

# Earned Value Management Performance Blueprint



## **Introduction**

When evaluating whether to proceed with any capital project, organizations look at a variety of factors and variables, such as the cost of materials, the cost of labor, fixed costs versus variable costs, and time as a function of meeting planned delivery dates—everything that impacts whether a project stays on time and on budget. A deviation in any one of these variables can have a significant impact on whether a project meets the value requirements set forth.

Value and cost differ substantially. Cost is merely the measurement of how much has been spent on a particular project cumulatively or at specific points in time. It is often a simple comparison of actual costs versus budgeted costs and rarely looks at all factors that impact the overall health of a project. Without rigid and consistent monitoring, projects can very easily veer off course and come in at substantially more than was budgeted. When that happens, the overall value of the project suffers.

Value is the measure of the actual worth of the project as measured by the time invested and money spent to date at each step in the project lifecycle, based on budgeted time and money. Without constant, rigorous monitoring, rarely does the value of a project equal its cost. Without sufficient checks and balances to drive accountability, project managers may not be held to task for bringing projects in on time and on budget; when this happens, it is often too late to correct overruns without seriously impacting the project.

All of this has driven the need to measure the true value of capital projects.

## **Managing capital planning and capital projects: The need for Earned Value Management principles**

The United States government funds and manages numerous capital projects, ranging from the implementation of agency-wide enterprise resource planning (ERP) systems for managing programs and the construction of federal buildings to the development of strategic weapons systems. Because these projects consume large amounts of scarce resources, both funds and time, it is essential that every step be taken to ensure all capital projects are managed efficiently and completed on time and on budget.

As part of its overall goal to improve efficiencies in all facets of capital projects, the federal government has realized a need to determine the true value of work performed, not the cost of work performed. In looking merely at the actual cost versus the planned cost of work performed, only funding performance is measured and the value of work performed is ignored. Determining the value of a project versus the cost of a project is fairly simple, but requires managers to look at projects differently.

For example, the construction of new a federal building has been authorized and monies appropriated. The federal building will have eight floors and has been budgeted at \$100 million from start to finish—constructed, furnished and ready for occupancy. To date, the builders have completed six floors at a total cost of \$84 million or \$14 million per floor. However, the value of the building is only \$75 million, the budgeted cost of each floor. To complete the building on budget, the builders must finish the last two floors for \$8 million per floor or face contract failure. If construction costs continue at \$14 million per floor, cost overruns could grow to as much as \$12 million.

Because the U.S. government wants to monitor and measure a project's health throughout its entire lifecycle, rather than just at specific points in time, it saw the need for an Earned Value Management (EVM) approach.

**Managing the entire project lifecycle: OMB Circular A-11 Guidelines**

To maximize the investment of scarce resources for large capital projects, the federal government, through the White House Office of Management and Budget (OMB), has established guidelines and requirements to gain true insight into the costs of time, people, and material associated with projects. Under the umbrella of “capital programming,” the OMB has integrated the planning, acquisition, and management of capital assets into the budget decision-making process, with the goal of assisting federal government agencies in improving their asset management and complying with two legislatively mandated, results-based initiatives: The Federal Acquisition Streamlining Act of 1994 and The Energy Policy Act of 2005.

These two acts have sought to drive improved efficiencies in every aspect of federal government programs and resource management. In particular, Title V of the Federal Acquisition Streamlining Act of 1994 (FASA) requires federal agencies “to establish cost, schedule and measurable performance goals for all major acquisition programs, and achieve on average 90 percent of those goals.” In short, it mandates that any program or project initiated by a federal agency set specific, measurable, attainable, relevant, and timely goals and that those goals be monitored constantly and consistently. In theory, the concept has achieved widespread acceptance, but it is much harder to put into practice.

