31 | 6/6 | 7 |
| 2.3 | Document Design | 2.2 | Brown | 6/1 | 6/28/96 | 28 | | | | 6/6 | 7/2 | 27 |
| 2.3.1 | Develop Design Specification | | Brown | 6/1 | 6/28 | 28 | | | | 6/6 | 7/2 | 27 |
| 2.4 | Design Review | 2.3 | Jones | 6/30/96 | 7/1/96 | 2 | | | | 7/3/96 | 7/5/96 | 2 |

Comments: All activities that are not meeting planned dates need to define: reason, approach to bring into conformance, and impact.

Once the activity matrix is completed, the project manager can prepare a graphical presentation of this information. If an automated tool is being used, this graphic will be automatically generated. In most cases, the project manager has a choice in the graphical representation. At a minimum, it should be shown as a GANTT chart, as illustrated in the next figure. For this example, planned dates and duration are still represented on the schedule, even though the task has been completed.

The objective of tracking and monitoring is to preserve the original schedule for comparison. In the above sample, the actual schedule is reflected for all those tasks completed. For tasks still open and ones that have not been completed, the new target schedule is reflected.

The vertical line on the schedule reflects the current date for which the schedule is being generated. It provides those reviewing the schedule with a quick reference point and also alerts the reader whether the information is current.

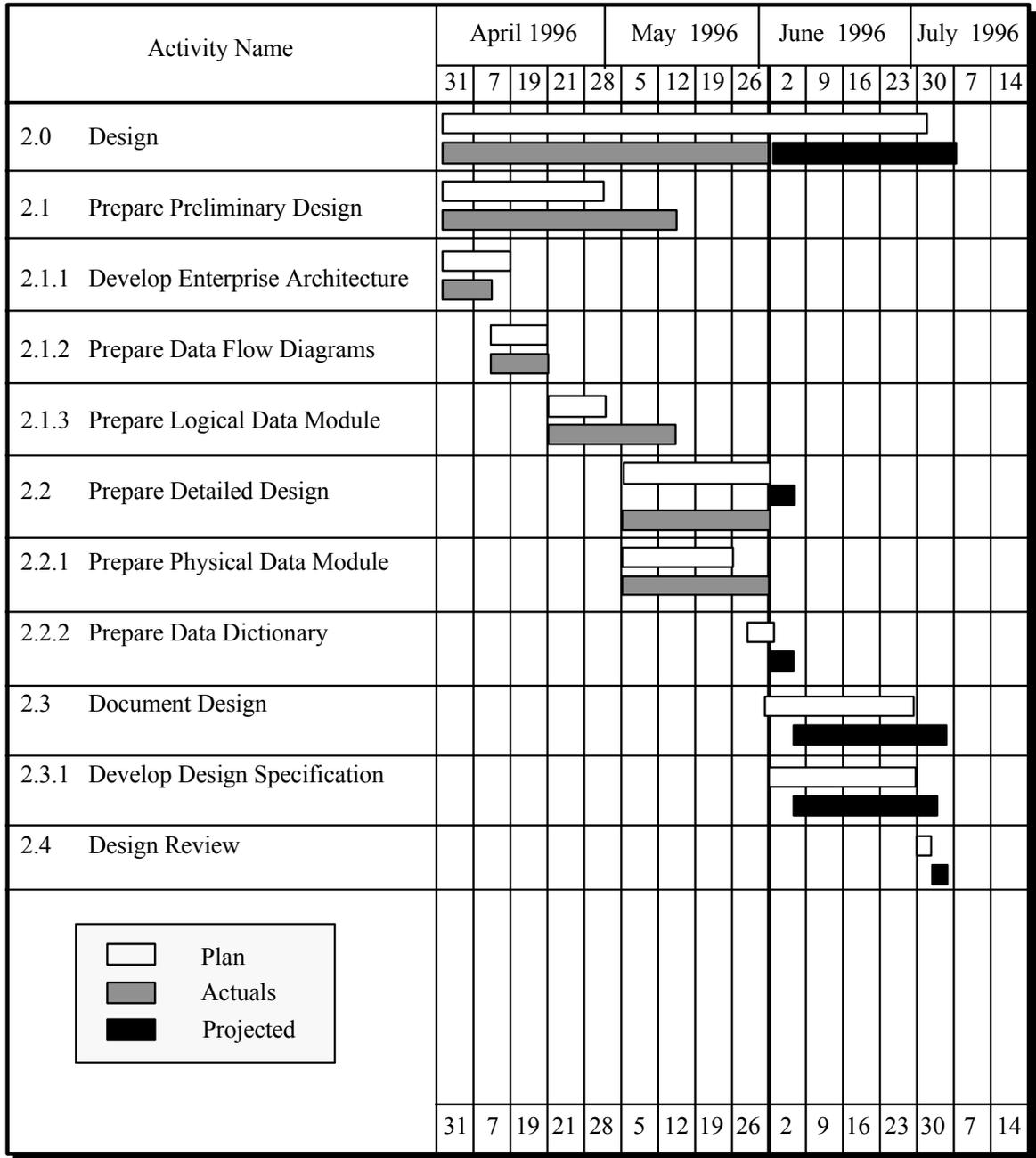
Again, the sample schedule does not reflect other project execution factors such as staffing, resolving technical issues, and staying within budget.

