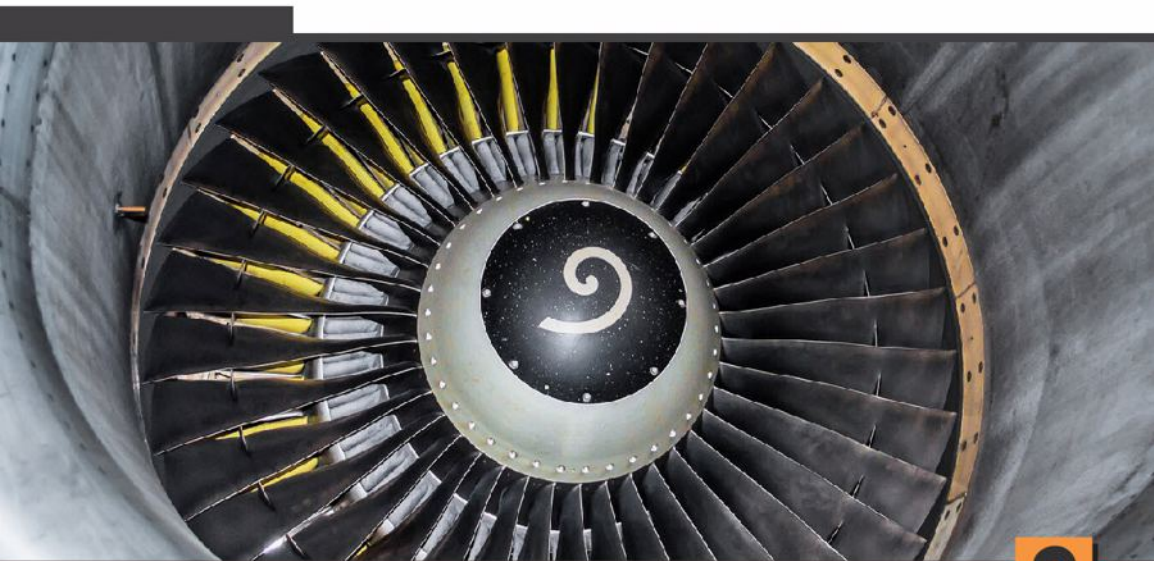


Earned Value Management

 **Fast Start Guide**

**The Most Important Methods and Tools
for an Effective Project Control**



aligned with the PMBOK Guide®



ROLAND WANNER

Fast Start Guide

Earned Value Management



**The Most Important Methods and Tools for
an Effective Project Control**

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Distribution: Amazon

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First Edition

ISBN: 979-8614468132 V1.0 February 2020



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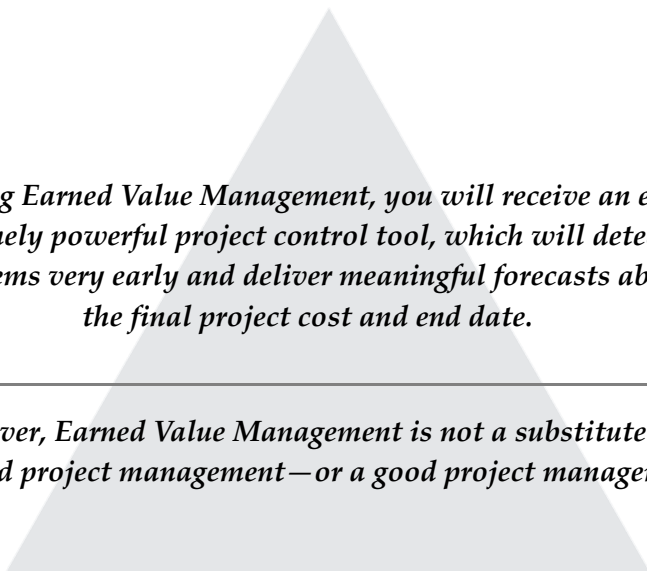
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Using Earned Value Management, you will receive an extremely powerful project control tool, which will detect problems very early and deliver meaningful forecasts about the final project cost and end date.

However, Earned Value Management is not a substitute for good project management—or a good project manager!

