

White Paper  
What's Different about Project Management and the use of Earned Value Management Systems  
(EVMS) in a Science Laboratory Environment?

Energy Facilities Contractor Operations Group (EFCOG)  
Project Management Working Group  
August 24, 2005

Background:

The Chief Operations Officer at Argonne National Laboratory is a routine member of EFCOG and recently identified the EFCOG project management (PM) working group as an area in which Argonne should more fully participate. A casual review of the PM working group membership reveals limited science laboratory participation and a prevalent industrial perspective. As is traditional in all working groups, the new member receives the opportunity to participate via actions assigned by the group. This white paper is in response to an action received at the July 2005 working group meeting.

Introduction:

The title of this white paper naturally leads to a premise that project management in a science laboratory is somehow different than the methods, tools, and techniques used in other business environments. That premise would be false. The methods, tools, and techniques are identical. We are all held accountable to the same expectations for fiscal responsibility, disciplined approach to outcome planning and delivery, awareness of change and impacts, and the bottom-line delivery of value to the taxpayer. *The premise that forms the context for this white paper is that the business of science as a mission element of DOE is different from other DOE mission elements.* The science mission demands change, demands over-the-horizon outcomes, demands routine technical integration among geographically and intellectually dispersed disciplines, and puts a high premium on innovation. The application of PM methods, tools, and techniques must reflect that business and satisfy risk based prerequisites to implement an effective Earned Value Management System (EVMS) as one of the tools.

**What's Different about Project Management and the use of Earned Value Management  
Systems (EVMS) in a Science Laboratory Environment?**

One can effectively argue that the demands of the science mission are the antithesis of the disciplined implementation of project management. However, that argument would fly in the face of the history of the science laboratories and the science mission which have both thrived and advanced based on the implementation of projects.

*“There are two schools of thought when it comes to project management innovation; some believe it hurts, while others know it helps. Traditionalists believe that the rigor of project management slows innovation, while others understand that a project management framework frees a team to brainstorm creative solutions.” - Carol*

Hildebrand summarizes for the Project Management Institute PM Network magazine in her May 2005 article *A Brighter Light Bulb*.<sup>1</sup>

Carol Hildebrand’s article provides a useful analogy in the application of PM tools in an environment that places high premium on innovation and change. The tools are used to create stability, not stifle creative thought or eliminate baseline variance. In a science laboratory, PM methods and process must routinely understand and recognize change, assess and respond in a risk management framework, and advance or retard scientific efforts based on interpreting the linkages to a laboratories strategic outcomes. The premium placed on innovation drives a subtle but important difference in perspective from a traditionalist model. PM tools in a science laboratory environment require evolution from a “change control discipline” philosophy to a mission focused “enable disciplined change” philosophy. One then asks how this affects implementation of EVMS.

