# Earned Schedule
# Contribution to Project Management

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## Abstract

*First introduced in 2003, Earned Schedule (ES) is a schedule analysis method extending the benefits of Earned Value Management. Presently, the ES method is used globally for all types and sizes of projects. It is being taught in universities, is now included in project management textbooks as well as the PMI® Practice Standard for Earned Value Management, and is a topic of graduate level research. This paper discusses its beginnings and the evolution of the techniques and capabilities occurring over the last decade. ES is shown to be useful to project managers for analysis and control of schedule performance.*

## Introduction

Earned Value Management (EVM) is a management system, integrating in a very intriguing way, cost …schedule …and technical performance. It is a system, however, that causes difficulty to those just being introduced to its concepts. EVM measures schedule performance not in units of time, but rather in cost, i.e. dollars. After overcoming this mental obstacle, we later discover another quirk of EVM – at the completion of a late performing project, schedule variance (SV) is equal to zero and the schedule performance index (SPI) equals unity. We know the project completed late, yet the indicator values say the project has had perfect schedule performance! A senior executive receiving the project performance report, minimally knowledgeable of EVM, cannot understand why he has an angry customer exclaiming, "Your product delivery is late!"[1]

This paper will first provide a brief introduction to EVM to show the reason for its failure to provide good schedule analysis information. With the need for Earned Schedule (ES) established, the derivation of the ES measure is described. From this initial discussion, the schedule performance indicators are developed. Having the indicators then leads to several analysis techniques long believed not to be possible from EVM. ES is the bridge between EVM and the project schedule.

[1] This paragraph is from the seminal article on Earned Schedule (Lipke, 2003).

The project forecasting capabilities from ES have been a subject for a considerable amount of practitioner and academic research. This research and the findings are presented along with the various derived schedule analysis techniques.

## EVM Introduction/Problem

Figure 1 is used to provide a brief description of EVM. The three characteristic S-curves of EVM, labeled PV, EV, and AC, are illustrated in the figure. For convenience the meanings of these abbreviations are provided in the figure. The PV curve depicts time distribution of the planned value by the schedule, i.e. the expected cost versus time to project completion, identified by the point, BAC. The PV curve is commonly referred to as the Performance Measurement Baseline (PMB). The AC curve is a graph of the actual cost accrual with time. Lastly, the EV curve portrays the accumulation of the earned value, indicating progress toward project completion (BAC). Fundamentally, as tasks are completed the project accrues the cost planned for those tasks as earned value.

The Earned Value Management (EVM) indicators are derived from the three S-curves. As shown on Figure 1, Schedule Variance (SV) is the computed cost difference, EV - PV, while the Cost Variance (CV) is the difference, EV - AC. The Cost and Schedule Performance Indexes, CPI and SPI, respectively, are ratios. SPI is computed from the ratio, EV/PV, while CPI equals EV/AC. Both sets of indicators are computed at periodic status points, usually monthly. The reference for EVM, PMI® *Practice Standard for Earned Value Management,* provides a much more in depth discussion of EVM and its management indicators (PMI, 2011).

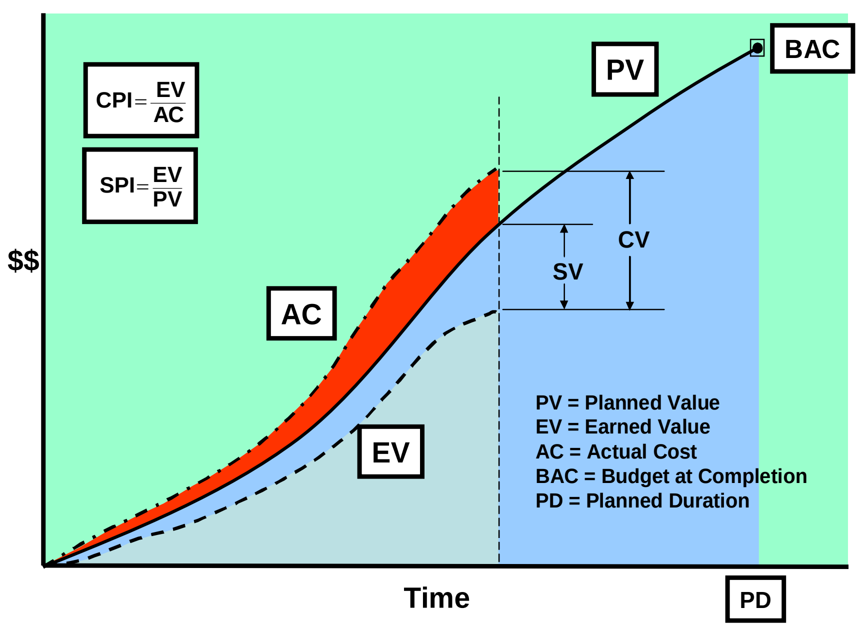
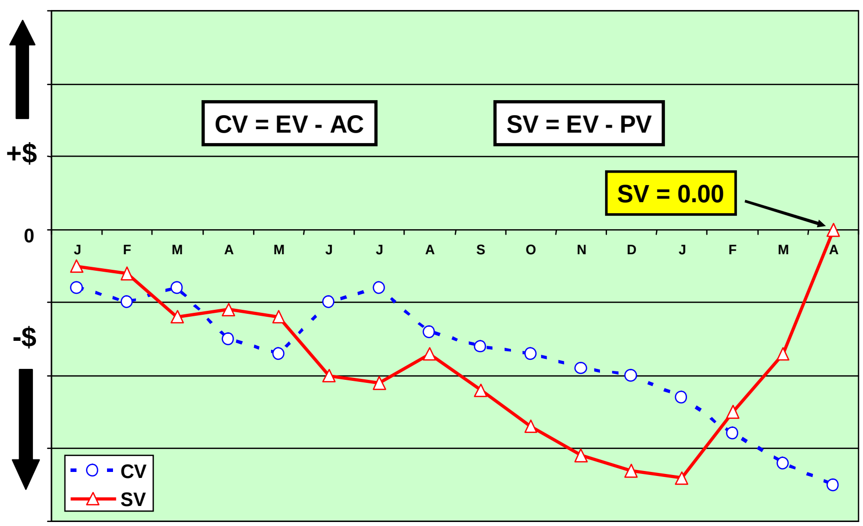



