Performance Measurement Using Earned Value Management (EVM)

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RefineM PROJECT MANAGEMENT CONSULTING

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Agenda

1. What is Virtual Lunch & Learn
2. Your Expectations from this Webinar
3. Introduction – Myself
4. Performance Measurement Using Earned Value Management (EVM)
   a) Intro to EVM
   b) Variances
   c) Performance Indices
   d) Forecasting
   e) EVM Pitfalls
5. Upcoming Learning Opportunities from RefineM
6. How to get 1 PDU for this Webinar?
7. Rewarding Our Star Attendees
8. Q & A
9. Supporting Slides

RefineM's Virtual Lunch & Learn

This is a monthly webinar delivered during the lunch hour in the first week (Wednesdays) of every month.

It's designed to help you learn while you eat lunch, providing a relaxed environment to enhance your experience.

The monthly webinars will cover a variety of Project Management / Agile topics.

Your Expectations

What are your expectations from this webinar?

Why are you here today?

NK Shrivastava, PMP, RMP, ACP, CSM, SPC

RefineM

Helping organizations turn their project management capability into a *competitive advantage*

- CEO/Consultant since Dec 2011
  - Agile Coaching/Adoption
  - Project Management/ Process Improvement Consulting and Training
  - Project Management Toolkits (for PMs, Executives and Agile Practitioners)

My professional journey b/f RefineM

- 20+ years of Successful Project Leadership
  - Led 100s of projects of all sizes, successfully
  - Recovered many projects, saved millions of $
  - Implemented numerous process improvements
  - Coached/mentored 100s of PMs, and some executives
  - Board Member – SWMO PMI Chapter (2008-2014)

Advanced Techniques in PM

1. Overview
2. Advanced Stakeholder Management
3. Advanced Scope/Change Management
4. **Performance Measurement Using EVM**
5. Advanced Risk Management

What else do you consider advanced skills?

Who Can Use These Techniques?

* Experienced project managers
* May or may not have a certification such as PMP®
* PMO leads / directors looking for training for PMs
* PMs looking to take on greater leadership role

Performance Measurement Using Earned Value Management (EVM)

- Intro to EVM
- Variances
- Performance Indices
- Forecasting
- Setting up EVM

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Definition of EVM?

Earned Value Management (EVM) is a management methodology for achieving the following:

1. Integrating scope, schedule, and resources.

2. Objectively measuring project performance and progress.

3. Forecasting project outcomes.

Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

What is needed to implement EVM?

* A project plan that identifies work to be accomplished,
* A valuation of planned work, called Planned Value (***PV***) or Budgeted Cost of Work Scheduled (BCWS),
* Pre-defined "earning rules" (also called metrics) to quantify the work accomplished, called Earned Value (***EV***) or Budgeted Cost of Work Performed (BCWP), and
* A valuation of actual work performed or Actual Cost (***AC***) or Actual Cost of Work Performed (ACWP)

EV Formula

$$EV = \sum_{\text{Start}}^{\text{Current}} PV(\text{Completed})$$

Your History with EVM…

- Do you use Earned Value Management in your projects?
- Do you use it for all the projects or certain selected projects?
  - ✓ Project duration in months
  - ✓ Average team size
- What benefits have you seen by using EVM in your projects?
- What are your top 2 challenges to implement EVM?

