Burn rate vs. earned value

Flynn, Thomas A.

10–12 minutes

Seminars & Symposium

How to cite this article:

Flynn, T. A. (2000). Burn rate vs. earned value. Paper presented at Project Management Institute Annual Seminars & Symposium, Houston, TX. Newtown Square, PA: Project Management Institute.

Introduction

Earned Value Analysis (EVA) has been the mainstay mechanism of project monitoring for projects in the government sector since the advent of C/SCSC (Cost/Schedule Control Systems Criteria) in the Federal Register some years ago. Subsequently, the work of Fleming and Koppelmen has brought EVA/CSCSC into the limelight in the non-governmental project management arena as well.

Although organizations clearly see the benefit in this practical and time tested approach, it has been my experience that they rarely are ready for the shifts in detailed project planning, work breakdown structure development and work package formation and tracking that are required to yield the benefits and real-time related results that EVA affords.

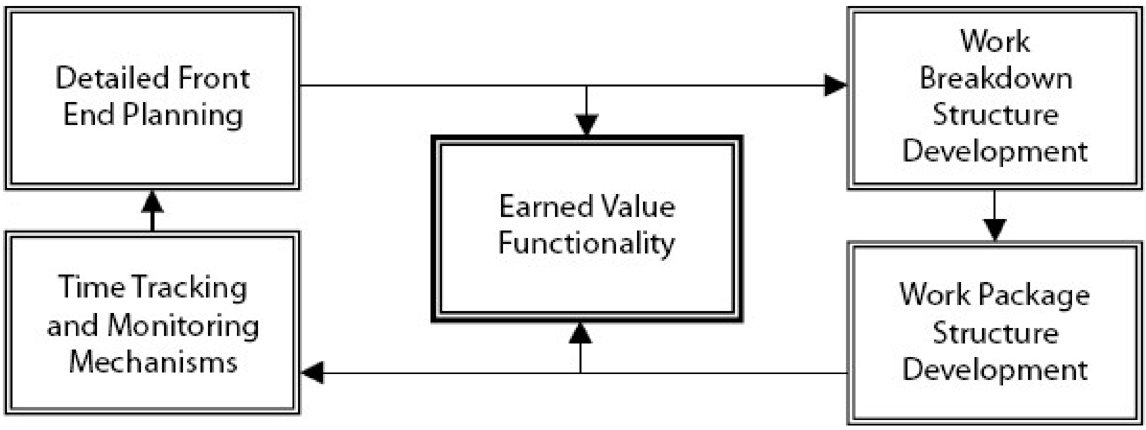
Many times, the organization cannot or will not facilitate the necessary process changes that are required to establish the time tracking, cost monitoring and percentage of completion mechanisms (see Exhibit 1).

Many project management teams have experienced the frustration of trying to implement the Schedule—Cost Variance and Schedule—Cost Projection formulas from EVA without adequate cost gathering and tracking systems, or the lack of internal resource project costs. In these cases, the best they could strive for is to utilize their intuition and walk the floor to verify resource dedication and accurate percentage of completion reporting.

Burn Rate

In cases where organizations were not quite convinced about the benefits of EVA and the initial inconvenience of the prior mentioned process changes, we have had success in instituting a scaled down version of EVA. Burn Rate, or productivity ratio, is a simplistic way to:

Exhibit 1



1. Ease the organization into a mindset that will eventually lead them to developing the necessary process changes to institute a more robust EVA methodology.

2. Allow project managers and teams to ascertain Burn Rates for actual vs. proposed task productivity and utilize this source of monitoring to proactively project and/or revise task completion dates.

The concept and components for calculating a Burn Rate are not difficult. The first step in the process is to take the duration estimates, which usually are given in duration days, and convert them to an accurate level of person hours (effort). For many project resources, this is a signal of change in itself. Duration estimates alone leave too much leeway in establishing productivity ratios and also lend subjectivity to percentage of completion determination.