*Figure 1. Earned Value Measures & Indicators*

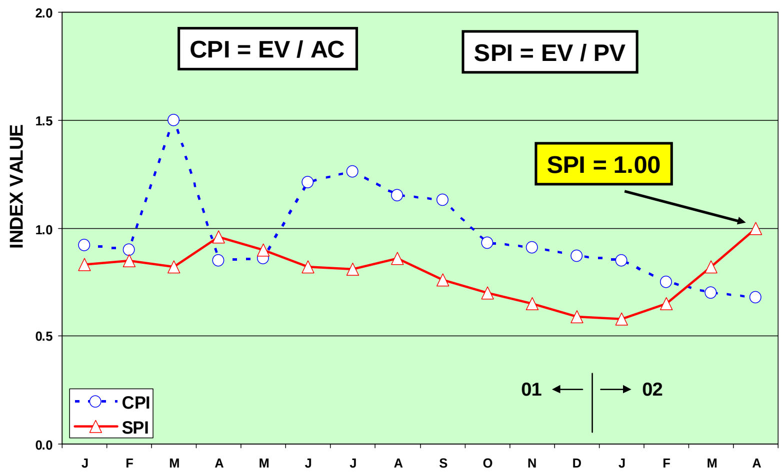
Figures 2 and 3 illustrate the behaviors of the EVM cost and schedule indicators. The cost indicators behave differently from those for schedule. The cost indicators appear to establish a trend with some variation. Similarly, the schedule indicators initially appear to establish a trend, but eventually begin moving toward their end result, zero variance and an index value equal to unity. The quirky behavior of SV and SPI occurs without fail for every project finishing late ….no matter how late. This anomalous behavior of the schedule indicators with its misinterpretations and misunderstandings weakens the initiative to broaden the acceptance and application of EVM.

Note how cost is referenced versus schedule. The cost indicators are referenced to actual costs (AC), whereas the schedule indicators are referenced to the PMB. It is this reference to PV that causes the problem for the schedule indicators. The end-point of the PMB, as mentioned earlier, is the planned cost for the project, i.e. BAC. The end-point for the EV is, likewise, BAC. Thus, as the EV approaches project completion, it converges to the planned cost. In the case of a late project, PV equals BAC prior to project completion, while EV incrementally achieves the value. From this explanation, you should now easily understand the behavior of the schedule indicators shown in Figures 2 and 3. Schedule Variance must converge to 0.0 at project completion, while the Schedule Performance Index concludes at 1.0.




Note: Project completion was scheduled for Jan 02, but completed Apr 03.

*Figure 2. EVM Cost & Schedule Variances*




Note: Project completion was scheduled for Jan 02, but completed Apr 03.

*Figure 3. EVM Cost & Schedule Performance Indexes*

The irregular behavior of the schedule indicators causes additional problems for project managers. At some point it becomes obvious when the SV and SPI indicators have lost their management value. But, there is a preceding gray area where the manager cannot be certain of the reliability of the indicator and be confident in reacting to it. This uncertainty has caused the application of EVM to be focused on cost performance control, whereas the schedule analysis features are all but ignored.

## Earned Schedule Measure & Indicators[2]

The idea of Earned Schedule (ES) is analogous to the concept of Earned Value. However, instead of using cost for measuring schedule performance, the unit is time. The fundamental concept of ES is to determine the time at which the EV accrued should have occurred; i.e., the time associated with point on the PMB where PV equals EV. The significance of the Earned Schedule concept is that the associated schedule indicators behave reliably throughout the entire period of project performance.

More explicitly, ES is a measure of time duration, computed as illustrated by Figure 4. The cumulative value of ES is found by using EV to identify in which time increment of PV the cost value should have occurred. The value of ES then is equal to the cumulative time to the beginning of that increment (e.g., months) plus a fraction of it. The fractional amount is equal to the portion of EV extending into the incomplete time increment divided by the total PV planned for that same time period.

[2] This section is based upon an article published in *Projects & Profits* (Lipke, 2010).

