The Education of Justin Thyme© - Project Manager

A practical explanation & illustration of Earned Value Analysis for Projects

Ernie Saves the Day: The Earned Value Method

It was Wednesday, May 31st. Justin drove into the parking lot of National Foods, Inc. and deftly maneuvered his beloved '57 Chevy into a spot marked: "Justin Thyme - Project Manager."

National Foods, one of the nation's leading processors of cereals, baked goods, and snack foods was locked in a battle for dominance in the cereal category. Justin was heading up a project to develop a new cereal to compete with the popular Nuts-N-Honey brand.

Bypassing the elevator, he bounded up the stairs, two at a time, arriving at his third-floor office just in time to hear his phone ringing. Slightly breathless, he answered to find his boss at the other end. "Justin!," he bellowed, "where's that monthly report on the A&M project that you said that I would have today?"

"Hey! It's early yet. I just need to check some figures," Justin replied. "You'll have it on your desk before noon." Charles William Yost, III was a direct descendant of the cereal pioneer, and was head of NFI's Cereal Division. He was not about to lose this opportunity to go head-to-head with the competition, and he was watching the A&M project very closely.

Quickly deflating Justin's jubilant mood, the realities of day-to-day life at NFI soon set in. Moving to his desk, he took off his jacket and booted up his computer. Sure enough, at the top of his daily to-do list was a note that his monthly project status report for the Almonds & Molasses Cereal Project was due today.

A quick call to his project coordinator confirmed that the project status had been updated yesterday and the end-of-month numbers for the project schedule and cost were available.

Justin proceeded to prepare his report and sent it up to his boss. "Ah! That wasn't too bad. Now I can get on to the business of putting out the daily fires." Coolly handling the various issues of the day, Justin wasn't prepared for a call from his boss early that afternoon. "What's the status of the A&M, he inquired, sounding somewhat irritated?" "But, Boss," replied Justin, "I just put the monthly status report on your desk this morning." "Yeah! I saw it. But how's the project really going? Your report doesn't tell me what I need to know. Are we in trouble on this one?"

> ### National Foods, Inc.
> ### Cereal Products Division
> Monthly Project Status Report
> Almonds & Molasses Cereal Project
>
> Dear Boss:
> As of 5/30/95, we are 42% complete and have spent $162,875.
> Respectfully submitted,
> Justin Thyme, Project Manager

Justin told the boss that he would have better information for him by the end of the day. He thought back to what he had learned at a recent seminar on project management. *Senior managers want to know two things about every project,* they told him. *When will the project be completed and how much will it cost?*

Again checking with his project coordinator, Justin prepared a revised report with the information that his boss needed. Dropping it off on the boss' desk on his way out, Justin headed for home ... thinking that his boss should now be satisfied with the information. But read on.

> ### National Foods, Inc.
> ### Cereal Products Division
> Monthly Project Status Report
> Almonds & Molasses Cereal Project
>
> Dear Boss:
> As of 5/30/95, we estimate that this project will be complete on 8/1/95, at a cost of $335,500.
> Respectfully submitted,
> Justin Thyme, Project Manager

Thursday morning, Boss drove into his reserved spot in the parking lot and headed right for a corner office, marked: A. Countant, VP Finance & CFO. "Art," he cried, "I can't seem to get a handle on how well the A&M project is going. Here's what I have from Justin. But it doesn't tell me if the project is really OK. Can you get me the full story?"

"No problem," replied Arthur. "We just completed our monthly project accounting reports. Let me pull the A&M report for you." With an air of satisfaction, the CFO fetched a copy of the report and, handing it over to the boss, noted, "This should tell you everything that you need to know about the status on the A&M.. And by the way, I don't think that you need to have any concern about this project. If we look at the cash flow data, we had planned to expend $192,000 by 5/30, and have only expended $162,875. Not to worry, boss!"

> ### National Foods, Inc.
> ### Cereal Products Division
> Monthly Comptroller's Status Report
> Almonds & Molasses Cereal Project
>
> **Status as of 5/30/95**
>
> Planned expenditures to date are **$192,000**
>   This represents **57.2%** of the project budget
> Actual expenses to date are **$162,875**
>   This represents **48.5%** of the budget
> We estimate cost at completion of **$335,500**
> Respectfully submitted,
> A. Countant, V.P. Finance & CFO

But Boss was worried. None of the information provided to him seemed to satisfy that queasy feeling that something was not right with the A&M. Returning to his office, he found still another report from Justin. A note attached said, "Sorry that I didn't get you the data that you needed. I think that this revised report will tell you what you want to know." The note was attached to the report shown at the right.

