Governing and Leading Projects using Earned Value Management (EVM)

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https://mosaicprojects.com.au/PMKI-SCH.php

EV - Definition

- Earned value management is a structured method used to provide a performance measurement system for the review of past, and to forecast future, performance

- Performance includes managing scope, time and cost in an integrated framework
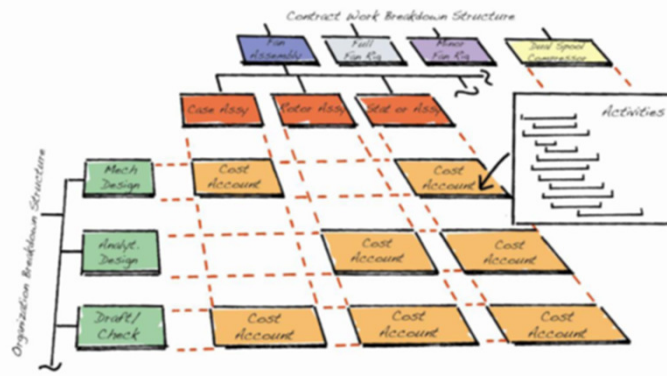
EV - The Key Requirements

1. The project decomposed into management cells using an effective **WBS**

2. An effective *schedule* linked to the **WBS**

3. An effective *cost plan* linked to the **WBS**

4. Management authority and responsibility linked to the **WBS**

WBS = Work Breakdown Structure:
https://mosaicprojects.com.au/WhitePapers/WP1011_WBS.pdf

The Key Requirement

- **Effective EVM operates at the work package level**

EV - The Key Requirements

- EV operates at the Work Package level
  - A manager is responsible for delivering a defined product or service
  - The value and duration of the WP are significant
  - The span of responsibility covers many related
    - Schedule activities
    - Cost plan 'line items'
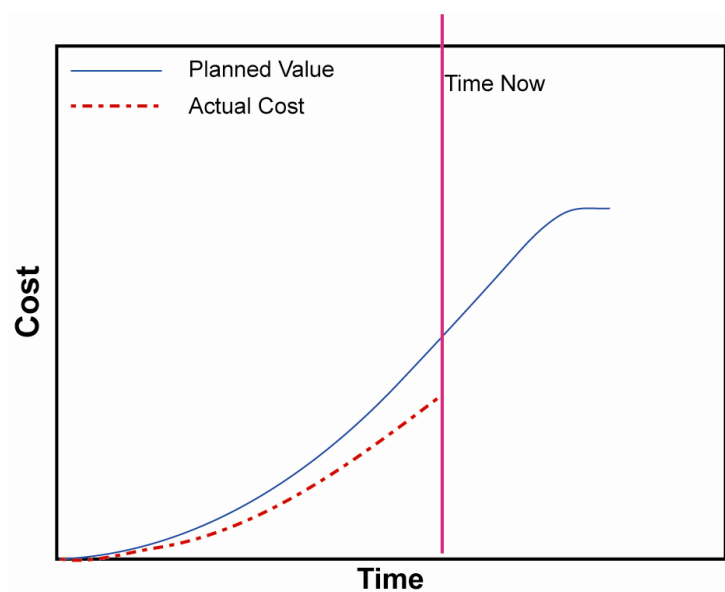
Overview of Earned Value