Preface

Welcome to the *Earned Value Management Fast Start Guide*. Several years have passed since my first book on Earned Value Management (EVM) was published in 2007. Since then, a lot has changed in the field of project management. In the last 10 years, Agile Project Management has also made a breakthrough— at least in software projects.

Agile elements are also increasingly being used in "traditional" projects based on the waterfall model, which will certainly have a positive effect on their success. But without good project management and consistent project monitoring and control, the success rate of projects will not increase significantly— and there is still a lot of work to do in this respect. With Earned Value Management, you will receive a tool that has impressively demonstrated its effectiveness over the past decades.

In this book I will first give you a brief introduction to the project control and planning process. This provides you with a solid basis for a better understanding of the detailed explanations about Earned Value Management and its requirements in the next chapters.

Then, you will receive a comprehensive description of Earned Value Management. This includes the requirements for project planning and budgeting when using EVM, as well as a detailed description of the specific EVM key figures and their application with the Earned Value methods.

You will then learn how to use EVM key figures to create meaningful project forecasts and what you should pay attention to when reporting with EVM. Finally, I will give you detailed instructions on how to successfully implement EVM in your company.

The content of the book is supported by more than 50 figures which will help you understand what you have read even better. A comprehensive glossary and index will help you quickly find explanations

to specific terms and content. With this book you lay the foundation for your next projects to be even more successful.

Who Was This Book Written For?

As a buyer of this book, you probably already have some experience in project management. However, in this book you will learn all the additional elements of effective project monitoring and control with Earned Value Management.

This book is an indispensable tool for project managers, program managers, project controllers (project financial analysts) and project portfolio managers, who want to make their project controlling even more effective. In addition, it is a comprehensive training and reference book for everyone who wants to take an important step forward in project management.

With this book, you will receive the best preparation for the Earned Value Management questions in the PMI PMP® certification.

Useful Information

The basis for this book are the following standards:

- EIA-748, Standard for Earned Value Management Systems
- PMI, PMBOK® Guide Sixth Edition, 2018
- PMI, The Practice Standard for Earned Value Management, Third Edition, Project Management Institute (2019)

For additional information, documents of the U.S. Department of Defense (DoD) and Department of Energy (DoE) have been used.

This book focuses on individual projects and programs, not on the controlling of project portfolios.

Introduction

Too many government and commercial projects fail. Every year, more than 70% of all projects end far above the defined budget, the planned deadline or they do not deliver the originally specified features or functions. More than 25% of all projects fail and are terminated. That is why every year, U.S. companies lose several billion dollars. This is probably not news to you.

Controlling and reporting project costs, schedules, technical progress and risks is of ever increasing importance in project management. Earned Value Management (EVM)—now in use for several decades—has provided to be the most efficient project control methodology

Once the sole domain of the U.S. Department of Defense, EVM has now been in use for a long time, especially in commercial enterprises around the world. The distribution of EVM is also strongly promoted by the PMBOK® and the PMI PMP® certification.

In the early days, EVM was criticized, due to its inflexible and dogmatic approach. This was overcome in the last 25 years through developments in international standards and adaption to the “real world” showing that the basic principles of managing projects with EVM are relatively easy to understand.

What Is Earned Value Management?

Earned Value Management (EVM) is the best practice in project control. It is a collection of methods with which you can effectively monitor your project and detect deviations from the plan data at an early stage. EVM provides you with objective values for project progress and early warning signals through trends and statistical predictions.

You already receive all the data EVM needs to deliver valuable results through professional project planning and good project management.

What Questions Does Project Control Have to Answer?

Successful project control gives answers to difficult questions, such as:

- The actual costs are lower than the planned costs. Does this mean that the project is working well or that it is behind schedule?
- The actual costs are higher than the planned costs and the project is half completed. What are the estimated costs of the project when it is completed?
- When will the project be completed?
- How efficiently are we using our time and resources?
- How much will the profit or the ROI be at project closure?

The traditional project cost analysis does not provide answers to these questions. It often deals only with the actual costs of completed work, compared to the planned costs or the budget. However, this comparison has a major shortcoming—the effective project performance is not considered at all. Earned Value Management, however, is a method for measuring, monitoring and communicating of the real performance of a project.