When the boss laid the two reports (Justin's and Arthur's) side by side, his skepticism was justified. Here was the problem that he suspected all the time. The CFO's report

> ### National Foods, Inc.
> ### Cereal Products Division
> Monthly Project Status Report
> Almonds & Molasses Cereal Project
>
> **Status as of 5/30/95**
>
> **Schedule:**
> Current completion is **42%**
> We estimate project completion on **8/1/95**
> **Budget:**
> Expenditures to date are **$162,875**
> We estimate cost at completion of **$335,500**
> Respectfully submitted,
> Justin Thyme, Project Manager

gleefully reported that actual expenditures were only 48.5% of budget (against a planned expenditure of 57.2%). But Justin's report noted that the project was only 42% complete. **Could the alarming truth be that they had spent 48.5% of the money to accomplish only 42% of the work?** Furthermore, there was an equally glaring indication that the project was well behind schedule. **Did the data, culled from the two reports, show that the project should have been over 57% complete, while being reported as only 42% complete?**

By this time, Boss was fuming. Here were two of his trusted, senior leaders, buried in project and accounting data, and they couldn't tell that this key project was in trouble. In fact, the CFO mistakenly reported that the project was doing well. **Obviously measuring actual expenses against planned expenses is not a valid gauge of cost performance.**

Boss called Justin and Art to his office. "There has to be a better way," he exclaimed. "Art, you're sitting in your office running a lot of budget and cost figures that tell us

nothing about the cost performance on projects. Justin! Your position was specifically established to make sure that projects are adequately planned and managed. If you can't tell when a project has slipped badly, we can't justify your position."

Justin wiped the sweat from his forehead and pulled out several project planning documents. "But Boss, look at these computer reports. Our planning team identified all of the work when we initiated the project and produced these critical path schedules. We update and analyze biweekly, and take corrective action where necessary to keep the projected end date from slipping. Our latest update shows that the work on the critical path is proceeding satisfactorily."

"Then where's the contention," replied Boss, rapidly losing his patience? "The accounting reports say we're OK. The scheduling reports say that we're OK. But, we obviously are not OK. Justin! Could it be that while you're micro-managing the work on the critical path, that the other work is slipping? And if that's the case, won't that come back to hurt us as we get further down the road?"

"That's a reasonable fear," replied Justin. "When we first planned the project, we were very concerned about the items that were driving the project end date, that is, the critical path. But we knew that we had some leeway on most of the other work. But our latest float analysis shows that much of the non-critical work has lost most of its margin. If we had been taking a closer look at the rate of overall work completion, as indicated by the project percent complete figure, we would have picked that up."

"All right! Now we're getting somewhere," Boss cried out. "We recognize that the traditional indicators that we have been using can hide the truth about the actual condition of the project performance. We also seem to have the information that we need, but we can't get it to tell the story that we need to know. Would you both agree on this?" Boss asked rhetorically."

Without waiting for a response, he continued; "Here's what I want to do. There's a new project manager over in the Snack Foods Division that I've heard some good things about. It seems that she is a member of the Project Management Institute and recently earned her Project Management Professional certification. I want you to meet with her and find out whether she has a way of dealing with this project performance measurement problem."

"That's all we need now," cried Art to Justin, as they meekly exited the room. "Some wet-behind- the-ears tenderfoot is going to show us how to do our jobs. I don't need this crap!"

"Aw, wait a minute, Art," replied Justin, "there probably is a better way to use the data that we have. Boss is right. We haven't always had a good grasp of where we are. And, look at your last report on A&M. You said that we were performing very well, cost-wise. Nothing can be further from the truth. Let's give the new gal a chance."

The Solution

The sun was shining as Art and Justin walked over to the adjoining building for their nine o'clock meeting with Ernie. Ernestine V. Alu, although still in her twenties, was responsible for coordinating project teams on new product developments for the Snack Foods Division. Ernie was one of the "new breed" of project leaders. A rarity prior to the last few years of the 20th century, she was actually schooled in the techniques of project management, rather than "learning on the job." During her degree work, she was required to read "Earned Value Project Management," by Fleming and Koppelman, published by the Project Management Institute. In this book, the authors took a very structured project accounting system that had been developed in the 1960's for application to very large aerospace and defense projects, and reduced the material to 130 pages of common sense, that could be applied effectively to the simplest projects. At National Foods, she quickly found this Earned Value Analysis (EVA) technique to be a useful supplement to the tried and true critical path method, which she also employed.