As a result, the OMB has from time to time clarified and codified their wishes with specific guidelines issued through circulars. One such circular, OMB Circular A-11, sets forth new requirements for the management of capital projects:

*Part 7 (section 300) of the Circular establishes policy for planning, budgeting, acquisition and management of Federal capital assets, and instructs [federal agencies] on budget justification and reporting requirements for major information technology (IT) investments and for major non IT capital assets. OMB provides procedural and analytic guidelines for implementing specific aspects of these policies as appendices and supplements to this Circular and in other OMB circulars.*

In addition to setting forth clear requirements for managing capital projects, Circular A-11 also requires federal agencies to use an EVM philosophy and defines the standards under which the EVM framework will be applied to projects:

*Earned value management (EVM) is a project (investment) management tool effectively integrating the investment scope of work with schedule and cost elements for optimum investment planning and control. The qualities and operating characteristics of earned value management systems (EVMS) are described in American National Standards Institute (ANSI)/Electronic Industries Alliance (EIA) Standard -748-1998, Earned Value Management Systems, approved May 19, 1998. It was reaffirmed on August 28, 2002.*

The ultimate goal of the rules governing capital projects is to guarantee that scarce resources—money and people—are used efficiently and effectively.

### **Earned Value Management (EVM) model in federal capital projects**

The *Capital Programming Guide*, a supplement to Part 7 of OMB Circular A-11, provides federal agencies with guidance on the principles and techniques for effective capital programming. The guide requires federal agencies to develop, implement, and use a capital-programming process to develop their capital asset portfolio. It outlines specific steps with which federal agencies must comply to ensure they are following an EVM framework:

1. Evaluate and select capital asset investments that will support core mission functions performed by the federal government, and demonstrate projected returns on investment that are clearly equal to or better than alternative uses of available public resources;
2. Initiate improvements to existing assets or acquisitions of new assets only when no alternative private sector or governmental source can more efficiently meet the need;
3. Simplify or otherwise redesign work processes to reduce costs, improve effectiveness, and make maximum use of commercial services and off-the-shelf technology;
4. Reduce project risk by avoiding or isolating custom designed components, using components that can be fully tested or prototyped prior to full implementation or production, and ensuring involvement and support of users in the design and testing of the asset;
5. Structure major acquisitions into useful segments with a narrow scope and brief duration, make adequate use of competition and appropriately allocate risk between government and contractor. The agency head must approve or define the cost, schedule, and performance goals for major acquisitions, and the agency's chief financial officer must evaluate the proposed cost goals;
6. Ensure consistency with federal, agency, and bureau enterprise architecture (EA), demonstrating such consistency through compliance with agency business requirements and standards, as well as identification of milestones, as defined in the EA transition strategy;

- 7.** Institute performance measures and management processes monitoring and comparing actual performance to planned results. Agencies must use a performance-based acquisition management or earned value management system, based on the ANSI/EIA Standard 748, to obtain timely information regarding the progress of capital investments. The system must also measure progress towards milestones in an independently verifiable basis, in terms of cost, capability of the investment to meet specified requirements, timeliness, and quality. Agencies are expected to achieve, on average, 90 percent of the cost, schedule and performance goals for major acquisitions. Agency Heads must review major acquisitions not achieving 90 percent of the goals to determine whether there is a continuing need and what corrective action, including termination, should be taken;
- 8.** Ensure IT systems conform to the requirements of OMB Circular No. A-30, Management of Federal Information Resources;
- 9.** Ensure financial management systems conform to the requirements of OMB Circular No. A-127,
- 10.** Conduct post-implementation or post-occupancy reviews of capital programming and acquisition processes, and projects to validate estimated benefits and costs, and document effective management practices, that is, lessons learned, for broader use; and
- 11.** Establish oversight mechanisms requiring periodic review of operational capital assets to determine how mission requirements might have changed, and whether the asset continues to fulfill ongoing and anticipated mission requirements, deliver intended benefits to the agency and customers, and meet user requirements.

It is for the requirement in point seven of the OMB's guidelines, that IBM has developed the *IBM Cognos Earned Value Management Performance Blueprint*.

### **The IBM Cognos Earned Value Management Performance Blueprint**

Earned Value Management provides quantifiable measurements and analysis about project performance at any point during a project. There are three critical components used to measure performance:

- **Activity:** Also known as work breakdown structure (WBS), activity refers to a series of tasks that are hierarchical and contain interdependencies
- **Schedule:** Actual and plan
- **Cost:** Actual and plan, including detailed breakdowns for material, labor, and overhead and allocation of these resources

### **Concepts**

Earned Value is also known as Budgeted Cost of Work Performed, or BCWP. The EVM methodology primarily focuses on analysis of variances in cost and schedules. While it is important to identify and track these individually they are very much related. For example, while the project may have positive cost variances at a given point in time, these may be caused by or cause delays. Similarly a project that is running well ahead of schedule may be due to overspending.