- The foundation is a time phased budget
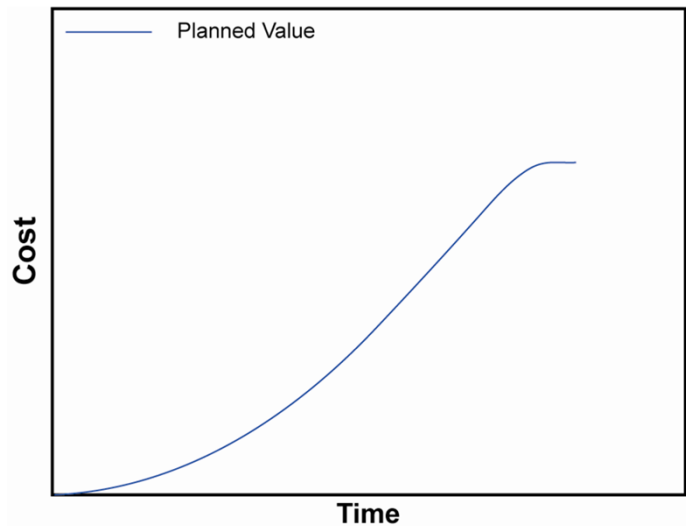
Overview of Earned Value

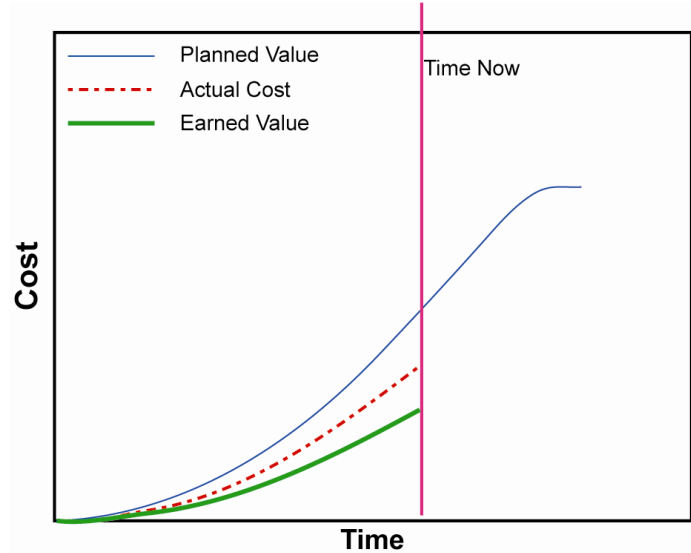- Measuring actual costs adds little extra value

  Is this project profitable or behind schedule?

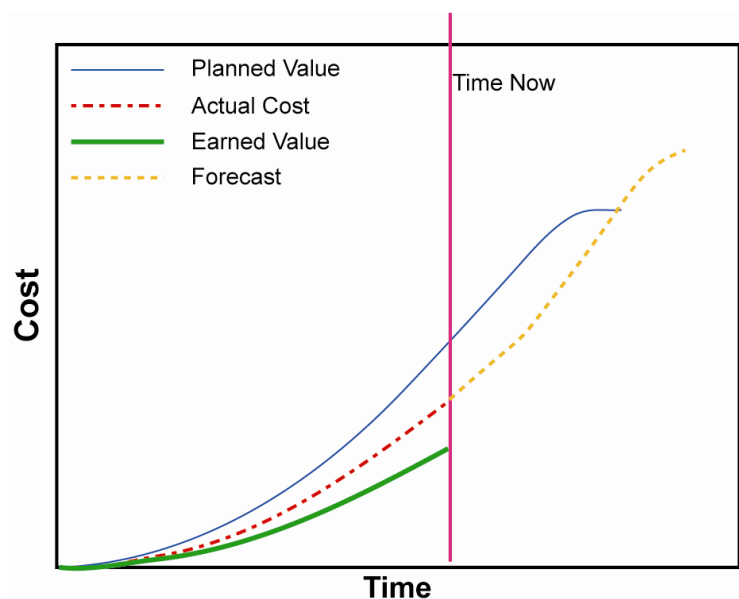# Overview of Earned Value

- Earned value measures what has been accomplished to highlight the real situation

This project is losing money and behind schedule!