Project Execution - PM Elements

Tracking and Monitoring Project Performance

Initial Release 1.0
Date: January 1997

Project Schedule Update



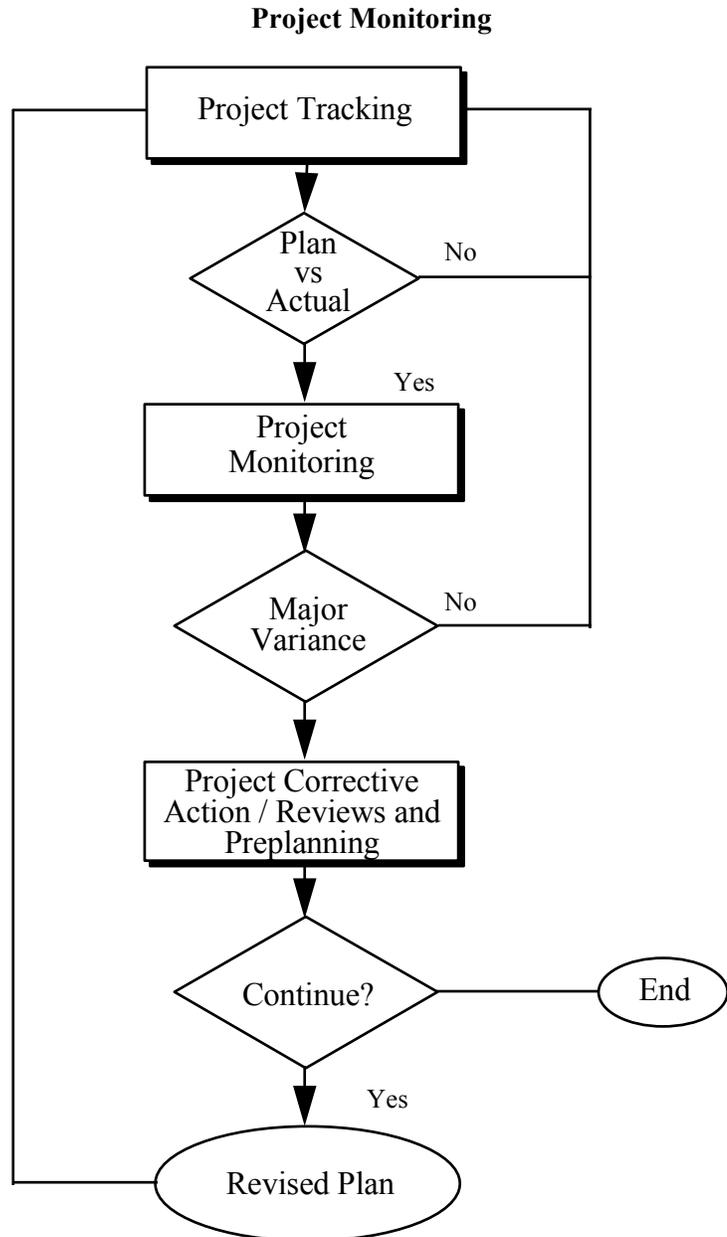
Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Monitoring

As is graphically presented below, the project monitoring process is an interactive part of tracking and is firmly tied to project planning. Project monitoring takes the outputs of tracking and uses them to determine planned versus actual.



Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Planned Versus Actual Costs

The basic consideration underlying all the elements of monitoring is “planned versus actual.” When the project manager completes this comparison, he/she then evaluates whether the existing plan can continue to be used, whether the project plan can get back on plan, or whether the project (in whole or in part) has deviated significantly from the plan.

Cases where actual progress and projected progress differ significantly suggest the need for replanning, which would include updated project budgets. To determine what is “significant” deviation from the plan, a number of standards can be used. The Department of Finance states that if a project in total is 10% over cost or schedule, then a Special Progress Report is required.

The actual state organization and/or project can develop additional standards for determining “significant.”

Cost Determination

The tasks associated with a project budget is the WBS. Budgets for each task should be simple and directly related to a specific WBS task. Comparing performance to plan can be difficult when the work cannot be quantified. How do you know what percentage of a design is complete, for example?

The way to measure progress is through estimation and completion of tangible products or milestones. First, tasks during the planning cycle should be broken down into activities to permit progress to be monitored fairly frequently. Second, tangible deliverables should be used as signposts to show progress. For example, in a software development project, printed code is one element of evidence. Budget updates are obtained from the people responsible for managing the work efforts.

Cost of performing a task is directly related to the labor assigned to the task, the duration of the task, and the cost of any non-labor items required by the task.

