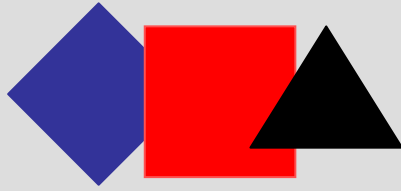




Why Phases are the Key to Project Performance Evaluation

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Greater Toronto ISLIG – May 17, 2007



Agenda

- Objectives
- Review of Earned Value Management
- Issues with Conventional EVM
- Phase Earned Value Analysis concept
- Using PEVA in sample project
- Applying PEVA to portfolio analysis
- Conclusions

Objectives

- Introduce and describe a new PM concept ***Phase Earned Value Analysis (PEVA)***
 - ◆ My proposed extension to Earned Value Management (EVM) theory and methodology
 - ◆ Uses project phases to facilitate EVM concepts
- Demonstrate how PEVA can provide
 - ◆ Simplified calculation of earned value measures
 - ◆ Meaningful identification of schedule variance
 - ◆ Improved visual presentation of status and trends
 - ◆ Evaluation of projects and programs in portfolios

EVM Defined

- Earned Value Management (EVM) is a method for integrating scope, schedule, and resources... and for measuring ***project performance***.
 - ◆ It compares the amount of work that was ***planned*** with what was actually ***earned*** with what was actually ***spent*** to determine if cost and schedule performance are as planned.
 - PMBOK 3rd Edition

Planned Value (PV)

What did we plan to achieve by now?

- **Planned Value (PV)** is the authorized budget assigned to the scheduled work to be accomplished...
 - PMBOK 3rd Edition
 - ◆ Includes both direct and indirect costs
 - ◆ Includes contingency amounts in the budget
 - ◆ Includes **part of budget** for activities in progress

Earned Value (EV)

What have we achieved so far?

- **Earned Value (EV)** is the value of completed work expressed in terms of the approved budget assigned to that work...
 - PMBOK 3rd Edition
 - ◆ Includes estimated EV for partly completed activities
 - ◆ **Cumulative Earned Value** is the total of all EV amounts for all project activities completed to date

Actual Cost (AC)

What have we spent so far?

- **Actual Cost (AC)** is the total costs actually incurred and recorded in accomplishing work performed during a given time period...
 - PMBOK 3rd Edition
 - ◆ Can include both direct and indirect costs
 - ◆ **Cumulative Actual Cost** is the total of all AC amounts for all project activities completed to date.

EVM Cost Variance and Cost Performance Index

- **Cost Variance (CV):** *What is the difference between what we have achieved and spent?*

Cost Variance = Earned value – Actual cost

$$CV = EV - AC$$

- ◆ *Negative CV is the \$ value that performance lags behind costs*

- **Cost Performance Index (CPI):** *What is the ratio of our performance to our costs?*

$$CPI = EV / AC$$

- ◆ *CPI gives performance as a ratio of actual costs to date*

EVM Schedule Variance and Schedule Performance Index

- **Schedule Variance (SV):** *What is the difference between what we have achieved and what we should have achieved by now?*

Schedule Variance = Earned Value – Planned Value

$$SV = EV - PV$$

- ◆ *Negative SV is the \$ value that performance is behind plan*

- **Schedule Performance Index (SPI):** *What is the ratio of our performance to our plan?*

$$SPI = EV / PV$$

- ◆ *SPI gives performance as a ratio of the budget to date*

Forecasting final results

- Management wants to know:
 - ◆ How will it all end?
- Final results determined by
 - ◆ quality of the project plan
 - ◆ actual performance results
 - ◆ management's desire to affect results
- Forecasting variables
 - ◆ value of the work remaining
 - ◆ performance efficiency factor
 - ◆ total actual costs to date

Forecasting final cost results: Estimate at Completion

1. Actuals to date plus an new estimate

- Assumes all of the original estimating was seriously flawed
- Take your costs to date, then add a new estimate for the remaining work
- This is known as a “Management EAC”

$$EAC = \text{Actual Costs} + \text{Estimate to Complete}$$

2. Actuals to date plus remaining budget

- Assumes current cost variances are atypical
- Take costs to date, add the budget for the remaining work

$$EAC = \text{Actual Costs} + (\text{Total Budget} - \text{Earned Value})$$

$$EAC = AC + BAC - EV$$

Forecasting final cost results: Estimate at Completion

3. Cumulative CPI Estimate at Completion

- Most commonly used approach for EAC
- Take your remaining work, divide it by your cost efficiency to date, then add your costs to date

$$EAC = Actual\ Costs + \frac{(Total\ Budget - Earned\ Value)}{Cumulative\ CPI}$$

◆ Cumulative CPI EAC Simplified

- Above formula can be simplified (through algebra) to get:

$$EAC = Total\ Budget / Cumulative\ CPI$$

$$EAC = BAC / CPI$$

- Divide your total budget (BAC) by cost efficiency to date

Predicting a Project's Time Duration

- Critical path on current schedule is best indicator of completion date
 - ◆ Schedule Variance (SV) indicates the progress of the work compared to plan
 - ◆ SPI gives the ratio of achievement compared to plan, but
 - ◆ Conventional SV and SPI are invalid in the last third of the project (more on that later)