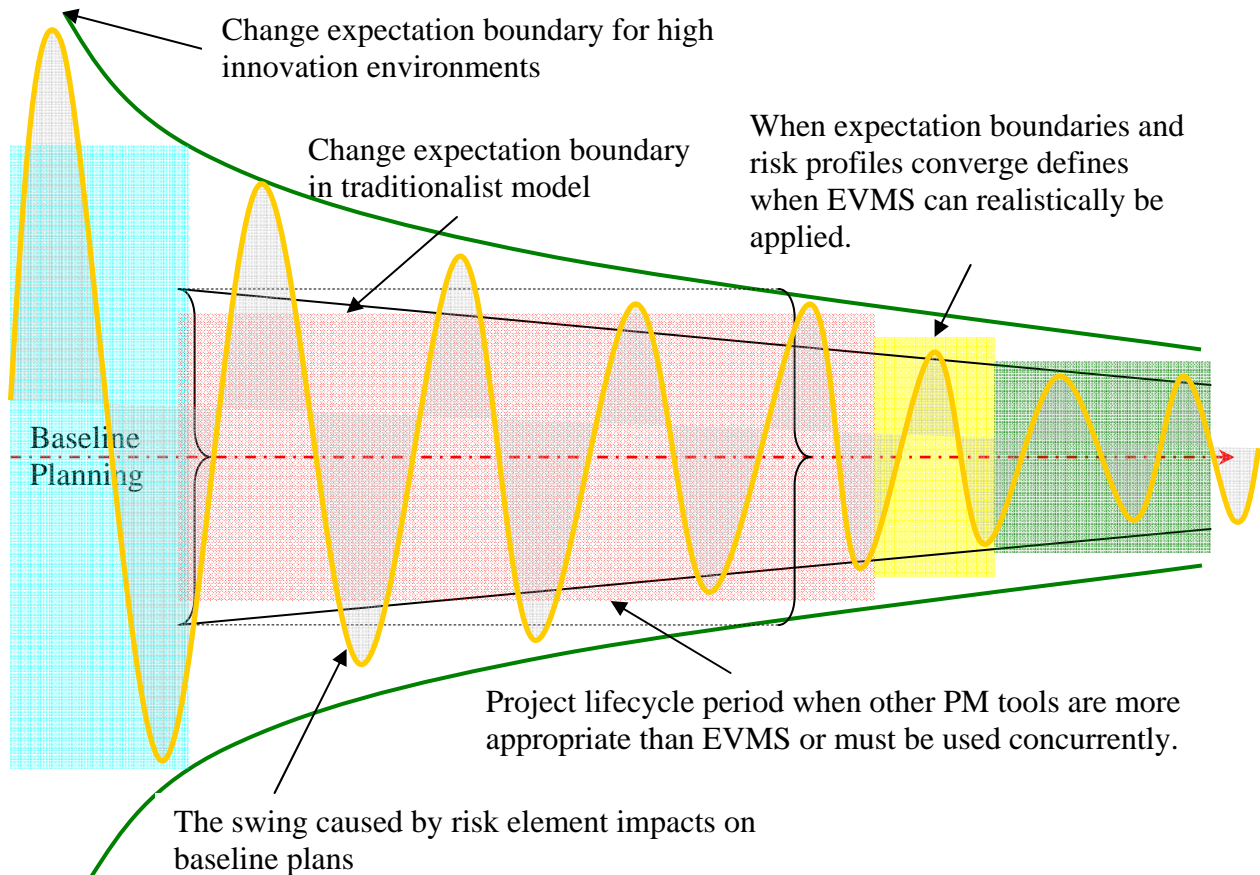


Figure 1 - The change acceptance range is typically +/- 30% - 40% at project start for traditional models – this is defined in DOE cost estimating guidance and recommendations from 413.3-1. EVMS is typically applied early. For high innovation environment projects the same (+/- 30%-40%) range is the appropriate trigger, but may occur later in the project lifecycle. Therefore, baseline planning must be managed using tools in addition to EVMS and a baseline plan at some level of detail must always be in place.

Figure 1 illustrates that the traditionalist model (straight black line boundaries) has a narrow expectation band for change which supports early application of EVMS as a tool in project lifecycles. ***A key point of this illustration is that EVMS applies when the rate of change can be expected to remain within this narrow band.*** This key point translates equally well to projects that emerge in a high innovation environment. The same figure identifies that the change acceptance range for high innovation projects translates to the right in project lifecycle before it achieves a similar narrow window. Does this cause conflict with DOE Order 413.3-1 because the project lifecycles don't overlay directly and the critical decision process doesn't match up exactly? No. It means we require other tools be used in concert with an EVMS until such time as the change expectation boundaries converge and reach the values expected from the traditional model.