Take Advantage of the Strengths of Earned Value Management

With Earned Value Management, it is possible to calculate statistically the final project costs and the project's completion date long before project closure. Only results count—expenses are costs, but no result. This way, over-optimistic estimates regarding actual project progress will be revealed quickly.

EVM performance figures disclose cost and schedule trends very clearly. If these deviate from planned data, it is possible to react early. This is a great strength of EVM, of which project managers and senior management should take advantage. Earned Value Management is a method that can be applied to virtually all types of projects and in any industry.

However, Earned Value Management is:

- not a tool for financial management
- not a substitute for good project management and good project leadership
- not a security for project success

Why Is EVM Not Used More Often?

Earned Value Management is still rarely used outside large US Government programs and the defense industry although it is the most effective cost management tool for projects and programs. There were several reasons for this:

- The alleged complexity of the surrounding methodology and processes
- The effort required for collecting the necessary input data and reporting
- The effort of integrating the results into other management-information systems

In the past, these reasons were partly an obstacle to the proliferation of EVM. However, in recent years, it has been recognized that

excessive administration only costs and does not help. Earned Value Management, as it is practiced today, fits into any company that handles various larger projects and programs. Implemented to the appropriate extent and with good software support, EVM is an extraordinarily powerful tool that gives company management full transparency regarding costs and deadlines.

1

Project Control Fundamentals

In this chapter you will get a short overview of project control and what it includes. This foundation will help you when you explore individual areas of project monitoring and control with Earned Value Management during the course of this book.

If you are not yet so familiar with project control, you should definitely read this chapter. This chapter is also a good repetition for those who are already familiar with it, but it can also be skipped to get ahead faster.

Introduction

Project control is the foundation for project success! Does this sound a little arrogant to you? When you have read this book, then you will surely agree with my opinion. Because the term “project control” is more than just pure number crunching as many people believe. Project control is a comprehensive leadership method that extends into personnel management and quality management.

What is project control all about? Roughly speaking, project control has the goal of systematically monitoring the project on the basis of a sound project planning to identify deviations from the planned values as early as possible. The deviations should then be eliminated with effective measures so that the project returns to the planned course. You probably already know this. However, you can read in detail in this book what all this includes and how this is implemented in the project with Earned Value Management.

Project Control – A Crucial Task Of The Project Manager

Project control is a key management activity of the project manager, which occupies more than 50% of his working time. Do you find this statement exaggerated? It can't be that much! But as you will discover in this book, project control is a comprehensive concept that covers many areas of actual project management.

Project Control Is More Than Just the Plan/Actual Comparison

Many project managers, project sponsors and steering committees unfortunately do not know exactly which tasks project control covers and what benefits it has for their project. When asked what project control is, many project managers would give me the answer: "Project control? Yes, that's the PLAN/ACTUAL comparison that I do monthly, and the check I do to see that all work packages are completed at the planned time." That's how I would have responded 30 years ago as project manager greenhorn. Today I know that the project manager's work largely involves project control activities and that project control makes a significant contribution to the success of the project.

In this book you will learn which methods and techniques project control employs and how you can make your projects with Earned Value Management even more successful.

The Project Controller – the Good Conscience of the Project Manager

For smaller projects, project managers do the project control activities themselves. For large projects and programs, however, they are lucky if they are supported by a project controller, a project financial analyst or a project office. This allows the project manager to concentrate even better on further project management activities and the important stakeholder management.

Project controllers (or project financial analysts), with their very broad project control and project management knowledge, are a considerable help for project managers and, therefore, also become their "good conscience." If the project manager and project controller are a good team, then an important step toward a successful project is already done.

Project control is management work! The project manager is always responsible for project control—they will, however, gladly delegate a certain part of it to their project controller.

The Three Basic Parameters of Project Management

There are three important core parameters in project management: project scope, schedule and budget. These are also the most important core parameters in project controlling. However, traditional project controlling very often does not take the project scope into account. Earned Value Management, on the other hand, provides metrics that compare what was planned at a certain time at what cost and what was actually completed.

