Earned Schedule – A Quantum Advance

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Earned Schedule (ES) is a method of deriving schedule performance from Earned Value Management (EVM) data [1]. The ES indicators are time-based, unlike the cost-based EVM schedule indicators, Schedule Variance (SV) and Schedule Performance Index (SPI) [2]. Having time-based measures and indicators to describe the schedule performance of a project is highly logical and offers considerable advantages over the EVM cost approach to schedule depiction. The most significant advantage ES has over its EVM counterparts is that its indicators, SV(t) and SPI(t), provide reliable information regardless of whether or not the project is late or early performing with respect to its planned performance. In contrast, the erratic behavior of the EVM schedule indicators is well known: SV = 0.0 and SPI = 1.0 at the conclusion of a late project, falsely indicating perfect performance. The ES characteristic of yielding reliable information throughout the project period of performance facilitates the ability to forecast final duration and completion date ….something unavailable from EVM alone.

The ability to make schedule forecasts without performing a complete bottoms-up schedule analysis of the work remaining has been long desired by EVM practitioners. With ES, for the first time, project managers and customers have the ability to cross-check the bottoms-up estimate of the completion date in the same way that final cost estimates are validated using the Independent Estimate at Completion (IEAC) calculations. The simplest expression created for duration prediction, termed the 'short form' equation, is IEAC(t) = PD / SPI(t), where PD is the planned duration for the project [3]. With this forecasting capability, Earned Schedule offers a quantum advance in the practice of EVM and project management ….ES is truly a breakthrough technique.

The Earned Schedule idea is simple: identify the time at which the amount of earned value (EV) accrued should have been earned. By determining this time, time-based indicators can be formed to provide schedule variance and performance efficiency information.

On the next page is a graphic, Figure 1. Earned Schedule Concept, to assist in the description of how the ES measure is obtained [1]. Projecting the cumulative EV onto the project management baseline (PMB), as shown by the diagram, determines where planned value (PV) equals the EV accrued. This intersection point identifies the time that amount of EV should have been earned in accordance with the schedule. The vertical line from the point on the PMB to the time axis determines the "earned" portion of the schedule. The duration from the beginning of the project to the intersection of the time axis is the earned schedule (ES).

With ES determined, indicators can be formed. It is now possible to compare where the project is time-wise with where it should be in accordance with the PMB. "Actual time," denoted AT, is the duration at which the EV accrued is recorded. The time-based indicators are easily formulated from the two measures, ES and AT. Schedule Variance becomes SV(t) = ES – AT, and Schedule Performance Index is SPI(t) = ES / AT. In general agreement with the terminology used to this point, the ES indicators and predictors are distinguished from their EVM counterparts by appending with (t) [4].

The graphic and the box in the lower right of Figure 1 portray how ES is calculated. While ES could be determined graphically as described previously, the concept becomes much more useful when facilitated as a calculation. As is readily observed from the figure, all of the PV through May has been earned. However, only a portion of June has been completed with respect to the baseline. Thus the duration of the planned schedule completed is in excess of five months. The EV accrued appears at the end of July, making actual time equal to seven months. The method of calculation to determine

the portion of June to credit to ES is a linear interpolation. The amount of EV extending past the cumulative PV for May divided by the incremental amount of PV scheduled for June determines the fraction of the June schedule that has been earned.

The preceding is an extremely brief description of the Earned Schedule concept. Supplementary to this introduction, there is a considerable amount of accessible ES information to aid potential users. Published papers, conference presentations and workshop material are available from two websites: www.earnedschedule.com and http://sydney.pmichapters-australia.org.au/ (Education, then Papers and Presentations). Both sites offer the information free of charge. Additionally, calculators facilitating the application of ES are available from the 'earnedschedule' site.
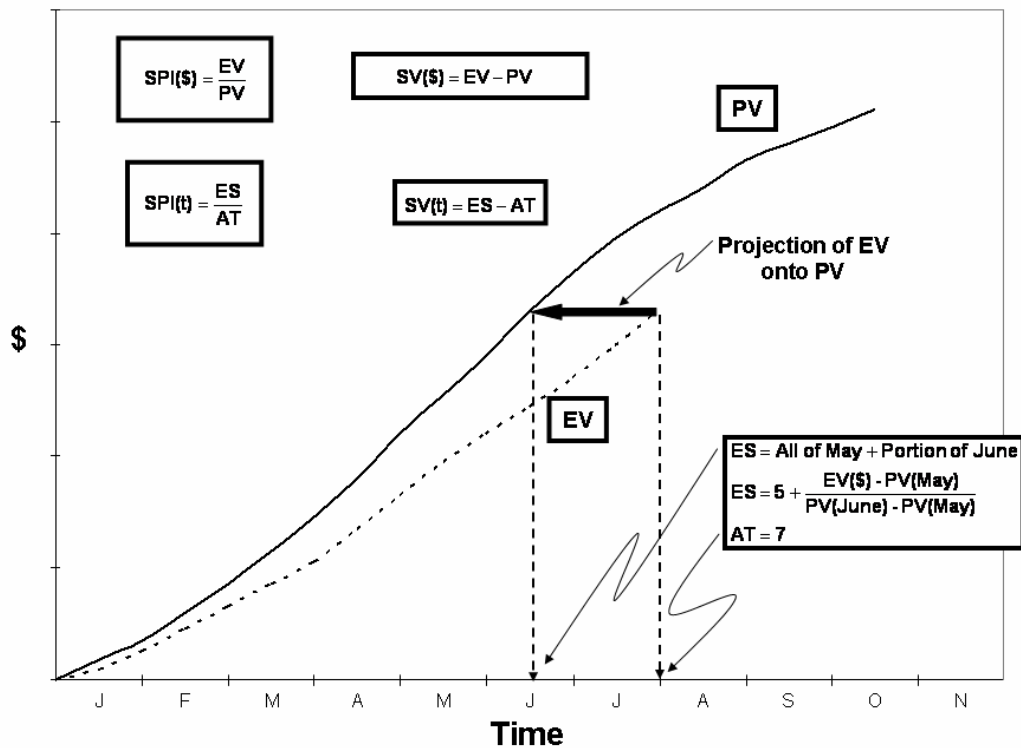

Figure 1. Earned Schedule Concept

The ES concept has demonstrated via the use of notional, real and simulated data to provide the best time-based depiction and forecast of schedule performance in comparison to other EVM data driven methods. Likewise, it is notable that the ES method has rapidly propagated to several countries (United States of America (USA), Australia, United Kingdom (UK), Belgium, and Sweden) and is being used by several major defense and commercial projects in the USA and UK. With the potential publication of the experiences and empiric study from the expanding practitioner application, coupled with academic research being conducted at the University of Ghent, Belgium, there is expectation of rapid development of the ES "Body of Knowledge."

The ES methods are described within an emerging practice insert to the Project Management Institute – College of Performance Management EVM Practice Standard released November 2004.

References
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2. Fleming, Quentin, *Cost/Schedule Control Systems Criteria, The Management Guide to C/SCSC*, Probus, Chicago, Ill., 1988.
3. Henderson, Kym. "Further Developments in Earned Schedule," *The Measurable News,* Spring 2004: 15-22.
4. http://www.earnedschedule.com/Terminology.shtml