To develop updated costs and account for actuals, the project manager needs to review:

- Labor costs.
- Non-labor costs.
- Other expenditures.

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Update the Cost Model

Estimating how long the task completion takes still remains the single most difficult part of deriving updated cost estimates. In calculating the cost of labor, costs must be burdened appropriately for each state organization. Burdened cost typically refers to the overhead and general expenses that are beyond strict salary associated with an employee.

Non-labor charges include such items as material costs, reproduction, travel, cost of capital (if leasing equipment), computer center charges, and equipment costs.

Actual labor and non-labor cost information is entered into the cost estimation system or spreadsheet that compare to the numbers used to develop the plan. Spreadsheets work well for projects of small to medium scope. For large systems, a project management tool is typically preferred for cost estimation.

Within the system, costs are assigned and estimates updated at the lowest level WBS work package task. These costs are then combined to determine a sub-task cost, and in turn, are combined to determine the overall task cost, which can be summed to find the total project cost.

Document Assumptions

It is essential to document all assumptions made while planning and updating the project budget. Not only can it greatly impact the later success of the project, but the lack of such documentation can jeopardize the successful tracking to the budget.

If, for example, a budget assumed that a staff member would be available at a defined rate, but only substantially higher paid employees are available to perform the task, there will be a budget problem.

Review the Cost Estimates

Updates to budget are best developed by more than one person. Rarely does a single individual have the knowledge and understanding of all the factors affecting every aspect of a project.

Project managers have a choice in how they track (and report) project financial data. The basic financial tracking method is to periodically calculate an Estimate at Completion (EAC).

Project Execution - PM Elements

Tracking and Monitoring Project Performance

Initial Release 1.0
Date: January 1997

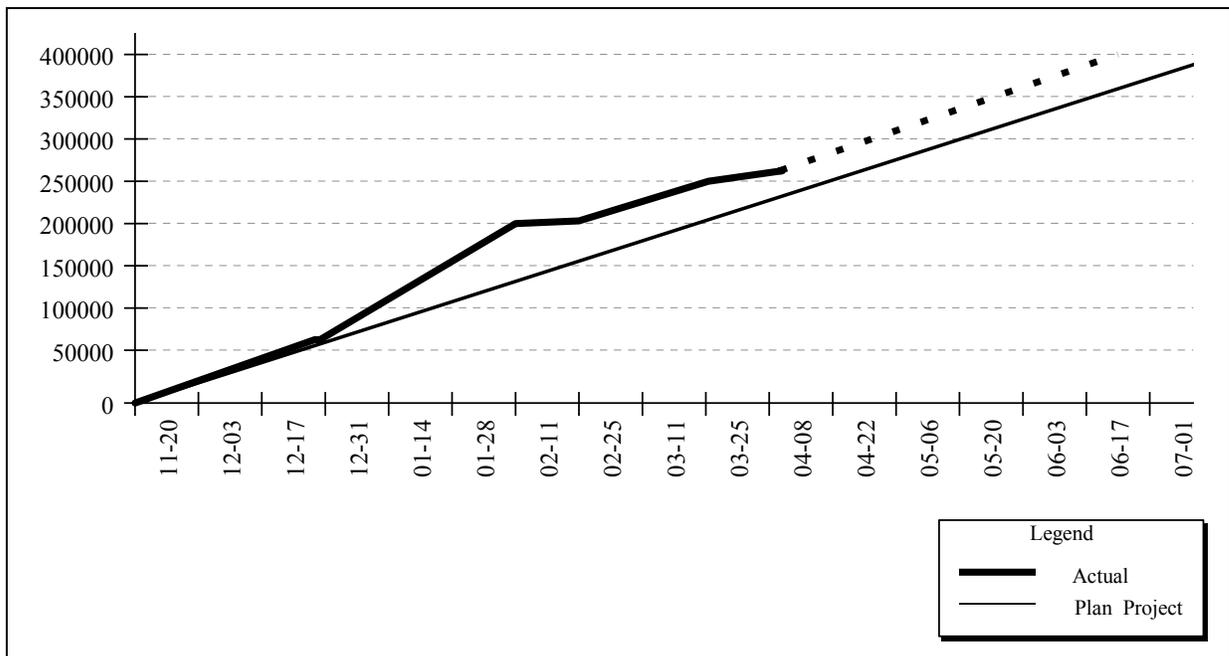
Stimuli for calculating an EAC include: routine (e.g., weekly or bi-weekly) reporting requirements, upcoming reviews or tracking indicators that show actual costs may be diverging from planned costs.

Each project creates an EAC in the planning phase to identify (and quantify) the costs associated with each of the project's WBS elements, thereby developing an overall budget for the project.

Another financial tracking method is to maintain financial metrics. Projects that prepare monthly reports for a customer would be more likely to have a need to maintain financial metrics.

Finally, many projects can obtain useful financial status by generating a planned vs. actual spending profile graphic. This method is particularly useful for presentations to upper management because of its visual impact. The spending profile, as shown below, can show in a glance what is happening with the project's costs. Creating these profiles is one of the many tracking options available to project managers.