Overview of Earned Value

- EVM also calculates the forecast to completion based on the performance to date

AS 4817/ISO 21508

- Earned Value Performance Management requires:
  - Knowing what work is to be done, by whom & when
  - Applying objective measures of progress
  - Reporting significant deviations
  - Planning and implementing corrective actions
 - Forecasting completion costs and dates*
  - Managing changes

  * Using Earned Schedule

ISO 21508

- Describes how to accomplish this in 11 steps

  1. Decompose the Project Scope
  2. Assign Responsibility
  3. Schedule the Work
  4. Develop Time-Phased Budget
  5. Assign Objective Measures of Performance
  6. Set the Performance Measurement Baseline (PMB)
  7. Authorize and Perform the Work
  8. Accumulate & Report Performance Data
  9. Analyze Project Performance Data
  10. Take Management Action
 11. Maintain the Baseline

ISO 21508

The 11 Step Work Flow from AS4817-2003
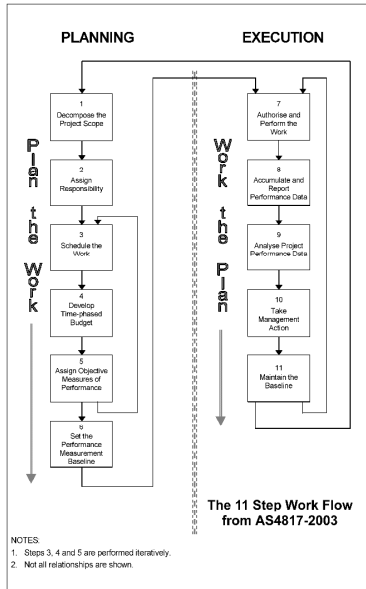
These 11 steps are consistent across:

AS 4817 2003   The original Australian Standard

AS 4817 2006   The updated Australian Standard

ISO 21508 2018 International standard.

AS 4817 2019   Australian adoption of ISO 21508 with modifications*.

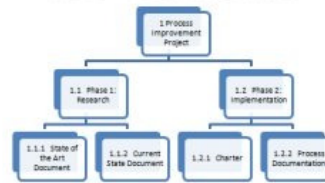* Modification incorporated a normative annex for use in commercial contracts.

ISO 21508

- Steps 1 through 6 create the plan and set the 'performance management baseline' (PMB) for the project

The 11 Step Work Flow from AS4817-2003
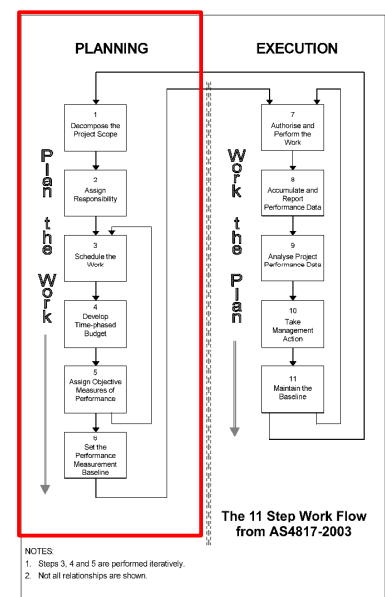
Step 1: Decompose the Project Scope

- Decompose via WBS
- WBS includes all work (100% rule)
- Scope of items mutually exclusive
- Lowest level Work Packages or Planning Packages*
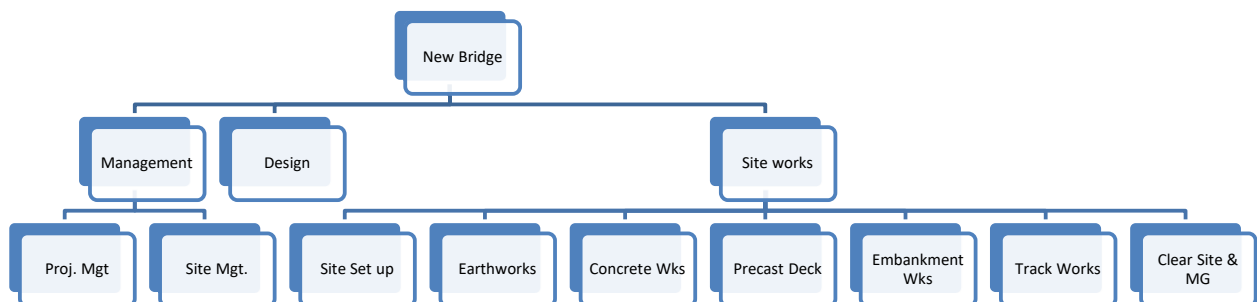
WBS – Chart Format

```
                1 PROCESS
                Improvement
                  Project

       1.1 Phase 1:          1.2 Phase 2:
         Research            Implementation

  1.1.1 State of   1.1.2 Current    1.2.1 Charter   1.2.2 Process
    the Art         State Document                  Documentation
    Document
```