The following table shows the relationship between these core metrics and which questions these core metrics answer.

	Scope	Schedule	Budget
Plan	What are the deliverables?	When are they due	How much will it cost?
Progress	What tasks have been completed?	How long has it taken to complete the work accomplished?	How much have we spend to complete the tasks reported finished?
Projection	Will all project specifications be met?	When will the project be completed?	What is the estimated total cost at completion?

Figure 1: Project Management Basic Parameters

As you have read earlier, these are exactly the questions that EVM addresses and answers.

When you use EVM, you need to follow certain planning, monitoring and reporting procedures, especially when you work as a contractor for large corporations or government organizations. Basically, you are free to apply project management best practices such as PMBOK® GUIDE, PRINCE2, V-Modell or other company-specific metrics. Earned Value Management complements these standards perfectly or is even included in them.

EVM in the PMBOK® Guide

The standards of Earned Value Management are outlined in the PMBOK® Guide Sixth Edition in Chapter 7.4. and are aligned with the Standard EIA-748 "Earned Value Management Systems (EVMS)".

The figure below shows you the relationship between EVM and the PMBOK® Project Management Process Groups and Knowledge Areas. Highlighted (X) are project management areas to which EVM is most applicable.

Knowledge Areas	Process Groups				
	Initiating	Planning	Executing	Monitoring & Control	Closing
4. Project Integration Management	X	X	X	X	X
5. Project Scope Management		X		X	
6. Project Schedule Management		X		X	
7. Project Cost Management		X		7.4 Control Cost	
8. Project Quality Management		X	X	X	
9. Project Resource Management		X	X	X	
10. Project Communications Management		X	X	X	
11. Project Risk Management		X		X	
12. Project Procurement Management		X	X	X	X
13. Project Stakeholder Management			X		

Figure 2: EVM and Project Management in the PMBOK®

From Management Accounting To Project Control

There was a kind of controlling already 400 years B.C. in the Roman Empire, when Quaestors were responsible for the state treasury. Like most modern management methods, management accounting was first established in the United States. As the first large company, the "General Electric Company" created the position of a comptroller in 1882. Some years later, management accounting also came to Europe. Controlling is sometimes interchangeably used with Management Accounting as managerial functions and has to be considered as an independent concept. Controlling could be defined as follows:

Controlling is a forward-looking system of planning, monitoring and control activities for the alignment of corporate events in terms of the achievement of corporate and profit goal.

That means: Controlling is a comprehensive control and coordination approach to support senior management and responsible managing bodies at the result-oriented planning and implementation of business activities. If you break down the definitions of controlling to the activities of a controller, as a specialist in corporate planning and control, then you will obtain the following operational tasks:

- Analyzing internal and external factors that affect the profitability and liquidity of the company.
- Participating and consulting at planning and formulation of strategic business objectives. Organizing and coordinating operational sub-planning.
- Monitoring and comparison of actual business development with the short-, medium- and long-term planning. Analysis of variance causes, recommendation of adjustment measures.
- Development and implementation of flexible, transparent methods for analyzing, planning and control.

An important task of the controller is to accompany the management teams in the formulation, agreement and tracking of planned objectives. The controller supports the respective managers for more secure decisions.

Project Control – More Than Just Management Accounting?

Is project control "just" the implementation of "normal" management accounting on projects? This is the opinion of many companies. So unfortunately, their project control is often only a financial control of projects. Project control is more than just a financial control, which focuses on costs (Baseline/Target/Actual), budgets, depreciations and some other financial ratios—and this mostly for cost centers or investments.

Applying controlling to projects means to focus on the characteristics of the project: costs, deadlines, project progress, quality, risks, resources, changes, etc. Therefore, a project controller is for me more than a "project financial analyst" who only deals with financials.

Project control is an important managerial task in the project and its benefits are still often underestimated. Project control obtains an increasingly important role, not only at the individual project level, but also at the project portfolio level. At this level, too, it is important to plan, monitor and control a large number of projects within the company.