Gesturing to the coffee pot, in the corner of the conference room, Ernie prepared to dim the lights for a Powerpoint presentation on the principles of EVA. "This will only take a few minutes, as the basics are quite simple. But first, let's see if I understand why Charlie Yost was so frustrated with your reports," Ernie started. "Art; as I understand it, your reports contain two essential figures: the budgeted expenditures to date and the actual expenditures to date, noted in either dollars or percent." Yes," replies Art. "We track the actuals against the plan and report variances, sounding the alarm if the actual cash flow exceeds the budget."

"Justin" Ernie continued, "Your reporting concentrates on progress, does it not?"

"Essentially that's correct" Justin quickly jumped in. "We measure percent complete on a periodic basis, noting the performance trends and estimating the project completion date.

"Gentlemen! You are so close to having what you need. If you could just combine what you both are measuring, you can have the accurate picture that you need. Please follow these slides with me, and you'll see how simple it really is.

"We have to start with a few assumptions. We will assume that you have a project plan. This plan consists of a budget, and an end date, and a planned rate of accomplishment toward that end date. This is the same plan that Art used to measure actual costs against planned costs. This is the same plan that Justin used to report percent complete and the estimate at completion

EVA Method Assumptions

- A plan for the project has been developed
- There is a project budget
- There is a project end date
- The tasks have been identified & scheduled
- Each task has a budget or effort
- There is a Work Breakdown Structure (opt)

"Bear with me now while we pick up a few new terms. The alphabet soup is a necessary part of EVA, but you can adjust these terms to your liking later.

"'The budget is called **"BAC," the Budget at Completion**. It is simply the budgeted or forecast cost for any piece of work, or the entire project. We must have a BAC to engage in earned-value analysis, as it is the basis for many of the EV computations, as you will soon see."

Justin started to sweat a little and loosened his tie. Art, squirmed in his chair and emptied his coffee cup. They glanced at each other and then turned their attention back to Ernie.

Excited at the opportunity to talk about her favorite subject, Ernie walked up to the screen to zero in on the illustration of BAC. "At any point in time during the project, we have the **"BCWS," the Budgeted Cost of Work Scheduled.** This is the value of the work that was scheduled to be completed as of the progress measurement date. Justin, this is your 'Target %C.'

"You both look a bit puzzled. Don't get put off by the terminology. Justin, would you feel more comfortable if we called the BCWS the 'Planned Accomplishment,' or the 'Planned Value?'"

Justin nodded, but the look on his face didn't change.

"Hang in there just a few more minutes," Ernie implored. "I guarantee that it will all fall into place.

"Now," she continued, "if we take the measured percent complete that Justin usually calculates, and multiply that by the BAC, we have the '**BCWP,' Budgeted Cost of Work Performed**. Another term for BCWP could be 'The Earned Value'. It is the value of the work accomplished to date. It is a measurement of the progress to date. So now we have two key measurements, the Planned Accomplishment (the BCWS) and the Actual Accomplishment or Earned Value (the BCWP).

"At this point, even without measuring any costs, we are able to gage the actual progress against the planned progress. And because we are using a dollar basis (the BAC), all parts of the job are weighted. We can compare BCWS and BCWP at any level of the project. We might do it at the highest level, and then drill down into details only where the numbers look bad – a form of management by exception. By performing these measurements on a regular and consistent basis, we can look at the performance trends, and see of the performance is improving or worsening."

> **EVA Terms**
> - BAC – Budget at Completion
> - BCWS – Budgeted Cost of Work Scheduled
>   (planned accomplishment to date)
> - BCWP – Budgeted Cost of Work Performed
>   (earned value or actual accomplishment)
> - ACWP – Actual Cost of Work Performed

Art got up to refill his coffee cup. "OK!. It's beginning to make sense. It's simple and structured and allows us to have a measurement that is consistent from period to period. I like that."

"Art, you'll like this next part even better. Now, let's add one more element, the costs. If we allocate actual costs to the project and its components (using traditional Work Breakdown Structure techniques), we can develop the periodic **"ACWP," the Actual Cost of Work Performed**. This tells us what it cost to do the work.