Issues with Standard EVM

1. Cost/time integration challenge

- Requires a single WBS to organise both the schedule and budget

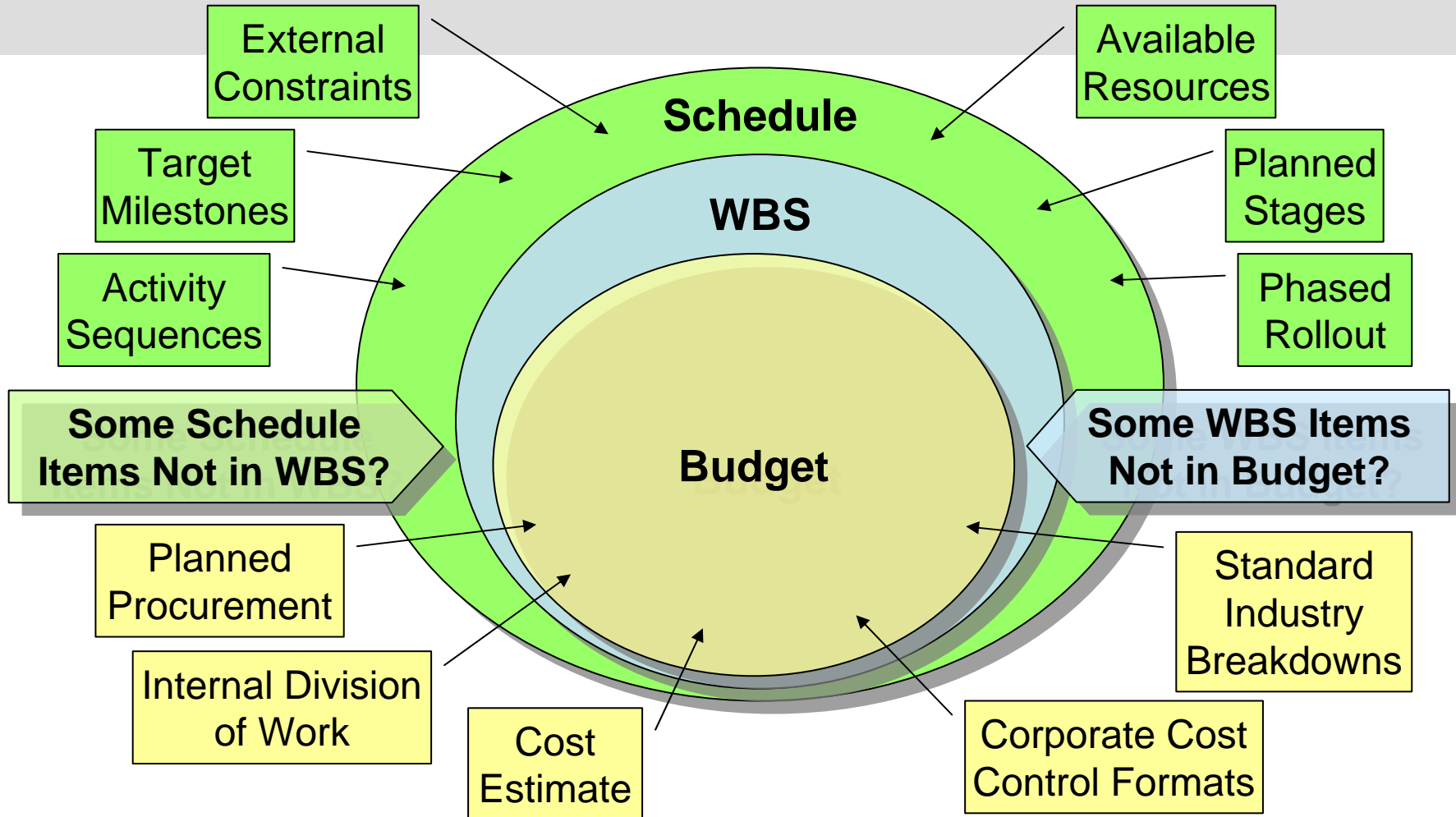
2. Progress evaluation challenges

- Schedule variance expressed in dollars
- Variance indicators become useless in 2nd half
- Doesn't deal with milestones