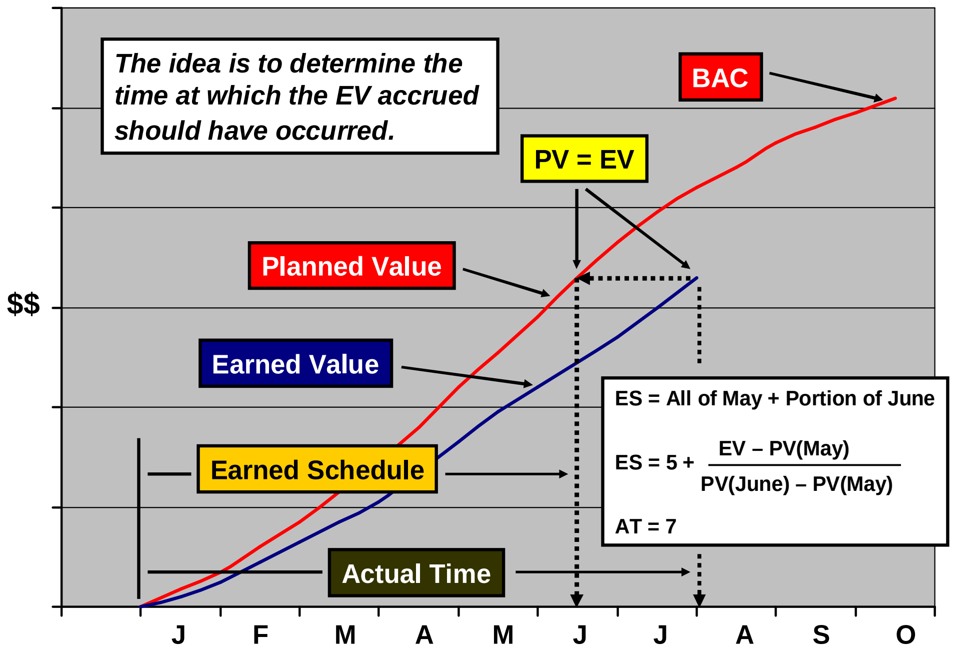



*Figure 4. Earned Schedule Concept*

To further explain, the ES computation process has two components:

1) The number of time periods (C) of the PMB for which EV ≥ PV
2) The fraction (I) of the C+1 period of the PMB

The value of period C is easily determined by counting the number of time increments of the PMB that satisfy the condition, EV ≥ PV. The computation of I is not so simple, but neither is it overly complex. The value of I is calculated by employing a linear interpolation method for the C+1 period of the PMB. The amount of EV extending into the C+1 period is equal to the difference EV minus $PV_C$, where $PV_C$ is determined from the PMB value associated with period C. The periodic amount of PV for period C+1 is the difference $PV_{C+1}$ minus $PV_C$. The fraction I is calculated from the quotient of these two values as follows:

$$I = (EV - PV_C) / (PV_{C+1} - PV_C)$$

When determined, the two values (C and I) are summed to become the value of ES:

$$ES = C + I$$

where the units are time periods, commonly months or weeks.

Using the ES measure, indicators are established which behave appropriately and analogously to the cost indicators (CV and CPI):

Schedule Variance: SV(t) = ES – AT
Schedule Performance Index: SPI(t) = ES / AT

where AT is the actual time (refer to Figure 4)

The Schedule Variance, SV(t), is positive when the ES exceeds AT, and, of course, is negative when it lags. The Schedule Performance Index, SPI(t), is greater than 1.0 when ES exceeds AT, and is less than 1.0 when ES is less than AT. These proposed indicators are completely analogous to the EVM cost indicators, CV and CPI. The proposed schedule indicators are referenced to AT, similarly to the EVM cost indicators reference to AC.

Referring again to Figure 4, the performance portrayed is of a project having schedule performance lagging its plan. We'll use this figure as an example of the previous narrative to assist with understanding the ES calculation. Viewing the figure, the vertical dashed line from the point on the PMB where PV = EV intersects the time axis at a point occurring some time in the month of June. The inset of the figure shows the calculation of ES and the value for AT. The time period at which the EV accrued is reported is the end of July, AT = 7. The whole number component of ES, i.e., C, is associated with the PV at the end of May or month 5.

The interpolated portion of ES, I, is spelled out in the insert of the figure:

I = [EV – PV(May)] / [PV(June) – PV(May)]

EV is larger than the PV value for May, but smaller than the PV value for June. Thus, the interpolation is made for June. Let us now assign some values and make the calculation: EV = $100, PV(May) = $90, PV(June) = $110. Using the equation for I, we have:

I = [$100 – $90] / [$110 – $90] = 0.5 months

Notice that the PV planned for June execution is $110 minus $90, or $20. With C and I computed, ES is determined:

ES = 5 + 0.5 = 5.5 months

Using ES and AT, the time-based values for schedule variance and schedule performance index can be calculated:

SV(t) = ES – AT = 5.5 – 7 = -1.5 months
SPI(t) = ES / AT = 5.5 / 7 = 0.79

Thus, the indicators provide management information concerning the performance pictured in Figure 4. The project is behind schedule by one and one-half months and the planned schedule is being completed at the rate of 0.79 months for each month of execution.

## Forecasting & Prediction

Forecasting using the schedule performance index from ES, SPI(t), was introduced by K. Henderson in 2004 (Henderson, 2004). In his article two formulations were proposed, which parallel the cost forecasting from EVM:

1) IEAC(t) = PD / SPI(t)
2) IEAC(t) = AT + (PD – ES) / PF(t)

where IEAC(t) = Forecast Duration[3]
PF(t) = Time-Based Performance Factor

The second formulation reduces to the first when SPI(t) is substituted for PF(t).

In Mr. Henderson's paper he showed that for three EVM-based methods only the ES forecast from formula 1 correctly converged to the actual duration. His paper also demonstrated formula 2 correctly converges to the actual duration for any PF(t) chosen, thereby validating the correctness of the formulation.