WBS – Outline Format

1	Process Improvement Project
1.1	Phase 1: Research
1.1.1	State of the Art Document
1.1.2	Current State Document
1.2	Phase 2: Implementation
1.2.1	Charter
1.2.2	Process Documentation

* Planning packages are expanded into work packages later

Step 1: Decompose the Project Scope

New Rail Bridge – WBS

```
                              New Bridge

   Management         Design                      Site works

 Proj. Mgt  Site Mgt.   Site Set up  Earthworks  Concrete Wks  Precast Deck  Embankment   Track Works  Clear Site &
                                                                   Wks                        MG
```

For more on the **WBS** see:
https://www.mosaicprojects.com.au/WhitePapers/WP1011_WBS.pdf

Also: ISO 21511 Work breakdown structures for project and programme management

Step 1: Decompose the Project Scope

- **Every WBS element creates a set of defined deliverables**

New Rail Bridge – Work Packages

Project management & overheads

Design & Approvals	Site set up	Site management & services					Clear Site & Make Good
		Earth works	Concrete piers & walls	Manfr. & Install PC Bridge Deck	Emban-kment works	Track works	
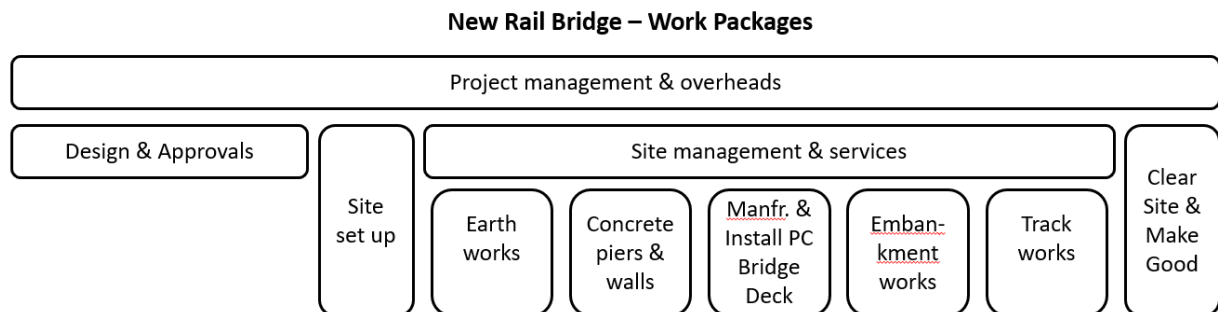
Step 2: Assign Responsibility

- Responsibility assigned to a person for
  - Each element of the WBS
  - The overall project
- Responsibility clearly defined
- Internal managers assigned to oversee external work

Step 3: Schedule the Work

- Schedule activities fit below work packages
- Key interfaces and constraints are defined
- Sequences and interdependencies
- Schedule planned, developed and managed
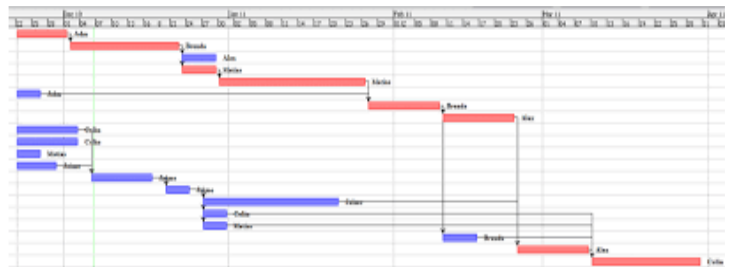
Step 4: Develop Time-Phased Budget