Spending Profile



Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Estimate at Completion (EAC)

Although applicable to all projects, an EAC is particularly apropos to large IT projects because it periodically determines the expected total cost of the project at project completion. Projects, particularly large projects, suffer cost overruns due to inadequate estimating procedures and overlooked items.

The EAC provides:

- An historical baseline of the budget.
- A disciplined process for obtaining inputs.
- A means of allocating and tracking budgets to manageable sizes at the task leader level.
- A library of metrics that can be updated with actuals throughout the life of the project for use on similar projects.

The EAC is an assessment of the total effort required to complete each contract task. It estimates the amount of effort required to complete each WBS element and adds that estimate to the costs incurred to date to derive the anticipated cost of each WBS element at project completion. A possible process for budget updates is detailed below and is graphically presented in the table that follows. The steps are:

- Estimate hours and other direct costs for each WBS element.
- Calculate the estimated remaining cost by entering the remaining effort/activity scheduled to be accomplished into a task cost spreadsheet.
- Add costs incurred to date.
- Sum the task leader estimates and the costs to date to derive an EAC for each WBS element.
- Sum the EACs for each WBS element to derive an EAC for the overall project.
- Determine the actual amount of funds available to the project.
- Compare the EAC to total funds available to the project.

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Estimating Numbers Should not be Used in Isolation of Other Project Data

- If the total available funds are less than the estimated total cost, then:
 - ⇒ Re-cost the project,
 - ⇒ Eliminate unneeded or excessive requirements until the remaining estimated cost is within the bounds of the remaining funds, or
 - ⇒ Advise executive management that current estimated scope of work for the project is greater than initially estimated.

At a minimum, a full EAC should be done at each major milestone and all major contractual changes. A costing model may be used to cross-check to see if the EAC is reasonable.

Estimate Cost at Completion Summary

| WBS | Activity Description | Analysis in Hours | | | | | | Analysis in Dollars | | | | |
|-------|---------------------------------|-------------------|--------------|--------------|-----------------|----------------|--------------------|---------------------|--------------|-----------------|----------------|--------------------|
| | | Res # | Budget hours | Actual hours | Est to Complete | Est @ Complete | Variance (+/=More) | Budget hours | Actual hours | Est to Complete | Est @ Complete | Variance (+/=More) |
| 2.0 | DESIGN | | | | | | | | | | | |
| 2.1 | Prepare Preliminary Design | 3 | 900 | 1,150 | 0 | 1,150 | 250 | 90,000 | 115,000 | 0 | 115,000 | 25,000 |
| 2.1.1 | Develop Enterprise Architecture | | 400 | 500 | 0 | 500 | 100 | 40,000 | 50,000 | 0 | 50,000 | 10,000 |
| 2.1.2 | Prepare Data Flow Diagrams | | 300 | 250 | 0 | 250 | (50) | 30,000 | 25,000 | 0 | 25,000 | (5,000) |
| 2.1.3 | Prepare Logical Data Module | | 200 | 400 | 0 | 400 | 200 | 20,000 | 40,000 | 0 | 40,000 | 20,000 |
| 2.2 | Prepare Detailed Design | 5 | 1,000 | 640 | 408 | 1,048 | 48 | 100,000 | 64,000 | 40,800 | 104,800 | 4,800 |
| 2.2.1 | Prepare Physical Data Model | | 600 | 600 | 8 | 608 | 8 | 60,000 | 60,000 | 800 | 60,800 | 800 |
| 2.2.2 | Prepare Data Dictionary | | 400 | 40 | 400 | 440 | 40 | 40,000 | 4,000 | 40,000 | 44,000 | 4,000 |
| 2.3 | Document Design | 2 | 430 | 0 | 430 | 430 | 0 | 43,000 | 0 | 43,000 | 43,000 | 0 |
| 2.3.1 | Develop Design Specification | | 430 | | 430 | 430 | 0 | 43,000 | 0 | 43,000 | 43,000 | 0 |
| 2.4 | Design Review | 10 | 160 | | | | | | | | | |
| | Total for the Project | | 4,820 | 3,620 | 1676 | 5,256 | 646 | 466,000 | 358,000 | 167,600 | 525,600 | 59,600 |

The financial information included in this simple spreadsheet shown above provides most of the budgetary numbers needed. Again, what varies is the method by which the estimates to complete and at completion are done. Three variations on EAC are shown below:

EAC = Actuals to date plus the remaining project budget modified by the performance factor, often the cost performance index developed as part of an Earned Value method of estimating.

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Beware of the Trap to Report More Progress than has been Achieved.

EAC = Actuals to date plus a new estimate for all remaining work. This approach is most often used when past performance show that the original estimating assumptions were fundamentally flawed, or they were no longer relevant due to changes within the project environment.

EAC = Actual to date plus the remaining budget. This approach is most often used when current variances are seen as atypical and the project management team's expectations is that similar variances will not occur in the future.