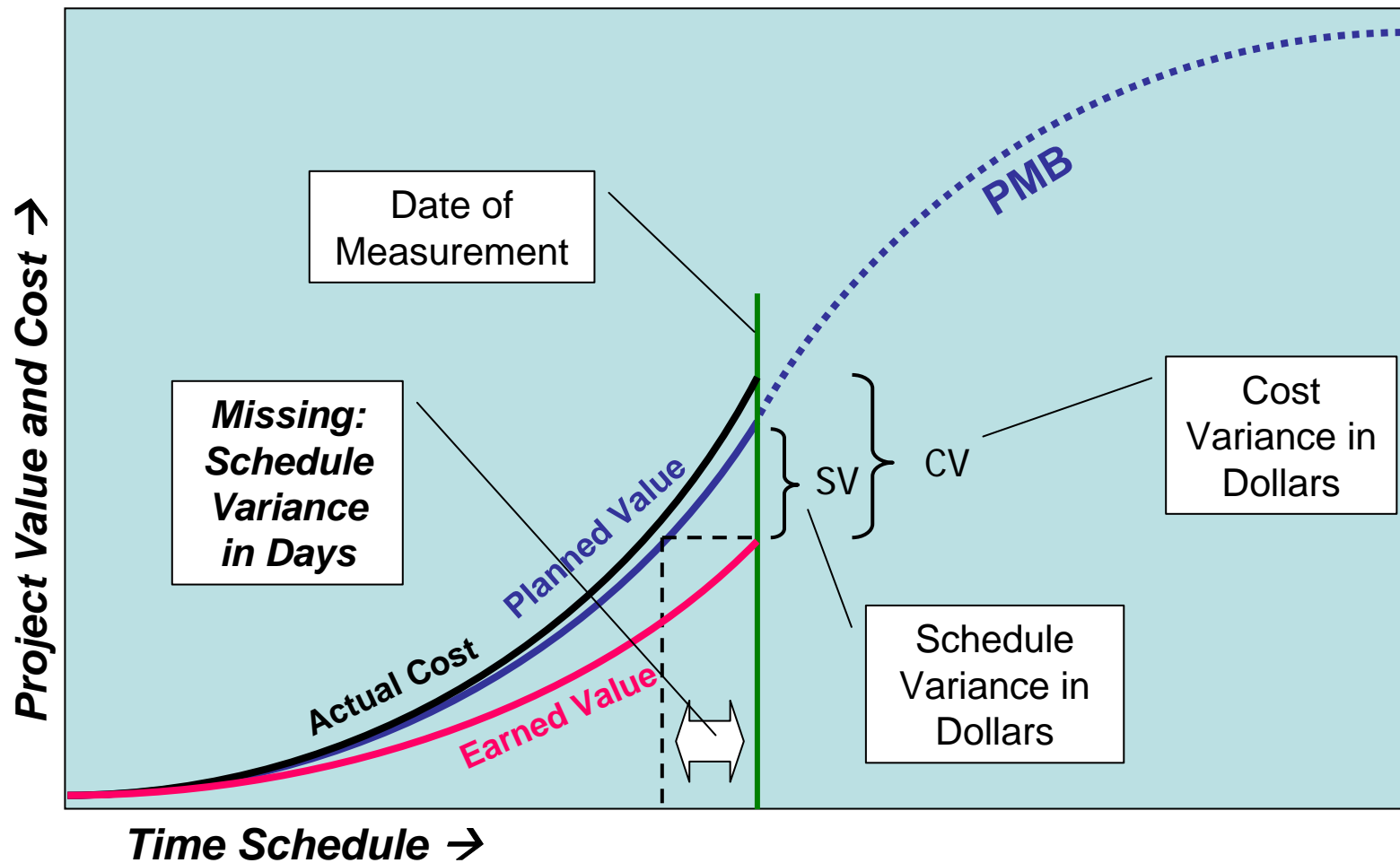
3. Forecasting challenge

- EVM can't forecast future trend lines for costs and achievements

EVM Cost/time Integration Challenge



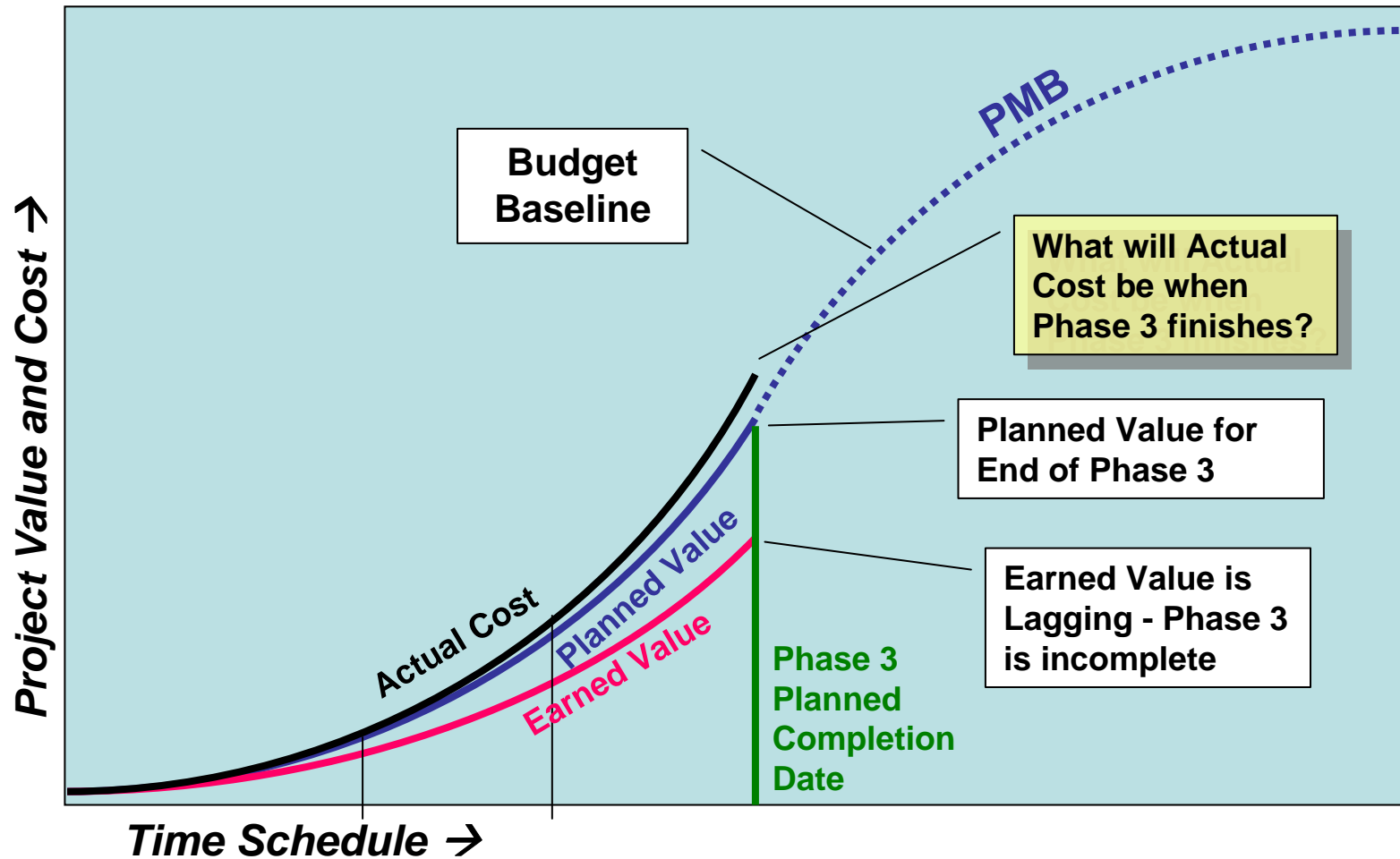
EVM Progress Evaluation Challenge: Schedule Variance in Dollars



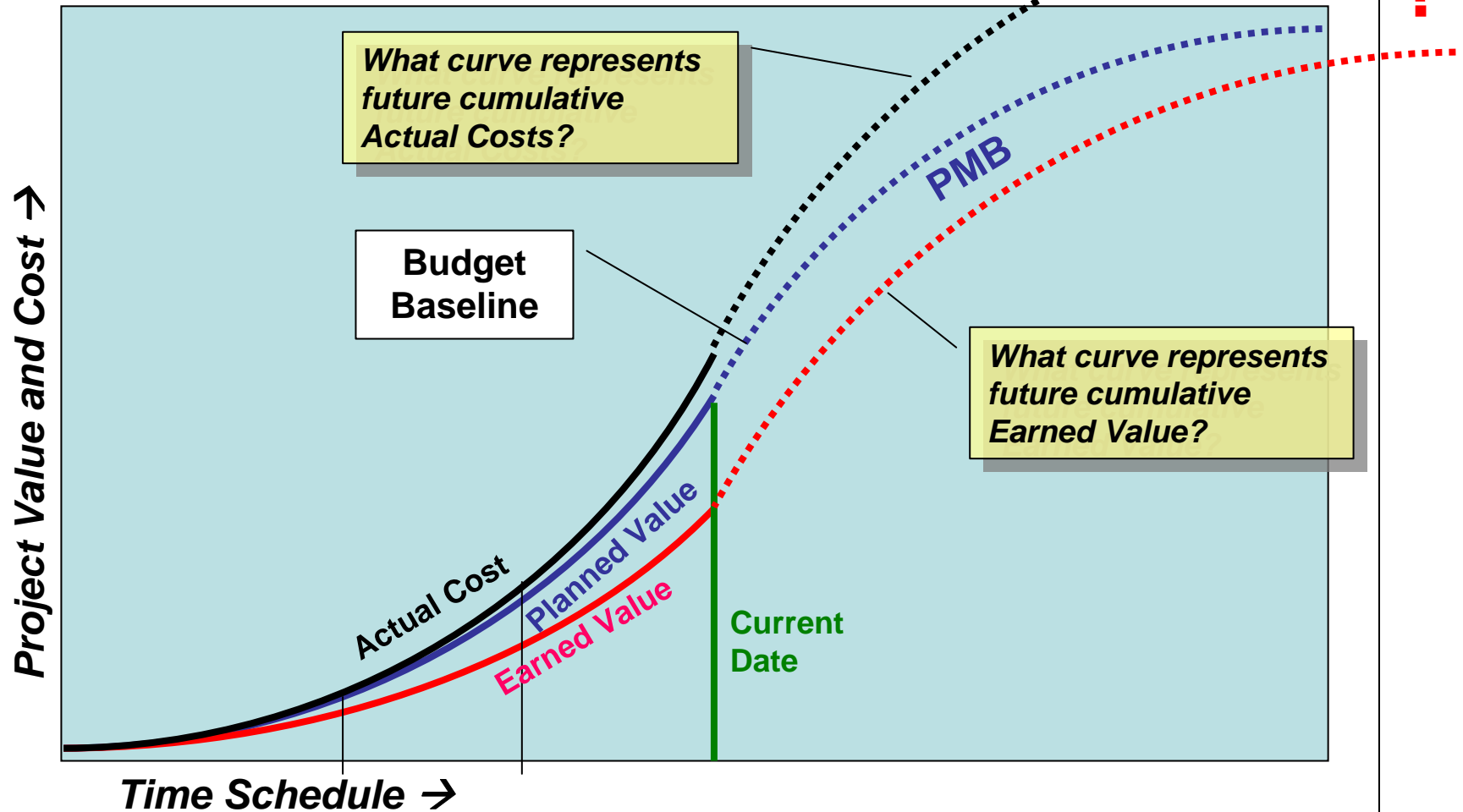
EVM Time Performance Challenge: Schedule Progress Anomaly

