An Overview of Earned Value Management

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The Key Elements

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**
5. **Effective EVM needs ‘work packages’**

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Overview of Earned Value

- Earned Value Performance Management
  - What work, by whom & when
  - Realistic resources
  - Objective measurement of progress
  - Report significant deviations
  - Forecast completion dates/costs
  - Plan/implement corrective actions
  - Manage changes

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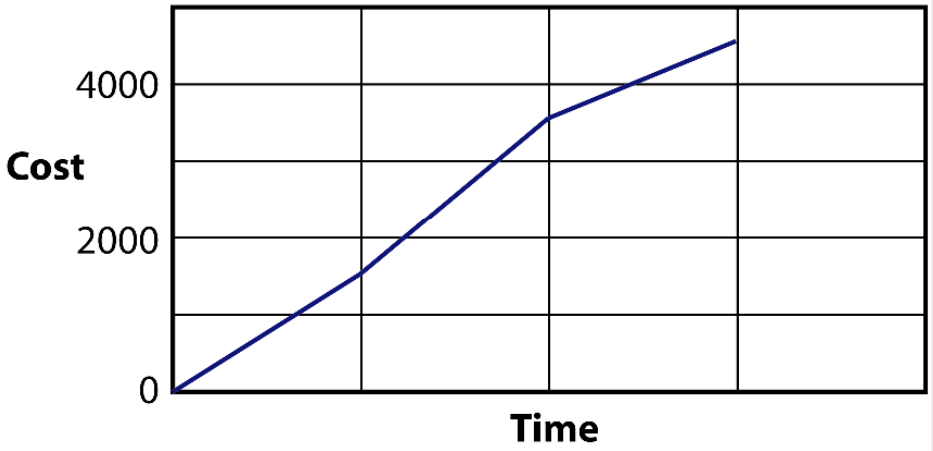
Overview of Earned Value

Write Specification

Month	1	2	3	4
Outline				
Write				
Review & Accept				

Outline	1000			
Write	500	2000	500	
Review & Accept			500	



Developing a time phased budget to 'write a specification'.

Outline = 1000

Write = 3000

R & A = 500

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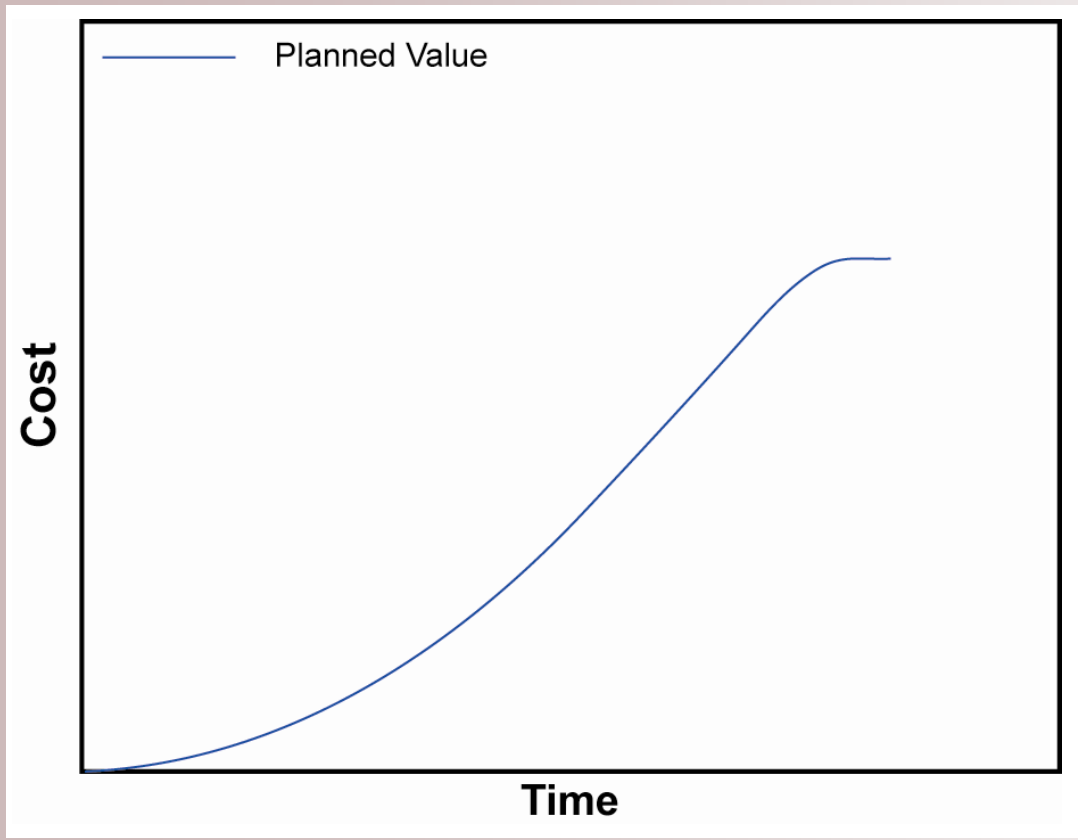
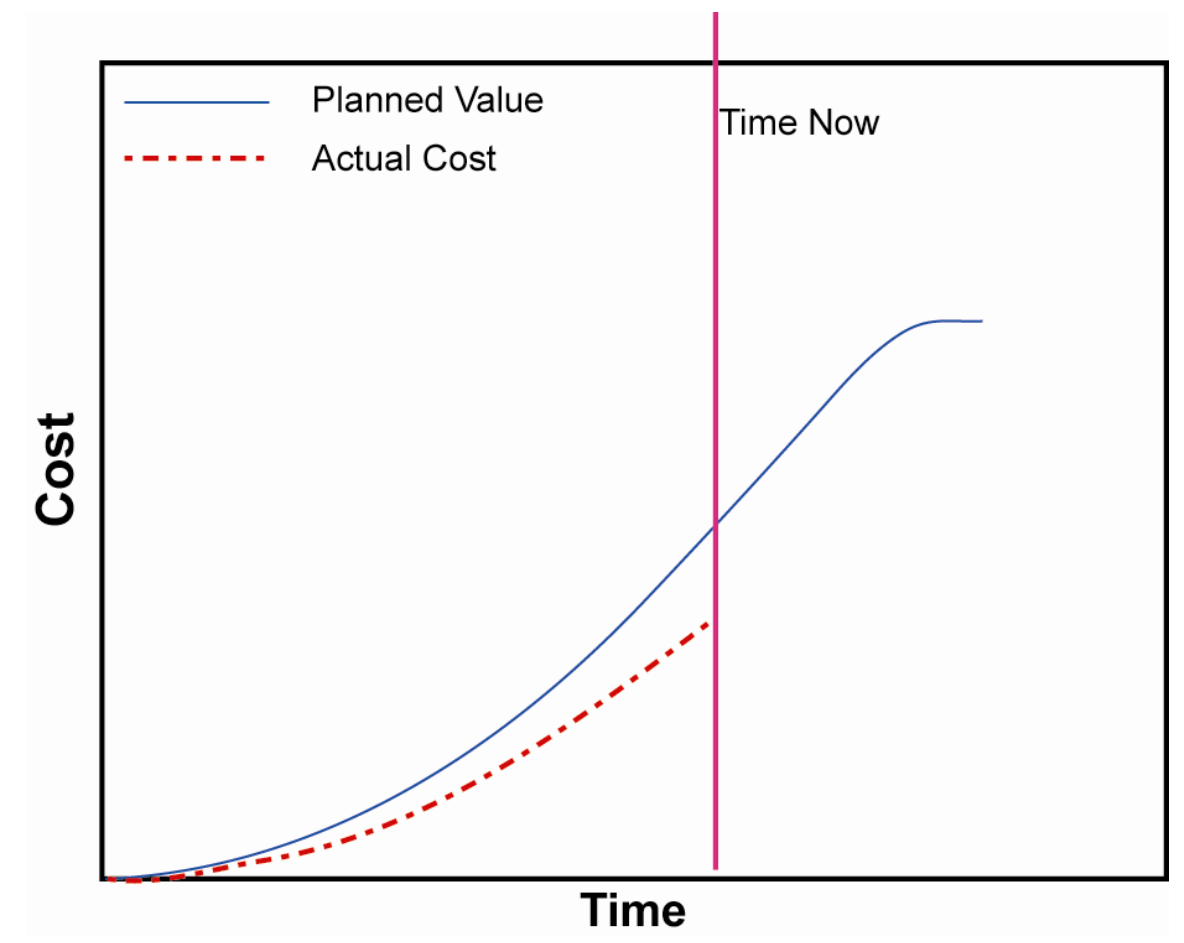
Overview of Earned Value



- The foundation is a time phased budget

Overview of Earned Value



- Measuring actual cost adds little extra value

Is this project profitable or behind schedule?