Some project and/or agencies may also wish to use variance methods as estimating techniques that go beyond just EAC and ETC. The following steps provide additional financial metrics that can further assist in determining if the project is "really" on schedule.

This financial data, however, should not be used in isolation. Variance and earned value calculations are recommended to be utilized to supplement the project manager's information.

To determine earned value:

- Determine the budgeted cost for work scheduled (BCWS), the budgeted amount of cost for work scheduled to be accomplished, plus the planned effort or apportioned effort scheduled to be accomplished in a given time period.
- Determine the budgeted cost of work performed (BCWP), the budgeted amount of cost for completed work, plus budgeted for level of effort or apportioned effort activity completed within a given period of time. This is sometimes referred to as "earned value" and is a measure of work accomplished during a given period. Tasks may be classified either as discrete or level of effort. If discrete, no credit is given for completing a task until it is done. If a task is level of effort, $BCWP = BCWS$.
- Determine the Actual Cost for Work Performed (ACWP), the amount of cost reported as actually expended in completing the work accomplished within a time period.
- Calculate the Cost Variance (CV) by subtracting ACWP from the BCWP.

$$CV = BCWP - ACWP$$

- Calculate the Schedule Variance (SV) by subtracting BCWS from BCWP.

$$SV = BCWP - BCWS$$

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

- Calculate the Cost Variance % by dividing the cost variance by BCWP.
- Calculate the Schedule Variance % by dividing the Schedule Variance by BCWS.
- Calculate the Cost Performance Index (CPI) by dividing BCWP by ACWP.
- Calculate the Schedule Performance Index (SPI) by dividing BCWP by BCWS.
- Calculate the percent of work complete by dividing the Cumulative BCWP by the Budget at Completion.
- Calculate the Percent Spent by dividing the cumulative ACWP by the Budget at Completion.

These variances can then be plotted graphically and over time show how the project team is doing.

Resource Loading Updates

Updating the project resource plan is an important tracking event since shifts in this plan can cause performance, cost, and schedule problems. The staffing plan showing the number of personnel, by type, that were required on the project was developed as part of the planning process. As part of tracking, this information is compared monthly on a planned versus actual basis. Periodically, the project manager also validates whether these planned resources are still sufficient to complete the task on schedule and within budget given changing conditions.

Updating projected resource loading and staffing profiles, as shown below, helps the project manager adjust to these changing conditions by refining the estimated effort to complete the project, validating the continuing need for resources and identifying problems early in the project. By identifying and analyzing discrepancies, the project team can determine if adequate resources are being applied to the project and can get early indications that the project is falling behind schedule or is more complex than initially estimated.

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Resource Loading

| POSITION | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------------|------|------|-----|-----|-----|------|------|------|------|------|-----|-----|
| SW Mgr | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Sr. SW Eng. | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| SW Analyst | 1 | 1 | 1 | 1 | 1 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 1 | 1 |
| Programmer | | | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| Config. Mgr | | | 0.5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Tech Writer | 0.5 | 1 | 1 | 1 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Support | 0.25 | 0.5 | 0.5 | 1 | 1 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 1 | 0.5 |
| TOTAL | | | | | | | | | | | | |
| PLANNED | 3.75 | 4.5 | 7 | 8 | 8.5 | 7.25 | 7.25 | 7.25 | 7.25 | 7.25 | 8.5 | 7 |
| POSITION | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| SW Mgr | 1 | 1 | 1 | | | | | | | | | |
| Sr. SW Eng. | 1 | 1 | 1 | | | | | | | | | |
| SW Analyst | 1 | 1 | 1 | | | | | | | | | |
| Programmer | | | 2 | | | | | | | | | |
| Config Mgr | | | 1 | | | | | | | | | |
| Tech Writer | 0.5 | 1 | 1 | | | | | | | | | |
| Support | 0.25 | 0.25 | 0.5 | | | | | | | | | |
| TOTAL | | | | | | | | | | | | |
| ACTUAL | 3.75 | 4.25 | 7.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