- Budgets assigned in measurable units ($) to:
  - Work Packages
  - Planning Packages
- Management Reserve & Undistributed Budget identified and recorded
- Reconcile to Project Budget

Step 5: Assign Objective Measures of Performance

- Accomplishment expressed as EV

- Objective performance measures set

- 1 measure per Work Package

- Progress and costs accumulated in same way

- EV at 100% complete = budget

Step 6: Set the Performance Measurement Baseline (PMB)

- Scope clearly identified and recorded

- Schedule clearly identified and recorded

- Budget clearly identified and recorded

- Scope, schedule, budget formally approved

- PMB* becomes a controlled document

* Performance Measurement Baseline

Setting the PMB
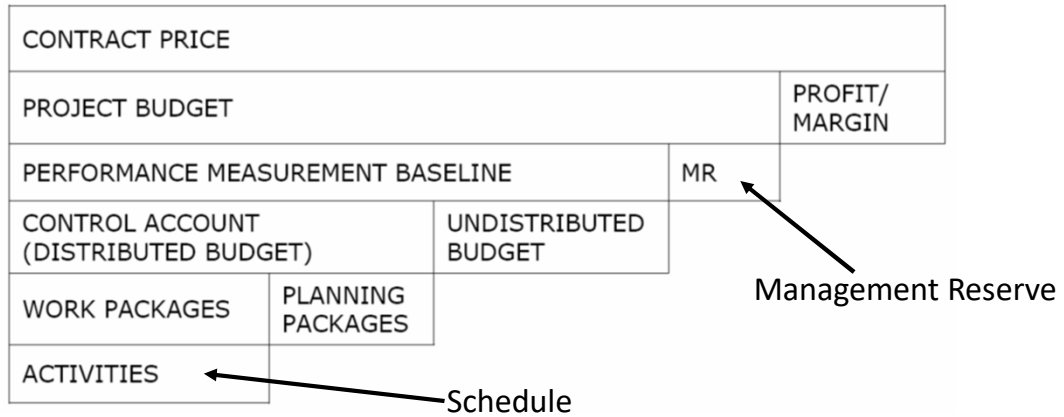
- Components of the
Performance Management Baseline

ISO 21508

- Steps 7 through 11 manage
the work of the project to
achieve the PMB

- These steps are repeated
each month (project
update) or as needed
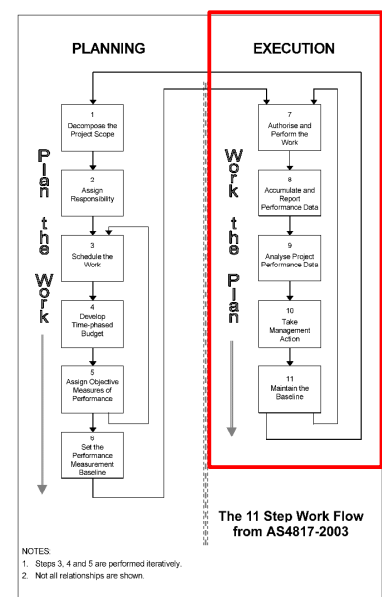
Step 7: Authorise and Perform the Work

- Source of authority clearly defined
- Work planned before authorized
- Work authorized as planned
- Responsibility and measures clearly identified as part of authorization

Step 8: Accumulate & Report Performance Data

- Data accumulated consistently and periodically
  - Progress measured and accumulated (Earned Value)
  - Actual costs accumulated (including accruals)
  - Schedule performance measured
- Variances compared to the PMB identified
- Responsible manager informed (CAM)

