INTRODUCTION TO EARNED VALUE: A CASE STUDY

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ABSTRACT

Earned value is an approach to track the value of a project's product as it relates to planned and actual spending. This session will introduce the audience to basic earned value concepts and how to use these concepts to forecast and report project costs. The material presented follows the foundation provided in the *Project Management Body of Knowledge (PMBOK® Guide)* established by the Project Management Institute (PMI®). We will follow a case study to demonstrated the concepts, challenge the audience and forecast estimate at completion.

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Earned Value is like the ghost that you can't see but everyone tells you exists. You know it's out there but don't truly understand what it does and why we as project managers need it.

Simply put, earned value is a comparison of what we planned to spend, what we actually spent, and the value of the project's product at any given point of time. We can then take that input to perform a cost and schedule analysis to determine project status. Using this data combined with a thorough understanding of our project's situation, we can forecast the completion cost of our project.

For example, consider Figure 1 below. This project is to build two military tanks. Each tank will cost $1M for a total Budget at Completion (BAC) of $2M. I know, not very realistic costs but the math works.

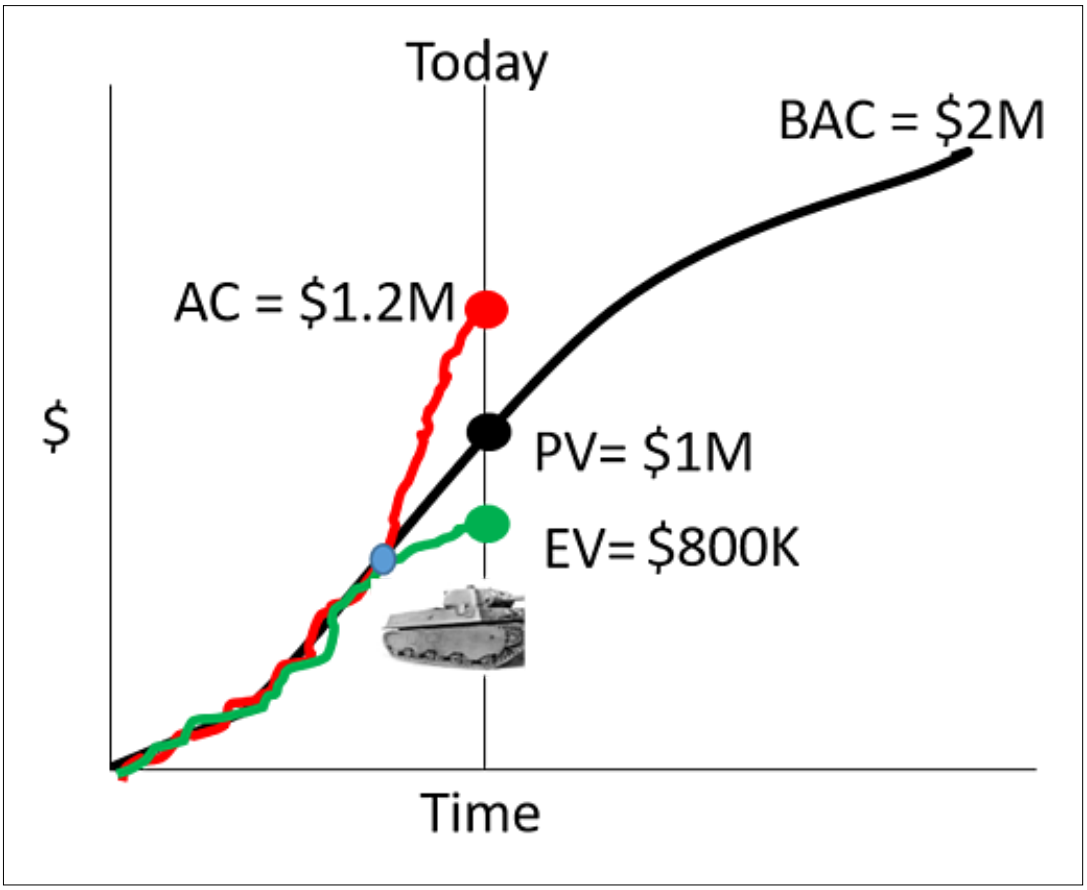

Figure 1: Earned Value Analysis

Following the diagram above, the project manager must report that the team had planned to spend $1M and deliver one tank, but has actually spent $1.2M to deliver 80% or $800K worth of the first tank. This $800K is called Earned Value. Clearly this is not good news and, utilizing some simple formulas, we can calculate just how bad.

- **Cost performance** can be calculated using **Cost Variance (CV)** which is a comparison of the earned value of tank one against the actual cost to-date to deliver that value. CV = EV-AC or ($400K). My project is $400K over budget. We can convert that variance into an index by calculating the **Cost Performance Index (CPI)**: EV/AC or $.66. The CPI states that the project is spending at a $.66 efficiency against the dollar. Not Good!