- EVM progress indicators (SV and SPI) may become meaningless during last half of project
- Why? Because both compare EV with PV
 - ◆ As every project (or phase) nears completion, the Earned Value must approach the Planned Value
 - ◆ So, even if the project is months or years late...
 - **SV must approach zero (no time variance?)**
 - **SPI must approach 1.0 (on schedule?)**

Issues When EVM is Applied to Phase Milestones



Challenge: Using EVM to Plot Future EV and AC Curves



The PEVA Concept

1. Recognizes structured project phases
2. Allows separate time and cost baselines
3. Simplifies planned and earned value
4. Simplifies actual cost calculations
5. Compares planned and actual milestones
6. Forecasts future milestone dates and cumulative costs at those points

1. PEVA recognizes structured project phases

- Structured phases are a key mechanism for the control of the scope, time and cost dimensions
 - ◆ Logical project divisions
 - ◆ Phase end is a vantage point
 - ◆ Time for stage gates, phase review, etc.
- EVM allows performance evaluation at phase end, but... fails to isolate a phase from the balance of the project

2. PEVA allows separate time and cost baselines

- Cost and time baselines are prepared separately
- Requirements for both budget and schedule:
 - ◆ Address all of the work of the project
 - ◆ Adopt phases as the primary divisions
- EVM requires:
 - ◆ Common single WBS, for both schedule and budget
 - ◆ Control accounts, each with identified costs, time frame and responsible groups

3. PEVA simplifies planned value and earned value calculations

- PEVA establishes the Phase Planned Value by summing the budgets for all work in that phase
 - ◆ Phase EV is equal to Phase PV when that phase is completed
- EVM requires managers to calculate or estimate the PV and EV of all activities in progress

4. PEVA simplifies cost calculations

- PEVA calculates the Phase Actual Cost by adding expenditures and/or staff time for any work completed for that phase
 - ◆ Just need identify the right budget category within a phase
- EVM requires complex calculations for cost of work in progress
 - ◆ Managers need time-sheet codes and staff hours for each work package
 - ◆ Need to attribute each cost to a specific package

5. PEVA compares planned with actual milestones

- PEVA compares the planned completion date for each phase with the actual completion date
 - ◆ PV is baselined with each planned phase completion date, and
 - ◆ EV and AC are tracked with each actual phase completion date.
- EVM cannot recognise phase completion or other milestones

6. Forecasts future milestone dates and cumulative costs at those points

■ PEVA Forecasting

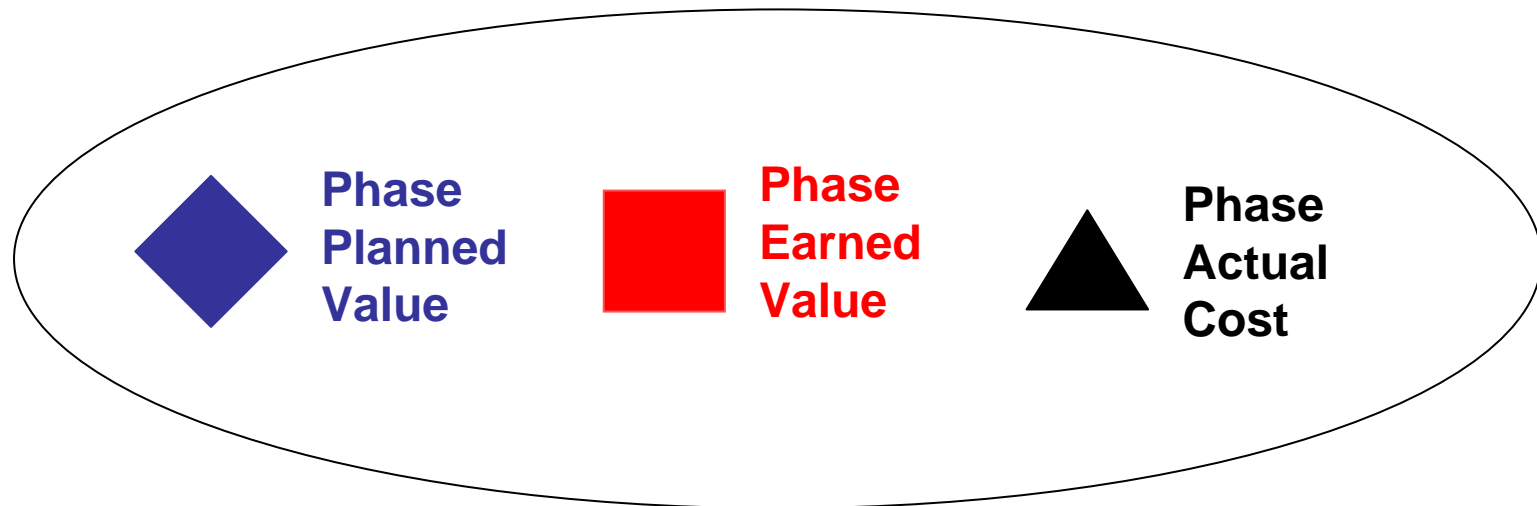
- ◆ **Cost:** PEVA uses the efficiency to date (CPI) to forecast the expected cost of all future phases
- ◆ **Time:** PEVA uses the rate of progress, called SPI(t), to forecast the end date of each future phase