Project Control in the PMBOK

The comprehensive term “project control”, as used in Europe, is not common in the Anglo-Saxon language. You can also note this quickly if you deal a little further with the PMBOK of the PMI. There you will find only the definitions and descriptions on Planning, Monitoring and Control. This is then also notable in the basic concept of the PMBOK, which consists of "Project Management Processes" and "Project Management Knowledge Areas".

If a project consists of several phases, then you will find these Process Groups within each phase. That means, each phase has an Initiating and Planning Process, and in each phase something is created. Monitoring and Controlling will take place during each phase and each phase has a Closing Process.

In the following figure you can see how the different Process Groups overlap themselves during the project life cycle.

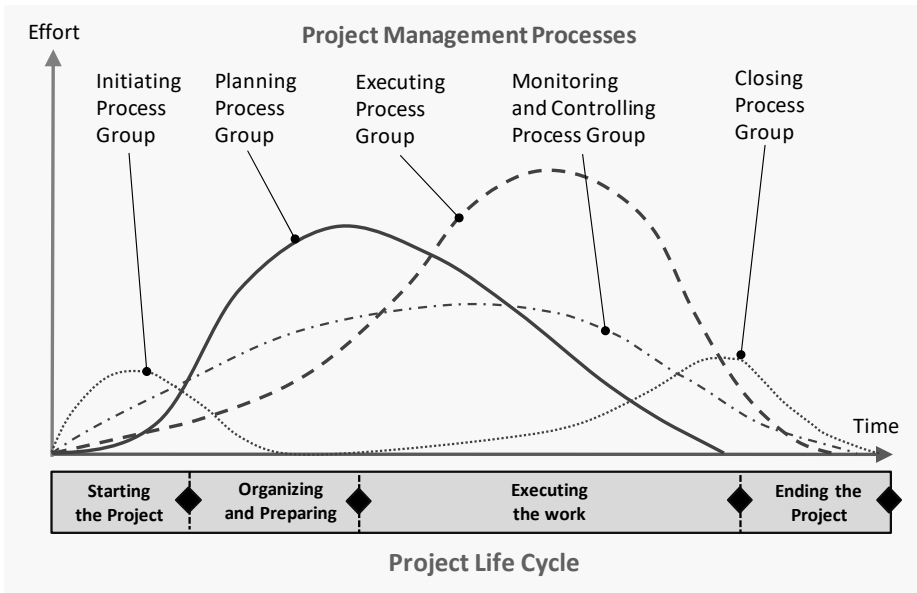


Figure 3: The Interaction between the individual “Process Groups” of the PMBOK

The following ten project control activities of the *PMBOK® Guide Sixth Edition* are summarized in the “Monitoring and Controlling Process Group”:

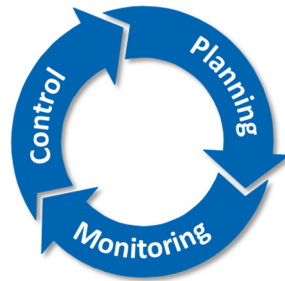
- Monitor and Control Project Work
- Perform Integrated Change Control
- Validate Scope
- Control Scope
- Control Schedule
- Control Costs (incl. Earned Value Management)
- Control Quality
- Control Resources
- Monitor Communications
- Monitor Risks
- Control Procurements
- Monitor Stakeholder Engagement

The Project Control Process

In the previous sections, you learned about project monitoring and control according to PMBOK. At this point, I want to summarize what project control consists of from the process perspective.

Project Planning:

1. Project Implementation Planning
2. Project Scope Planning
3. Activity Sequencing
4. Resource Planning
5. Organization Planning
6. Project Cost Planning
7. Project Scheduling
8. Project Budget Planning



Project Monitoring:

1. Collecting actual data, planned data and percentage of completion at the status date
2. Analyze and document deviations

Project Control:

1. Define and plan responses
2. Decide on responses
3. Delegate responses

PV – Planned Value

The previously common term for the Planned Value was:

BCWS – Budgeted Cost of Work Scheduled

At all times during the project, the Planned Value describes the Budgeted Costs of the Work Scheduled. It can only be determined from project planning. This means that it has a direct relation to the WBS. This means:

- $\text{Planned WBS \$} = \text{Planned Value \$}$
- $\text{No WBS} = \text{No Planning} = \text{No Planned Value}$

The PV is the defined Baseline against which current project progress is measured. Once this baseline is defined, it is only changed if adjustments to the project scope are necessary and authorized.