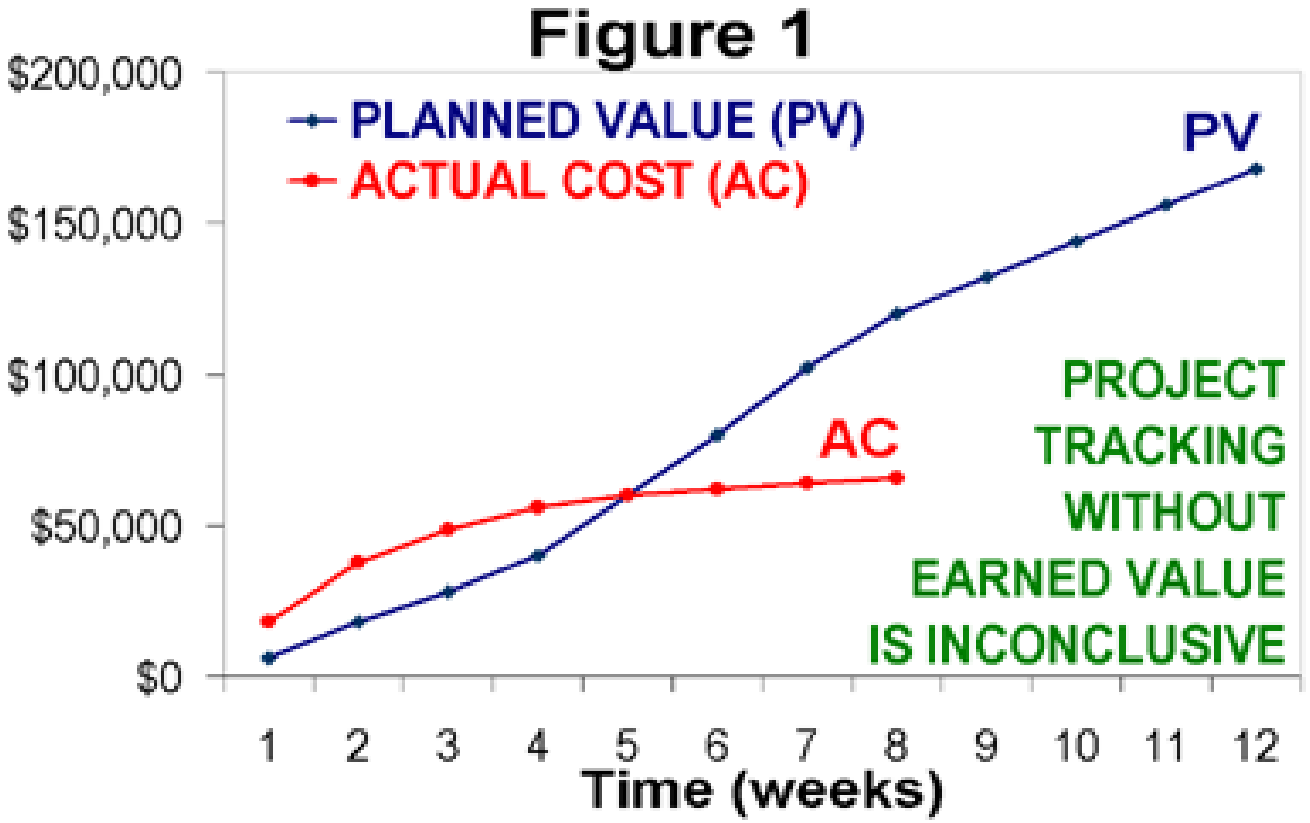
EVM Advantage

* EVM has the ability to combine measurements of scope, schedule and cost in a single integrated system.

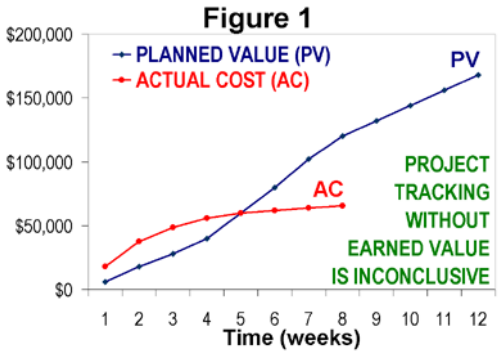
* EVM is notable for its ability to provide accurate forecasts of project performance problems.

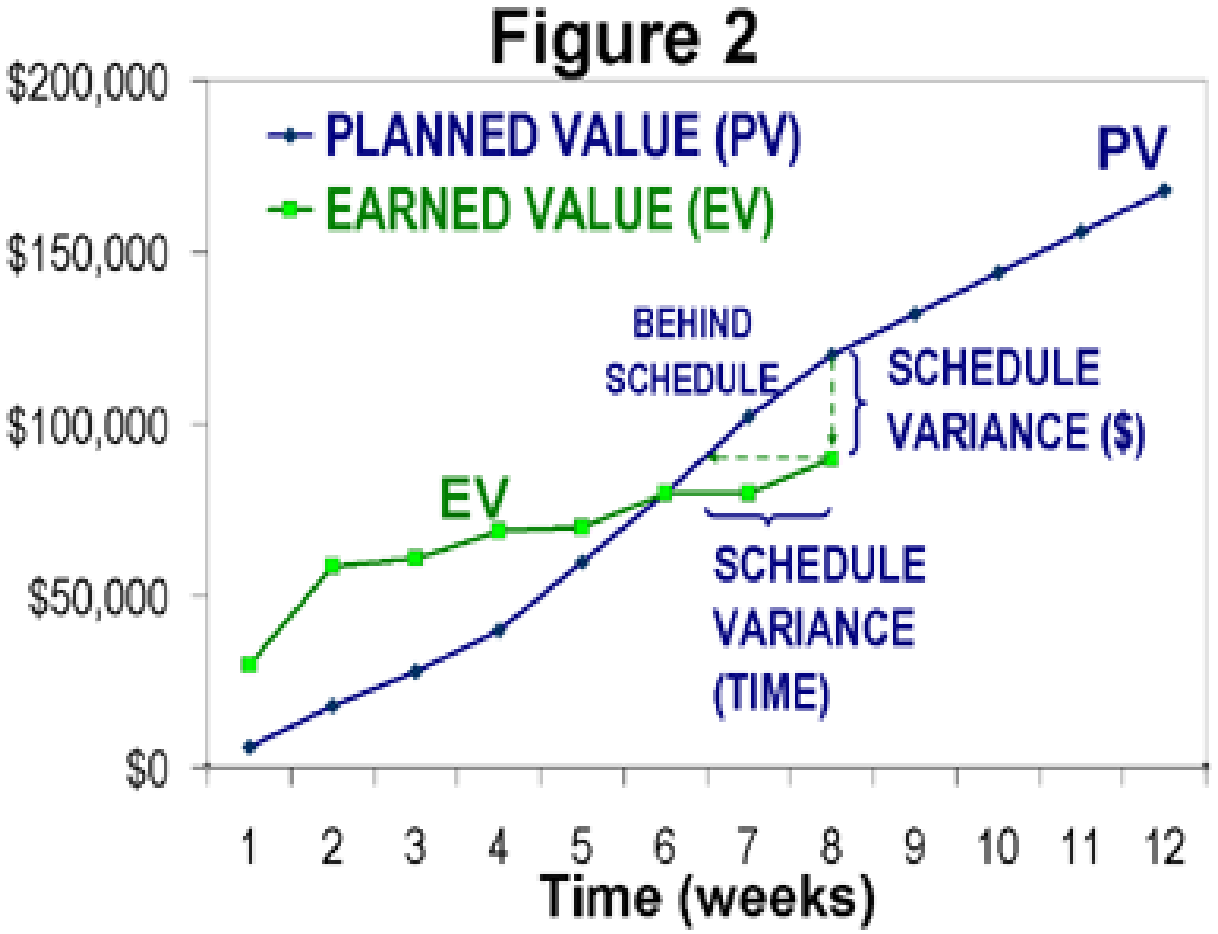
* Since EVM is a graphical tool, PMs can use it to facilitate communication at the team or executive level.