■ EVM Forecasting

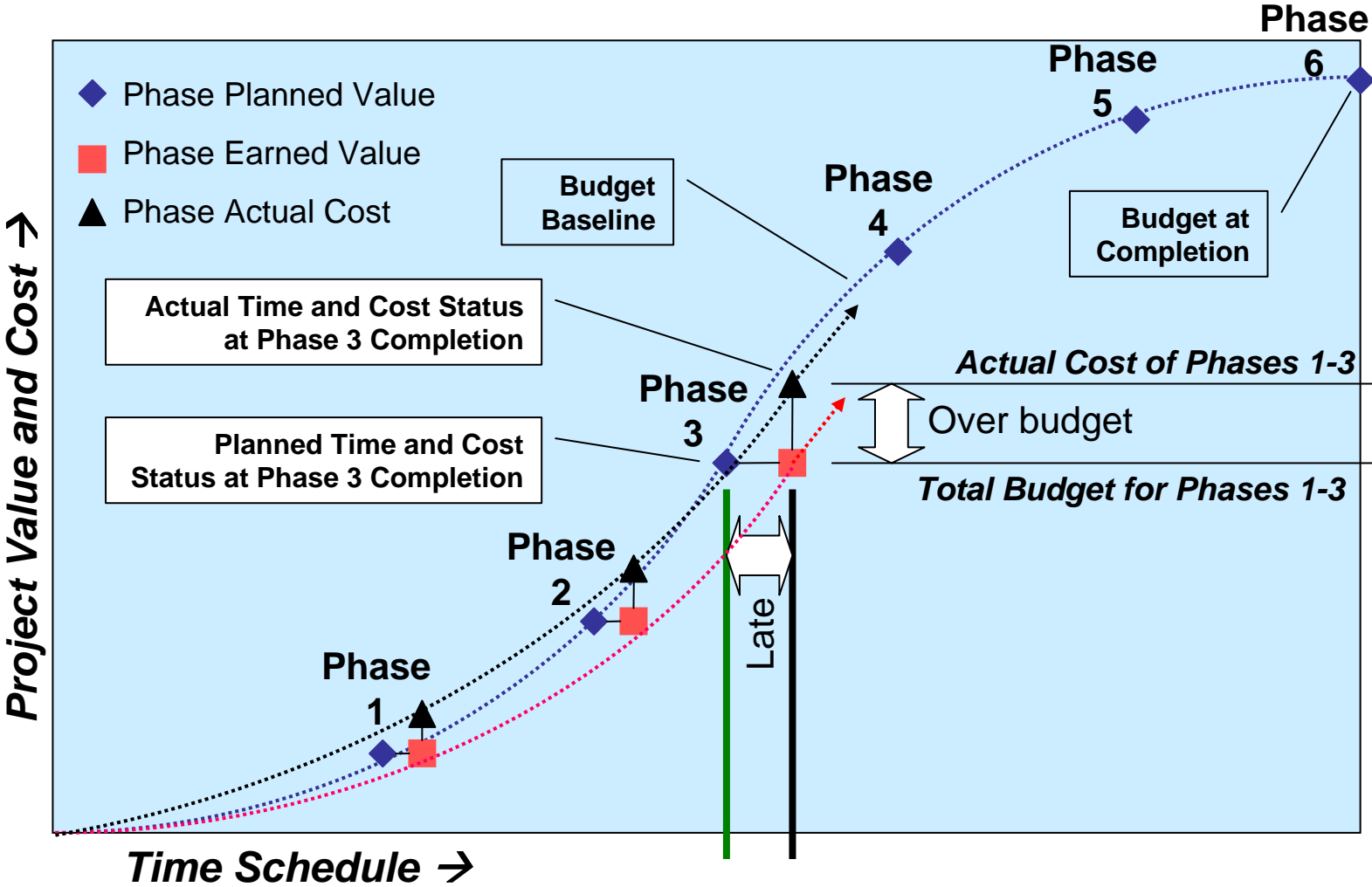
- ◆ **Cost:** EVM uses the efficiency to date (cumulative CPI) to forecast the estimate at completion (EAC)
- ◆ **Time:** EVM cannot reliably forecast the project end date

Introducing the PEVA Symbols

- PEVA tracks performance only at phase end
 - ◆ Or at the end of a sub-phase
- Distinct symbols are used for charting PEVA at the end of each phase:

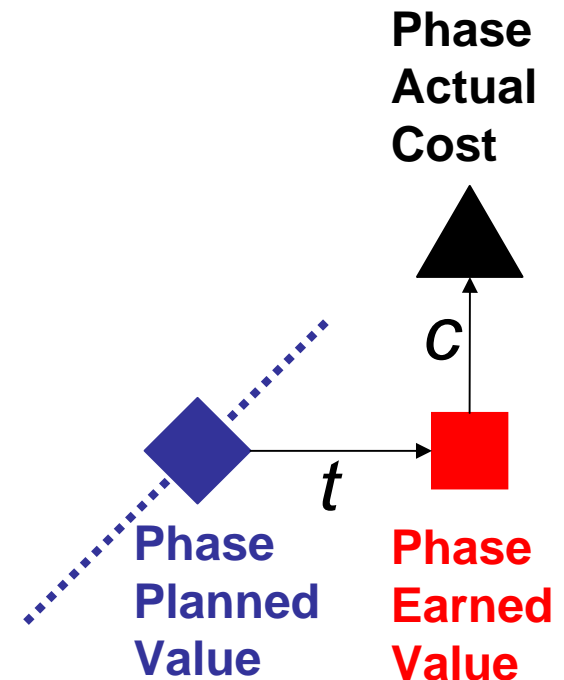


Phase Earned Value Analysis Concept



PEVA Symbol Relationships

- PEVA symbols identify the accumulated Phase Planned Value, Phase Earned Value and Phase Actual Cost
- At the end of every phase:
 - ◆ Earned Value will equal the Planned Value, and
 - ◆ Actual Cost will be calculated on the same date that the Earned Value was achieved
- One of nine basic PEVA relationships can occur at the end of each phase...