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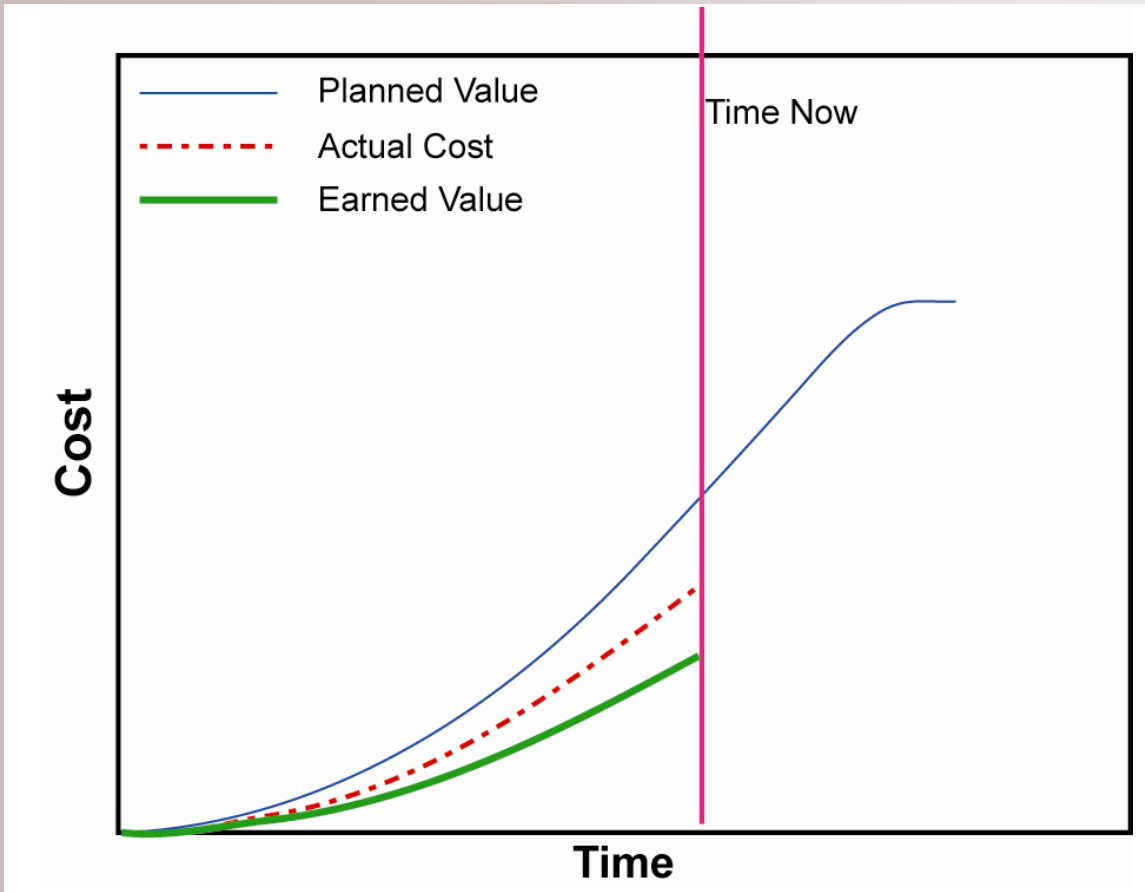
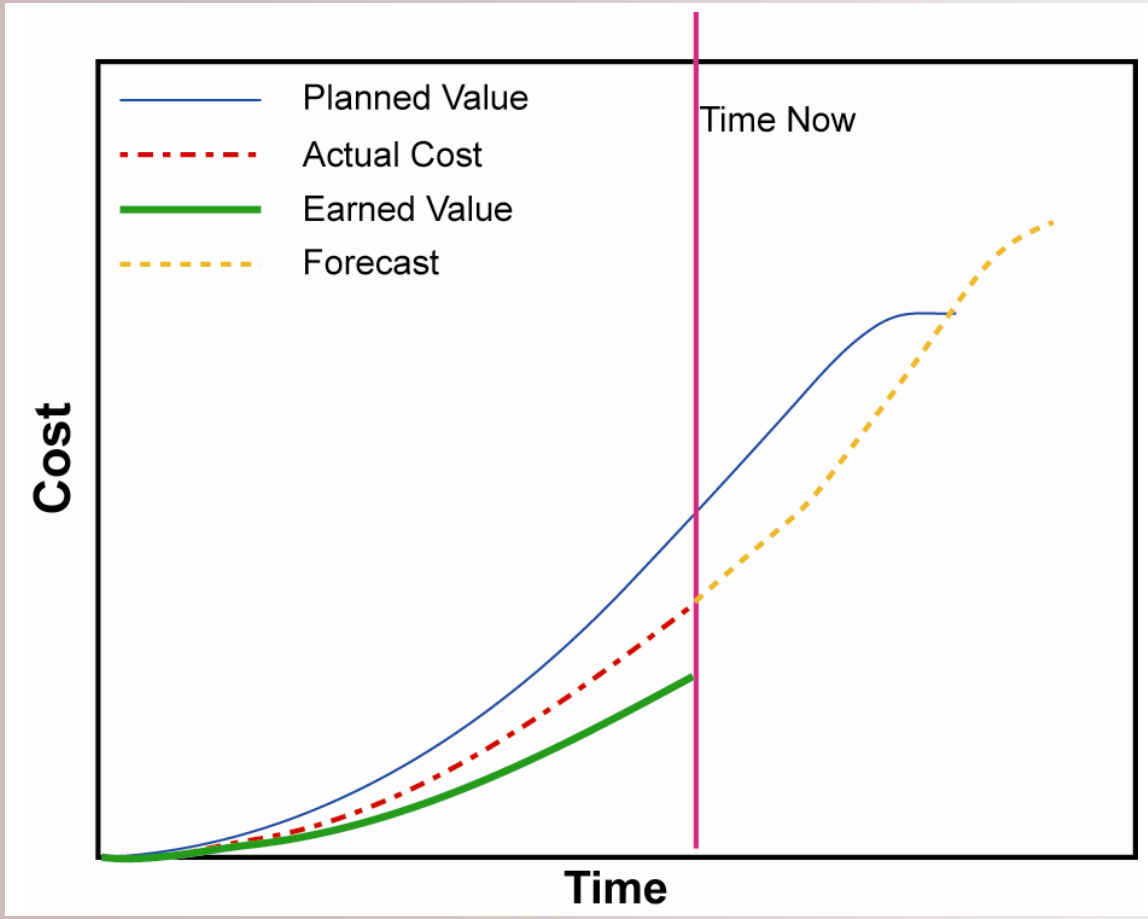
Overview of Earned Value



- Earned value highlights the real situation

  The project is losing money and behind schedule!

Overview of Earned Value



- Calculations can also project the ‘cost to complete’ and the ‘time to complete’

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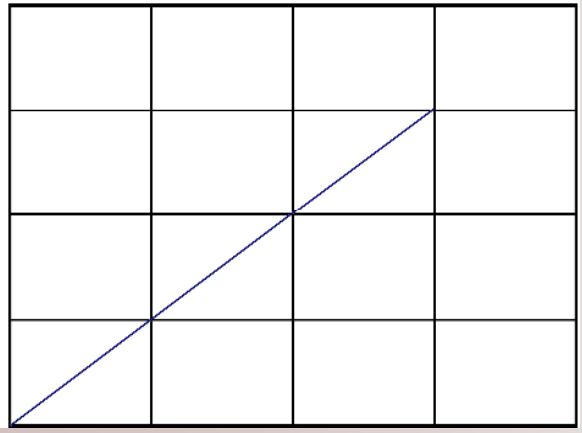
Time Phased Budget

Write Specification

Month	1	2	3	4
Outline				
Draft				
Review & Accept				

Cumulative Values

Planned Value	1000	2000	3000	



- Establish a time phased baseline
  - Work packages or activities
  - Scheduled dates
  - Allocated costs

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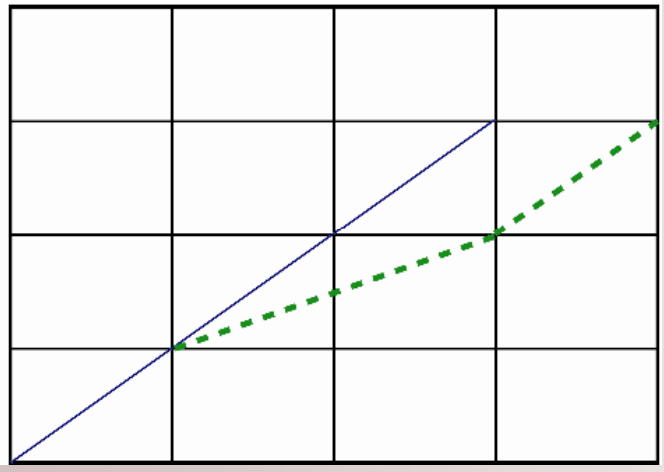
Earned Value