Key terms in the EVM process include:

- Budgeted Cost of Work Performed (BCWP), which is another term for Earned Value
- Actual Cost of Work Performed (ACWP)
- Budgeted Cost of Work Scheduled (BCWS)
- Actual Cost of Work Scheduled (ACWS)
- Estimate at Completion (EAC)
- Budget at Completion (BAC)
- Estimate to Complete (ETC), which is the plan backlog
- Interim to date planned and actual costs (ITD)

Formulas used to calculate Earned Value include the following:

### **Variations**

These variations may not always include all actual costs, since they may not have been accumulated at a point when the percent complete can be determined by the project manager.

#### **Figure 1: Schedule Variance (SV(\$))**

$$\begin{aligned} \text{SV (\$)} &= \text{BCWP} - \text{BCWS} \\ &= \text{EV} - \text{PV} \end{aligned}$$

*Figure 1*

A variance greater than zero is viewed as positive (ahead of schedule).

#### **Figure 2: Schedule Performance Index (SPI)**

$$\text{SPI} = \frac{\text{BCWP}}{\text{BCWS}}$$

*Figure 2*

A variance greater than 1 is positive (ahead of schedule).

Integrating the schedule performance index with the ACWP and BCWP is critical in determining whether a project as a whole is over or under budget as well as any part of the WBS is over or under budget.

Estimate at Complete (EAC) represents the total project plan (BCWP) at the end of the project. Costs are typically cumulated during the project so that cost variances can be calculated as shown below.



**Figure 3: Cost Variance (CV)**

$$\begin{aligned} CV &= BCWP - ACWP \\ &= EV - AC \end{aligned}$$

*Figure 3*

**Cost Performance Index (CPI) or Efficiency Index**

< 1 means that the cost of completing the work is higher than planned (favorable)

= 1 means that the cost of completing the work is right on plan (favorable)

> 1 means that the cost of completing the work is less than planned (favorable or unfavorable).

For example, a variance that is greater than one might mean that the baseline plan had higher than normal budgeted costs. A variance of less than one may mean that uncontrollable project costs, such as labor rates, materials, or other project unit costs may have played a part. A good project plan has a baseline and at least one revised plan, particularly if it is a multi-year, high-dollar project.

**Figure 4: Estimate at Completion (EAC)**

EAC is the manager's projection of total cost of the project at completion.

$$EAC = AC + \frac{(BAC - EV)}{CPI}$$

*Figure 4*

**Figure 5: Estimate to Complete (ETC)**

ETC is the estimate to complete the project.

$$ETC = EAC - ACWP$$

*Figure 5*

**Figure 6: Estimate-to-Complete calculation or the To Complete Performance Index (TCPI)**

The ETC or TCPI performance index identifies what work/performance/effort a project needs to be accomplished to complete. The TCPI should be compared to the CPI. Any significant difference should be accounted for to explain why the manager projects either improved or degraded performance in the future.

$$TCPI = \frac{(BAC - BCWP)}{ETC}$$

Figure 6

**Independent Estimate at Completion (IEAC)**

The IEAC is a metric to project total cost using the performance to date to project overall performance. This can be compared to the EAC, which is the manager's projection.

Figure 7: Performance Index

$$\frac{ACWP}{BCWP}$$

Figure 7

## Reporting

The reports in this *Blueprint* (see examples in Figures 8 through 14) display a combination of schedule and cost performance indices and are updated whenever there is a change in either the projected or actual data.