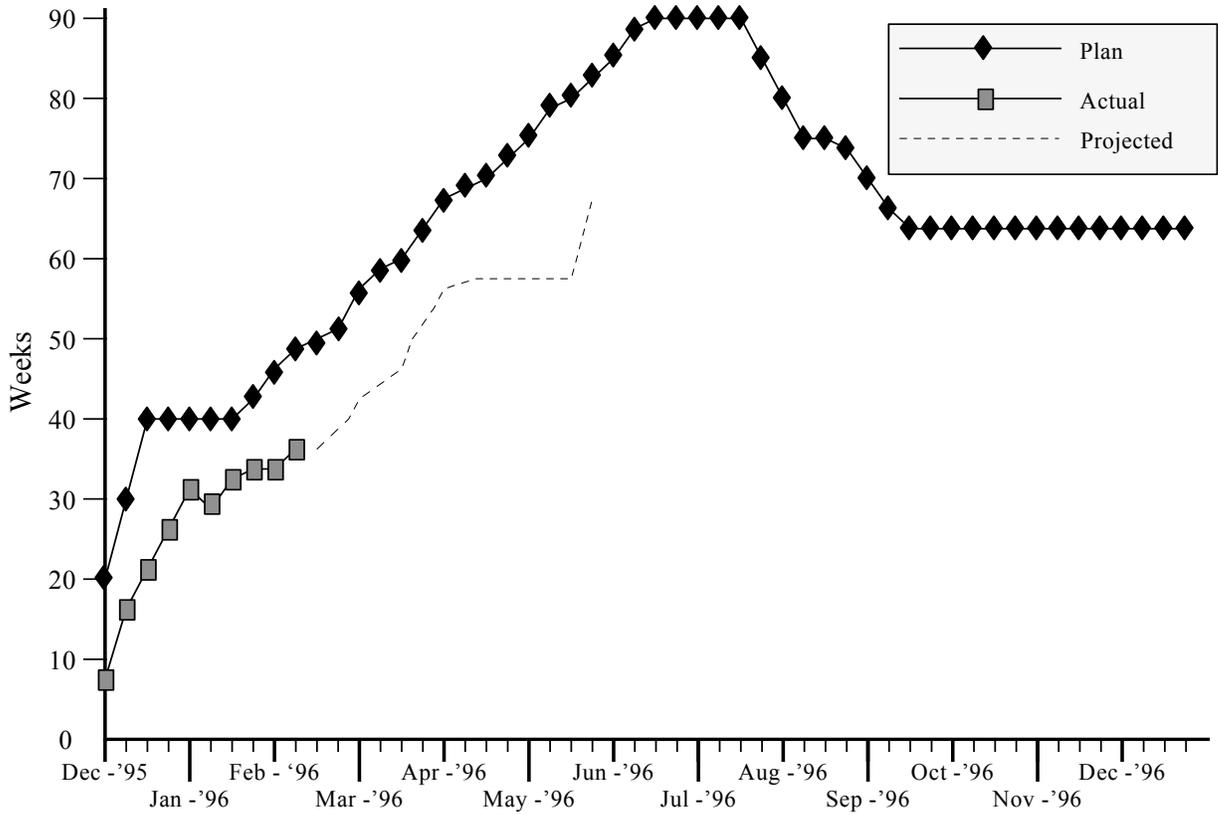
This same information can be graphically presented on a timeline with actuals compared to planned.

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Staffing Profile



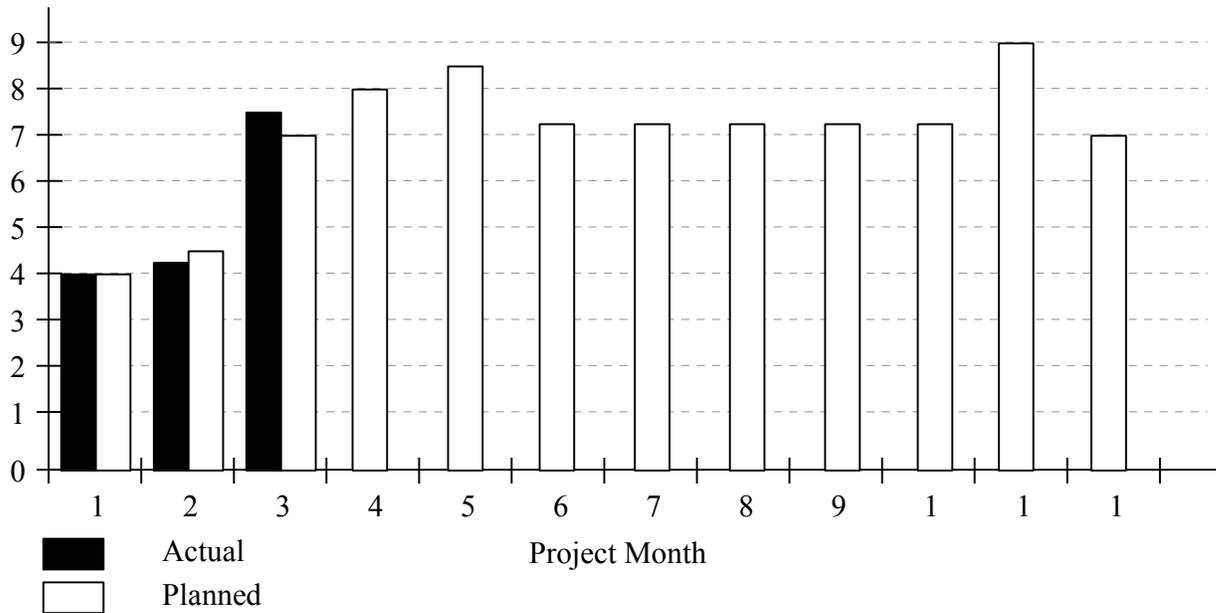
Lastly, this information can also be represented in a bar chart as shown in the next table so that actual monthly can be tracked as opposed to trends.