Write Specification

Month	1	2	3	4
Outline				
Draft				
Review & Accept				

Cumulative Values

Planned Value	1000	2000	3000	
Earned Value	1000	1500	2000	3000



- Plot actual performance (Earned Value)

The Draft took two months to complete reducing the EV at the end of Month 2 and delaying the completion of the project

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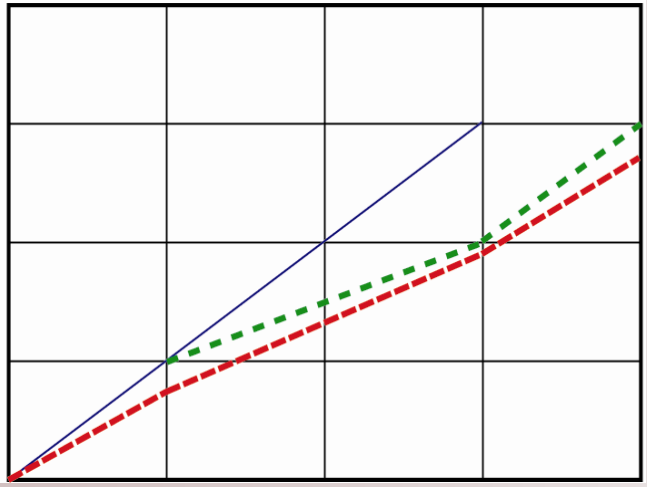
Actual Cost

Write Specification

Month	1	2	3	4
Outline				
Draft				
Review & Accept				

Cumulative Values

Planned Value	1000	2000	3000	
Earned Value	1000	1500	2000	3000
Actual Cost	800	1350	1900	2800



- Plot Actual Costs

Actual Costs=

Outline = $800

Draft = $1100
(50% in Each month)

Review = $900

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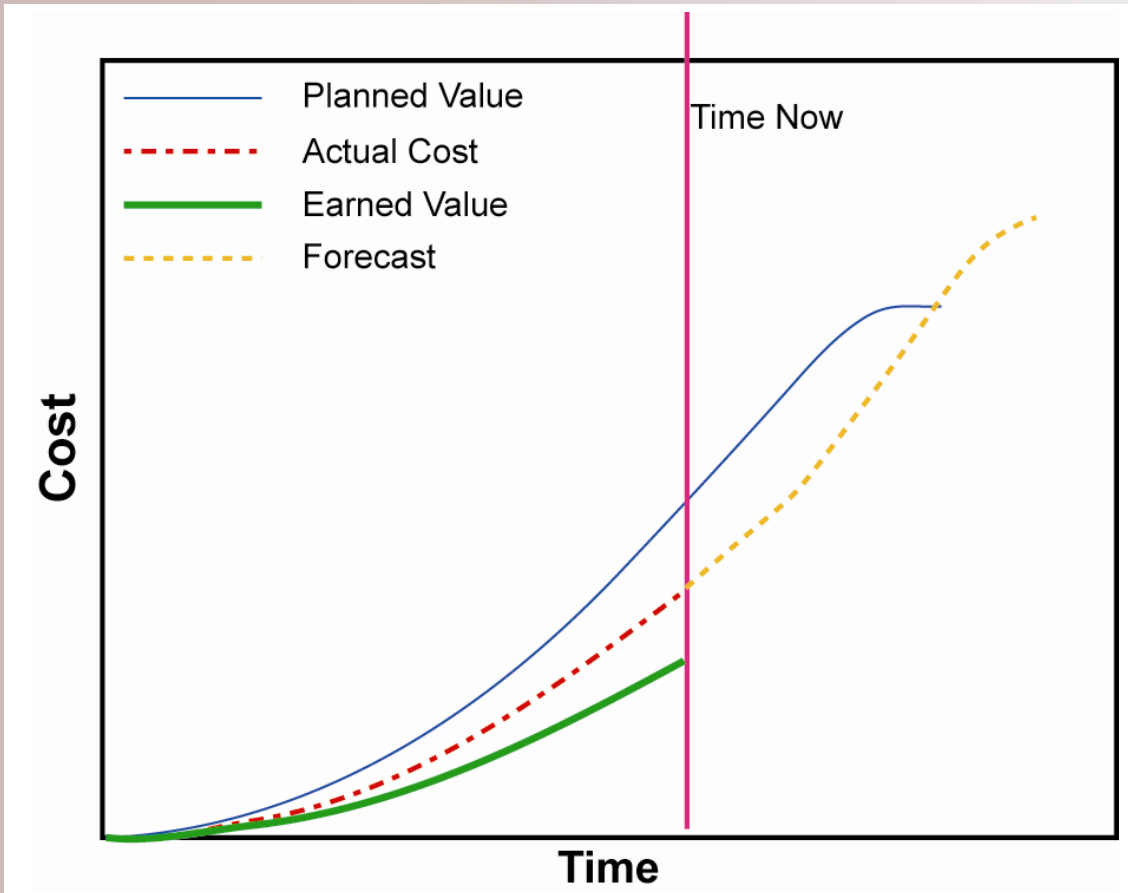
Summary - Earned Value



- Plot the results and forecast to completion

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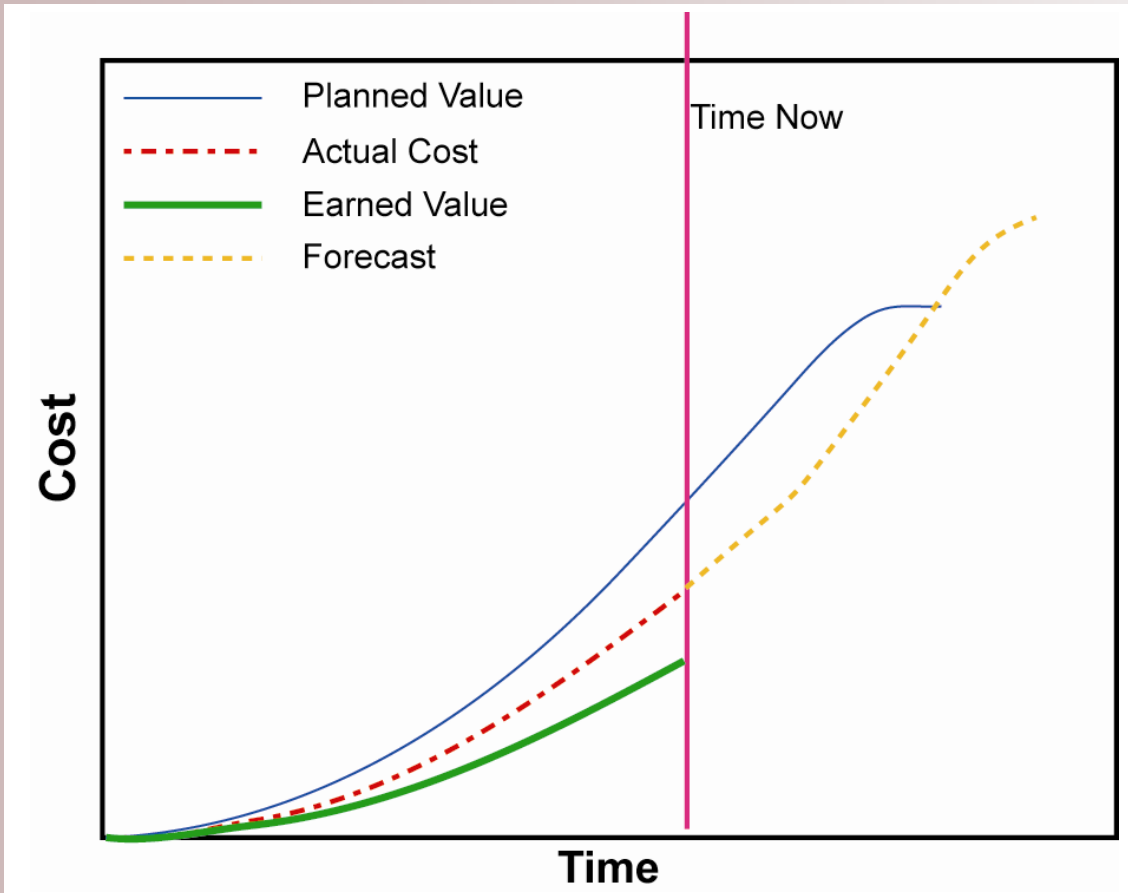
Summary - Earned Value