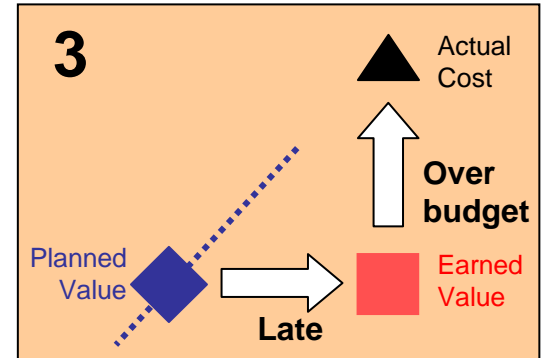
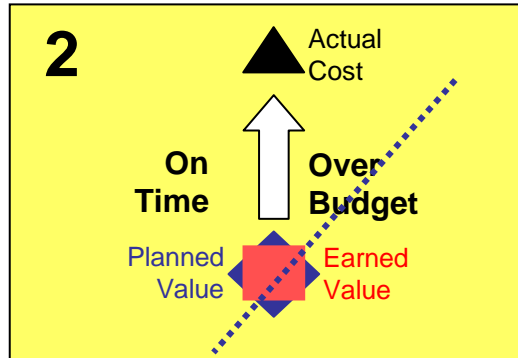
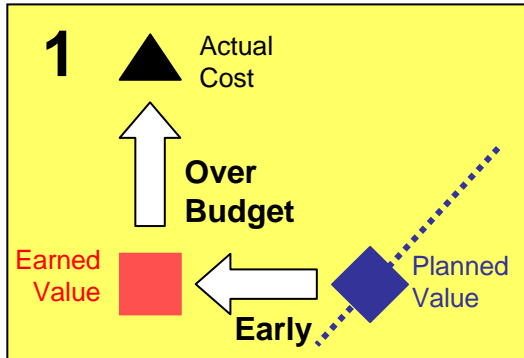
Nine Possible PEVA Conditions

Early Completion

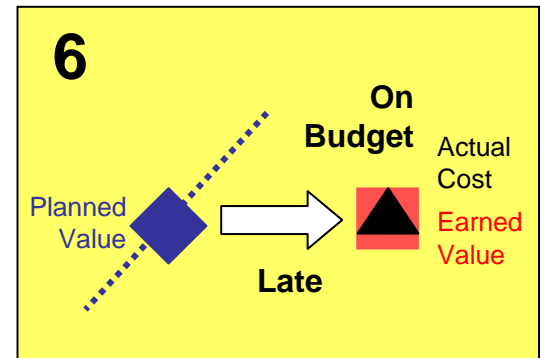
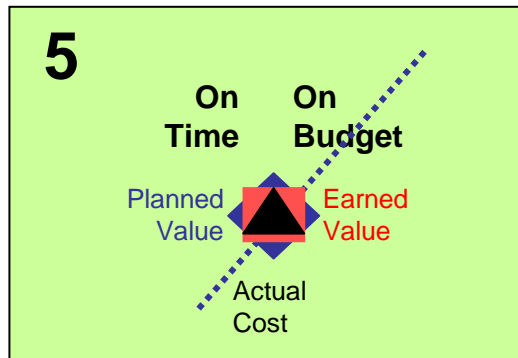
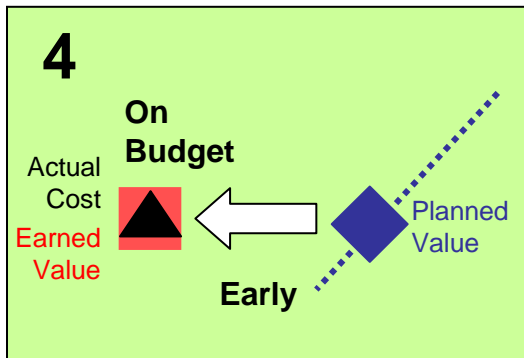
On Time Completion

Late Completion

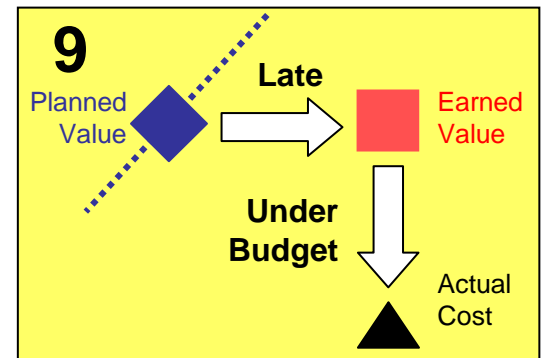
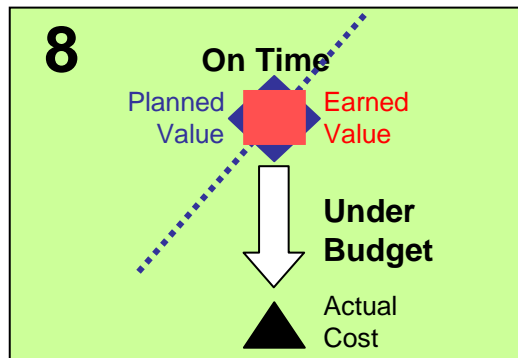
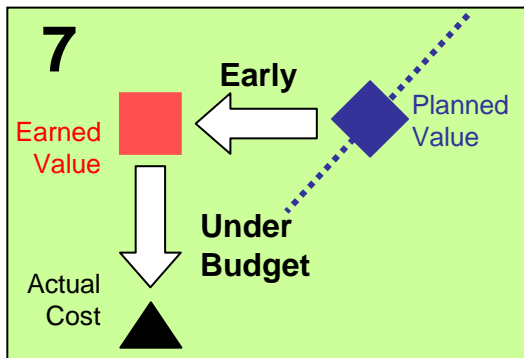
Over Budget