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Monthly Staffing Profile



Executive Status Reports

A standard requirement of all projects is to provide reports to executive management. At a minimum, the frequency of the reports should correspond with the executive meetings that are scheduled. This typically is on a monthly or quarterly basis or at major project phase/milestone completion.

The information shared in the Executive Report should be in a consistent format throughout the project and should correspond to the Project Status Reports discussed below. The types of reports that a particular agency uses will vary. A general rule of thumb is that the detail should be kept to what can be explained during the Executive Meeting. If more details are needed to clarify issues, then these should be provided as supplementary data. A sample of an Executive Report (Form: PM 07) is shown on the next page.

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Form: PM-07 Executive Status Report - Sample

Project: _____

Date: _____

Project is On Plan Ahead of Plan Behind Plan
Reporting Period: From: _____ To: _____

Current Status:

Significant Accomplishments:

Open Action Item Summary

Milestone Status

Upcoming Deliverables Status:
Completed Deliverables Since Last Review:

Financial Status

Planned Versus Actual Costs:
Planned Versus Actual Schedule:
Planned Versus Actual Staffing:
ETC Review:
EAC Projection:

Technical Status/Issues

Requirements:
Design:
Development:
Configuration Management:
Testing:
Integration:
Quality

Last Risk Update. Status:

Attach updated schedule and budget summary. For all issues shown in the technical area, be prepared to provide more detailed information.

Project Execution - PM Elements

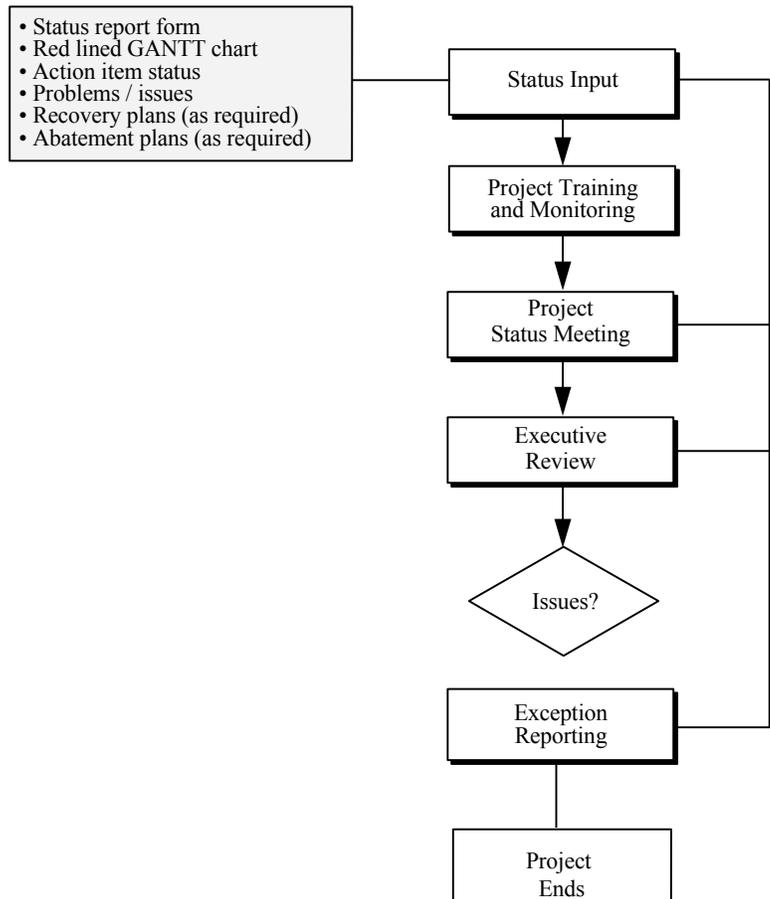
Tracking and Monitoring Project Performance

Initial Release 1.0
Date: January 1997

Project Status Reports

Status reports are generally produced on a weekly or biweekly basis by key project team members. These team members should know what areas of execution they are responsible for. Status reporting is an integral part of the project management processes. It is the means by which the project team, the contractors and executive management stay informed about the progress and key activities required to successfully complete the project. The purpose of the status report, like the status meetings, is to develop a standard format for the formal exchange of information on the progress of the project. The status reports should be tailored to the projects, but should be the same format for the full team member. The status reporting process can be graphically represented as:

Reporting Process



Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

The status reports should be prepared by the project team detailing activities, accomplishments, milestones, identified issues, and problems. Some level of recovery plans should be prepared for activities that are not on schedule and abatement plans prepared for anticipated problems.

The status report form will be used to report key information including:

- Current status.
- Significant accomplishments for the period.
- Scheduled activities.
- Issues.

Along with the status report form, the following may be attached:

- Updated GANTT charts.
- Recovery plans for activities not on schedule defined by the project team as being late, (e.g. slippage in the critical path activities).
- Abatement plans for expected problems.
- Resolution to assigned action items (including the Issues and action process).