Conversion to Level of Effort

To convert the duration estimates, we must establish two attributes for the assigned project resources, one time-based and one percentage-based. These attributes are:

1. **Full-Time Equivalency Hours (FTE)**—The amount of productive work hours per resource per day. Usually 5.5–6.0 for full time internal resources working an eight-hour day. This may vary organization-to-organization and project-to-project.

2. **Percentage of Dedication**—The percentage of dedication (% of their workday) that the resource will be committed to the scheduled task(s).

Exhibit 2

Resource	Duration (days)	Daily FTE Hours	Percentage of Task Dedication	Resource Effort Hour Tally
John Joseph	10	6.0	.50	30
Mary Adams	8	6.0	.50	24
Mike Levy	8	6.0	.75	36
John Adair	12	6.0	.50	36
Bill Purcell	10	6.0	.75	45
Sample Task Effort Hour Tally				**171**

A tally of the effort hours can be done very easily in Microsoft Excel. The data may be entered into the scheduling application of choice, i.e., MS Project. The working time calendar may be adjusted to reflect the FTE hours and the percentage of dedication entered in units when the resource is assigned to the task.

Therefore, the cumulative formula for Duration to Effort Hour conversion is then:

$\Sigma\,[D^{IR}\,(FTE^{H})(PER^{D})]$

Where:

Σ = The cumulative sum of the converted individual resource effort hours

D^{IR} = Duration of task for the individual resource (in days)

FTE^{H} = Full-Time Equivalency Hours

PER^{D} = Percentage of Dedication to the task

Exhibit 2 depicts an Excel spreadsheet version of the effort hour tally for a sample task.

Applying Burn Rate Formulas

Once we have converted the durations to effort hours, we can begin to apply the Burn Rate formulas. However, we must remember that productivity normalizes at roughly 20-25% of overall completion. Until that percentage of work has been increased, it is difficult to rely on the productivity ratios and the resulting projections. Therefore, the project manager must stay in close contact with the project work during this initial period to get a feel for whether or not the early productivity is aligning with estimates. He or she must also be able to assess if the team(s) will be able to pick up the pace as time goes on.

The four basic components of calculating Burn Rate are as follows:

1. BPHS—Budgeted Person Hours Scheduled—The amount of person hours (effort) proposed for a scheduled task during the time period under analysis.

2. BPCS—Budgeted Percentage of Completion Scheduled—The

percentage of completion proposed for the task during the time period under analysis.

3. APHG—Actual Person Hours Generated—The actual amount of person hours (effort) spent on a scheduled task during the time period under analysis.

4. APCG—Actual Percentage of Completion Generated—The actual percentage of completion generated for the task during the time period under analysis.

Utilizing these four components we can calculate simple Proposed Burn Rates (productivity ratios) and compare them to Actual Burn Rates. The formulas for both are as follows:

1. **Proposed Burn Rate (PBR) = BPHS/BPCS,** or the Budgeted Person Hours Scheduled divided by the Budgeted Percentage of Completion Scheduled.

2. **Actual Burn Rate (ABR) = APHG/APCG,** or the Actual Person Hours Generated divided by the Actual Percentage of Completion Generated.

Example of PBR and ABR

PBR (cumulative)

Our team, a 10-person group, has developed a schedule that depicts the first three months of work to represent 4,500 person hours of effort (cumulative). The resulting percentage of completion (cumulative) for all tasks worked in the three-month period is 27% (BPHS =4,500, BPCS = 27).

Therefore, by simple calculation, the PBR = 4,500/27 = 167 effort hours per 1% of task completion (167:1).

ABR (cumulative)

At the two-month mark of the project schedule (data date), the project team registers the following data:

APHG—3,200 effort hours generated (as of the data date)

APCG—20% of task completion generated (as of the data date)

Therefore, ABR = 3,200/20 = 160 actual effort hours per 1% of task completion or (160:1)

General Comparison

We now want to calculate a Burn Rate Variance (BRV) or, (PBR/ABR) or 167/160 = 1.04. Therefore, at this point in time, we are producing 4% more work for the hours generated than proposed. A result equal to or greater than 1.0 signals on target or above target performance. A result under 1.0 signals below target performance.

