



**Project Management
White Paper Series**

What is the status of your project?

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by Keith Fournier

Introduction

During the execution of a project, accurately determining its status can be challenging. A software implementation project can be especially difficult. The ability to know the “health” of your project is critical to minimize risk. Project managers must be able to understand the relationship between all three aspects of the triple constraint: time, cost, and quality (or sometimes called functionality). The triple constraint postulates when a project is behind schedule with no change in project scope, one of the three aspects of the constraint will ultimately suffer.

Which aspect of the triple constraint will the project manager be able to change? Time seems to be the easiest to sacrifice. Users want promised functionality and many projects have fixed-fee budgets. If no more funds are available, time to completion usually suffers. This is why IT projects always seem to be completed late. However, changes in project scope impact project performance most significantly and can considerably increase the costs. Even fixed-fee projects can experience costly change orders if project stakeholders refuse to enforce project scope and move changes to future phases. As a result, the Standish Group has determined from their research that 52% of all projects finish at 198% of their initial budget! And we wonder why IT projects have such a bad name. Is the best way to estimate an IT project to take the initial budget and schedule estimates, double them, and add 10%? Based on the Standish research, this looks like a good rule of thumb.

Project sponsors always want to know... Is the project on-time and on-budget? Have you been involved in a project that is 99+% done for the last 10 status meetings? Each subsequent status meeting, the project completion percentage increases by only 0.1%, for example, being 99.3% complete. It seem like projects are typically on-time and on-budget until the last 5 or 10% of the project schedule. This kind of status manipulation can be minimized if the project has a detailed project plan and diligent adherence to the project scope is maintained. Early in the project, the project team tends to make a “minor” change in scope/functionality to keep the users happy and engaged. However, the impacts of these decisions always catch up at the end of the project. Scope must be controlled and managed from the very beginning.

Proper project planning and activity estimating allows project managers, team members and sponsors to have more confidence in status reports during the

implementation of the project. Researchers at the Defense Acquisition University determined that a well developed project plan can accurately estimate final project performance with only a small portion of the project completed. “Once a project is 10% done, the overrun at completion will not be better than the current overrun. Once a project is 20% complete, the CPI (Cost Performance Index) does not vary from its current value by more than 10%. The CPI and SPI (Schedule Performance Index) are statistically accurate indicators of final cost results.” (Defense Acquisition University) Project managers should therefore begin to manage expectations of the team and sponsors early.

As mentioned in the previous article, it is a good rule for project managers to “disappoint early and disappoint often.” This axiom is not only important for keeping scope but to keep project stakeholders informed of issues. If there is a problem at any time in the project, the best time to address the issue is now! Waiting will not make it go away. As shown by the Defense Acquisition University, schedule and cost problems are rarely eliminated during the course of the project. Project managers have several techniques to help develop accurate status estimates. Some are more complex than others. The project manager and their team should devise a plan to estimate and monitor the project based on its scale and scope.

Project Performance Techniques

Many techniques can be used to determine the status of a project. Some project managers may use the “gut feeling.” But that technique will not work when talking to the local media or elected officials. The project manager’s intuition is based on previous experience, communicating with team members and observing the project activities. However, their intuition should be buttressed by objective facts and analyses.

Projects are typically or naturally segmented into phases. Each phase can have several technical or deliverable milestones. However, using milestones to determine project status has only limited value. Milestones, by definition, identify only the work performance dimension of the project. The deficiency with using milestones is the lack of feedback on quality performance and certainly does not indicate budget position. Therefore, project managers need to know budget consumption, milestone achievement and functionality delivery/acceptance. Earned Value Management (EVM) provides the ability to see all of these simultaneously or 3-dimensionally (as

geographers prefer). This project monitoring technique can give a very accurate view of your project's status.

Earned Value Management (EVM)

Earned Value Management (EVM) allows for the combined measurements of schedule performance (time), financial performance (cost) and technical performance (quality). Earned Value (EV) identifies the current "value" of work accomplished or "earned" up to a specific point in the project. The value of the work performed can be compared with the budget spent and the duration of time necessary to accomplish the work.

Once the project data is compiled, EV can generate many types of useful reports. In an EVM status report, a positive variance in cost or schedule is good and a negative variance is "less than optimal." (As project managers, we try to eliminate the word "bad.") For example, if 50% of the project labor budget has been spent, 50% of scheduled tasks are complete, and 50% of the project schedule is consumed, this indicates that the project is on-time and on-budget or a zero variance on cost and schedule is evident. This example demonstrates the interrelationship between the three different aspects of project performance.