- All of this needs calculation using defined formulae (but not today)

AS 4817 (+ ISO 21508)

- Earned Value Performance Management
  - Basic Actions
    - What work, by whom & when
    - Realistic resources
    - Objective measurement of progress
    - Report significant deviations
    - Forecast completion dates/costs
    - Plan/implement corrective actions
    - Manage changes

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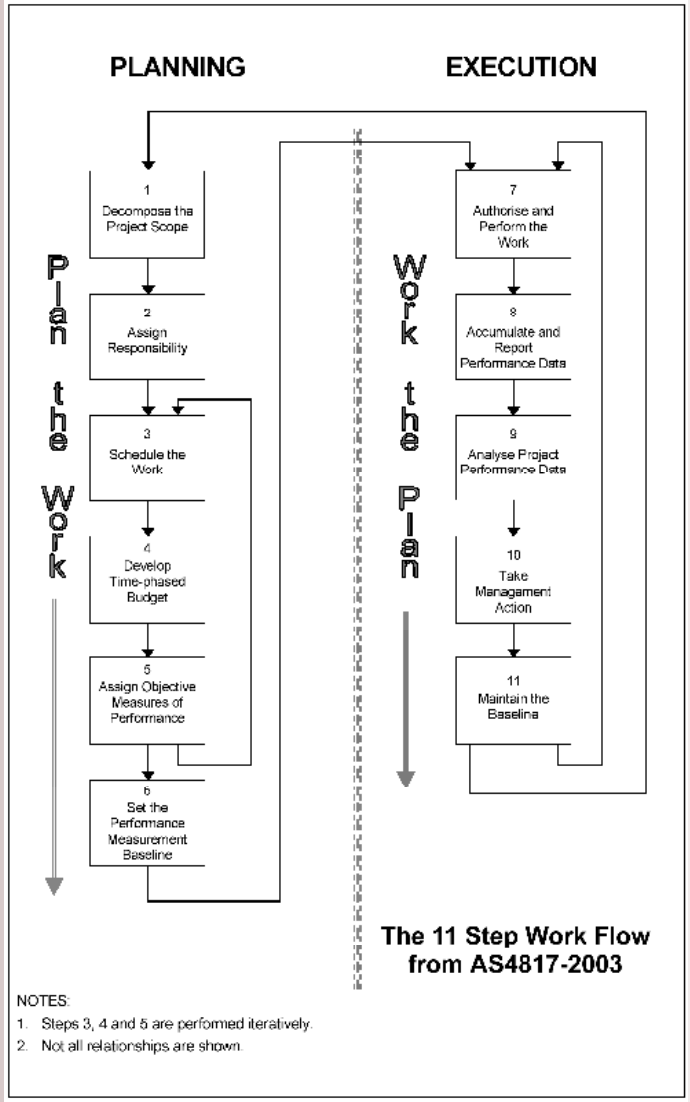
AS 4817 Process



Step 1 – Decompose the Project Scope

- Decompose via WBS
- WBS includes all work
- Scope of items mutually exclusive

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Step 2 – Assign Responsibility

- Responsibility assigned
  - Each element
  - Project
- Responsibility clearly defined
- Internal managers for external work

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Step 3 – Schedule the Work

- Activities below work elements
- Key interfaces and constraints defined
- Sequences and interdependencies
- Objective measures identified

Step 4 – Develop Time-Phased Budget

- Budgets assigned in measurable units
- Distributed over duration
- Budget for far term assigned and phased
- Management Reserve and Undistributed Budget
- Reconcile to Project Budget

Step 5 – Assign Objective Measures of Performance

- Accomplishment expressed as EV (budgetary value)
- Objective measures used
- EV of 100% complete = budget
- Objective measures planned and set
- Performance assessed as per planned method
- Progress and costs in same period
- 1 measure per activity

Step 6 – Set the Performance Measurement Baseline

- Scope clearly identified and recorded
- Scope consistent
- Schedule clearly identified and recorded
- Schedules integrated (vertical & horizontal)
- Budget clearly identified and recorded
  - Formally managed (Step 11)
- Scope, schedule, budget formally approved
- S, S, B become PMB and controlled

Step 7 – Authorise and Perform the Work

- Source of authority clearly defined
- Work planned before authorised
- Work authorised as planned
- Responsibility and measures clearly identified as part of authorisation

Step 8 – Accumulate & Report Performance Data

- Schedule records achievement and forecasts
- EV progress accumulated
- Actual costs inclusive
- Actual costs accumulated
- Schedule forecasts
- Data and variances summarised
- Data accumulated consistently and periodically
- Management receive regular & consistent data

Step 9 – Analyse Project Performance Data

- EV progress compared with plan
- Schedule progress compared with baseline
  - Slippages
  - Forecasts
  - CP/Float
- EV progress compared with plan Actual costs
- Variance analysed – corrective actions proposed
- EACs generated routinely and compared to budget
- Schedule forecasts compared to plan

Step 10 – Management Action

- Corrective actions developed and implemented
- Forecasts revised based on corrective actions and Baselines updated
- No retroactive changes to performance data
- Corrective actions monitored

Step 11 – Maintain the Baseline

- Baseline changes controlled and approved
  - Scope
  - Schedule
  - Budget
- Changes documented and traceable
- No retroactive changes to plan

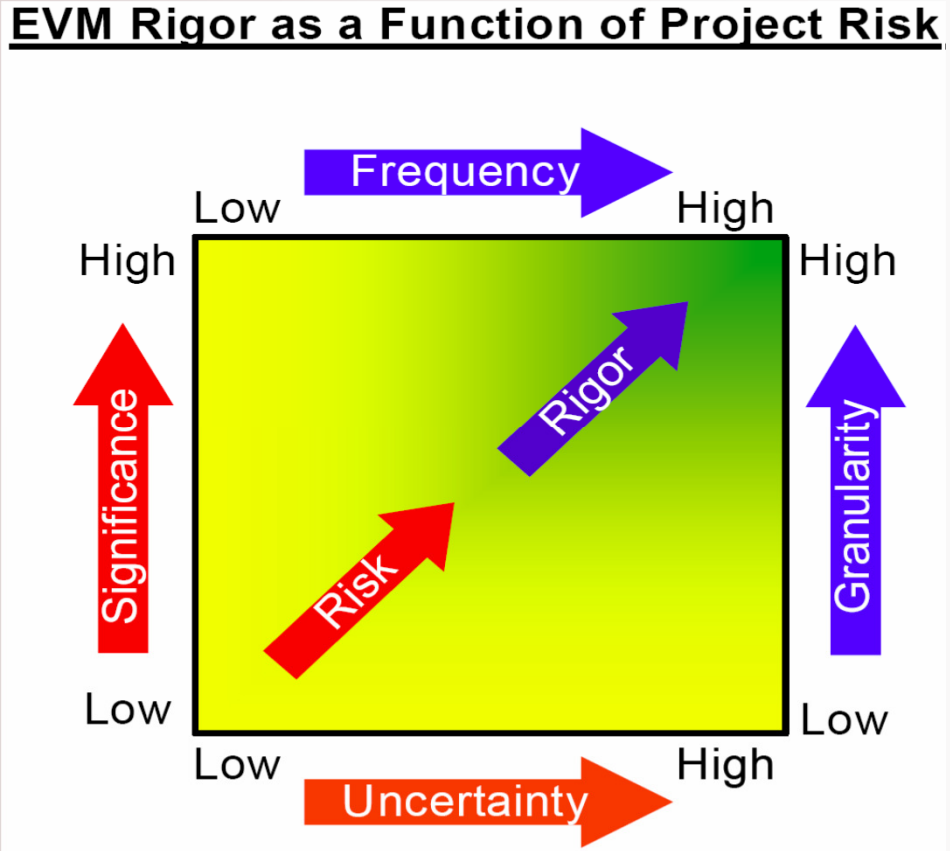
EV Management

- **Control has three components:**
- Knowing what the ‘in control’ state is
- Measuring the variance from that state
- Acting to remove the variance

- Requires a practical tool set

EV Management

- Balance risk and rigour
- Adequate detail
- Sensible frequency



Analysing Performance Data

Performance Measures		Schedule		
		SV > 0 & SPI > 1.0	SV = 0 & SPI = 1.0	SV < 0 & SPI < 1.0
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

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Analysing Performance Data

- Management Reports (CSSR format)