In the time span from year 2004 through 2007, two independent papers were published investigating the capability of the ES forecasting method. One paper written by Lew Hecht describes, positively, the usefulness of ES in a case study of a single US Navy project (Hecht, 2007/8). The second paper is a comprehensive examination of the capability of ES. The research team of Vanhoucke and Vandevoorde applied a simulation method for assessing the performance of two EVM-based methods and ES in forecasting project duration (Vanhoucke, & Vandevoorde, 2007). A portion of the Vanhoucke and Vandevoorde paper was updated and published in the Winter 2007-2008 issue of *The Measurable News* (MN) (Vanhoucke, & Vandevoorde, 2007/8). The conclusion from the MN paper and its parent indicates "The results …confirm…that the Earned Schedule method outperforms, on average, the other forecasting methods."

Subsequent to these initial application and research findings it was later recognized that four frequently used EVM-based methods of duration forecasting had not been compared to ES. A research study was conducted using real data from 16 projects to analyze the respective forecasting capabilities of the overlooked EVM methods along with ES (Lipke, 2008).

[3] IEAC(t) = Independent Estimate of Completion (time) is the accepted terminology. Forecast Duration is used, instead, to better convey the intent in the text.

The question posed in the study was "Is ES a better forecasting method of final project duration than the four methods from EVM?" To make a determination, the extreme case was examined and tested. The test was constructed to show whether the EVM methods in the aggregate produce better forecasts than does ES.

The testing examined performance for various bands of percent complete. The testing results were to establish whether the EVM methods or ES performed better in early, middle, late, or overall bands and which more quickly converged to the actual duration. Figure 5 illustrates the results from one of the projects, number 13. Smaller values for the standard deviation from the actual final duration indicate better forecasting performance. Clearly, ES in this instance is considerably better than any of the EVM methods.

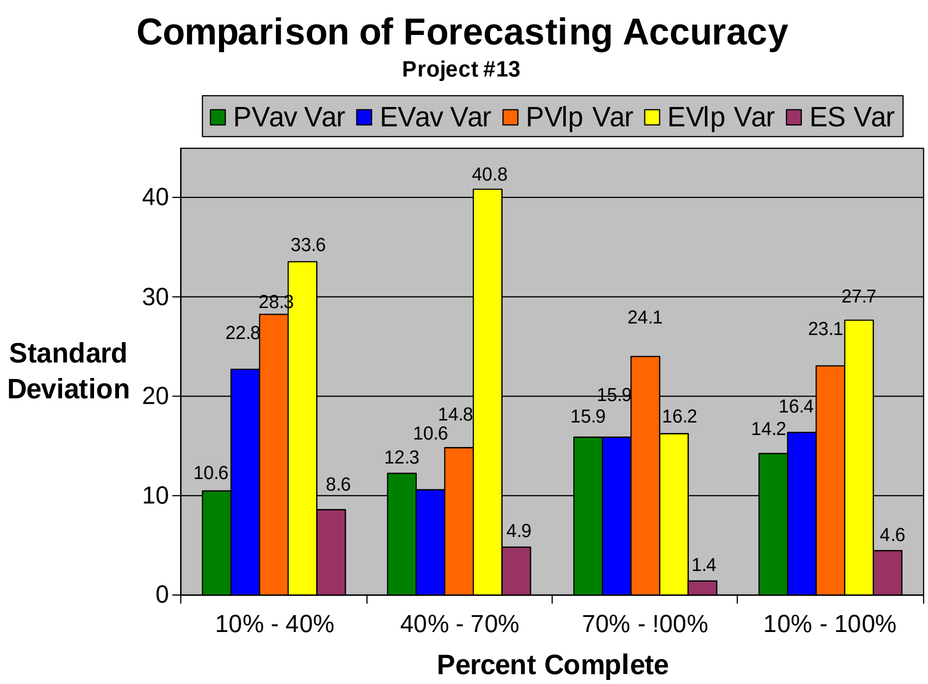



*Figure 5. Forecasting Accuracy – Early, Middle, Late, Overall*

The results shown in Figure 5 proved to be typical. Thus, the hypothesis testing of the computed forecast results conclusively indicated "…from among the methods and data set studied, ES is shown to be the best method of forecasting project duration."[4]

The forecasting of project duration can be used to determine a forecast completion date by simply adding the forecast duration to the project start date. Certainly this capability is helpful to project managers, and especially for senior executives, when making decisions for meeting customer product delivery dates.

[4] Quote is taken from the conclusions of reference (Lipke, 2008-2).

Whereas duration forecasting provides an estimate of when the project is likely to complete, *prediction* yields an understanding of the likelihood of completing at definite points in time; for example, the planned completion or the negotiated product delivery date. ES provides this capability for the first time in the history of EVM.

The creation of ES has allowed for development of the "To Complete" indicator for schedule performance comparable to the EVM To Complete Performance Indicator (TCPI) for cost. Just as TCPI provides the cost efficiency necessary to achieve a desired cost outcome, the "To Complete" schedule indicator gives managers the schedule performance efficiency required to complete the project for specified durations or dates.

The definition of the To Complete Schedule Performance Index (TSPI) is

$$TSPI = (PD - ES) / (TD - AT)$$

where TD = total duration desired

The numerator is the duration remaining for the work yet to be accomplished. The denominator represents the duration from the last status point to the desired completion time.

From research it has been shown that the TCPI and TSPI indicators provide definitive results for project managers (Lipke, 2009-1). As indicated in Table 1, when the computed value of TSPI is less than or equal to 1.00, there is good likelihood that the desired date or associated duration (TD) can be achieved. However, when the value of TSPI is greater than 1.10 there is very low probability of being able to meet the desired delivery date. In this event, the project manager knows he/she should not proceed without notifying the customer and that negotiation is in order.