Exhibit 3

EVA Formulas	Burn Rate Formulas	Comment
CV = BCWP - ACWP	PHV = BPHS – APHG (PHV- Person Hour Variance)	Cost has been converted to Person (effort) hours. Results in the minus indicate over the person hour budget.
SV = BCWP –BCWS	PCV = APCG– BPCS (PCV – Percent Complete Variance)	Schedule value has been converted from $ to percent complete. Results in the minus indicate under performance.
CPI = BCWP / ACWP	PHPI = BPHS / APHG (PHPI – Person Hour Performance Index)	Comparing budgeted effort to actual effort. Results of less than 1.0 indicate over person hour budget.
SPI = BCWP / BCWS	PCPI = APCG/ BPCS (PCPI – Percent Complete Performance Index)	Comparing budgeted % complete to actual % complete. Results of less than 1.0 indicate under performance.
ETC = (BAC-BCWP) / CPI	PHTC = (BPHAC – BPHS) / PHPI (PHTC- Person Hours To Complete, BPHAC– Budgeted Person Hours At Completion)	Determining the remaining effort hours to complete at our current PHPI.
EAC = ETC + ACWP	EPHAC = PCTH + APHG (EPHAC – Estimated Person Hours At Completion)	Determining the total effort hours projected to complete the task(s) under analysis
VAC = BAC - EAC	PHVAC = EPHAC – BPHAC (PHVAC – Person Hour variance At Completion)	Forecasting the overrun or under run of the person hour Budget. A positive sum signals a person hour overrun.

We can equally apportion the BPCS over the task's duration, or in this case, 27% completion over three months, (27%/3 = 9% per month). This would yield a target BPCS at month 2 of 18%. In the example above, the APCG at month 2 is 20%, we are performing 2% above the target.

Getting Into the Details

In the above example, given that things are moving along better than planned, we may not be required to delve much deeper. Yet, if the BRV is not as favorable, we will need to dissect the tasks under analysis to determine which one may be the culprit that is dragging down the APHG and/or the APCG. Very possibly, they all may be lagging, in which case we may need to look at team morale, reasons for the lack of productivity, and consider possible scope reductions.

One area that must not be overlooked in calculating Burn Rate is time tracking and reporting. We are not as concerned with the dollars and cents, yet this does not alleviate the necessity of tracking actual person hours spent at a task level. If task level time tracking is not possible, the Burn Rate is not rendered totally ineffective; however, you will not be able to get into the details of specifically which task is burdening the project.

The tracking and determination capability is important due to the fact that a task's percentage of completion may not be lagging due to poor performance (productivity), the resources simply may not be committing the time against the task that they had originally proposed.

Cross Referencing Burn Rate With EVA

Obviously, in the above example, we have only looked at comparative Burn Rates over the two-month period under analysis. Due to the lack of sophistication in the process, we have also considered the Burn Rate to be steady and equally apportioned over time.

Given this assumption, the BPHS at the two-month data date should be: 4,500 hours/3 = 1,500 hours x 2 months = 3,000 effort hours. Our APHG is 3,200. Therefore, although we are completing more work than planned, we are requiring more hours than planned. This is a good example of why we must try to cross-reference the more effort-centric or performance-based Burn Rate formulas with those of traditional EVA in order to achieve a more detailed analysis. Exhibit 3 shows such a cross-reference.

Summary

As explained earlier, in the absence of full EVA components and information, Burn Rate can be utilized to project and calculate proposed and current productivity ratios. Although not as comprehensive as EVA, this capability will allow the project manager to be proactive to possible productivity variances, resource management issues prior to them reaching the crisis stage.

Burn Rate can be and is best utilized in a cross-referenced manner with the more traditional EVA formulas, rendering the EVA formulas more effort or time focused. In the absence of the necessary cost data and/or means to track this data, utilizing these cross-referenced Burn Rate formulas is a viable mechanism for monitoring productivity and schedule performance.

Proceedings of the Project Management Institute Annual Seminars & Symposium
September 7–16, 2000 • Houston, Texas, USA