"With just these three values, BCWS, BCWP, and ACWP, we can make several simple performance evaluations.

"First there is **"CV," the Cost Variance**. This is the difference between the work performed (the Actual Accomplishment or Earned Value) and the actual cost for that work. It is a simple calculation:

$$CV = BCWP - ACWP.$$

"In your recent accounts on the A&M project, you two actually had the CV, but in different reports. Justin, in your first memo, you noted that the actual expenditures to date were $162,875. You also reported that the project was 42% complete, which (multiplied by the BAC) gives us a BCWP of $140,910. The CV is -$21,965.

"Actually expressed in dollars, it doesn't tell us as much as it would expressed in percent. So we might prefer to use the **"CPI," the Cost Performance Index**, which is calculated as:

$$CPI = BCWP / ACWP.$$

"This is also a better basic measurement for watching cost trends. For the A&M project, therefore, we have $140,910 / $162,875 = .87. Anytime that the CV is less than 1, we have an unfavorable cost performance. In this case we are getting only 87 cents value for every dollar spent. This also tells us that our forecast for a final project cost, of $355,500 is likely to be way off of the mark.

"Using the third value, BCWS, we can also calculate the **"SV," the Schedule Variance**. This is the difference between the work actually performed and the planned work. We calculate this as:

EVA Terms

- BAC – Budget at Completion
- BCWS – Budgeted Cost of Work Scheduled (planned accomplishment to date)
- BCWP – Budgeted Cost of Work Performed (earned value or actual accomplishment)
- ACWP – Actual Cost of Work Performed
- CV – Cost Variance
- CPI – Cost Performance Index
- SV – Schedule Variance
- SPI – Schedule Performance Index

SV = BCWP - BCWS.

"Art, you noted the BCWS when you reported that the project expenditure plan called for incurring $192,000 cost, at the reporting date. When we couple that with Justin's 42%C figure (BCWP = $140,910), we calculate the SV as $140,910 - $192,000 = -$51,090.

"As before, this is better expressed as the **"SPI," the Schedule Performance Index**. On A&M, we calculate this as:

BCWP/BCWS= 140910/192000=.73.

$$SV = BCWP - BCWS$$
$$SV = \$140,910 - \$192,000$$
$$= (\$51,090)$$

$$SPI = BCWP / BCWS$$
$$SPI = \$140,910 / \$192,000$$
$$= 0.73$$

This SPI is a basic measurement for watching schedule performance trends.

"Holy cow!" Justin (an avid Yankee fan) exclaimed. "What we are really saying here is that work on the A&M project is only progressing at just under three-quarters of the planned progress. Is that right?"

"That appears to be the case," Ernie replied. "That's what we gain from this approach. We get a clear measurement of work progress, and we measure the actual costs against the actual accomplishment, rather than the planned accomplishment."

Just then, Art's pager buzzed, reminding him of a 10:30 staff meeting. "Can we continue this tomorrow?," he queried.

She willingly replied: "I have to be over in your building in the morning. If you're both available for lunch, we can meet in the cafeteria and then wrap things up in another half hour or so." Art and Justin happily nodded in the affirmative and thanked Ernie for her time and effort on their behalf. Walking back to their building, they excitedly reviewed the earned value concepts and considered how they could be applied to their reporting on the A&M project. They also had to address the issue of how to break the news to Charlie Yost, that the project was not going very well. This was not going to be comfortable. As if to punctuate the problem, the early sunshine had disappeared, and it had started to rain. They ran the last few yards back to the building, Art going to his staff meeting, and Justin to his fire-drill of the day.

Plotting Performance Trends and Projecting the Future

The sun was out again, the next day, as Justin, running a bit late, carried his lunch tray through the cafeteria, looking for Art and Ernie. They waved to him as he glanced their way, and he made his way to their table. They hardly looked up as he approached, as they

were in an animated discussion on the previous day's earned value stuff. Accustomed to working with formal, structured processes, Art, the consummate accountant, fully appreciated the rationality of these earned value concepts.

Justin, less committed to such structure was still a bit skeptical. "It took me several years to understand and use critical path scheduling on my projects. Now you want me to junk the whole thing for the earned value stuff?"

"Not exactly, Justin," Ernie replied. "No one is suggesting that you ignore critical path scheduling. But sometimes the earned value measurements, together with the critical path scheduling, provide the best means of planning and controlling a project. And there my be other times where traditional scheduling and cost control methods are not available to a project. Let me tell you a story about just such an incidence.