Step 9 – Analyse Project Performance Data

- Schedule progress and forecasts compared with baseline:
  - Earned Value compared with Planned Value
  - Earned Value compared with Actual Costs
- Variance analyzed – corrective actions proposed
- EACs* generated and compared to budget

  * Estimate At Completion

Analysing Performance Data
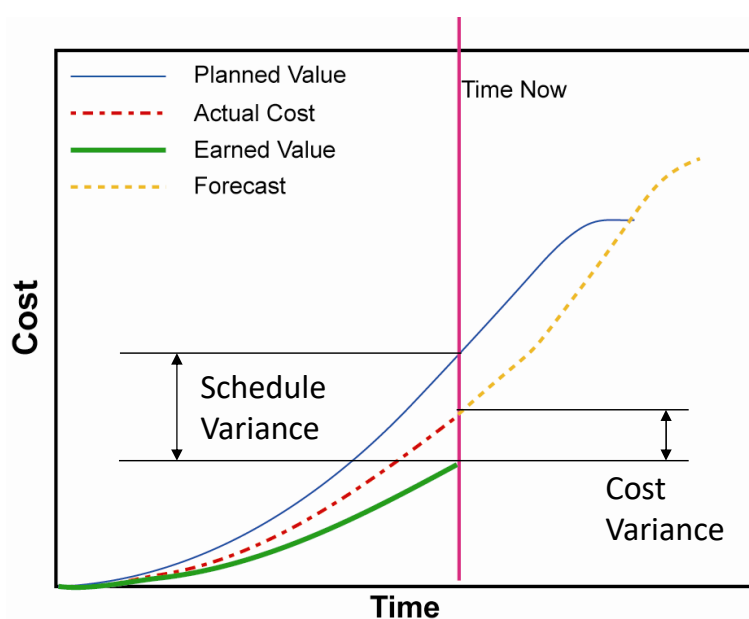
- The two variances offer 9 possible combinations

Analysing Performance Data

Performance Measures		Schedule		
		SV > 0 & SPI > 1.0	SV = 0 & SPI = 1.0	SV < 0 & SPI < 1.67
Cost	CV > 0 & CPI > 1.0	Ahead of Schedule Under Budget	On Schedule Under Budget	Behind Schedule Under Budget
	CV = 0 & CPI = 1.0	Ahead of Schedule On Budget	On Schedule On Budget	Behind Schedule On Budget
	CV < 0 & CPI < 1.0	Ahead of Schedule Over Budget	On Schedule Over Budget	Behind Schedule Over Budget

- The responsible manager needs to explain
  - What caused the variance
  - What is being done about the variance

Analysing Performance Data

- The big picture is not enough:

We are looking good

For more detail on this project see:
https://mosaicprojects.com.au/Mag_Articles/AA015_Practical_EVM.pdf

Analysing Performance Data

- ## The big picture is not enough:

For more detail on this project see:
https://mosaicprojects.com.au/Mag_Articles/AA015_Practical_EVM.pdf

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Analysing Performance Data

- ## For each Work Package and Control account:
  - ### **What's** occurred is easy
  - ### **Why** is harder
  - ### **What** can be done about it requires skill
- ## **Focus on what matters!**

Analysing Performance Data

- For each Work Package and Control account:
  - What is easy
  - W̶h̶
  - ̶d̶o̶n̶e̶ about
  - ̶r̶equires skill
- **Focus on what matters!**

The trend is your friend

Step 10 – Management Action

- Corrective actions developed & implemented

- Preventative actions developed & implemented

- Forecasts may be revised based on actions

- No retroactive changes to performance data

- Corrective & preventative actions monitored for effectiveness

Step 11 – Maintain the Baseline

- Baseline changes are authorized, controlled, and approved
  - changes to scope, schedule, budget baselines
- Changes are documented and traceable
- No retroactive changes to plan