CSSR REPORT FORMAT 1 - WBS					
CONTRACTOR: LOCATION:	CONTRACT TYPE:	PROGRAM NAME/NUMBER:	REPORT PERIOD:	SIGNATURE: TITLE: DATE:	
CONTRACT DATA					
(1) ORIGINAL CONTRACT TARGET COST	(2) NEGOTIATED CONTRACT CHANGES	(3) CURRENT TARGET COSTS (1) + (2)	(4) ESTIMATED COST OF AUTHORISED UNPRICED WORK	(5) CONTRACT BUDGET BASELINE (3) + (4)	
PERFOMANCE DATA					
	CUMULATIVE TO DATE			AT COMPLETION		
	BUDGETED COST		ACTUAL COST WORK PERFORMED (4)	VARIANCE		BUDGETED (7)	LATEST REVISED ESTIMATE (8)	VARIANCE (9)
	WORK SCHEDULED (2)	WORK PERFORMED (3)		SCHEDULE (5)	COST (6)			
GENERAL AND ADMINISTRATIVE								
UNDISTRIBUTED BUDGET								
MANAGEMENT RESERVE								
TOTAL								

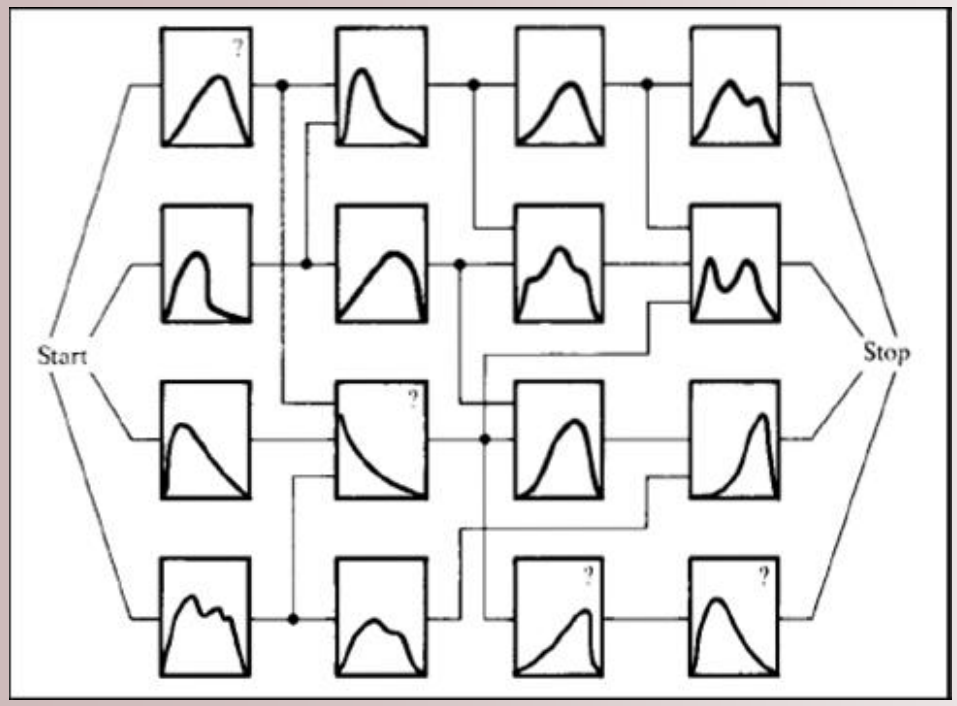
Analysing Performance Data

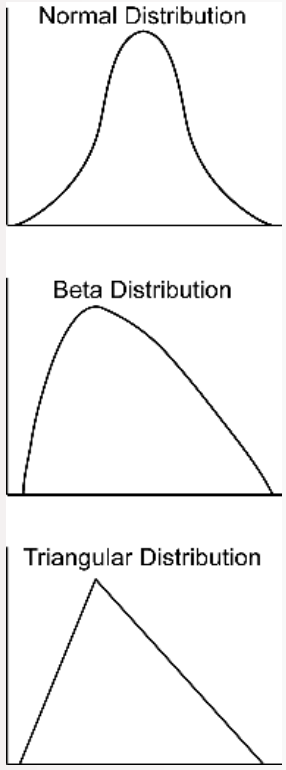
- CAM Reports (ID and explain changes)

	CSSR REPORT FORMAT 2 - PROBLEM ANALYSIS			
CONTRACTOR: LOCATION:	CONTRACT TYPE:	PROGRAM NAME/NUMBER:	REPORT PERIOD:	SIGNATURE: TITLE: DATE:
Section 1 Section 2 Section 3 Section 4				

Uncertainty / Risk

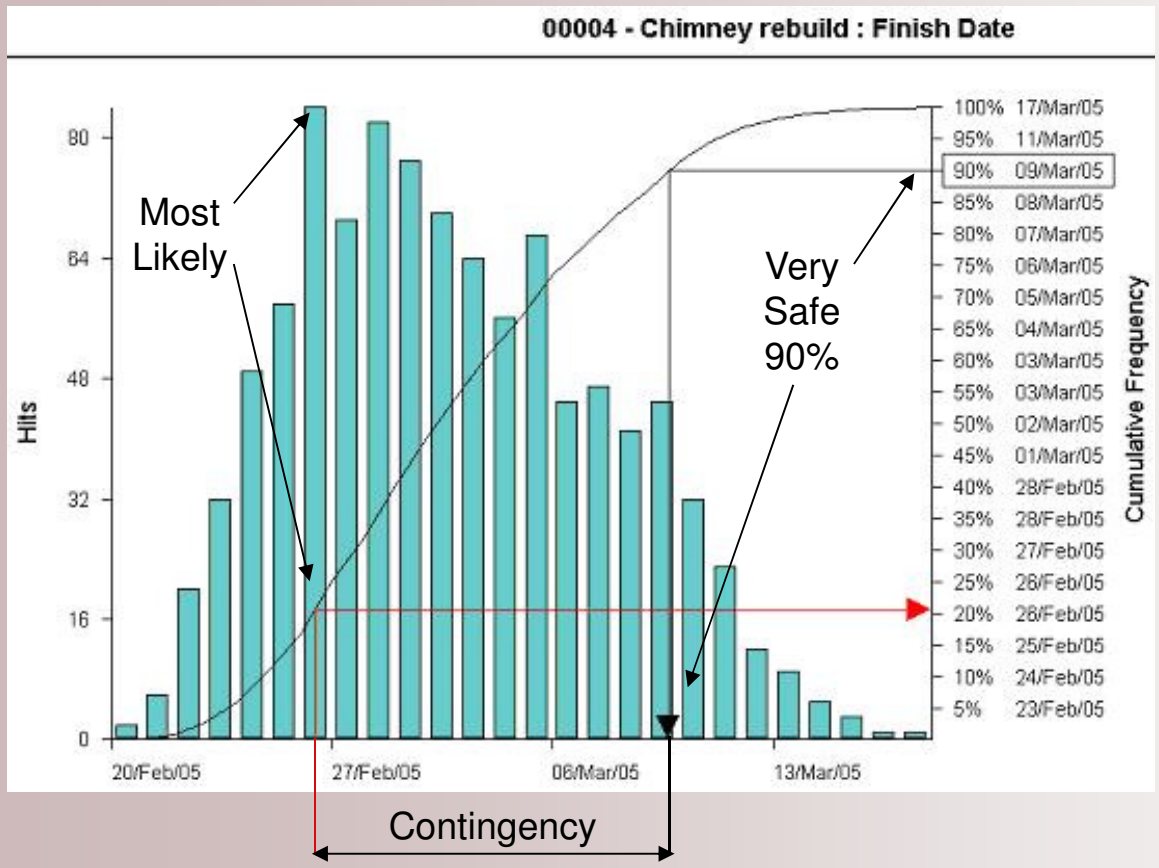
- Distribution options:





Uncertainty / Risk

- Monte Carlo Simulation output



Monte Carlo simulation involves running the project many hundreds (if not thousands) of times with different values selected for each element based on the range and distribution defined for each task. This example looks at time. A similar analysis can be done for costs.