"Remember when they installed the new telephone system at the plant four years ago? We were installing our own main switch and redoing our 5000-line voice and data system. I was serving an internship here, assigned to the plant facilities department. They had contracted with a phone system installer to do most of the work. The subcontractor agreed to a fixed-fee contract and a firm cut-over date. The facilities group notified the telco that the plant would be moving over to its own main switching system on that date, cutting over from the telco switch. As the start of the contract work approached, the plant manager suddenly got nervous. Here they were, in the hands of a fixed-price subcontractor (you know how they resist giving any information about how the job was planned or priced) and if the work was not done as scheduled the plant could end up without telephone service.

"After initial resistance, we worked out a reasonable compromise with the sub. Together, we identified all of the work and put a weight factor on each work item. The weight factor was based on the approximate effort for each item, so that, in effect, the weight factor served as a 'budget' for each work item. The sub refused to prepare a critical path schedule, and we agreed that the nature of the work was that the order of execution was too flexible to be cast in concrete. Instead, they agreed that work would be accomplished at a even pace over the twenty-week project, essentially progressing at about five percent per week.

"When the sub showed up to start the job, we were concerned that they did not have sufficient manpower to execute the work on time. But they retorted that this was not a matter for our concern. They reminded us that they had a firm price and that it was up to them to manage the work as they saw fit. We reminded them that they had also committed to a firm date and that it was our business to make sure that the date was met.

"While each party was protective of their contractual obligations, the facilities manager (the project manager for National Foods) and the subcontractor's PM had developed a cordial relationship and wished to work together to have a successful project. So they agreed to walk the plant each Friday afternoon and to note the progress for each work item on the task list that had been prepared earlier. Some tasks were marked as complete,

getting credit for 100% of the budget (weight factor). Other tasks were noted as in progress, getting credit for a percentage of their BAC. After completing the tour, they added up the various BCWP's (%C * BAC) and arrived at a project earned value.

"For instance" she grabbed a napkin from the table and proceeded to jot some numbers down. "Let's say that there were four items on the list, that were scheduled for activity during the first week.." Ernie wrote down the following:

Task 1	*BAC = 1000*	*BCWS = 1000*	*%C = 100*
Task 2	*BAC = 1000*	*BCWS = 750*	*%C = 50*
Task 3	*BAC = 1500*	*BCWS = 1000*	*%C = 50*
Task 4	*BAC = 500*	*BCWS = 250*	*%C = 0*

"When we take the %C and multiply it by the BAC, we get the earned value (BCWP)," she said, as she added the BCWP values to the napkin.

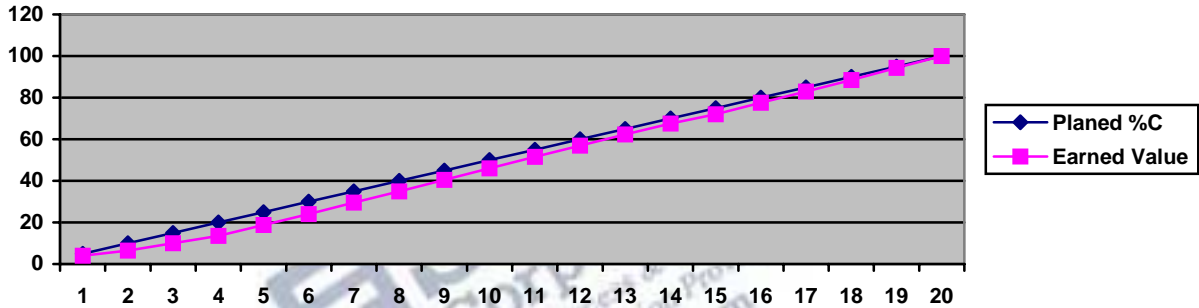|				
Task 1	*BAC = 1000*	*BCWS = 1000*	*%C = 100*	*BCWP = 1000*
Task 2	*BAC = 1000*	*BCWS = 750*	*%C = 50*	*BCWP = 500*
Task 3	*BAC = 1500*	*BCWS = 1000*	*%C = 50*	*BCWP = 750*
Task 4	*BAC = 500*	*BCWS = 250*	*%C = 25*	*BCWP = 125*

"If we sum these numbers we get a BCWS (the planned accomplishment) of $3000 and a BCWP (the actual accomplishment or earned value) of $2375. In this example, you can see that work is proceeding at about 80% of the plan. If the total project budget was, say, $60,000, we could calculate that the project was about four percent complete, at week one ($2375 / $60,000).