*Table 1. Prediction Using Earned Schedule*

| TSPI Value | Predicted Outcome |
|---|---|
| $\leq 1.00$ | Achievable |
| $> 1.10$ | Not Achievable |

Of course TSPI can have values between 1.00 and 1.10. If this is the case, the project manager has knowledge that there is possibility for recovering the project. With good tactics, the project can meet its commitments. TSPI (and TCPI, as well) provides much needed information to the project manager for controlling and managing the project.

## Application to Critical Path

In most instances of EVM application, the management method is used solely for cost analysis of project performance. There is little acknowledged use of the data for analysis of schedule performance; it remains with the schedulers. This section on critical path (CP), however, will demonstrate that application of ES is useful to both the EVM and schedule analysts in the performance of their duties.

From the description thus far, ES provides reliable indicators for assessing schedule performance as well as the facility for forecasting and prediction. These applications of the method have thus far been applied to the overall project. This limited application raises the question, "Can the ES techniques be applied to the CP?"

CP analysis is used by schedulers for forecasting and for providing information to project managers bringing focus to appropriate control actions. The theory is that by protecting progress on the CP, the project manager minimizes the time duration to completion.

ES can provide useful information to the project manager and the analysts, and it is not difficult to do. A small amount of additional work is involved, but it is not as time consuming as a complete bottom up review of the entire schedule. All that is required is to create a separate PMB from the tasks which make up the CP. Then, status the performance of the CP using EV from those same tasks. In essence, a CP project has been created for separate analysis. This approach is described in the paper, "Applying Earned Schedule to Critical Path Analysis and More," (Lipke, 2006) and appendix D of the recently published PMI® Practice Standard for EVM (PMI, 2011).

By analyzing the total project and the CP performance together, the project manager can ascertain an imbalance in performance between non-critical and critical activities. When the SPI(t) from the total project is equal to the SPI(t) from the CP analysis, the project is maximizing its performance. However, when these values are not in agreement, execution problems are likely to arise which will delay project completion.

The analysis described here is not intended to be a substitute for detailed schedule analysis. Rather it is to be regarded as another input to bridge the cost and schedule domains of project management.

## Schedule Adherence[5]

The preceding discussion of CP provides a good transitional segue to the concept and measure of schedule adherence. From the previous section the idea is put forth that there may be performance which is "out of place." More clearly, accomplishment can

[5] The reference for Section VI is the 2008 *CrossTalk* article (Lipke, 2008-1).

occur that is not totally positive for the project as a whole. In the previous section this condition was recognized by when the SPI(t) values from the total project and the CP were not the same.

Schedule Adherence (SA) is a more definitive method of identifying asynchronous performance. Figure 6 is a visual for assisting the understanding of SA. In the figure, the darkened areas indicate task accomplishment.

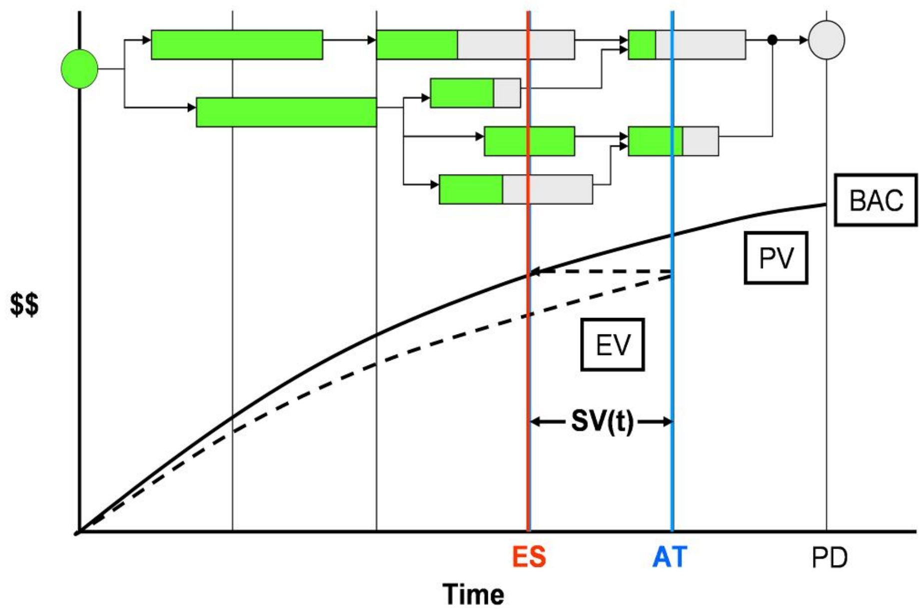



*Figure 6. Schedule Adherence*

Regardless of the project's actual position in time, we have information describing the portion of the planned schedule which should have been accomplished. That is, for a claimed amount of EV at status point AT, the portion of the PMB which should be accomplished is identified by ES. When the schedule is adhered to, task accomplishment (darkened areas) will only appear to the left of the vertical ES line. By adhering to the planned sequence of tasks, the manager is assured during project execution that the predecessors to the tasks in work are complete.

It is more than likely the project is not performing synchronously with the schedule; EV is not being accrued in the correct sequence. As shown in Figure 6 the accumulated earned value is distributed such that there is accomplishment depicted to the right of the ES line.