Diagram produced by PertMaster

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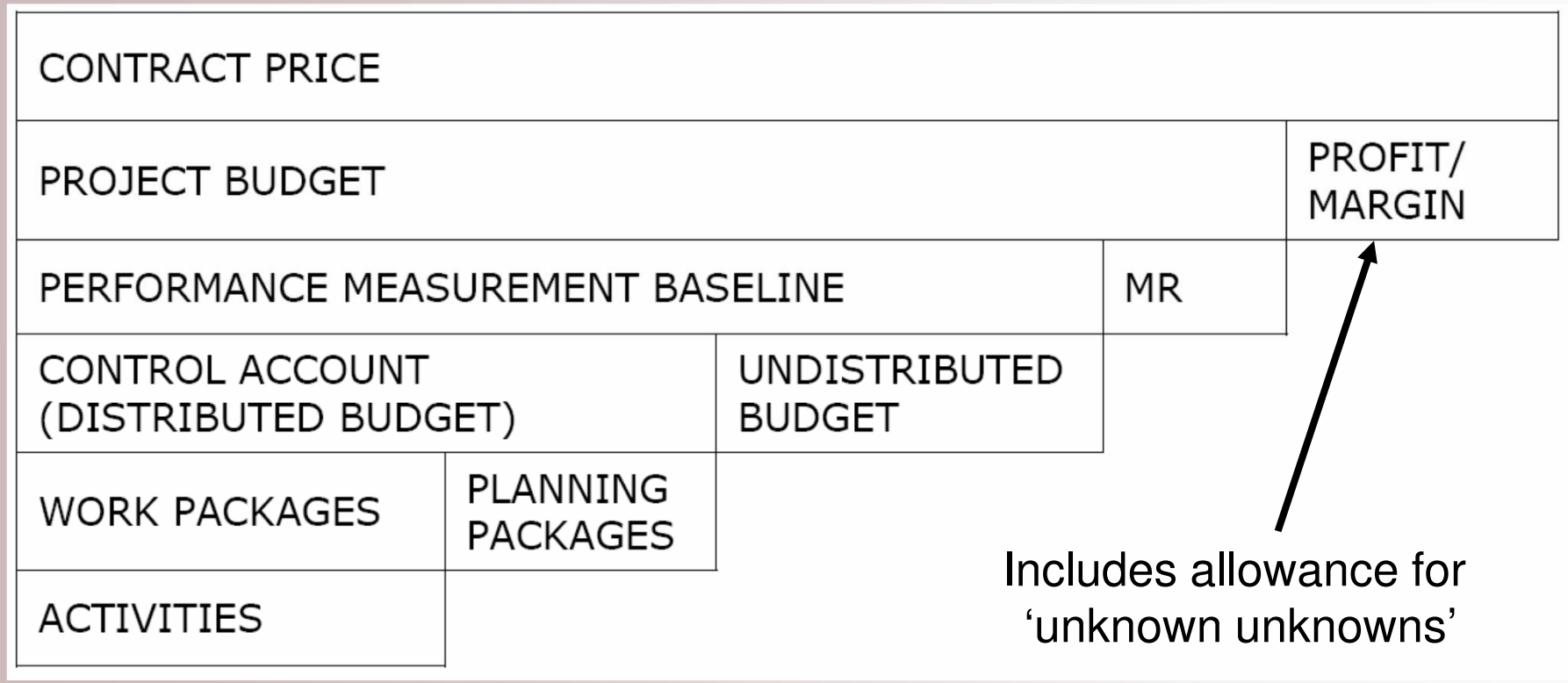
Contingency

- Monte Carlo provides an estimate of the contingency needed for normal variability in estimates
- Risk assessments provide an estimate of the impact of identified risk events
- General management assessments can estimate ‘unknown unknowns’