It's All In The Numbers

- The complete picture is needed for effective governance and control

Traditional EVM cannot predict time slippage
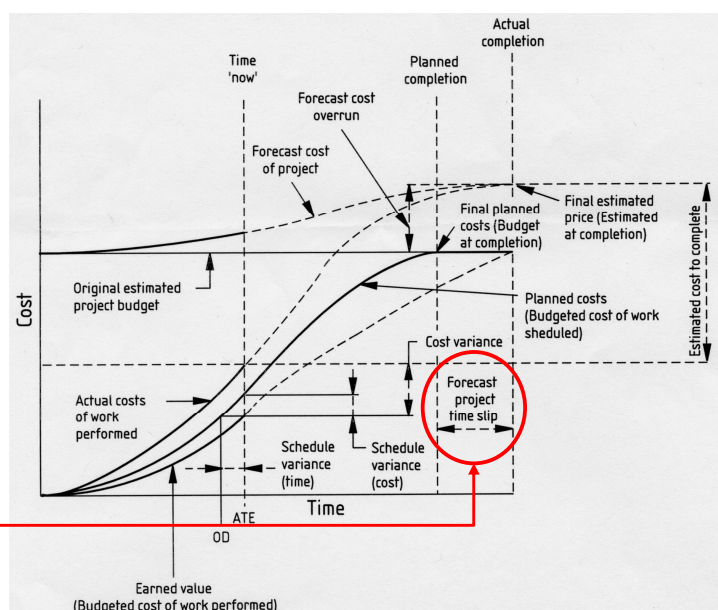
Earned Schedule

- Earned Schedule predicts time outcomes based on performance
- As accurate as EV
- Uses the same data as EV
- Is freely available from:
  http://www.earnedschedule.com
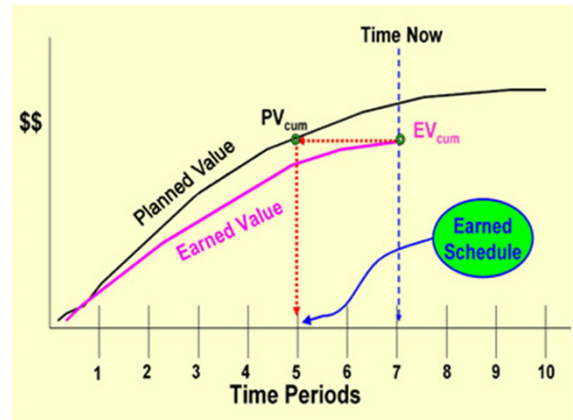
Uncertainty / Risk

- There is no such thing as a 'risk free project'
- Every estimate is uncertain
- Every process has a degree of variability
- **Successful projects manage risk and uncertainty**

Uncertainty / Risk

- Profit margin creates organizational resilience
- Management reserves are held outside of the PMB for unforeseen issues
- Contingencies are calculated for identified risks and managed within the PMB

Reporting Options

Data is not information, information is not knowledge, knowledge is not understanding, understanding is not wisdom.

Clifford Stoll

Effective reporting gets you to 'information' and helps with 'understanding'

Reporting Options

- Elegant report development is a art!

- KISS - Less is better

- Consistency is critical

- For more on communication see:
  https://mosaicprojects.com.au/PMKI-PBK-040.php

Reporting Options

Which map is more useful
If you are looking for the Dojo

Summary

- Everyone can tell a project is late after it finishes late

- Ditto cost overruns

- Generally time issues manifest before cost issues (SV or schedule)

TfL Rail Class 345
Future Crossrail / Elizabeth Line
Ride from Liverpool St. to Stratford
(2018.05.10) - by Herb Fong

3½ years late, £4 Billion over budget
Reporting on-time and-on budget 4 months
before original opening date ☹

Summary

- Project control systems focus on finding problems early

  - But human nature wants to avoid problems

- Management is responsible for making sure they are fixed

- This requires a rigorous controls system

Summary

- EVM cannot 'control the future'
- **Neither can contracts**
(*but this does not stop lawyers trying*)
- The EVMS need to be designed:
  – To optimise the method of working and coordinate the work of the teams
  – As an effective communication tool!