The areas not darkened to the left of the ES line indicate lagging performance, thereby identifying the possibility of a constraint or impediment. Performance may be lagging the expectation due to something preventing it from occurring. The EV indicated to the right of ES further identifies tasks performed at risk; they will likely have significant rework appearing later in the project.

Both sets of tasks, lagging and ahead, cause poor efficiency. Of course, for the lagging tasks, impediments and constraints make progress more difficult. *Concentrating management efforts on alleviating the impediments and constraints will have the greatest positive impact on project performance.*

This conceptual discussion leads to the measurement of schedule adherence. By determining the earned value (EV) for the actual tasks performed congruent with the project schedule, a measure can be created. The adherence to schedule characteristic, P, is described mathematically as a ratio:

$$P = \Sigma\ EV_j / \Sigma\ PV_j$$

$PV_j$ represents the planned value for a task associated with ES. The subscript "j" denotes the identity of the tasks from the schedule which comprise the planned accomplishment. The sum of all $PV_j$ is equal to the EV accrued at AT. $EV_j$ is the earned value for the "j" tasks, limited by the value attributed to the planned tasks, $PV_j$. Consequently, the value of P represents the proportion of the EV accrued which exactly matches the planned schedule.

A characteristic of the P-Factor is that its value must be between zero and one; by definition, it cannot exceed one. A second characteristic is that P will exactly equal 1.0 at project completion. During project execution, P equal to zero indicates that the project accomplishment is not, at all, in accordance with the planned schedule. Oppositely, P equal to one indicates perfect conformance. The P-Factor further enhances the description of project performance portrayed by EVM.

Additionally, the P-Factor allows for the forecasting of rework costs associated with out of sequence task accomplishment. Furthermore the rework forecast for the remainder of the project is utilized to form the Schedule Adherence Index (SAI), an indicator useful for determining the effectiveness of management action to improve schedule adherence. The complexity of these features requires explanation beyond the scope of this paper. The description of the computational methods is available in the article, "Schedule Adherence and Rework" (Lipke, 2011-1).

For illustration of the application Figure 7 is included, showing the graphs of the rework forecast and SAI for a real project. The schedule adherence for this project is incredibly good. The P-Factor is a high value early in the execution, 0.930, increasing to 0.995 by 75 percent complete, and remaining fairly constant for the status points that followed. Not only is SA good, CPI and SPI(t) were very good as well, 1.05 and 0.98, respectively.

For this project, BAC is approximately $2.5 million. The forecast of $40 thousand for the cost of rework, only 1.6 percent of BAC, is consistent with the other indicators of good performance.

Although only a single set of correlated data, the fact that all of the indexes have relatively high values demonstrates the conjecture that when SA is good, cost and schedule performance are maximized. If true, the SA index is an important management indicator. The implication is the appropriate use of SAI as an additional management tool will increase the probability of having a successful project.

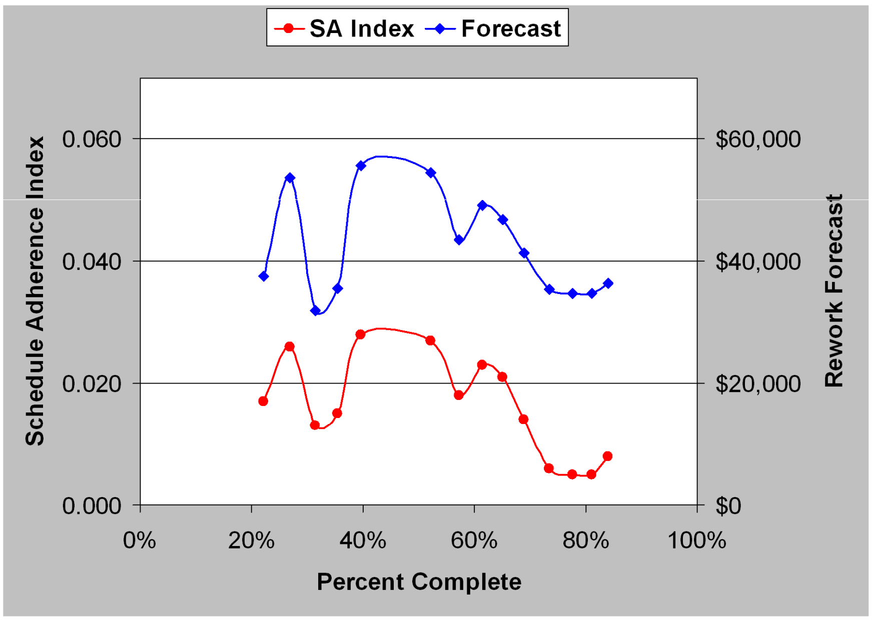



*Figure 7. Rework Forecast with SAI (real data)*

## Additional Methods

Several advancements to the project duration forecasting methods have evolved over the decade since the creation of ES, adding refinement and improvement. Three methods are briefly presented in this section: Statistical Forecasting, Effective Earned Value, and Longest Path.

### *Statistical Forecasting*

By using the variation of the periodic values of ln SPI(t) confidence limits can be computed for the cumulative value of ln SPI(t).[6][7] Taking the antilog of the three

[6] The term "ln" is the abbreviation for logarithm.

computed values yields, the high and low confidence limits, $SPI(t)_H$ and $SPI(t)_L$, respectively, and the nominal cumulative value, SPI(t).

The three SPI(t)s are then used in the familiar forecasting formula

$$IEAC(t) = PD / SPI(t)$$

to produce the nominal forecast and its associated confidence limits, $IEAC(t)_H$ and $IEAC(t)_L$.