Project tracking without EV

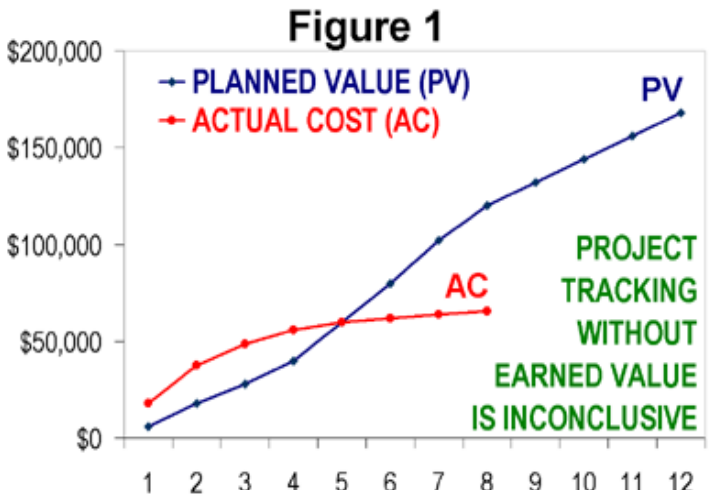


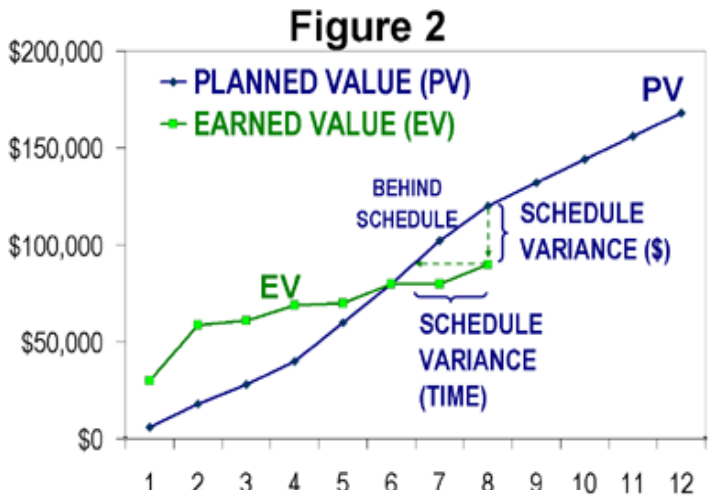
Project tracking without & with EV

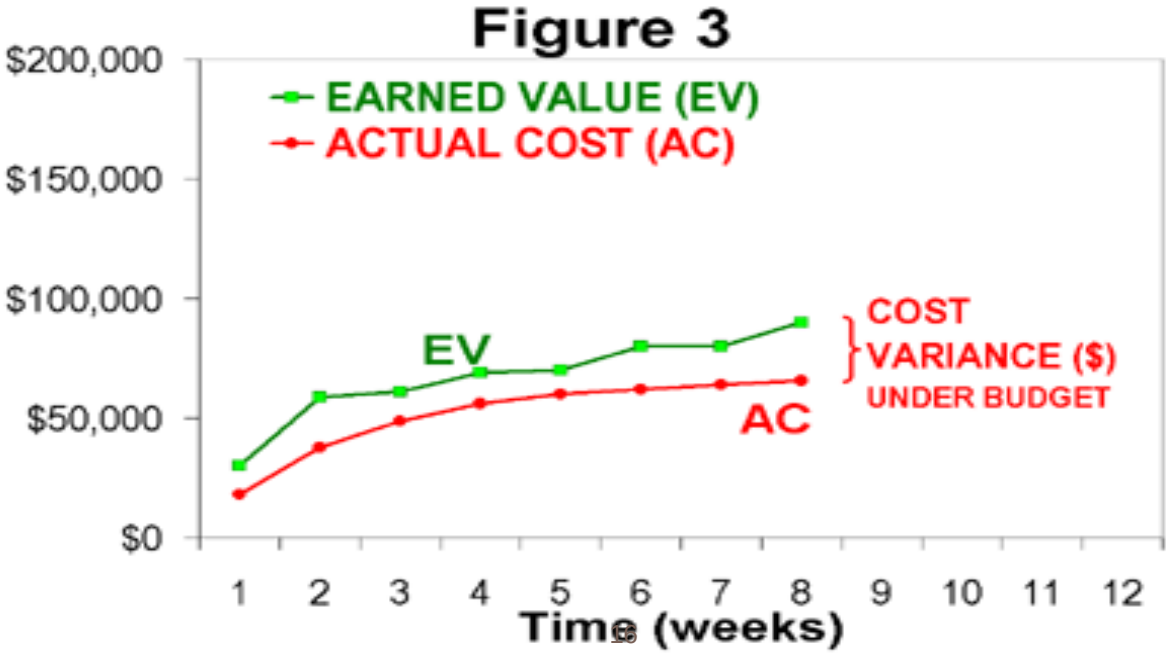




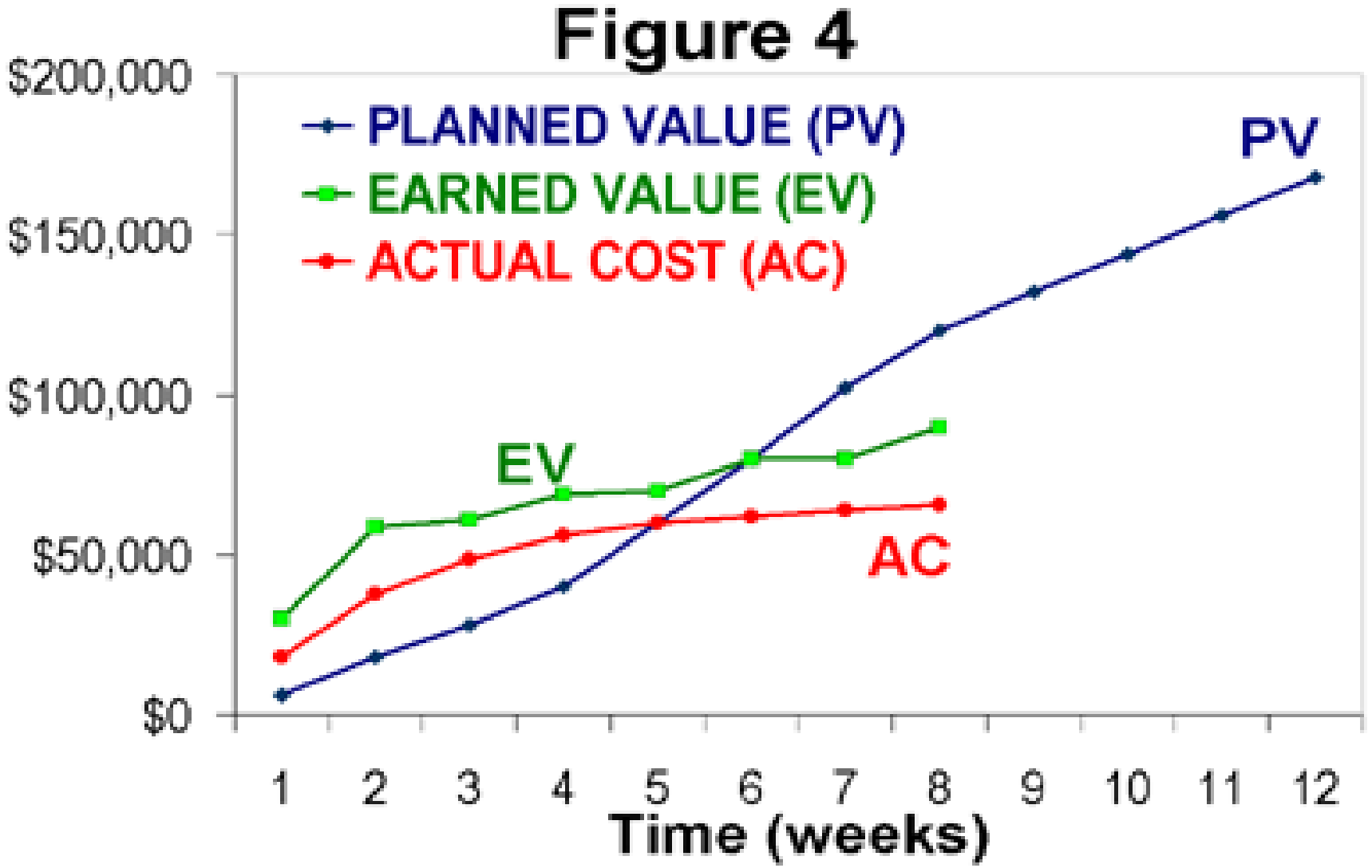
Project tracking without & with EV







Project tracking with full EVM



EVM Metrics for Past Performance

Metric	Description
Planned Value (PV)	Value planned for work to be performed
Earned Value (EV)	Value earned for work performed
Actual Cost (AC)	Cost of work performed
Cost Variance (CV)	Difference between earned value, actual cost
Cost Performance Index (CPI)	Value earned per dollar spent
Schedule Variance (SV)	Difference between planned, earned value
Schedule Performance Index (SPI)	Value earned per day spent

EVM Metrics for Forecasting

Metric	Description
Budget At Completion (BAC)	Value planned for the sum of work
Estimate At Completion (EAC)	Estimated cost of sum of work
Variance at Completion (VAC)	Difference between BAC, EAC
Estimate to Completion (ETC)	Cost of completing the project
To-Complete Performance Index (TCPI)	Efficiency needed to finish work

Basic Measures

- Planned Value (***PV***)
  - ✓ Comes from the plan
  - ✓ WBS, Schedule/.mpp, or wherever plan is stored)

- Actual Cost (***AC***)
  - ✓ Comes from where actual values are stored
  - ✓ .mpp or Time Tracking Tool

- Earned Value (***EV***)
  - ✓ Derived based on Earning Rules

Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

EVM Formulas

* Variances - *a positive # is better*
  - ✓ Always involves EV minus something
  - ✓ Schedule Variance (SV) = EV-PV
  - ✓ Cost Variance (CV) = EV-AC

* Performance Indices – *a # more than 1 is better*
  - ✓ Always involves EV divided by something
  - ✓ Schedule Performance Index (SPI) = EV/PV
    - *For each day spent, how much is project earning?*
  - ✓ Cost Performance Index (CPI) = EV/AC
    - *For each dollar spent, how much is project earning?*

Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

Forecasting

* Estimate to Complete (ETC)
  - ✓ ETC = EAC – AC
    - *Or bottom-up re-estimation*
    - *What will it cost to complete remaining work?*