When you apply the Planned Value over the course of the project, you get the cost plan (tabular representation), the cost trend (histogram over time) or the cost baseline (cumulative costs over time).

EV – Earned Value

The previously common term for the Earned Value was:

BCWP – Budgeted Cost of Work Performed

The Earned Value is the value of the work performed at a given time, based on the planned (budgeted) value for this work.

Evaluating the project according to Earned Value means that you do not evaluate it according to the Actual Costs incurred, but according to the Planned Costs (the Planned Value).

AC – Actual Cost

The previously common term for the Actual Cost was:

ACWP – Actual Cost of Work Performed

The Actual Cost corresponds to the actual incurred and recorded costs for the performed work up to the status date. The Actual Costs mostly derive from the accounting system of the company.

Depending on the reporting cycle of the project team members and the payment of supplier invoices, the Actual Cost may be overstated or understated. For larger balances, an evaluation adjustment has to be applied.

BAC – Budget at Completion

The Budget at Completion (BAC) is an important element in the calculation of the Earned Value and the final project costs. The BAC corresponds either to the defined total budget for the program, the project, the Control Account or Work Package. The sum of the BAC's, e.g. all Work Packages, Planning Packages and the Undistributed Budget results in the BAC of the project. If a work package is completed, the Planned Value of the Work Package corresponds to the BAC of the Work Package.

The BAC is not an EVM basic performance figure, but is described here, because we need it in the following chapter.

Overview of the EVM Performance Figures and Formulas

In the figure below, and in the following table on the next page, you will find the most important EVM Performance Figures with the corresponding formulas.