SUM to date	*BCWS = 3000*	*BCWP = 2375*
Project BAC = 60,000	*Project %C = 2375/60000 = 4%*	

"Getting back to the telco project, at the end of the first week, the composite BCWP totaled 3%, as against the 5% target. When confronted with the bad news, the sub admitted that they were a bit slow to start but promised that they were now up to speed. At the end of week two, the project BCWP was 6.5%, against a target of 10%. Our facilities manager suggested that the crew size be increased, but, again, the subcontractor resisted. This time he cited a problem with some tooling, that had been corrected. 'Not to worry' was the reply. But on week three, the actual accomplishment totaled only 10 % (against the target of 15%) and it was obvious that the subcontractor was loosing ground.

At the weekly review session, the sub still protested the claim that he did not have sufficient manpower on the job, but he agreed that he would take corrective action if the next week's measurement didn't show an upturn. At the end of week four, the earned value came to 13.5%, indicating a fairly constant rate of accomplishment that was only 70% of plan (3.5% per week vs. 5% per week). At the next weekly review, the subcontractor walked into the meeting and quickly reported that an additional crew was on the way. With the additional people on the job, the ongoing measurements showed an upturn to about 5.25% to 5.5% actual accomplishment per week, and the project was soon back on target for the cut-over date." Ernie grabbed another napkin and drew two curves; one representing the plan line, at 5% per week, and one representing the measured earned value.

"I am fully convinced that, without the simple planned accomplishment vs. actual accomplishment routine that was worked out by the two parties, the project would gone into panic mode toward the end and would have missed the end date. This was a most rudimentary use of the earned value concept. It did not require even any use of cost measurements and in no way compromised the subcontractor's wish to maintain control over the effort and silence over detailed costs."

"That's a great story," exclaimed Justin, as he wiped a crumb from his mustache and picked up his tray. "I remember that project. We had a 5,000 line system and a new switch put in, and the phones never stopped working. Can we go over to my office and continue? I need to learn more about the forecasting aspects of this system."

As they all rose to leave, Art excitedly added his approval of the success story just related by Ernie. "I see another advantage to what was done on the telco job that you didn't mention. Making a weekly earned value measurement provided the data for an accurate and just progress payment. Rather than paying the subcontractor a fixed periodic payment, we could have paid only for what was actually accomplished, based on the weekly BCWP, and the sub couldn't argue with the amount because they participated in the measurement."

"Good point, Art! We have actually started writing contracts that call for progress payments based on measured earned value, over at Snack Foods Division. I'll send over a sample contract when I get back to the office."

Art sprung for some ice cream cones on the way out, and they made their way over to Justin's office. With the ice cream in one hand and a green marker in the other, Ernie stepped over to the white board, ready to go into action. She paused, looking over at Justin, "Forecasting! Yes, by all means. After all, knowing where we are at the moment tells us just part of the story. When we report unfavorable cost variances and schedule variances, the question that the Charlie's of the world are sure to ask is: "How does this affect our objectives? Will the project be finished on time? If not, when? Will the project be brought in within budget? If not, how much over? And, if the data is not good, is there anything that we can do to turn it around?"

"In the telco job that we discussed during lunch, we noted that the work was being accomplished at 70% of the plan. If we didn't take corrective action, we would have projected that the 20 week project would take over 28 weeks to complete. This convinced the sub to take corrective action, by bringing in additional labor."

Knowing that it takes a bit of time to get used to the alphabet soup, Ernie tacked up the list of EVA terms that she had used the day before. Then she added a couple of new terms.

> **EVA Terms**
> * BAC – Budget at Completion
> * BCWS – Budgeted Cost of Work Scheduled
>   (planned accomplishment to date)
> * BCWP – Budgeted Cost of Work Performed
>   (earned value or actual accomplishment)
> * ACWP – Actual Cost of Work Performed
> * CV – Cost Variance
> * CPI – Cost Performance Index
> * SV – Schedule Variance
> * SPI – Schedule Performance Index
> * EAC – Estimate at Completion
> * ETC – Estimate to Complete

"To calculate a new end date, we need only to divide the planned duration by the SPI, the Schedule Performance Index. Taking the telco job, for example, 20 weeks divided by 0.7 equals 28.57. This is the most simple and mechanical way to do it. But I would also consider the trend line. If the production rate was very poor at first, but was picking up (as illustrated by the trend curve), you would want to take this into consideration by extrapolating the curve out in time until the line crossed the 100%C axis. There are many ways to look at the forecast end date, but you surely get the idea by now. So let's move to forecasting the project costs.