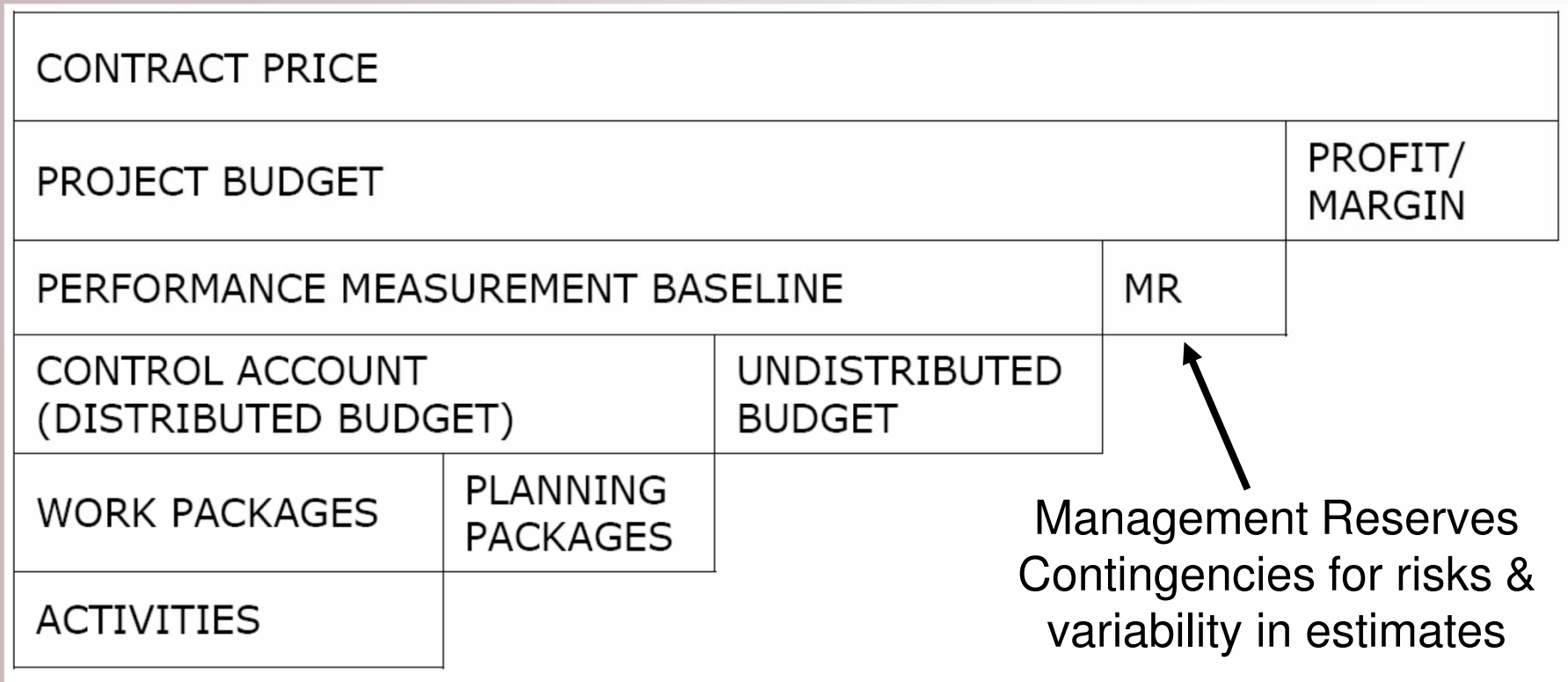
Contingency

- Performance Management Baseline



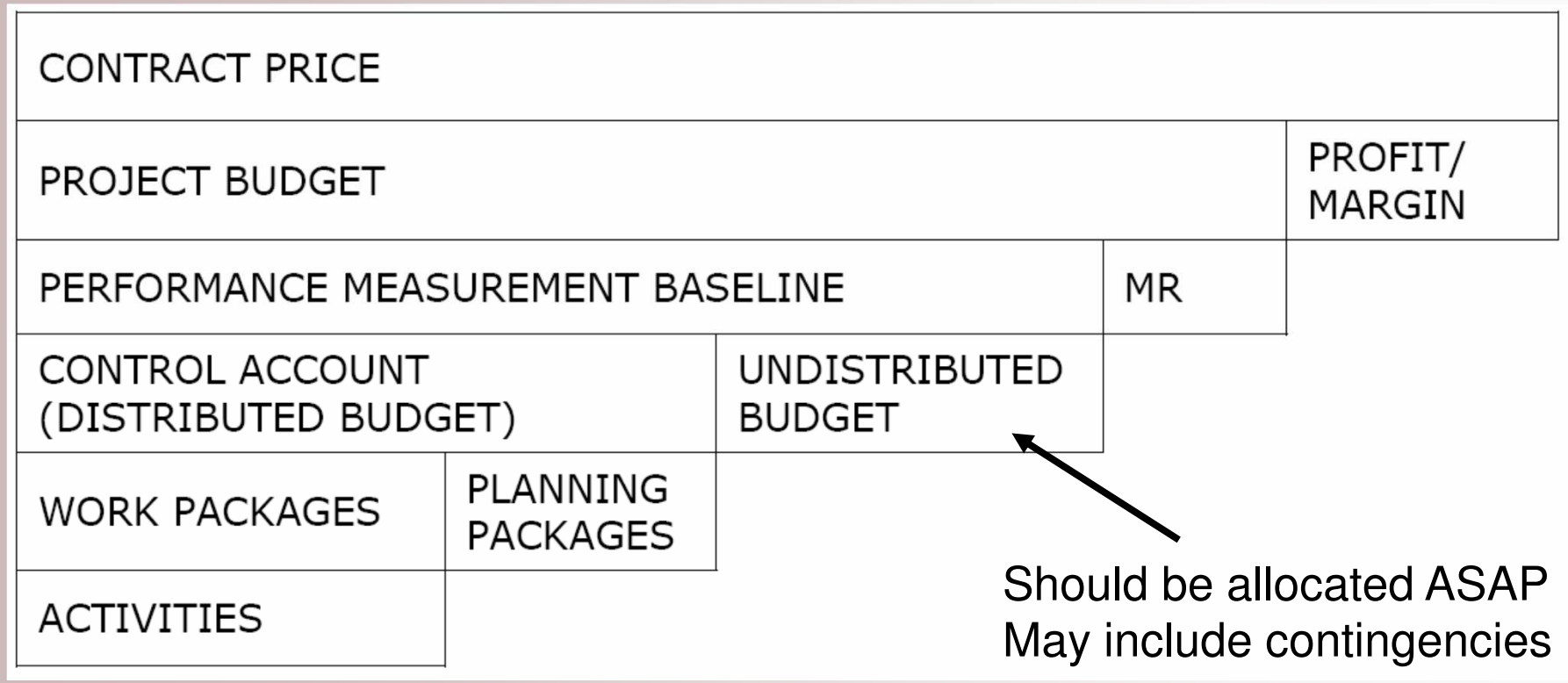
Contingency

- Performance Management Baseline



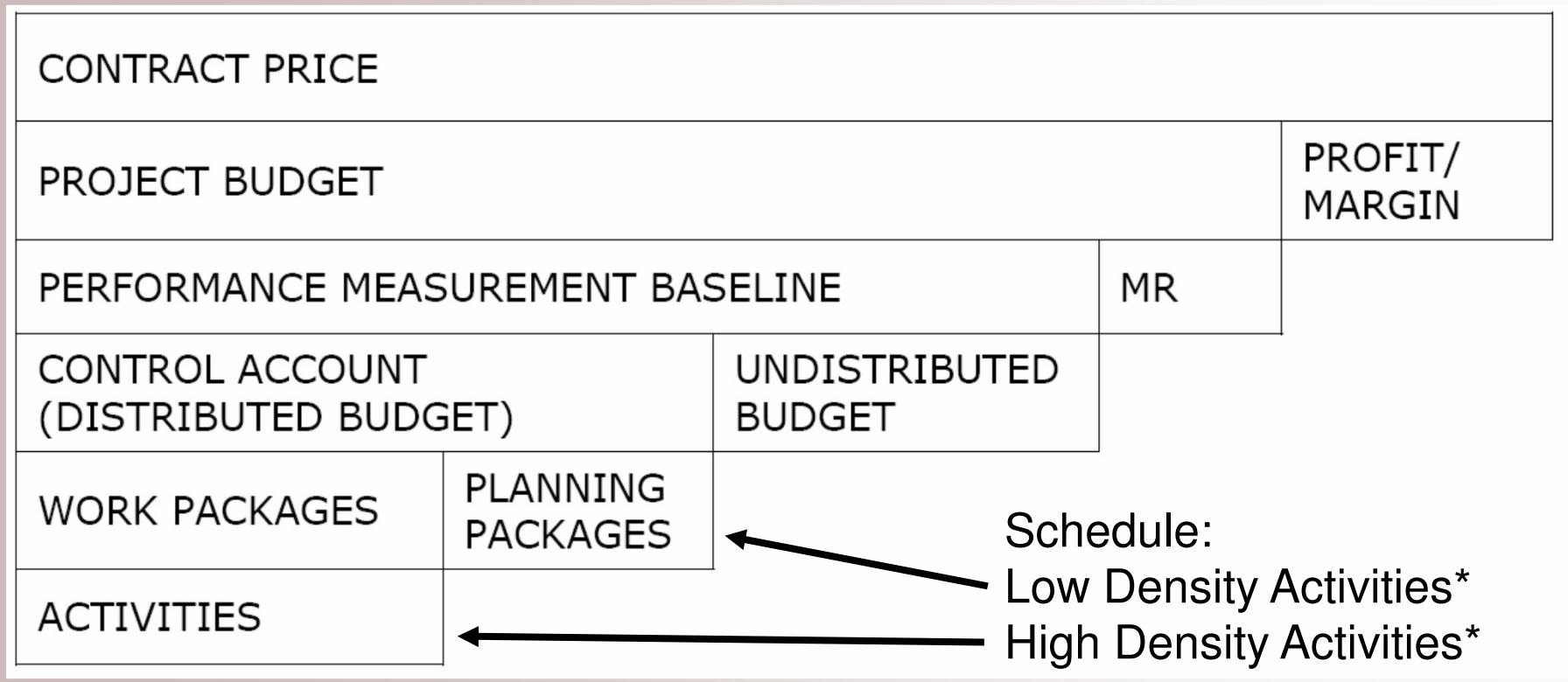
Contingency

- Performance Management Baseline



Contingency

- Performance Management Baseline



* See: http://www.mosaicprojects.com.au/WhitePapers/WP1016_Schedule_Density.pdf

Contingency

- An integrated risk management process
- **MR to PMB Contingencies**
- **Contingencies to PMB Work packages**

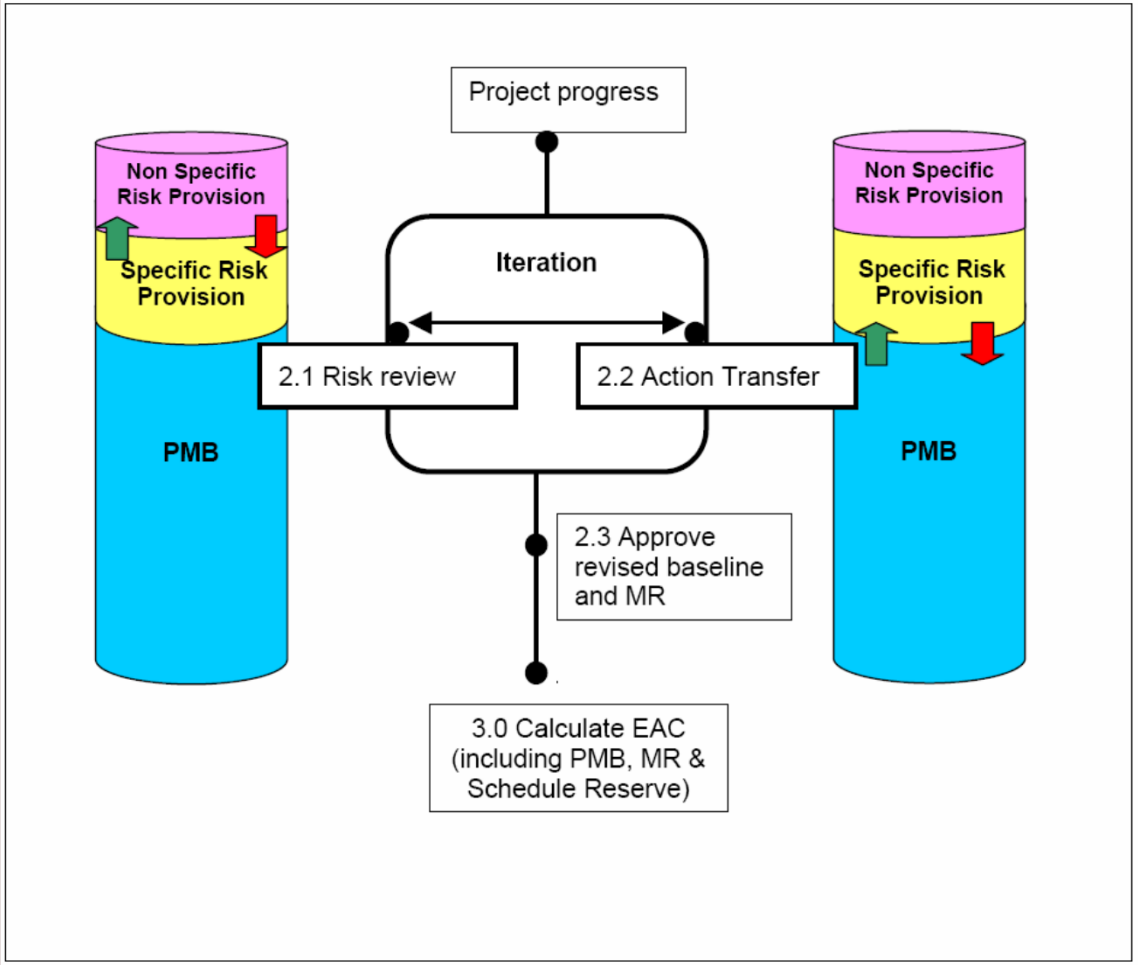


Figure 8 – Integrated Baseline Change Management Process

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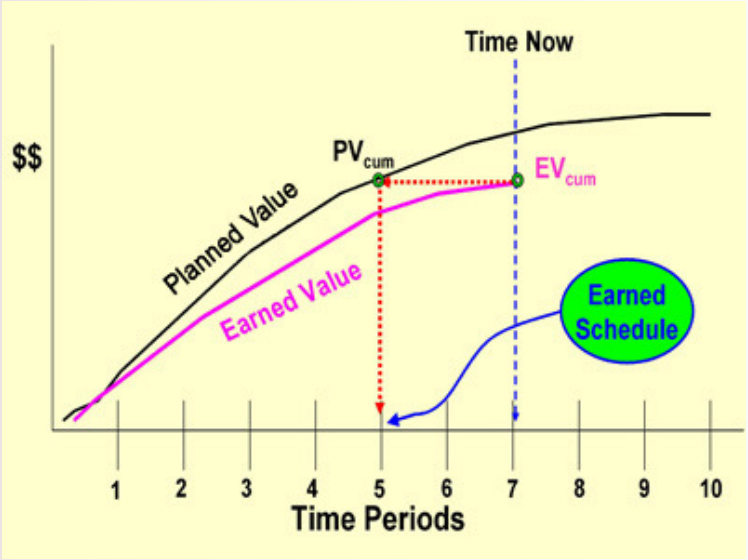
Earned Schedule