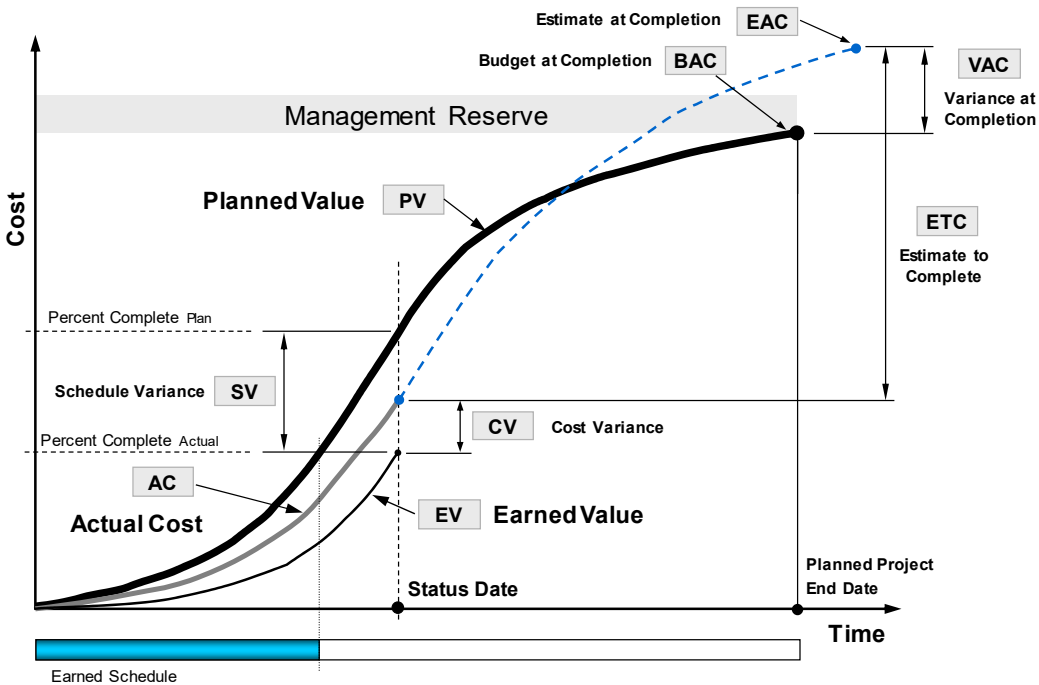


Figure 26: The EVM Performance Figures at a Glance

EVM Basic Performance Figures

Abbr.	Definition
EV (BCWP)	Earned Value (Budgeted Cost of Work Performed)
PV (BCWS)	Planned Value (Budgeted Cost of Work Scheduled)
AC (ACWP)	Actual Cost (Actual Cost of Work Performed)
BAC	Budget at Completion
SPI	Schedule Performance Index $SPI = EV/PV$ ($SPI = BCWP/BCWS$)
CV	Cost Variance $CV = EV - AC$ ($CV = BCWP - ACWP$)
CPI	Cost Performance Index $CPI = EV/AC$ ($CPI = BCWP/ACWP$)
SV	Schedule Variance $SV = EV - PV$ ($SV = BCWP - BCWS$)
EAC	Estimate at Completion $EAC = AC + ((BAC - EV)/CPI)$ additional variations see page 130
VAC	Variance at Completion $VAC = (BAC - EAC)$
TCPI	To Complete Performance Index $TCPI_{BAC} = (BAC - EV)/(BAC - AC)$ or $TCPI_{EAC} = (BAC - EV)/(EAC - AC)$
ETC	Estimate to Complete $ETC = (BAC - EV)/CPI$ additional variations see page 136
%	Percent Complete

The 50/50 EV Method

The “50/50 EV Method” is used to simplify the determination of work progress of tasks and work packages.

How to determine the Planned Value (PV): At the *planned* start of the work package, the first 50% of the BAC are credited to the PV. The second 50% are credited at the *planned* completion to the PV. During the entire duration the Planned Value does not increase. The Planned Value automatically takes on the value 100% if the *planned* end date of the work package is in the past.

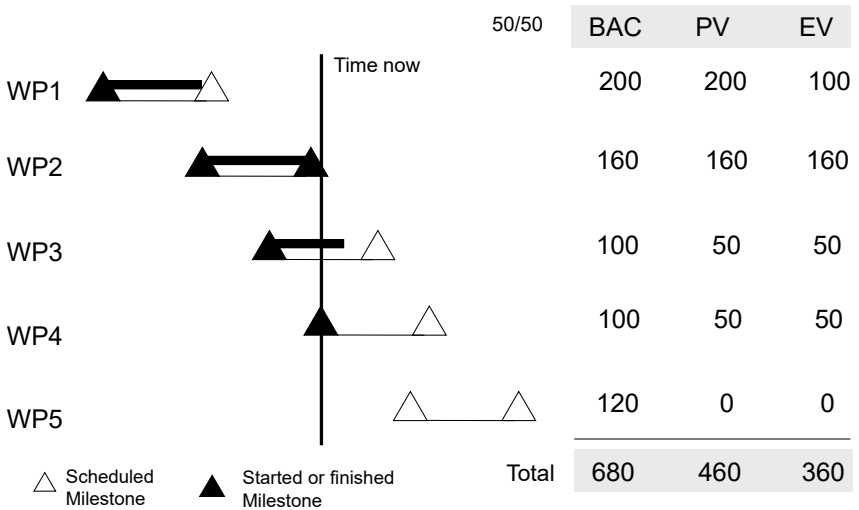


Figure 28: Determine the Earned Value with the “50/50 EV Method”

How to determine the Earned Value (EV): The procedure for EV is the same as for PV. However, the *effective* start and end of the work package are decisive for the credit. At the *effective* start of the work package, the first 50% of the BAC will be credited as EV. This value does not increase during the remaining duration of the work package. When the work package is completed, the remaining 50% of the budgeted costs will be credited to the EV. The “50/50 EV Method” is essentially a compromise between the 0/100 EV Method and the estimation of the degree of completion.

The "50/50 EV Method" tends to overestimate performance in the first half of the work package duration and underestimate performance in the second half. Therefore, this method should only be used for short work packages that start and end within two consecutive reporting time periods.