"In our earned value system, we would normally generate an **EAC, the Estimate At Completion**. This is accomplished by first generating an **ETC, the Estimate to Complete**, and adding that to the **ACWP, the Actual Cost to date**.

```
EAC = ACWP + ETC
```

"However, the ETC, which is the underlined estimated cost of the remaining work, can be calculated in different ways. We could assume that the remaining work will be completed as

---

budgeted. That is, if it cost us $500 to do the first $400 of effort, and the BAC is $2000, then we could generate an EAC of $2100

$$\text{ACWP (\$500) + budget for remaining work (\$1600) = \$2100}$$

"This is the method usually favored by the people responsible for the deteriorating cost performance, as they can ignore the unfavorable CPI in developing the ETC. However, it might be more appropriate to assume that the remaining work will follow the CPI of work to date. That is, if we are overspent by 20% to date, we will be overspent by 20% at the end. In that case, the formula is:

$$\text{EAC = BAC / CPI}$$

"If the CPI is $400 / $500 = 0.8, then $2000 / 0.8 = $2500. Personally, I would tend to go with this latter formula as the default. After all, if we spent $500 to do $400 worth of work, isn't reasonable to expect to spend $2500 to complete the $2000 effort?"

"Well, not always," chimed Justin, wiping the last lick of ice cream off of his mustache. "What if we looked into what was causing the overrun and took corrective action? Maybe completing the remaining effort at the budgeted cost would be appropriate."

"What if we used both methods?" Art offered as he grabbed a red marker and joined Ernie at the white board.

"What if we used the EAC = BAC / CPI as the default? We would let this figure stand unless the person responsible for the work in question could state what corrective action had been taken and what effect that action would have on the remaining costs. This would put the burden on the task manager to take corrective action or to have to live with the unfavorable EAC."

Everyone agreed that such an approach was reasonable and workable. Ernie asked to be excused to return to her office, and the two happy and enlightened men thanked her and sent her on her way. Now, Art and Justin, fully convinced that they should apply these earned value concepts to the A&M project, pulled out their last project reports and started to develop a new, earned value report.

Facing the Music

The June sun shone brightly as Justin stepped out of his Chevy and entered the plant, but his mind was fully focused elsewhere. This morning he was scheduled to present his solution to the project tracking and reporting crisis to Charles William Yost III. He didn't know whether to be pleased that he actually had a solution or embarrassed that the solution, when applied to the A&M project, showed that the project performance was considerably worse that previously reported. Putting the embarrassment aside, he decided that he was able to get things under control with the new approach and that the boss would eventually be pleased with the result.

Art was already in the executive conference room, spreading some butter on a bran muffin. Justin dropped his papers on the polished walnut table and grabbed a bagel from the goodies tray. Charlie walked in, poured a cup of decaf, and positioned himself at the end of the table. "I hope that you have something good for me" he started in, as he stirred two sugars into the steaming java.

Justin knew Charlie well enough that it wouldn't do any good to beat around the bush. He had to lay it all on the table and take his licking, if necessary. Anyway, he felt good about where they were going and jumped right in.

"I have some good news and some less good news, but I can assure you that it's mostly good stuff." Justin started in somewhat nervously. "We met with Ernestine Alu, over at Snack Foods Division, and you were right, she is doing some good things over there. There is an earned value analysis concept that she told us about and I feel confident that we can apply that approach here in Cereals. Art and I have already initiated that effort, and we are gaining a much better picture of the project performance. And, while we are not happy about what we learned about how the project is going, we have a much better knowledge of where the problems are and have already taken action to remedy the problems."

"OK," Charlie challenged Justin, "show me what you have."

Wiping some cream cheese off of his mustache, Justin placed a transparency on the projector. "Using EVA, Art and I have combined our progress measurements so that we could get a better look at the schedule and cost performance. As you can see on this slide, we have identified, from the plan, the total project budget (the BAC) and the planned accomplishment as of May 30th (the BCWS). Now here's the bad news. When we measured the percent complete for all of the work completed or in progress, we found that we had actually accomplished only 42% of the work, as against a target of 57.2%. We converted these data to a Schedule Performance Index (SPI), which shows that work is being accomplished at only 73% of the planned rate."