Summary

- The organisations governance system is responsible for:
  – Requiring management to establish and fund a robust project controls system
  – Ensuring management are skilled in the use of controls information
  – Requiring accurate project performance information

Invaluable Resources

- **GAO COST ESTIMATING AND ASSESSMENT GUIDE**
  GAO-20-195G
  Published: March, 2020
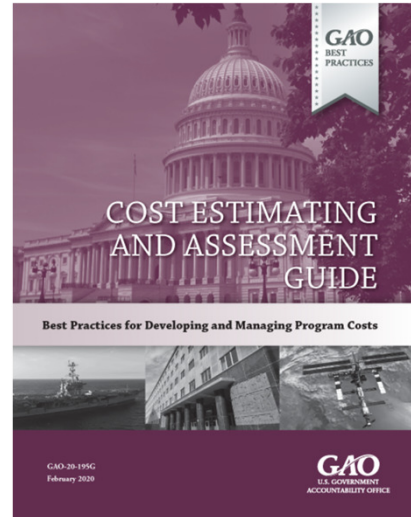
Free to download & use

Invaluable Resources

- **GAO SCHEDULE ASSESSMENT GUIDE: Best Practices for Project Schedules**
  GAO-16-89G
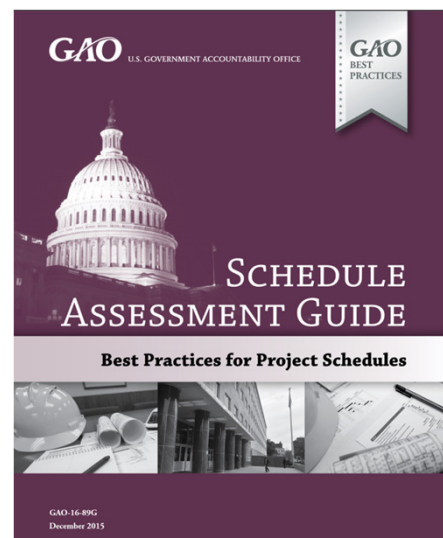 Published: Dec 22, 2015

Free to download & use

Invaluable Resources

- ISO 21508: Earned value management in project and programme management
  - Australian adoption pending
  - Modified to include normative appendix
- ISO 21511: Work breakdown structures for project and programme management

Invaluable Resources

- Mosaic EVM links:
  https://mosaicprojects.com.au/PMKI-SCH-040.php
- Mosaic Scheduling links:
  https://mosaicprojects.com.au/PMKI-SCH-010.php
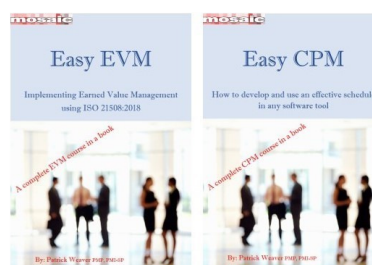
Conclusions

- EVM provides the framework for an effective project management and governance system
- It is flexible in the **how** of is structure and implementation (work packages)
- It is rigorous in the **what** of measurement, visibility and accountability
- **Predicts cost outcomes accurately**

Conclusions

- CPM* is good for motivation and direction
    - Assumes future work will go as planned
- Monte Carlo can calculate contingencies
- Earned Schedule can predict likely schedule outcomes based on performance
    - But cannot be used as a 'control' tool

*Critical Path Method schedule

Conclusions

- All four are needed for a full understanding of the current situation
  - Monte Carlo to understand uncertainty
  - CPM to direct and plan use of resources
  - EVM (cost) to predict and <u>manage</u> cost outcomes
  - ES to predict time outcomes

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Questions??

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https://mosaicprojects.com.au/PMKI-SCH.php