Fixed Formula Method

Planned Value is credited:

50% BAC at *planned* start date of work package

50% BAC at *planned* finish date of work package

Percent Start/Percent Finish

50/50 EV Method

Earned Value is credited:

50% BAC at *effective* start date of work package

50% BAC at *effective* finish date of work package

Figure 29: Fixed Formula Method explained

The 0/100 EV Method

The “0/100 EV Method” is a special case of the “Percent Start/Percent Finish EV Method.” It is used for short work packages/activities that are completed within one reporting time period.

The “0/100 EV Method” works with a very careful evaluation of the work performance. Therefore, it is unsuitable for projects with few work packages, as this can lead to considerable distortions of reality. For example, the total work progress may be constant for a certain period. If then several work packages are completed at the same time, there is a large jump in the degree of completion. However, this method is very useful for projects with many and small work packages and short reporting cycles.

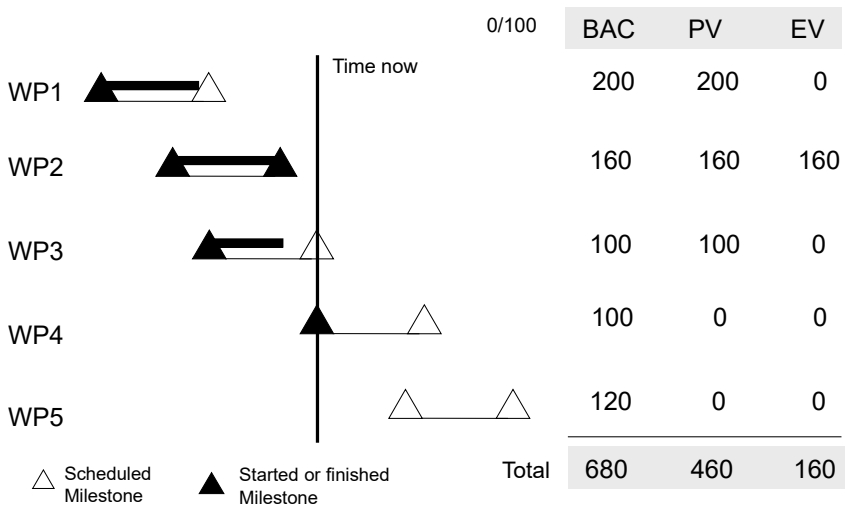


Figure 30: Determine the Earned Value with the “0/100 EV Method”

The “0/100 EV Method” is the most conservative EV Method to evaluate project performance, as it tends to underestimate work progress of the project. This fact makes it the safest of all EV Methods.

Work Remaining (WR) – Remaining work to the end of the project. The WR is equal to the budget at completion (BAC) minus Earned Value (EV).

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DoD Acquisition Community Connection, EVM-Homepage des DoD

<https://www.dau.edu/cop/evm/Pages/Default.aspx>

Performance Assessments and Root Cause Analyses (PARCA)

Earned Value Management division in the Office of the Assistant Secretary of Defense for Acquisition: <http://www.acq.osd.mil/evm/>

U.S. Department of Energy – Earned Value Management Information Center <https://www.energy.gov/projectmanagement/services-0/earned-value-management>

NASA Earned Value Management <https://www.nasa.gov/evm>

PMI's College of Performance Management <http://www.my-cpm.org/>

Blog of Roland Wanner, project controlling and EVM:

<https://rolandwanner.com/category/project-control/>

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Roland Wanner has been in the project business for over 30 years and has participated in many projects, both successful and failed. After his education as a mechanical and industrial engineer, he first worked 5 years as a project manager and then for several years as a project controller and project portfolio manager in mechanical and plant engineering. For more than 10 years he has worked as a project management specialist, project portfolio manager and project office manager in the banking and insurance sector.

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Blog of Roland Wanner: <https://www.rolandwanner.com/blog>

Here you will find interesting articles about Earned Value Management, Project Control, Agile Project Management and Risk Management for projects.

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We thank you very much for your ideas, thoughts, correction and suggestions. Please send them to: info@rolandwanner.com.

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