An example graph using real project data is shown in Figure 8. As the project moves toward completion, the three forecasts narrow and converge to the actual final duration. As is plainly seen, the nominal forecast is consistently worsening, as is the $IEAC(t)_L$. However, $IEAC(t)_H$ approaches the final duration by when the project is 40 percent complete and produces forecast values only slightly higher than the actual outcome. As a general rule, the forecast of the three that is most horizontal best represents the expected final duration.

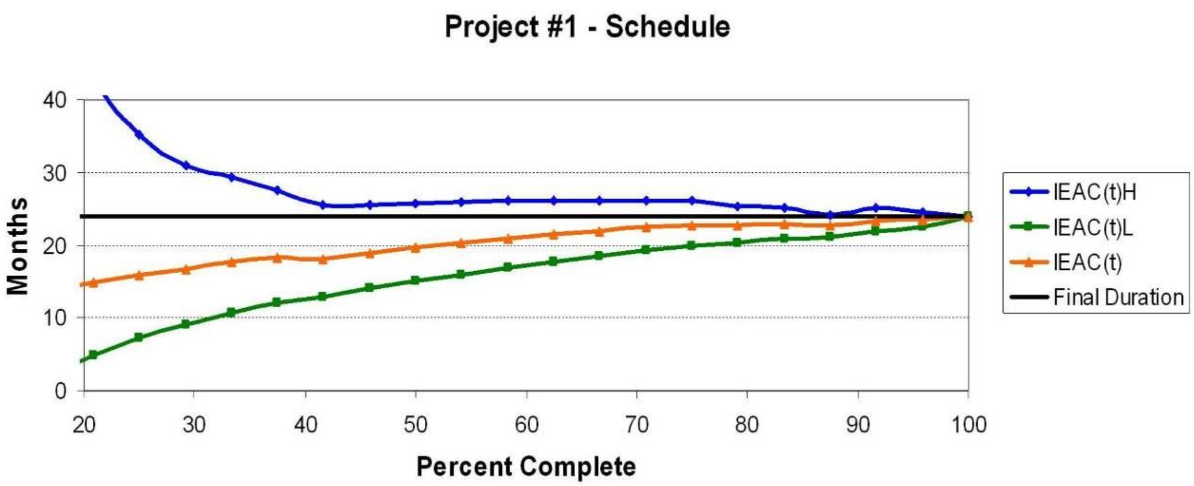



*Figure 8. Statistical Forecast (real data)*

This methodology is applicable to cost performance forecasting as well, using CPI and the forecasting formula, IEAC = BAC / CPI. Both cost and schedule statistical forecasting were tested using 16 projects and shown to produce reliable results (Lipke, & Zwikael, Henderson, Anbari, 2009).

[7] The log-normal statistical distribution for the periodic values of SPI(t) was established and verified by two studies (Lipke, 2002) (Lipke, 2011-2).

## *Effective Earned Value*[8]

In the Schedule Adherence section, it was shown that for some of the EV claimed there is rework associated with out of sequence performance. The rework has the effect of reducing the EV claimed and lowering the cost and schedule efficiencies, CPI and SPI(t).

The reduced EV is termed the effective earned value, EV(e). Using EV(e), effective indexes can be computed, CPI(e) and SPI(te). In turn, these amended indexes are used to produce more pessimistic cost and duration forecasts, which account for the effect of the out of sequence work.

A comparative example, using notional data, is depicted in Figure 9. Two graphs are shown. The one on the left indicates forecasting performance for when schedule precedence relationships are well maintained. For this circumstance, there is not significant difference in the forecast from IEAC(t) and IEAC(te), as is expected.

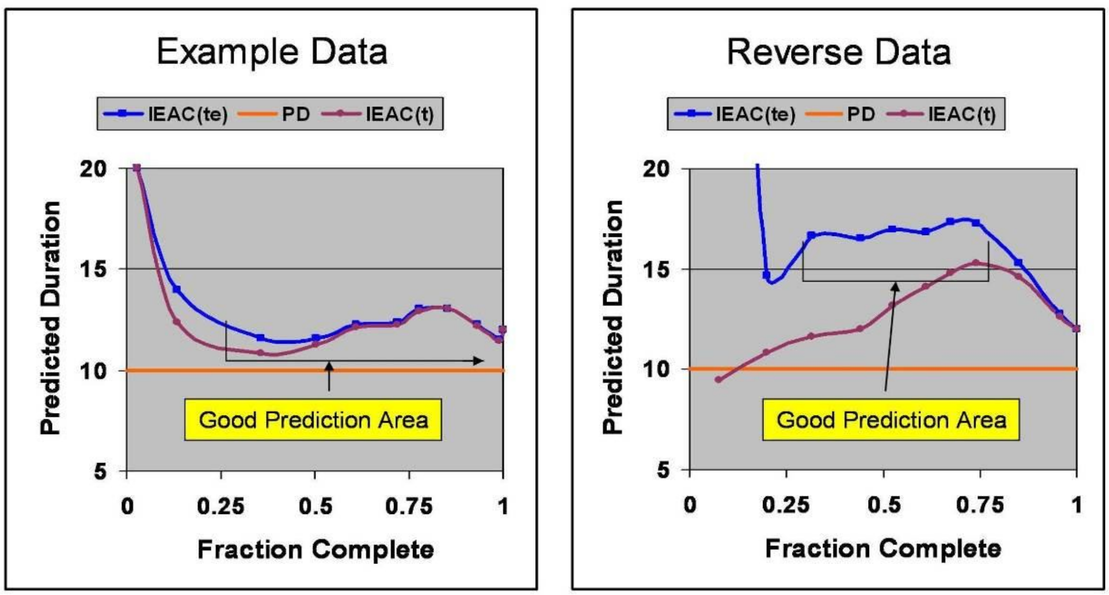



*Figure 9. Effective Earned Value*

The graph on the right shows the power of the method when out of sequence performance is prevalent. The notional data for the graph on the right was restricted to complete at the same duration as the one on the left. Thus, the evaluation of the comparison between IEAC(t) and IEAC(te) was confined to between 0.25 and 0.75 fraction complete.