- **Schedule performance** can be calculated using **Schedule Variance (SV)** which is a comparison of the earned value of tank one against what it was planned to be worth as of today. SV = EV-PV or ($200K). This project is behind schedule because tank one was planned to be complete and worth $1M but it's actually incomplete and worth $800K. We can convert this variance into an index by calculating **Schedule Performance Index (SPI)**: EV/PV or $.80. The SPI states that my project team is delivering $.80 worth of tank for every $1 dollar **we had planned** for them to spend. Again, Not Good.

When I teach this in our *Earned Value* Course or our *PMP® Exam Prep*. course, the first question I'm always asked is "why is the tank worth $800,000 when it doesn't function?" Good question! The military officer who is sponsoring your construction effort would certainly agree that the tank is worthless until it's complete. Addressing and assigning percent complete on any project product must be decided before the project begins and documented in the Cost Management Plan. There are many approaches that can be used to accomplish this.

- Firm fixed price contracts will often assign earned value upon the completion of project phases and acceptance of the deliverable at the end of that phase. This is called the "weighted milestone method". For example, if the Design Phase of a project makes up 25% of the project's work, the project will be awarded the dollar equivalent of 25% of the BAC. At that time a cost and schedule analysis can be done by calculating the actual cost and planned value.

- For cost reimbursable and time and materials contracts when more services and less products are being delivered and a detailed project schedule exists, earned value can be calculated for each activity on the project schedule. This is called the "fixed formula method". For example, if we are using the 50:50 formula, 50% of the value of an activity is earned the second that activity starts but the remaining value cannot be earned until the activity completes. This is great news when the activity starts, bad news when the activity is >50% complete and not yet completed, and great news again once the activity is completed on time.

- The "percent complete" method is used when the sponsor can look at the project's product and fairly easily measure completion. This works well in construction when one can look at the building and using their experience, understand the project's completion and the subsequent earned value.

As you can see, measuring value is not an exact science but it does bring us closer to calculating some value at any given point in the project.

Let's get back to our tank that is 80% complete and overbudget and behind schedule. The project manager needs to be able to answer some questions such as:

- What happened here?
- Can you complete this on time?
- Can you complete this for $2M?
- Are you asking for more money? If so, how much?

The answers to these questions are heavily dependent upon what occurred on the project. First note the blue dot on the graph. The project's performance up until that blue dot was stellar, on schedule and on budget. Something happened at that blue dot to cause the project to overspend and under-deliver. Let's examine the possible causes and use that information to re-calculate the project's BAC. We call that re-calculation the Estimate at Completion.

1. The senior technical lead was pulled off the project temporarily to work on a proposal at headquarters. The resource manager sent you two lesser skilled technical resources who were not as productive and added costs to your project. Once your technical lead returns, those unproductive resources are taken off the project. This is called an anomaly and when it occurs we can re-calculate the BAC using the formula AC (actual costs) + (BAC-EV). Your revised BAC, or EAC is now $2.4M and you will need to seek approval for an additional $400K. I don't think your sponsor will empathize with you so don't expect approval for additional funding.

2. The vendor supplying materials offered some special bulk ordering pricing which you just couldn't refuse. Thus, you didn't follow your original spend plan and your team was forced to deviate from the development to store all of the parts you purchased for both tanks. You simply need to re-plan the remaining work and assuming no additional development time is needed, you should be able to communicate that no additional funds will be needed, BAC=EAC.

3. Starting at the blue dot, the cost of steel went up because of trade tariffs. Materials pricing will not come down for your project, so you are stuck with purchasing steel at a higher price then originally planned. Under this circumstance you can use the formula BAC/CPI to calculate the Estimate at Completion which will be $2.9M. This change request of $900K should be approved unless you are delivering under a firm fixed price contract and then some negotiations will be needed.

4. The last scenario is that spending and productivity will continue on its present path. This is bad news and you may want to start writing your resume. Under this circumstance you can use the formula:

$$AC + \frac{BAC-EV)}{CPI*SPI}$$

   Your $2M project is now estimated to cost $3.4M! This can be caused by many things including unmanaged scope (scope creep), unanticipated materials costs, unqualified resources, etc.

In summary, projects go bad for many reasons. As project managers, some of these issues we can control and others we cannot. Having the capability, knowledge and experience to communicate these metrics will give you and your sponsors the information they need to make informed choices, manage impact and control projects.

REFERENCES

Launi, J.L. (2012). "Project Management Exam Prep. Bootcamp Slide Deck", Dec. 31, 2012

Launi, J.L. (2012). "Introduction to Earned Value Slide Deck" Dec. 5, 2012