Earned Value analysis focuses on two variances: schedule and cost. These are determined by some very simple formulas. The following is a brief introduction to terms and reports associated with EVM.

Performance Reports

Performance Reports provide an understanding of tasks completed or "value earned." These completed tasks are compared to what was expected to be finished and at what budgeted cost.

BCWS – Budgeted Cost of Work Scheduled
 BCWP – Budgeted Cost of Work Performed
 ACWP – Actual Cost of Work Performed

Status Reports

The status reports show the project's position as related to schedule and costs.

Schedule Variance (SV) = BCWP – BCWS
 Cost Variance (CV) = BCWP – ACWP

A positive variance is good. A negative variance is an indicator of issues and potential risk to the project.

Projection Reports

With the knowledge of how the project is performing and the current status of the project, the data can then be utilized to forecast trends.

Schedule Performance Index (SPI) = BCWP/ACWP
 Cost Performance Index (CPI) = BCWP/ACWP
 SPI > 1 = ahead schedule
 CPI > 1 = under budget
 If SPI and CPI are < 1, "less than optimal" conditions are evident.
 Cost Schedule Index (CSI) = SPI * CPI

Budget estimates can be developed with the previously gathered information.

PV – Planned Value (points along the total cost curve related to schedule)

BAC – Budget at Completion

EAC – Estimate at Completion

ETC – Estimate to Completion

VAC – Variance at Completion (VAC = BAC – EAC)

Statistics and formulas are great tools to assist in the determination of project status. These analyses give early warning to the project manager and team by projecting current trends and extrapolating final costs. The analysis is only as good as the collection and utilization of accurate information. However, as with any objective analysis, the key is to also have accurate and relevant subjective information. This facilitates the accurate interpretation of data.

Time Estimating

The challenge with EVM is the necessity to have accurately defined work, assigned value and defined earning rules. Estimating time accurately can be very time consuming and tedious. But with learning any new skill, it becomes easier and more precise every subsequent time it is employed. The basis of developing a good plan starts with understanding not only the duration of activities but knowing their sequences and dependencies. A comprehensive and coherent project plan includes a detailed Work Breakdown Structure (WBS). A WBS is compilation of tasks aggregated into activities related to the project work effort. Work packages are delivery oriented tasks taking between 40 and 80 hours to complete. Tasks are then aggregated to complete an activity. One or more activities complete a project.

Knowledgeable of Subject Matter Experts (SMEs) are needed to assist the project team in compiling the project scope, plan the project, and estimate project schedule and costs. Their assistance is critical in compiling an accurate project plan. Project costs and schedule can be derived from the bottom up or zero-based budget development process. To estimate the Level of Effort (LOE) to complete a WBS work package, analogous estimating techniques compiled from historical data can result in very accurate estimates.

Historical data should have been compiled and organized during the 'lessons learned' portion of completed projects. The challenge is when there is no historical information.

If there is a lack of historical data, estimating of project activity duration is problematic. Therefore, minimum and maximum estimated duration should be included in the activity development. For example, a particular activity is estimated to take 40 days. However, there is a possibility that the activity may take 10 days less or 20 days more. How do we deal with that? An activity duration technique called the Three-Point Estimates can be used.

The Three-Point Estimate utilizes activity completion estimates and calculates the execution "time estimate" for the activity. This methodology requires two assumptions: 1) the standard deviation is one-sixth of the time requirement range, and 2) the probability distribution of time required for an activity is expressed as a beta distribution. The formula for the Three-Point Estimate is as follows:

$$t^e = \frac{a + 4m + b}{6}$$

t^e = time expected

a = most optimistic time

b = most pessimistic time

m = most likely time

For the example:

$$t^e = \frac{30 + 4(40) + 60}{6}$$

$$t^e = \frac{30 + 160 + 60}{6}$$

$$t^e = \frac{250}{6}$$

$$t^e = 41.66$$

Utilizing the Three-Point Estimates formula, time estimated to complete the example activity is calculated to be 42 days. The "time estimated" can be added to an activity sequencing technique to develop total project duration estimate with a higher degree of confidence. One activity sequencing technique is called Program Evaluation and Review Technique (PERT). Each activity with their related "time estimated" is sequenced with activity dependencies into the PERT analysis. The result is a total estimated time for the entire project. Predicted accuracy of the estimates should be prominently documented to mitigate risk to the project manager and team.