[8] The reference for Effective Earned Value is (Lipke, 2009-2).

For the Reverse Data graph, IEAC(t) consistently produces increasing forecasts as the fraction complete increases. However, IEAC(te) produces a much higher forecast from the outset with only a small amount of variation throughout the confined "good prediction" area.

The application of effective EV for forecasting is thought to be most useful in the beginning of a project and when the project team has poor process discipline.

### *Longest Path*

As discussed in the earlier section, Forecasting and Prediction, ES forecasting was shown to be better than any other method using EVM data. However, recent research has demonstrated that the topology of the schedule has impact on the "goodness" of the forecast. The ES forecasts are more accurate for schedules that are more serial and less so when parallel (Vanhoucke, 2009).

Therefore, to improve the forecasting from ES, a serial path is needed. Instead of choosing one, forecasts are made for all serial paths embedded in the schedule. These forecasts are made just as previously described for the CP by creating a PMB for the path and tabulating the EV for the member tasks. The longest forecast from the various paths is chosen as the most representative forecast. The underlying rationale is the path most rapidly converging to the final duration is the one, presently, having the longest forecast.

Using notional data, the comparison of results from the total project to longest path (LP) forecasts is portrayed in Figure 10 (Lipke, 2012). As can be observed, after period 4, the variation of the LP forecast is reasonably uniform, whereas the total project forecast has much more variation in converging to the actual duration. For the data set, the LP result is definitely an improvement from the forecast for the total project.

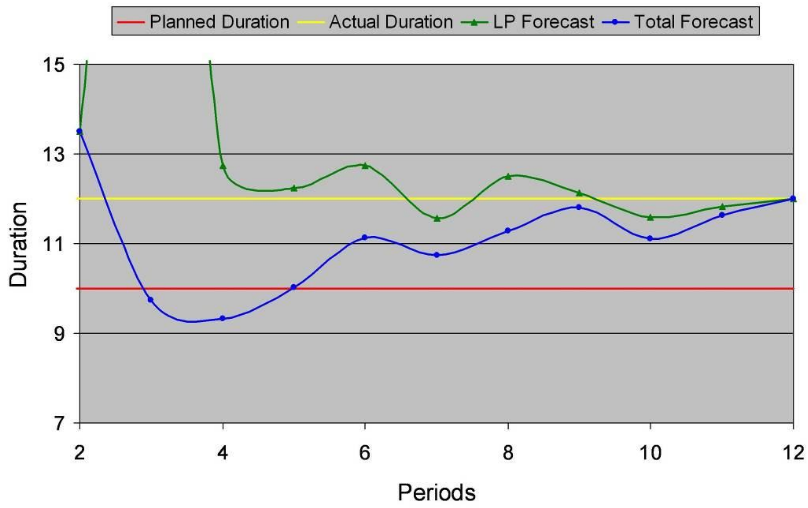



*Figure 10. Longest Path*

## Conclusions

Earned Schedule is a method demonstrated to enhance the application of EVM. In this paper, ES has been shown to produce valid indicators, reliable project duration forecasts, and predictions. From research it has been concluded that in comparison to the other EVM-based methods, ES produces the best project duration forecasts.

Furthermore, ES can be applied for the purpose of detailed schedule performance analysis. Using the schedule adherence attribute, impediments and constraints can be identified in the project process. The SAI index facilitates better control of schedule performance and provides the ability to forecast the rework from out of sequence performance.

ES has much to offer the project manager in the endeavor to guide and control his/her project to successful completion.

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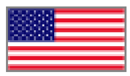

**Walt Lipke** retired in 2005 as deputy chief of the Software Division at Tinker Air Force Base. He has over 35 years of experience in the development, maintenance, and management of software for automated testing of avionics. During his tenure, the division achieved several software process improvement milestones, including the coveted SEI/IEEE award for Software Process Achievement. Mr. Lipke has published several articles and presented at conferences, internationally, on the benefits of software process improvement and the application of earned value management and statistical methods to software projects. He is the creator of the technique *Earned Schedule*, which extracts schedule information from earned value data. Mr. Lipke is a graduate of the USA DoD course for Program Managers. He is a professional engineer with a master's degree in physics, and is a member of the physics honor society, Sigma Pi Sigma (ΣΠΣ). Lipke achieved distinguished academic honors with the selection to Phi Kappa Phi (ΦΚΦ). During 2007 Mr. Lipke received the PMI Metrics Specific Interest Group Scholar Award. Also in 2007, he received the PMI Eric Jenett Award for Project Management Excellence for his leadership role and contribution to project management resulting from his creation of the Earned Schedule method. Mr. Lipke was selected for the 2010 Who's Who in the World. He can be contacted at waltlipke@cox.net.