An important concept for high innovation is to disconnect baseline planning from the tools used to manage baselines. Once a baseline has been established, use as many different PM tools as appropriate to manage the baselines until an EVMS tool can provide utility. Baselines need to be planned, established and managed early on all projects using many tools, only one of which is EVMS. In the case of projects that are driven by innovation, like projects emerging in the science mission, other tools such as risk management, work breakdown structures and dictionaries that reflect performance parameters, and configuration management are required; as is the continuous expectation for an early project baseline.

In a traditionalist model, PM methods (like work breakdown structures and activity definitions) are used to capture the scope of a defined solution at a level of detail needed to estimate with reasonable certainty the resources / commitments needed to accomplish the project. This "baseline plan" emerges early in project lifecycle. The application of EVMS to a defined solution then allows the project manager to "see and assess" progress based on earning measurable value against the plan. In a traditional model the PM "change control" process is used to accept or reject modifications to the plan. To quote a famous traditionalist.....*"when I pull on this leg of the WBS I want to see a technician's elbow move"* which serves as a designation for level of detail. In this model, project success or failure is based on high granularity measurement of incremental work progress within a specific defined outcome (the plan). This model is frustrated in a science mission environment because the science business is driven by expectations for innovation and change. The early life cycle for science mission projects must look for new solutions, which causes rapid change in project plans, which causes substantial swings in EVMS information, which causes increased project management labor to keep track of the changes, which causes PM to "cost too much", etc, etc, etc. The traditionalist model by itself becomes a self-defeating argument very quickly.

To prevent the traditionalist model from failing in the science mission, the application of PM tools must demonstrate the acceptance of "high value" early project innovation and "low value" of late project innovation. In recent successful high-innovation projects, this demonstration has occurred via risk profile management<sup>ii</sup> and planned use of contingency within the context of baseline change control. Where a traditionalist model requires high granularity in measurement of incremental work progress, the science mission introduces high-granularity measurement of project baseline risks. Recent best practice from the Spallation Neutron Source<sup>iii</sup>, pre-planning from the Rare Isotope Accelerator, and the nanoscience projects reflect the concept of risk

profile management early in the project life cycle, planned use of contingency as an early element of baseline implementation, followed by implementation of EVMS. This practice continues to improve as project investments become increasingly based on the recognition of high-value innovation early in project development. The blending of configuration and risk management PM tools as a prerequisite to EVMS encourages the disciplined acceptance of change based on resolved baseline risk. As baseline risk issues are resolved, the oscillations of change are damped such that traditionalist methods of EVMS can be made successful and more directly relevant to project manager information needs.

The strategic business profile of the US Department of Energy, and its laboratories, covers the waterfront of every project application area that industry has envisioned. Our methods for project implementation should reflect that waterfront.

---

<sup>i</sup> Carol Hildebrand writes regarding the 5 key PM learnings which companies can use to thrive in an environment driven by innovation. Her article is supported by research and interviews with Novations Project Management, and Advanced Technology Portfolio management at Chrysler Group. In addition, the article describes the limitations that project management imposes on creativity as described by professor John Bessant, Cranfield University, Bedford UK. [A Brighter Lightbulb](#), PM Network Magazine, pgs 36-41, May 2005.

<sup>ii</sup> Argonne National Laboratory, RIA R&D: Risk and Opportunity – A Project Perspective, revision number RIA PCDR-001, August 10, 2003. Describes a methodology used in the pre-planning of an Office of Nuclear Physics project based on the determination of risk elements that affected the establishment of cost and schedule baselines. This methodology was then used to highlight priorities for project focused investments in the RIA R&D program and the DOE approved Laboratory Directed Research and Development (LDRD) projects at Argonne as they applied to RIA.

<sup>iii</sup> Oak Ridge National Laboratory, SNS Project Execution, Les Price, DOE Project Director, Presentation of lessons learned and best practice implementation at the UC Project Management Workshop, May 20, 2004. Describes the management principles and SC delivery expectations for large science projects. Also provides perspective of scope management and emphasis on schedule performance based on baseline management using risk management, configuration management, and other project tools.