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



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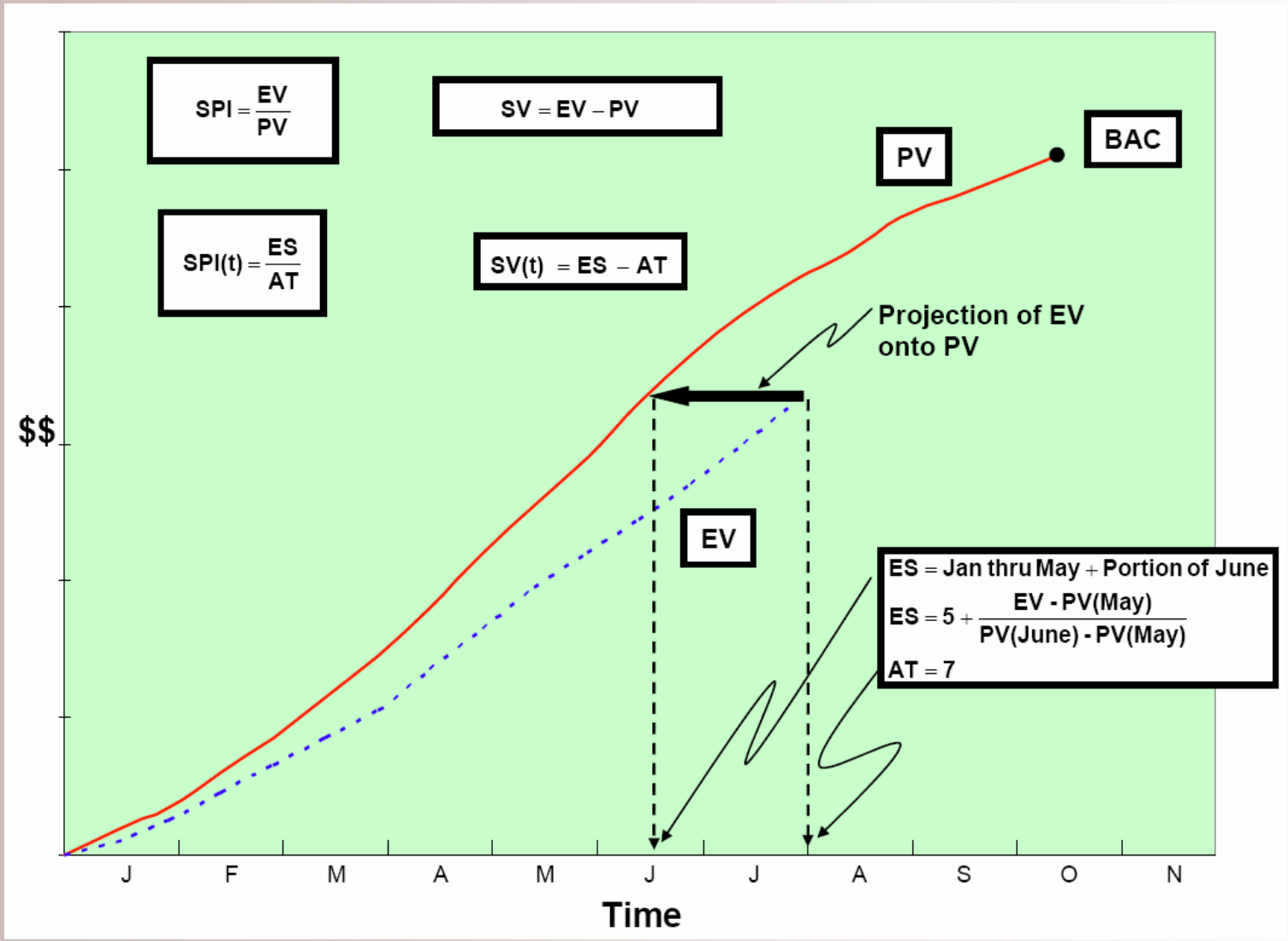
Earned Schedule



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

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 outcomes based on performance
  - But neither can be used as a ‘control’ tool
- All three are needed for a full understanding of the current situation

See: Why CPM is wildly optimistic - http://www.mosaicprojects.com.au/Resources_Papers_117.html

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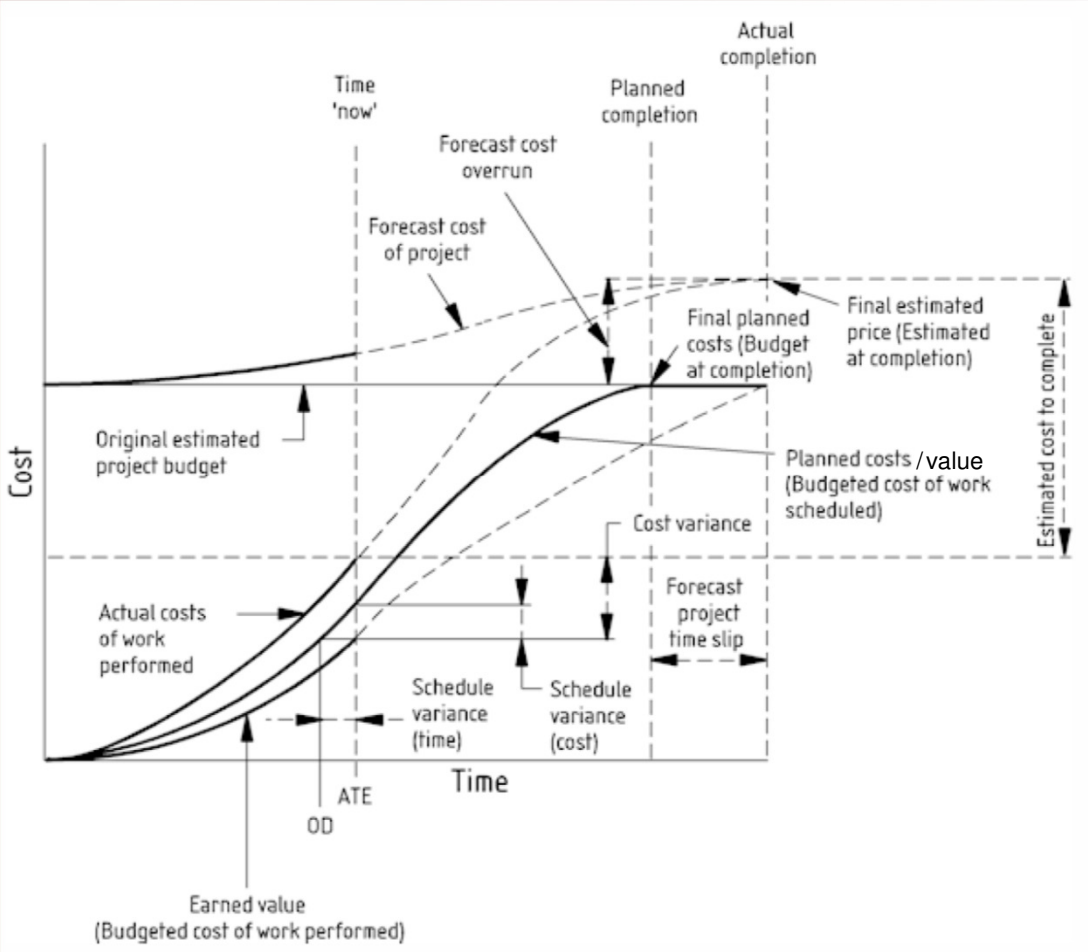
Conclusions



Earned value management - the complete picture!

Old and New Acronyms

BCWS = PV
BCWP = EV
ACWP = AC

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An Overview of Earned Value Management

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Questions??

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