National Foods, Inc.
Cereal Products Division
Monthly Project Status Report
Almonds & Molasses Cereal Project

Status as of 5/30/95

Planned expenditures:	$ 192,000	57.2%
Progress (EV):	$ 140,910	42.0%
Actual expenditures:	$ 162,875	48.5%
SPI = 0.73	CPI = 0.87	
Budgeted Cost at Completion:		$335,000
Estimated Cost at Completion:		$387,500
Est. Project Completion Date:		9/15/95

Charlie frowned as he squirmed in his chair. "Yes, but I figured that out last week when I looked at your fragmented reports."

"But wait, please, before you jump all over me. When we went back to dig up these data, we were also able to clearly identify which areas were contributing to the poor performance. We talked to the people responsible and forced them to recognize that their performance was not acceptable. The numbers could not be disputed. We then jointly developed a plan of action to bring things back on schedule. We won't know for certain

for several weeks, but there is a good chance that, now that we are aware of the problems, that we can bring this project in on the original target date."

"How will we know?" asked Charlie.

"For the next several weeks, we are going to take a weekly earned value reading. We will plot the SPI curve, and expect to see it turn around. We are going to have to turn in some very strong efforts to do this, but we will clearly know if it is working when the weekly SPI's come in at well over 1.0, and the SPI to-date moves closer to the target of 1.0."

Justin was going to explain this further, but Charlie apparently understood and wanted to move on. "What about the cost performance?" he pushed on.

"Let me handle this one," Art jumped in. "it's similar to the approach on schedule. But, instead of comparing the actual costs to the planned costs, as we did before, we will now compare the actual costs to the actual accomplishments (the earned value or BCWP). If we look at this slide, you can see that the actual expenditures to date of $162,875 are unfavorable compared to the value of the work accomplished, $140,910. We determined the last number by multiplying the total project budget (BAC) by the percent complete (42%). This tells us that we are getting only 87 cents of value for every dollar that we have spent to date, as indicated by the Cost Performance Index (CPI) of 0.87. Here, too, we are aiming to keep this figure at 1.0 or better.

In actual dollars, we can say that we are overspent to date by $ 21,965. Based on this CPI, we can estimate a cost overrun of $32,000. But, like the situation with the schedule performance, we have identified the problems areas and have examined the causes of the overruns. I wish that I could say that we will be able to gain some of this back. This is unlikely. But now that we know where the cost problems are, we have taken action to control further overruns. Our best guess at this time is that we can hold the total overrun to under 6 percent."

"One more thing." Justin added, "Our future reports will note any schedule or cost areas that are performing outside of a threshold, which we have currently set as ten percent. In such situations, the people responsible for these items will have to report on the cause of the problem and what steps they are taking to correct the situation, if possible. With this new system, we will know when problems are occurring when there is still time to take corrective action"

Art and Justin looked relieved when they saw Charlie nod his head in approval. "This all sounds very good," he noted. "I am disappointed in the poor performance on the A&M job, but if you can bring the project in on time with no more than a 6% overrun, I'll be satisfied.

"Thanks for responding so quickly to the situation. If this works, we'll want to establish standard EVA practices for the Division. Oh! One more thing, Justin. You have some cream cheese on your mustache."

Harvey A. Levine, with 38 years of service to the project management industry, is founder of **The Project Knowledge Group**, a consulting firm specializing in PM training, PM software selection, evaluation & implementation, and PM using microcomputers.

He has implemented or enhanced the project management capabilities of numerous firms, often combined with the selection or implementation of computerized project management tools. Mr. Levine is considered the leading consultant to the project management software industry and is recognized as the leading expert in tools for project management.

He has been an Adjunct Professor of Project Management at Rensselaer Polytechnic Institute and Boston University. And has conducted numerous project management public seminars for ASCE, AMA, IBM, and PMI.

Mr. Levine is the author of the book "Project Management using Microcomputers", and has been published extensively in other books, periodicals and videos.

Mr. Levine is a past president of the Project Management Institute and the recipient of *PMI's 1989 Distinguished Contribution to Project Management* award. Recently, he was recently elected as a *Fellow of PMI*.

Mr. Levine has offices in Saratoga Springs, NY and San Diego, CA and can be contacted via e-mail at: LevineHarv@cs.com