The necessity of accurate task and activity estimating to create the project plan is obvious. The tasks and activity costs can then be estimated based on the burdened cost for the labor. If contained in the activities, other expenses can be included. If these estimates are inaccurate, the entire earned value management analysis will be flawed. Then the risk of project failure (over budget, reduced functionality, or late) increases dramatically. As project managers, the main reason for your existence is to identify and mitigate project risk, and ensure the successful completion of the project.

Deficiencies with EVM

Quantifying work progress can be difficult. Earned Value can provide an objective and quantifiable method to understand project status. However, the time required for data management, input and manipulation can be extensive. Depending on the risk and magnitude of the project, a cost/benefit analysis should be performed to determine if EVM is an appropriate expense for the project. Data collection throughout the project can also be problematic. It is sometimes very difficult to accurately estimate how much of an activity or task is completed. If a team member is behind on their task, they may be inclined to bias their estimate. This occurs because there always seems to be enough time in the project to make up for lost time and/or that team member doesn't want to get into trouble for being behind. Therefore, time and task completion reporting should be monitored and reviewed closely by the project manager.

Earned Value only relates to activities and tasks performed in the project. Initial costs for hardware, software, infrastructure, training, and other project related costs are not necessarily included. Therefore, the types of costs contained in an activity must be defined at the beginning of the project. It must be clear that expenses other than labor are either included or excluded from the activity cost estimates. These other

project costs may skew budget utilization at the beginning of the project. Therefore, the project manager and team must be aware of these factors when interpreting EVM and overall budget conditions.

Another facet of a project is quality or delivery of functionality. The task of developing an application object may be complete. However, future issues with that object may not be revealed until integration or stress testing. Time must be allocated for addressing these types of issues into future tasks or activities. Quality control and assurance is another complex aspect of delivering a project. The project manager and team must integrate a quality plan into the overall project plan. As always, the goal of the project is to deliver expected functionality under the triple constraint.

Comprehending the reports from EVM is critical. If the project manager is not knowledgeable enough about the project, the EVM effort may only become an expensive deliverable from the implementation vendor. The project manager must intuitively know what is happening to mitigate risk in the project. If needed, a third-party advocate should be considered to work on the project owner's team. This advocate supplements staff expertise, assists in interpreting reports provided by your consultant, and audits functionality of tasks and activities considered completed.

Conclusion

Projects need good status monitoring. Earned Value Management is an excellent tool to understand project status. Project status can be captured in several dimensions with EVM including cost, schedule and functionality. The biggest reasons for project failure are change in scope and underestimating the impact of deviations in activity completion. The key to managing a project is to have situational awareness (SA) of a multitude of variables. Situational awareness is simply "knowing what is going on so you can figure out what to do" (Adam, 1993). The project manager must have technical knowledge, excellent communication and political skills and experience in similar situations. A project manager cannot become detached from the project and hope to truly know the health of the project if only statistical techniques are employed. EVM is only another tool in the project managers toolbox used to minimize emotion and look at the situation objectively.

The following are some guidelines when monitoring a project:

- 1) must have an accurate baseline for costs and schedule estimates,
- 2) utilize an automated work management system to track Level of Effort (LOE),
- 3) implement a financial management tracking system,
- 4) understand potential impact of linked and sequential dependencies,
- 5) watch for trends, don't only focus on actuals,
- 6) understand status metrics are more subjective than financial information,
- 7) keep project monitoring as simple as possible based on project scope and risk,
- 8) plan and organize the project and monitoring methodologies prior to starting project,
- 9) set risk tolerances for variances,
- 10) establish predetermined escalation procedures when issues or specific conditions occur,
- 11) stay objective and (try to) eliminate emotion,
- 12) focus on what to do "now" to fix problems,
- 13) employ change control board (CCB) to reduce or eliminate scope change, and
- 14) consider having a third-party project advocate on your team.

Effective project monitoring can be very complex. This article was intended to introduce the concept of Earned Value Management. It is recommended to research EVM or attend one of many classes are given on the methodology to implement and manage with EVM. It can be a very useful tool. If properly utilized, the benefits of EVM can greatly outweigh the costs and effort of implementing.

About the Author

Keith Fournier, PMP, APMC, CMS, GISP (keith@isd ltd.com) is a certified Project Management Professional (PMP) and has an Advanced Project Management Certification (APMC) with 17 years of GIS and IT project management experience. Keith was most recently the CIO and GIO for the award winning GIS and technology programs in Lucas County, Ohio. He is now the president of Innovative Systems Design Limited (www.isd ltd.com). ISD is an enterprise technology management consulting firm specializing in Enterprise Resource Planning (ERP), Enterprise Content Management (ECM) and Geographic Information Systems (GIS) strategic planning, acquisition and implementation.

