

## **The Benefits of Earned Value Management from a Project Manager's Perspective**

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One of the most critical problems that project managers encounter is the management of the performance on their project. Talk to any Project Manager, in industry or government, and you'll find that two of the most common complaints are cost and schedule overruns. In many instances there is no forewarning; schedules slip, costs soar, and the project manager is faced with the near impossible task of explaining why each impact occurred. When contractors are performing the majority of the work, the management job can become even more obscure. The simple lack of proximity to the contractor can limit effective communication. Add to that a mixture of cultural differences and a desire for the contractor to portray the most optimistic view of their performance, and you create an even more difficult task for the project manager.

This was somewhat the scenario when the Habitat Holding Rack (HHR) manager at Marshall Space Flight Center (MSFC) was introduced to the overall concept of Earned Value Management (EVM). Faced with increased costs (which eventually resulted in decreased scope of the project), continued schedule slides, and several technical anomalies, the project manager was looking for a way to gain a better handle on the project performance.

As a component of the Space Station Biological Research Program (SSBRP), the HHR project is an integral piece of the Program content. The HHR is the first rack hardware to be delivered for the Program and has therefore been the first rack to move through the trials of test and verification – documenting anomalies and technical difficulties that will benefit the other SSBRP rack projects. For these reasons, the HHR maintained high visibility throughout the manufacturing and assembly process, and continuing through test and verification activities. Needless to say, the higher visibility emphasized the need for improved performance on this project. And to improve project performance, a manager must first understand how to measure the cost, schedule and technical objectives effectively.

Enter the concepts of EVM. EVM is a process that has been used for years by government and industry projects, predominantly by the Department of Defense (DOD), to measure performance and health of the project. Government contractors also use the process either as directed within the contract itself (NASA Procedural Requirements (NPR) 9501.3), or simply by choice. Unfortunately many projects never fully realize the potential of EVM and what it can do to help managers better understand the overall health of the project. EVM is a tool that integrates the cost, schedule and technical requirements of a project. It requires discipline in all aspects of the project; it requires that the organization performing the tasks to plan the work and then to work to that plan. Obviously, some problems will occur that could not be predicted and therefore will not be a part of the initial plan; however, good planning does allow a manager to better mitigate those issues and concerns that are known. The use of EVM also helps the project manager in determining the current project status by answering questions such as:

Are we on schedule? Are we on cost? Do the costs reflect the true accomplishments? What are our variances? An added advantage of EVM is the identification of trends that helps a manager better predict where the project or a particular element is headed and a better method to establish a realistic Estimate At Completion (EAC) for the project. In essence, EVM gives personnel more reliable information to make better management decisions.

As the principle center for EVM, MSFC is fortunate to have a group of experts whose knowledge of EVM is substantial and who were willing to work with the HHR Project Manager to apply the principles of EVM to the project. The overall goal in using EVM on the HHR Project was first to understand performance and better deal with the current overrun environment. Second, EVM was to be used to improve ways to manage the cost and schedule concerns and to plan ahead for future impacts that may result from the current situation. Basically, EVM is a process to help measure performance in cost, schedule, and technical areas and to help the manager better identify project risks. If managers can measure performance effectively, and predict a good percentage of issues/concerns upfront, mitigation plans can be put into place that help reduce or eliminate big impacts to the project.

The first step in using EVM within the HHR Project was to identify exactly where the project stood at the current time. Without an understanding of current project status, there is no baseline from which to measure in future evaluations. For a standard project that is in the early stages of design development, an Integrated Baseline Review (IBR) is held. Much like a Design Review, the IBR is a review - used to understand the project's performance measurement baseline (PMB) and project objectives. The IBR also enables project personnel to understand the PMB in three areas: cost, schedule and technical performance. Based on this review, the project identifies and documents the risks associated with elements of the project so that mitigation plans can be developed for each.

Since the HHR Project was only two years from a completion date when managers recognized the need to use EVM, project personnel used a "mini-IBR", or a benchmark review, to assess the health of the project and to establish, midstream, a more realistic PMB. The review was scheduled such that it would not interfere with the contractor's regularly scheduled tasks. All in all, the entire process was handled smoothly and every effort made to alleviate any intrusion that would cause cost or schedule impacts in performing this review. Once the review was completed, the entire team had a much better vision of the remaining tasks and individuals came away with a clearer picture of their piece in the overall project flow. With contractors and government personnel working from the same baseline, and similar perspectives, the last step in the review was to document shared agreement in remaining project objectives. The review resulted in a better-informed project team, and a group of people that learned to work together as a team rather than a "government versus contractor" environment.

In reviewing the PMB, schedule experts performed a review of the HHR schedules to ensure that good network logic was in place and that all task dependencies in the schedule were linked appropriately. Personnel from the Project Analysis Office at MSFC worked with project and technical personnel to determine whether the time and resources associated with each task were appropriate. Once the schedules were reviewed, specific issues with missing network logic and unlinked tasks were discussed and actions

taken to update the schedules as needed. It was in the area of scheduling that the HHR team first realized the importance, and impact, of EVM. Although contractor personnel had established critical paths for every piece of the project schedule, there did not exist an overall, high-level schedule to tie them together. Once a good schedule was developed for the overall project – linking all major pieces of the project together – HHR personnel could better predict the end date for completion of the work as well as to develop a true critical path for the project. This schedule update also allowed for changes to be added to the schedule that resulted in clearly identified critical paths for the project and an end-date tied to the impacts of those changes.

Good schedules certainly help to better plan a project in detail, but implementation is key to any project success. Once the initial review was complete - covering all functional areas of the project - HHR personnel began to use EVM to regularly manage the project. Not only does the practice of EVM force good planning, it measures work progress and provides cost and schedule metrics to track project performance against the baseline plan. Using initial data, and each month's data as it was delivered by the contractor, the HHR manager could determine both cost and schedule variances and identify developing trends across the project's tasks. The primary data was submitted by the contractor via disk, loaded into a data analysis software tool (wInsight), and a 5-page summary report printed that could be reviewed with the contractor every month. This report was reviewed alongside the standard Cost Performance Report (CPR) that the contractor submits each month. Together with the EVM data, both contractor and HHR personnel were able to see a realistic picture of where the project had been, where it was headed, and how fast it was likely to get there.

In summary, EVM is a management process that has been embraced by project managers around the globe with good success. EVM allowed the HHR manager to define a PMB for the project that was more realistic than the previous baseline. In doing so, EVM provided managers with the necessary data to track performance and to ably discuss project impacts with higher-level management. The process also gave HHR personnel some data to back up that "gut" feeling that comes from years of project experience – experience that says you will almost always have schedule slips and cost overruns. EVM doesn't make the problems go away – but it does help to identify problems before they can reach their full potential. Today, project success is no longer an unattainable goal as objectives are more easily reached with the use of EVM to guide the project on a monthly basis. With good tools, solid upfront planning, and effective implementation of these tools, project managers can be better informed to make management decisions during the entire life cycle of their project.