A sample Status Report (Form: PM 08) is provided on the next page.

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Form: PM 08 Status Report Form

Project: _____ Date: _____
Submitted by: _____ Project Organization Area: _____

Project is On Plan Ahead of Plan Behind Plan
Reporting Period: From: _____ To: _____

| |
|---|
| Current Activity Status: <i>The description of activity should not span more than 2/3 lines. Activities should be linked to the project tasks list or WBS.</i> |
| Significant Accomplishments: |
| Planned Activities for next period: <i>The description of activity should not span more than 2/3 lines. Activities should be linked to the project tasks list or WBS.</i> |

| |
|--|
| Financial Status <i>Planned Versus Actual Costs:</i> <i>Planned Versus Actual Schedule:</i> <i>Planned Versus Actual Staffing:</i> <i>ETC Review:</i> <i>EAC Projection:</i> |
|--|

| |
|--|
| Technical Status/Issues |
| Previous Action Items: |

| |
|--|
| Last Risk Update. Status: |
|--|

Attach updated schedule and budget summary. Attached new change control requests and prepared to discuss

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Independent Reviews

An important part of project evaluation is done by conducting an independent oversight review. For medium to large size IT projects, the framework requires that project oversight reviews be done on a schedule consistent with the size of the project. For very large projects, an oversight entity may be assigned on a full-time basis. For other projects, the oversight reviews may be done on a periodic basis. Full details on project oversight are provided in the Independent Project Oversight Volume.

Regardless of the actual requirements, many state organizations are going to the process of oversight reviews to augment their standard tracking process. These reviews provide the opportunity to have an independent appraisal of where the project stands and the efficiency and effectiveness with which the project is being managed. The independent reviewers (as opposed to IV&V contractors) are interested in the project's processes rather than the project products.

The purpose of the audit procedure is to ensure that the project plans are being adhered to and that any identified problems or deficiencies are resolved in a timely manner.

A sample independent review process is defined below.

- ⇒ Review each engineering effort at least once during each phase.
- ⇒ Review the project at each phase for conformance to the applicable Project Implementation Plan, Software Development Plan, QA Plan, and VisiCom procedures. This review includes the CM and data management process, the use of methodologies and tools identified in the project plans, the software development folders, the peer review process, and the walk through process.
- ⇒ Provide a summary report of each audit to the Group Manager. This report should clearly identify any deficiencies or problems encountered during the audit.
- ⇒ For projects with problems or deficiencies, work with the Group Manager to ensure that a plan is implemented to resolve the problems/deficiencies and schedule a second audit to make sure that the problems/deficiencies have been resolved.
- ⇒ Independent audits work only if follow-up actions are taken to resolve any problems or deficiencies identified by the audits.

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Periodic Updates

As shown in the Tracking Matrix at the beginning of this section, additional tracking and monitoring activities will occur on a less frequent basis as opposed to the financial, budget, and status activities. Some of the periodic tracking processes are listed here.

Updating a Project's Work Packages

In the planning phase, each project may identify one, or a series, of work packages for specific work to be accomplished. Work packages are generally created to cover a specified subset of the project's overall requirements and are updated as project requirements change or as additional requirements are developed. It should be noted that work packages are tracked until completion; that is, until all of the work packages' requirements have been met. The project team should update the following areas (as appropriate) each time a work package is completed, rescheduled, or changed:

- Work package description.
- Engineer responsible for the work package.
- Start date.
- End date.
- Dependencies.
- (Normalized) requirements covered.

Updating Project Requirements

In the planning phase, each project must identify the requirements that the project intends to satisfy. This process may result in the creation of a matrix that lists normalized requirements from the Statement of Work and associated project specifications. Like the work package, once identified, project requirements are tracked until completion; that is, until all of the project's requirements have been met.

Based on the change control processes notes in the section, project requirements only change as a result of written notification and thorough review. Hence, project requirements will be updated as part of the change control process.

Project Execution - PM Elements

Tracking and Monitoring Project Performance

| | |
|-----------------|--------------|
| Initial Release | 1.0 |
| Date: | January 1997 |

Updating the Quality Project Plan

A Quality Activities matrix that lists project specific quality-related activities is required for each project. This matrix is initially developed in the project planning phase and is updated as project requirements change or as additional requirements are developed. The project team shall update the Quality Activities milestone schedule, as necessary, by:

- Adding or deleting quality activities.
- Providing actual quality activity completion dates (or revised expected completion dates) as the project progresses.

Updating the Configuration Management Plan

A Configuration Management Activities matrix that lists project specific CM-related activities may be included in the project plan. This matrix is initially developed in the project planning phase and is updated as project requirements change or as additional requirements are developed. The PM shall update the CM Activities milestone schedule, as necessary, by:

- Adding or deleting CM Activities.
- Providing actual CM activity completion dates (or revised expected completion dates) as the project progresses.