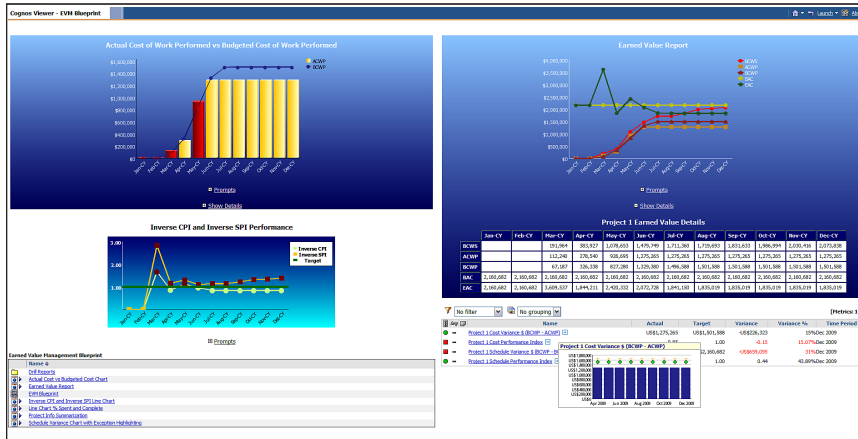


Figure 8: EVM Dashboard

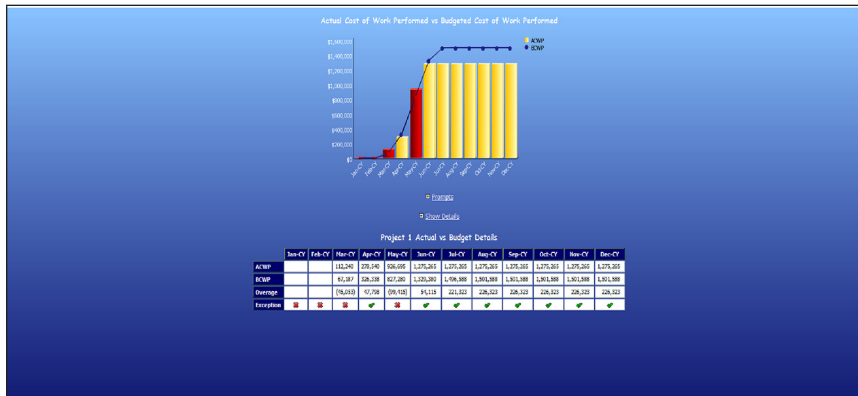


Figure 9: Cost Variance Analysis



Figure 10: Earned Value Analysis

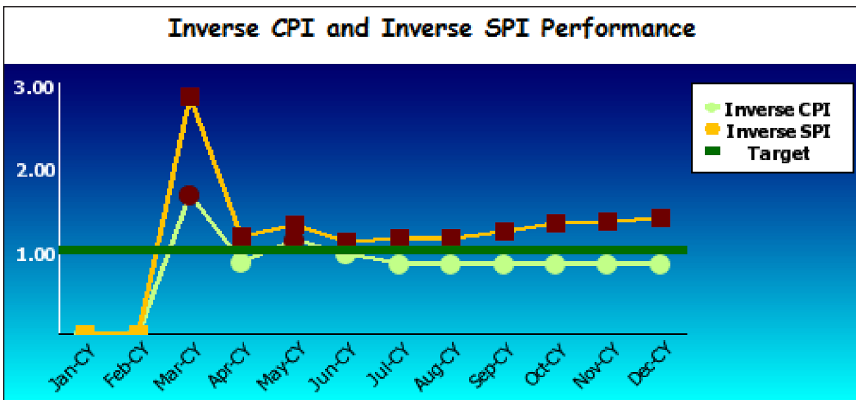


Figure 11: Inverse CPI and Inverse SPI Performance

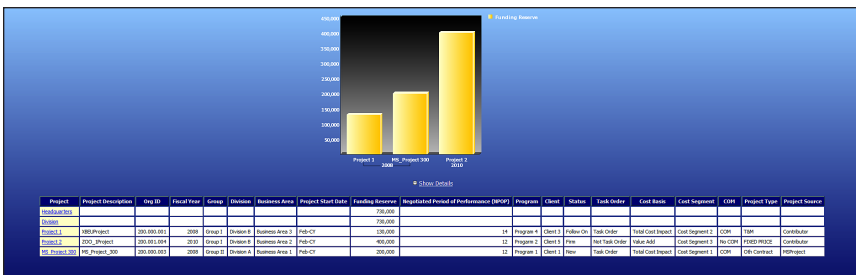


Figure 12: Multi-Project Comparative Analysis

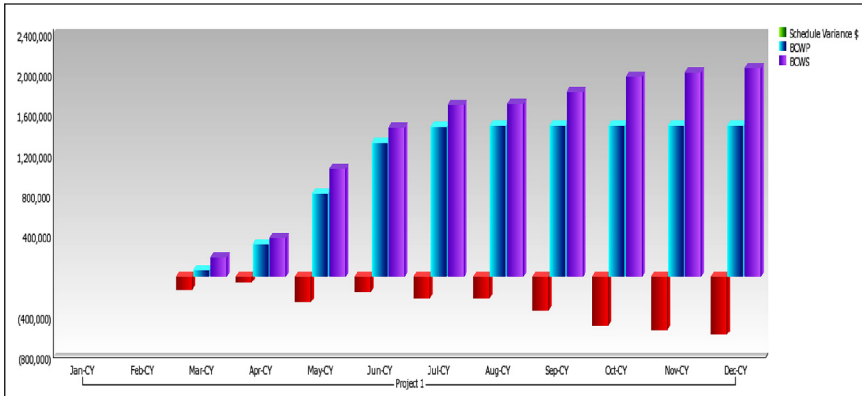


Figure 13: Schedule Variance Analysis

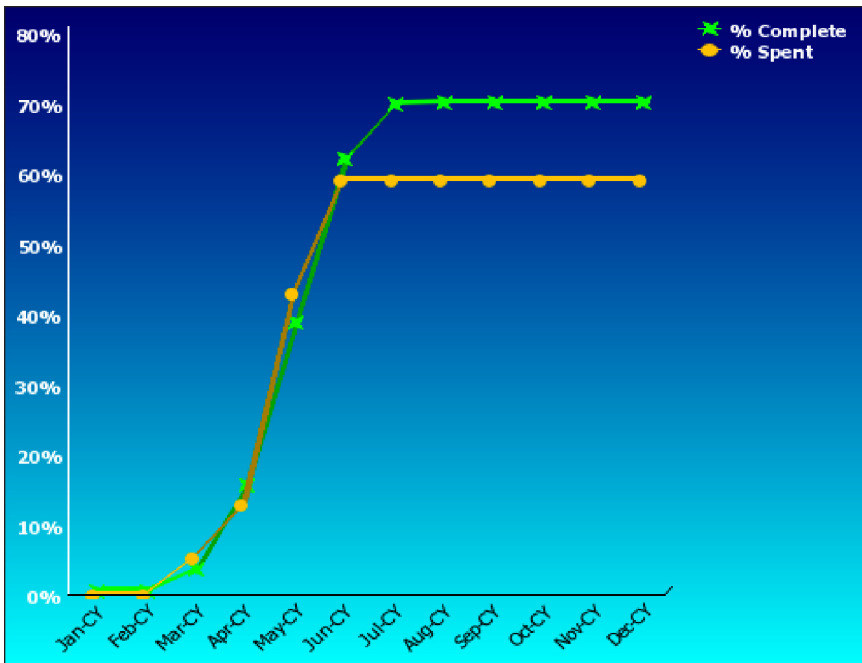


Figure 14: Completion vs. Spending Comparative Analysis

### **About the IBM Cognos Innovation Center For Performance Management**

The IBM Cognos Innovation Center was established in North America and Europe to advance the understanding of proven planning and performance management techniques, technologies, and practices. The Innovation Center is dedicated to transforming routine performance management practices into “next practices” that help cut costs, streamline processes, boost productivity, enable rapid response to opportunity, and increase management visibility.

Staffed globally by experts in planning, technology, and performance and strategy management, the Innovation Center partners with more than 600 IBM Cognos solutions customers, academics, industry leaders, and others seeking to accelerate adoption, reduce risk, and maximize the impact of technology-enabled performance management practices.

### **About IBM Cognos BI and Performance Management**

IBM Cognos business intelligence (BI) and performance management solutions deliver world-leading enterprise planning, consolidation and BI software, support and services to help companies plan, understand and manage financial and operational performance. IBM Cognos solutions bring together technology, analytical applications, best practices, and a broad network of partners to give customers an open, adaptive and complete performance solution. Over 23,000 customers in more than 135 countries around the world choose IBM Cognos solutions.

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