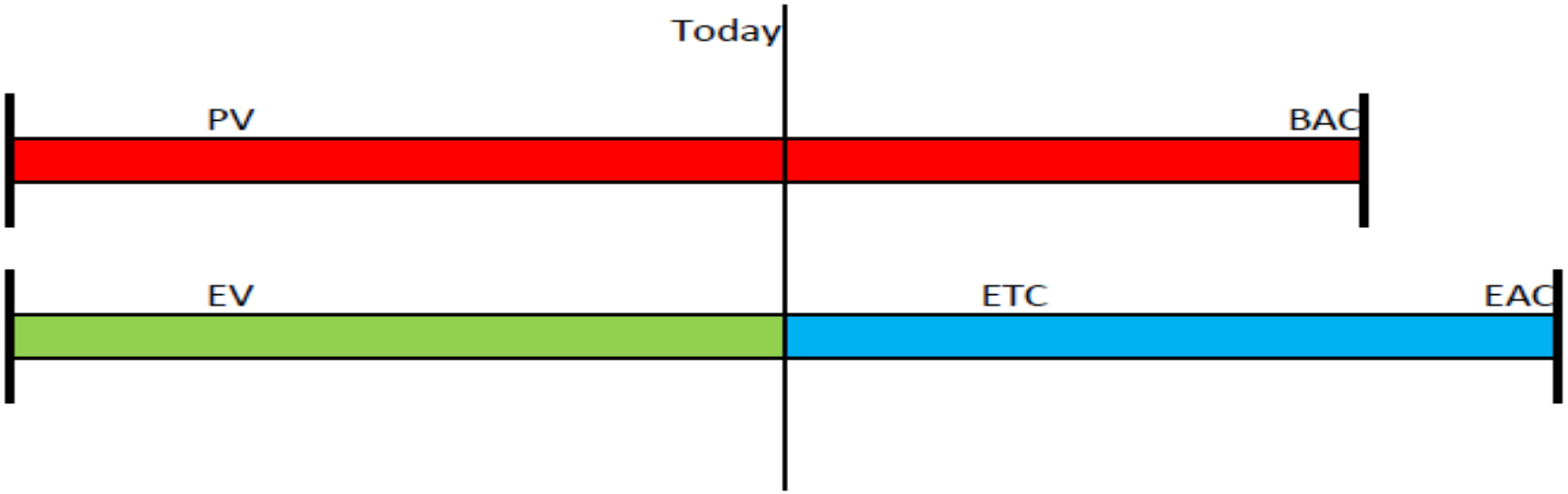
* Variance at Completion (VAC)
  - ✓ VAC = BAC – EAC
    - *How far over/under budget will we be at the end?*

* Estimate at Completion (EAC)
    - *What will it cost to complete the project?*
    - *Several calculations can be used for statistical (independent) EAC*

Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

Forecasting

* Using earned value analysis, team can forecast performance.
* Estimate at completion (**EAC**) may now differ from Budget at Completion **(BAC**)



Calculating EAC

* Factors influencing how to calculate EAC

✓ Is the initial plan still valid?

- *If not, bottom-up estimation is required – use analytical EAC*
- *Add AC to a bottom-up re-estimation of ETC*

✓ Is CPI expected to remain constant?

- *If yes, then use EAC = BAC/CPI*
- *With constant CPI, BAC can be used to estimate EAC*

✓ Is there a planned rate for future work?

- *If yes, use EAC = AC + BAC – EV*
- *With a planned rate, EV can be subtracted from current BAC and added to AC*

✓ Will both CPI and SPI be involved?

- *If yes, use EAC = AC + [(BAC-EV)/(CPI x SPI)]*
- *Same as formula for planned rate except both CPI and SPI are involved*

Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

Methods for Calculating EAC

AC = 150, BAC = 200, EV = 165; CPI 1.1, SPI 0.9; Bottom-Up ETC = 50

If	Use	Example
1. Initial plan no longer valid	EAC = AC + Bottom-Up ETC	EAC = **?**
2. CPI expected to remain constant	EAC = BAC/CPI	EAC = **?**
3. Planned rate for future work	EAC = AC + BAC – EV	EAC = **?**
4. Both CPI and SPI involved	EAC = AC + [(BAC-EV) / (CPI x SPI)]	EAC = **?**

Methods for Calculating EAC

AC = 150, BAC = 200, EV = 165; CPI 1.1, SPI 0.9; Bottom-Up ETC = 50

If	Use	Example
1. Initial plan no longer valid	EAC = AC + Bottom-Up ETC	EAC = **$200**
2. CPI expected to remain constant	EAC = BAC/CPI	EAC = **$182**
3. Planned rate for future work	EAC = AC + BAC – EV	EAC = **$185**
4. Both CPI and SPI involved	EAC = AC + [(BAC-EV) / (CPI x SPI)]	EAC = **$185**

To-Complete Performance Index (TCPI)

* Compares work to date with budget required to complete remaining work.
  - ✓ How much performance is needed to achieve the plan?
  - ✓ Greater than 1 means harder to complete
  - ✓ Less than 1 means easier to complete

* **TCPI for EAC = (BAC-EV)/(EAC-AC)**
  - ✓ Efficiency needed to maintain current EAC

* **TCPI for BAC = (BAC-EV)/(BAC-AC)**
  - ✓ Efficiency needed to maintain current plan

Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

TCPI Exercise

Assume BAC is 200, EV is 100, EAC is 225, AC is 110.

TCPI for EAC = ?

TCPI for BAC = ?

TCPI Exercise

Assume BAC is 200, EV is 100, EAC is 225, AC is 110.

TCPI for EAC = 0.87

TCPI for BAC = 1.11

Using TCPI

* Best compared with CPI
  - ✓ If TCPI > CPI, EAC or BAC may be understated
  - ✓ If TCPI < CPI, endpoint may be overstated

Basic question answered by TCPI:

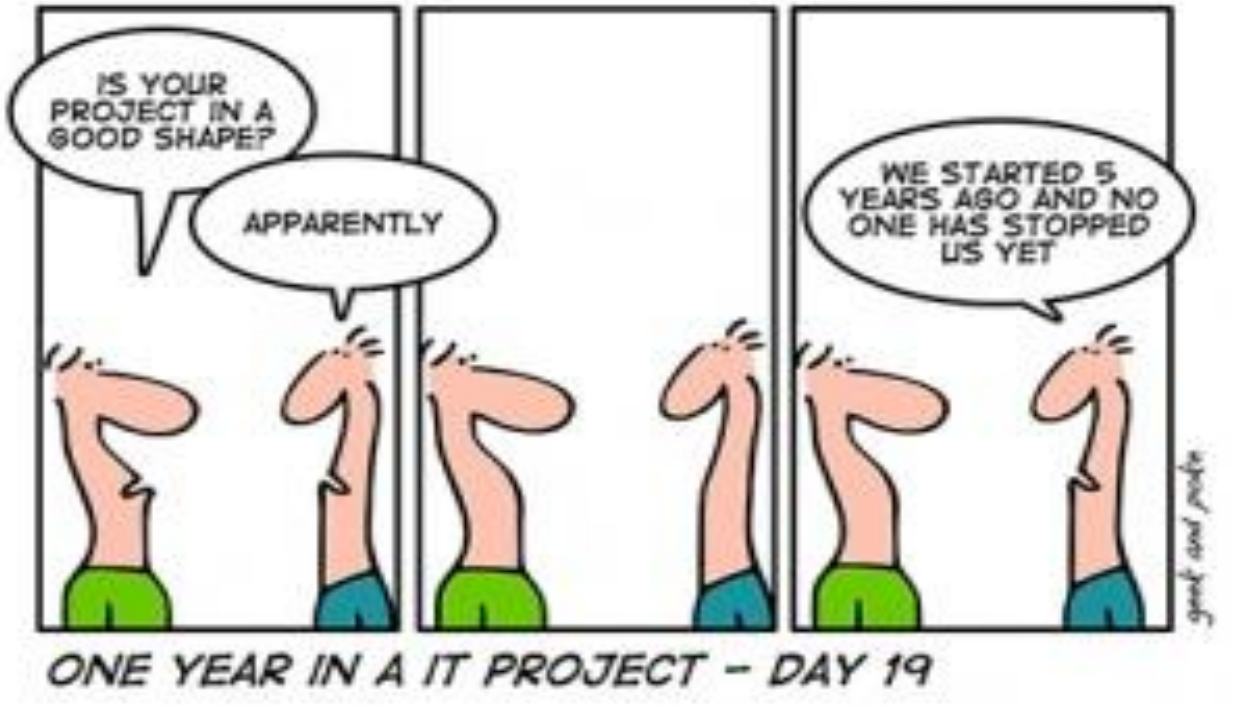
How efficient must we be with remaining resources?

Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

EVM - Hints to remember

- **EV comes first** in every formula.
- If it's **variance**, it will be EV **minus** something.
- If it's **index**, it will be EV **divided by** something.
- If it relates to **cost,** use **Actual Cost.**
- If it relates to **schedule,** use **Planned Value.**
- Negative numbers are bad, positive ones are good.

Smooth sailing ☺



EVM Questions

1. How much additional time does it add to the set up process? Management throughout the project?
2. Typically, do you find it necessary to "sell" the owner/stakeholders on the value of EV?
3. Are you meeting resistance when the extra costs associated with implementing EVM to a project are identified?
4. Do the extra costs of implementing EVM pay off in utilizing EVM?

EVM Challenges

1. Getting Buy-in from senior management – *to invest in implementing EVM process.*

2. Planning – *EVM implementation does need you plan, and plan in good amount of details so you have planned values (PV) for each week. We all know – planning is not easy ☹*

3. Collecting actuals – *so that you have AC at the end of each week. Tracking time and cost at the granular level and doing it across the board is a kind of cultural change.*

4. Decision on Earning Rules – *that would provide the data for the earned value (EV).*

EVM Pitfalls

Pitfalls

- Lack of organizational support
- Poor project controlling policies
  - ✓ Also, poor management response based on EVM metrics
- Poor project planning
- Inappropriate cost and budget distribution over time
- Inappropriate assessment of earned value during work execution
- Data consistency issues
- Inappropriate consideration of risk management

Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

Pitfalls Continued

- Inappropriate use of EVM for forecasting cost and schedule
  - ✓ Trend analysis as forecast, i.e. if BAC is $20,000 and CPI is 0.5, project cost will double (EAC = $40,000) This is likely to be exaggerated
  - ✓ Not "the project cost will double" but "the project cost may double without intervention"
- Overreliance on tools
- Excessive data from too much disaggregation
  - ✓ The more work packages are broken down, the more variation in execution may distort numbers
- Restricting EVM to project level
  - ✓ Program and portfolio level can benefit as well

Can you think of other pitfalls?

Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

Conclusion

* EVM makes you powerful
  - ✓ Gives you the ability to measure lagging and leading metrics
  - ✓ Gives you the ability to measure scope, schedule, and resources

* Like many advanced techniques, difficult to set up
  - ✓ Output is worth the effort
  - ✓ With EVM, more tools to see what it coming

Increase your project success forecasting ability with Earned Value Management

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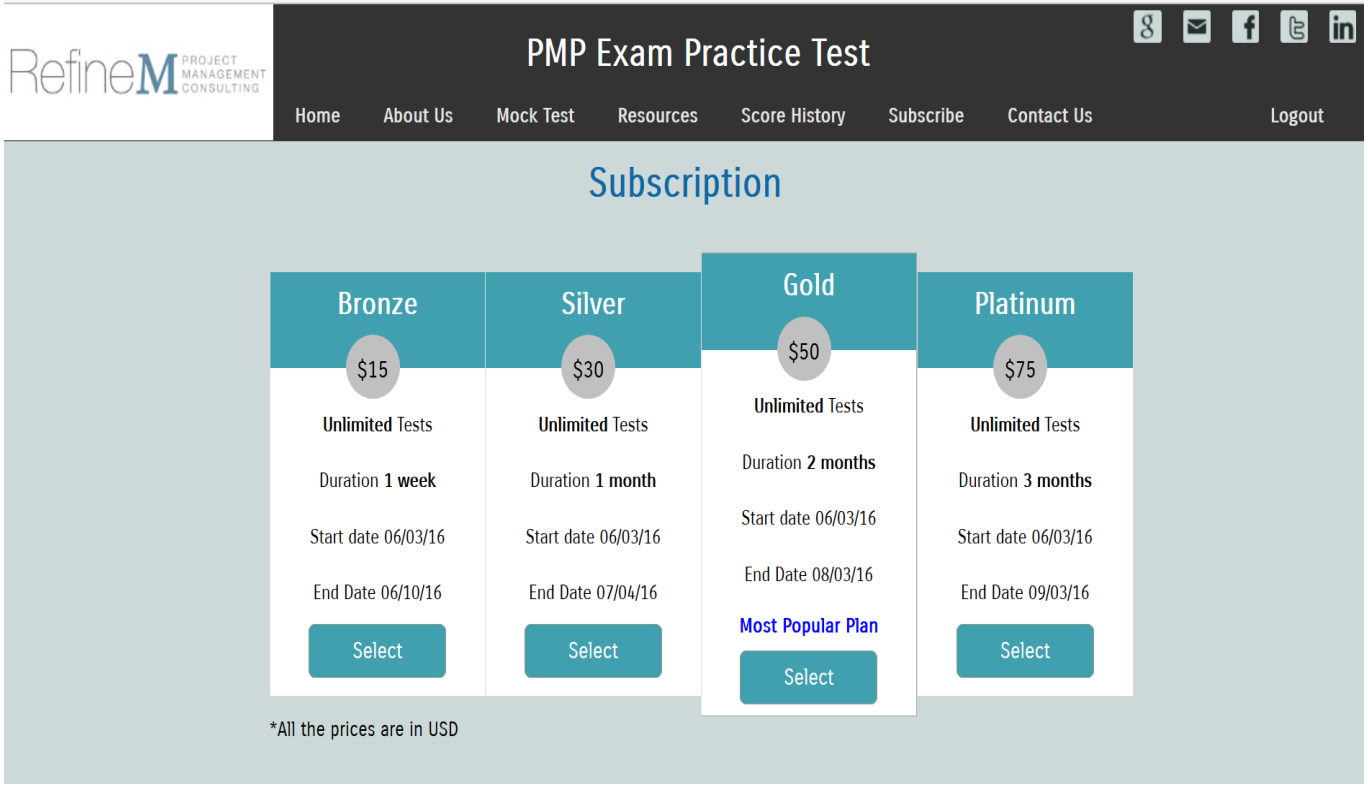

Next Lunch and Learn

* ***Advanced Risk Management Techniques***
  - ✓ How can you take your risk management to the next level?
  - ✓ Why is the risk contingency reserve important?
* ***Wednesday, July 6, 12:00-1:00 PM Central***

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4. **Activity Name:** "Performance Measurement Using Earned Value Management" *(complete this first, before you go to #5)*
5. **Provider:** "RefineM LLC" *(don't select dropdowns)*
6. **Date started:** June 1, 2016
7. **Date completed:** June 1, 2016
8. **Contact person:** NK Shrivastava
9. **Contact phone:** (417) 763-6762
10. **Contact email:** Trainings@RefineM.com
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* Anyone who attends 3 Lunch and Learn Webinars in a row is a Star Attendee and is eligible for a prize drawing for a $10 Amazon gift card.

This month's winner is:
Tim A.

Congratulations to the winner!

Stay tuned for our next drawing in July.

Questions?

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Leadership Skills for Project Managers	Aug 31*	Oct 06*	Nov 16	
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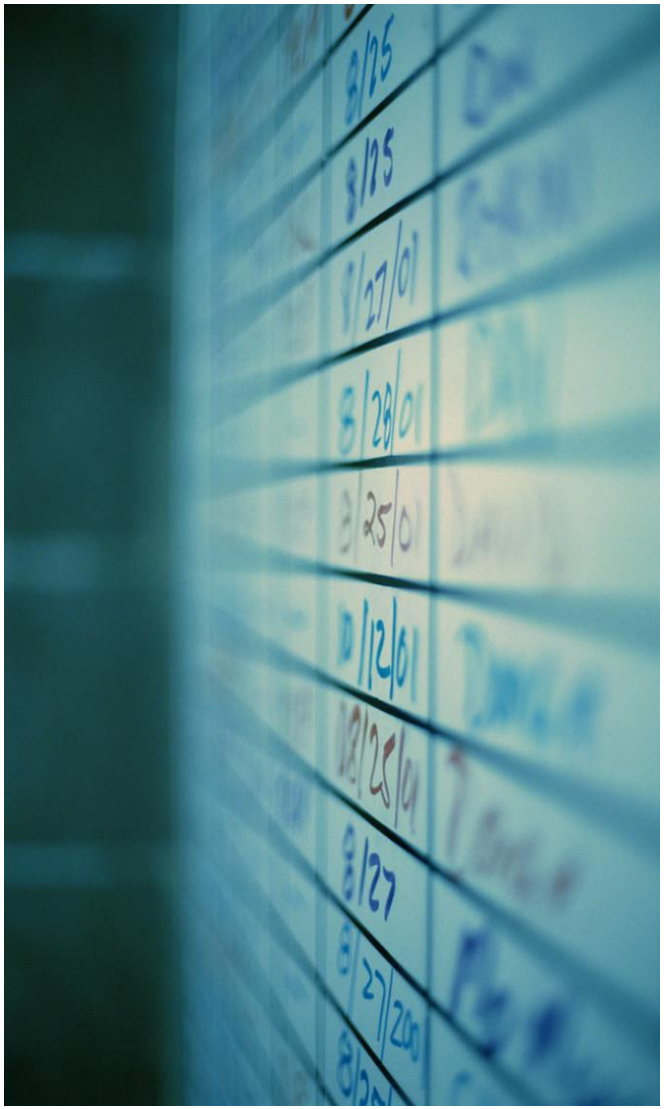
Earned Value Framework

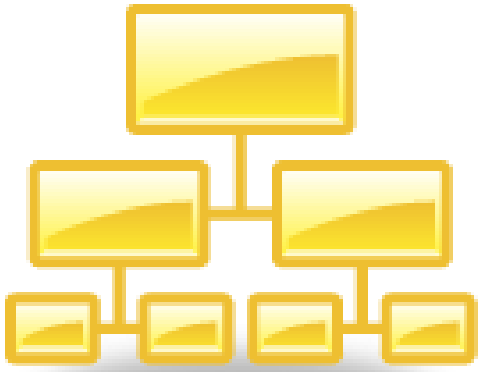


1. Organize Project
2. Assign Responsibility
3. Develop Schedule
4. Establish Budget
5. Determine Measurement Method
6. Establish Performance Measurement Baseline (PMB)
7. Analyze Performance
8. Maintain PMB

Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

1. Organize Project

* Describe project and products, develop work packages
* Goals: *Determine scope and establish work packages*
* Inputs: Project Charter, Requirements Documentation
* Outputs: Scope Management Plan, Scope Baseline (WBS)



Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

2. Assign Responsibility

- Determine managers of EVM process and control accounts
- Goals:
  - ✓ *Establish project's organizational structure*
  - ✓ *Establish roles and responsibilities*
- Inputs: Scope Baseline
- Outputs:
  - ✓ Organizational Breakdown Structure (OBS)
  - ✓ Responsibility Assignment Matrix (RAM)

Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

3. Develop Schedule

* Determine activities from work packages
* Sequence activities into time-phased execution model
* Goal: *Develop schedule aligned with WBS and budget*
* Inputs: Scope Baseline, Resource information
* Output: Integrated Master Schedule, aligned with WBS

Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

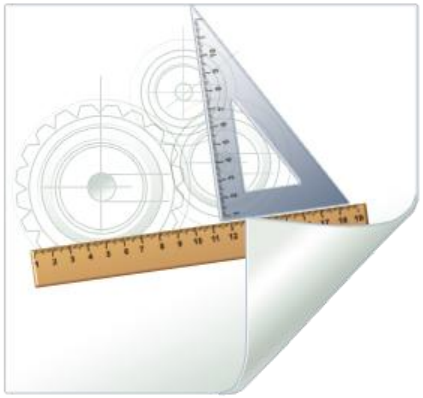
4. Establish Budget

* Convert requirements and constraints to a cost budget
* Goal:
  - ✓ *Develop budget aligned with schedule, scope to track EVM*
* Inputs: Project Charter, RAM, Schedule Baseline
* Outputs: Project Budget, Funding Requirements

Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

5. Determine Measurement Methods

* Select methods for measuring earned value
* Goal:
  - ✓ Produce methods for objective, accurate, and timely measurements
* Inputs: Scope Baseline, Schedule, Project Budget
* Outputs: Performance Measurement Methods



Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

5.1 Types of Effort and Methods

Type	Description	Methods
Discrete	• Defined start and end • Tangible output	• Fixed Formula • Weighted Milestone • Percent Complete • Physical Units
Apportioned	• Support for discrete tasks • i.e. inspection	Percent complete
Level-of-effort (LOE)	• Ongoing work • No tangible output • i.e. PM	EV earned with PV

Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

6. Establish PMB

- Performance Measurement Baseline (PMB)
  - ✓ Scope Baseline
  - ✓ Cost Baseline
  - ✓ Schedule Baseline
  - ✓ Undistributed and Distributed Budget
  - ✓ Contingency Reserve (for risks and other situations)
- Goal: *Develop basis for project monitoring and control*
- Inputs: Scope Baseline, Schedule, Budget, Risk Register
- Outputs: Performance Measurement Baseline

Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

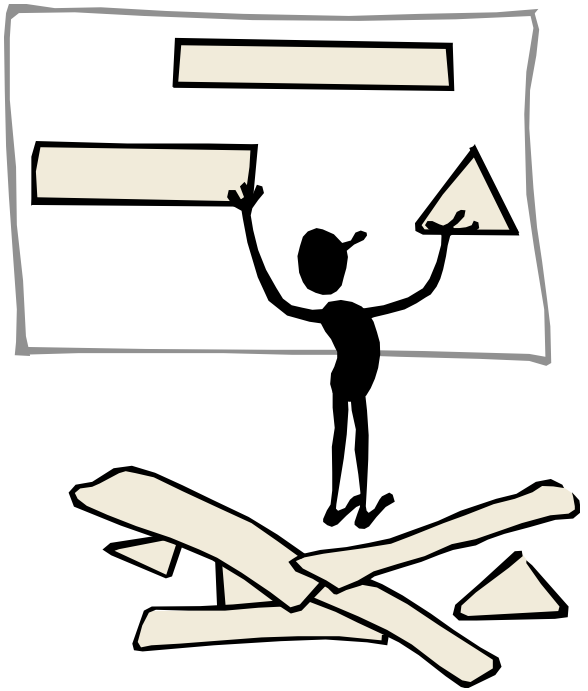
7. Analyze Performance

- Gather earned value information as project progresses
- Goals:
  - ✓ Produce metrics to gauge past, present, future performance
  - ✓ Practice "management by exception"
    - Focus on execution, control only when needed
- Inputs: PM Plan, Work Performance Information
- Outputs: Forecasts / trends, Corrective / preventive actions

Source: PMI's Practice Standard for Earned Value Management (Second Edition), 2011, Project Management Institute.

8. Maintain PMB

* Manage PMB through inevitable scope changes
* Goals: Deal with changes to the project
* Inputs: PM Plan, PMB, Change Requests, Change Control
* Outputs: Updates to PM Plan, PMB, Change Requests



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