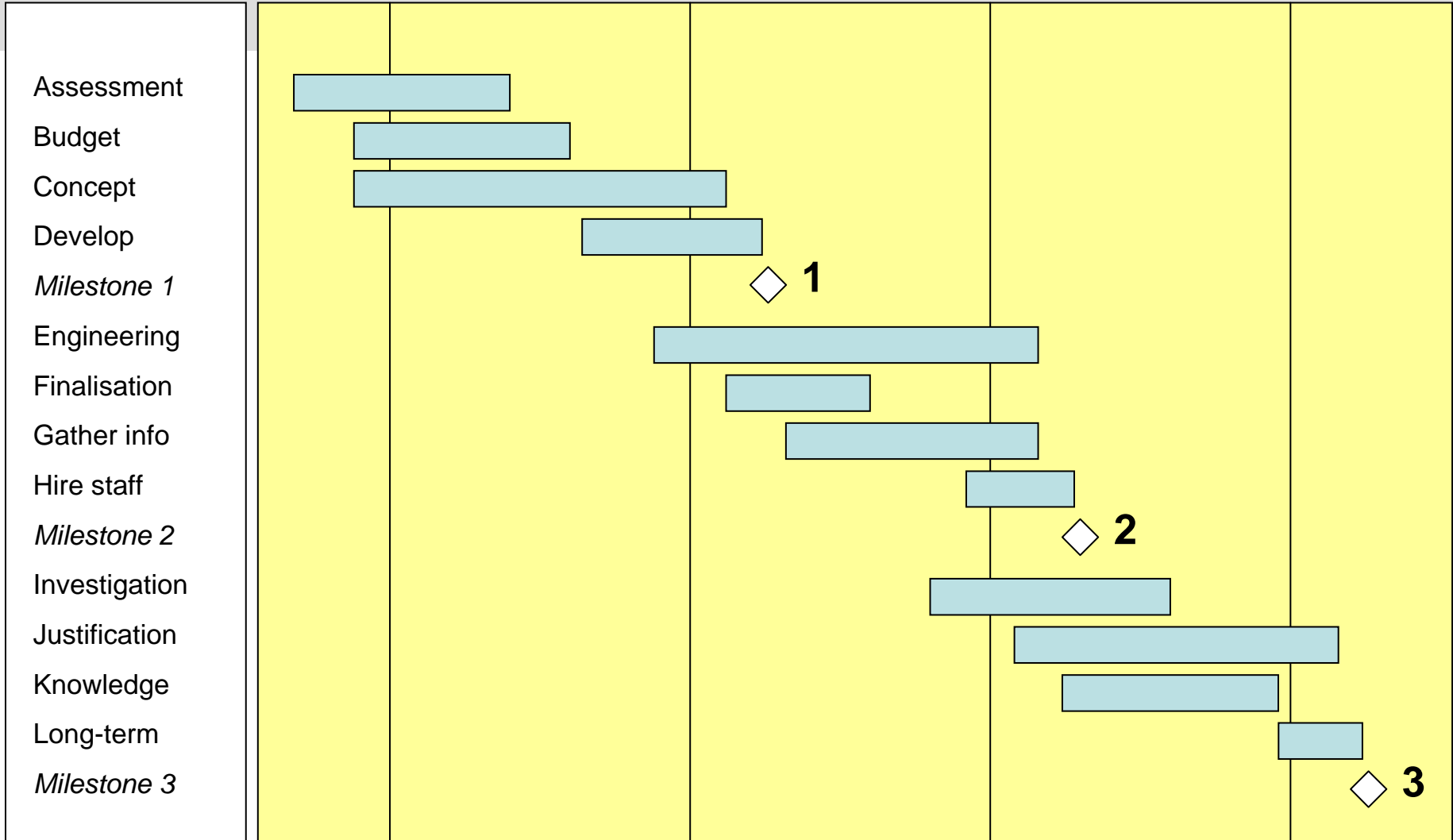
On Budget



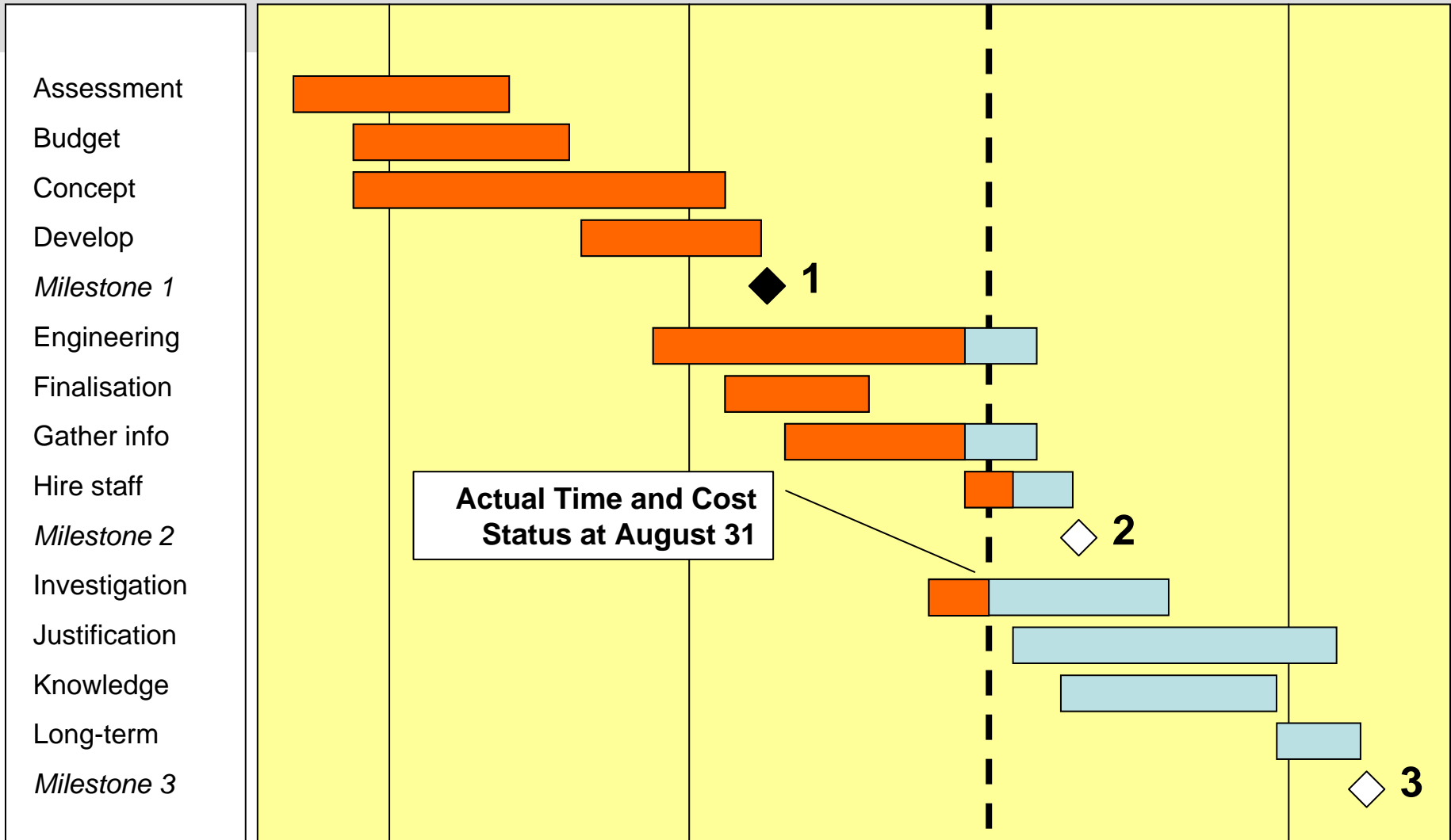
Under Budget



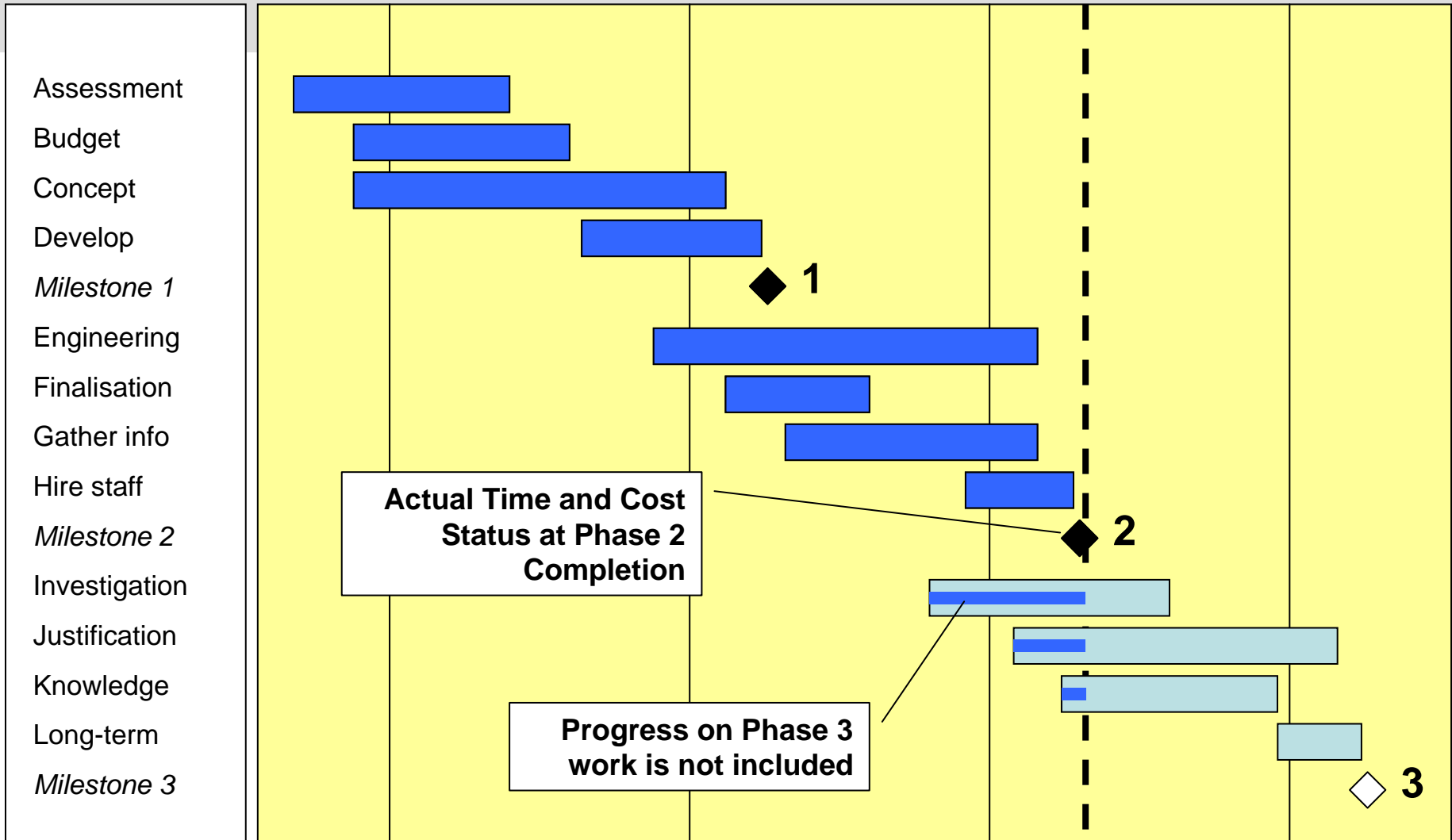
Typical Project Activity Grouped by Phases



EVM: Assessing Project Activity - End of August



PEVA: Assessing Project Activity - End of Phase 2



PEVA Components

1. Project Schedule

- ◆ Gantt chart in PM software

2. PEVA Cost Table

- ◆ Project budget in spreadsheet

3. PEVA Cumulative Performance Forecast

- ◆ Phase time/cost status and forecast in spreadsheet

4. PEVA Chart

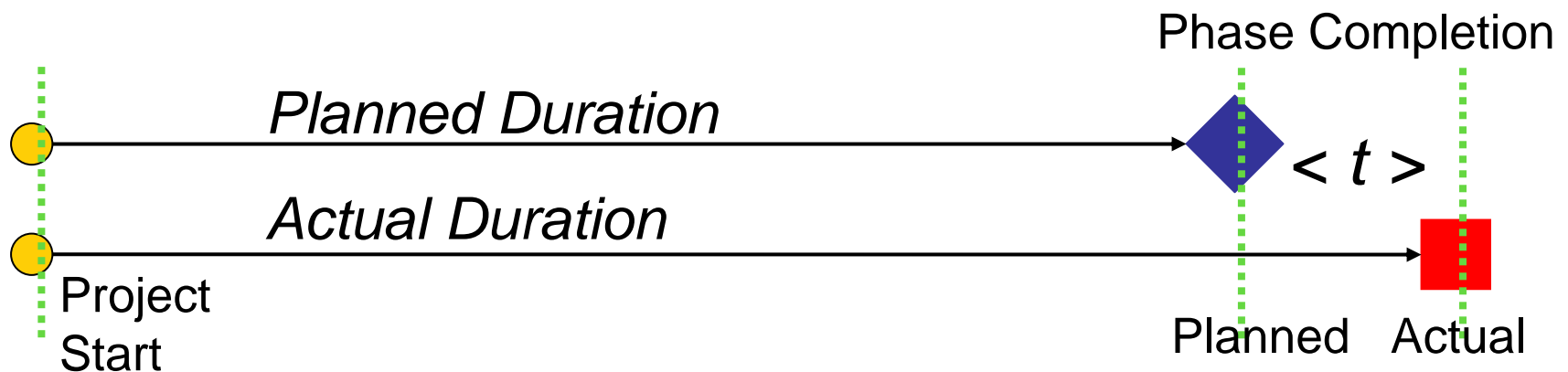
- ◆ Earned value tracking and forecast diagram

PEVA Cost Measures and Indicators

- **Phase Planned Value** is the total budget for each phase
- **Phase Earned Value** is equal to the Planned Value for each phase – when completed.
- **Phase Actual Cost** is the total of all internal and external costs attributed to each phase.
- **Phase Cost Variance:** $CV_P = EV_P - AC_P$
- **Phase Cost Performance Index:** $CPI_P = EV_P / AC_P$
- **Cumulative Cost Variance** is total EV_P less total AC_P , at each successive phase end.
- **Cumulative CPI** is the total EV_P divided by total AC_P , at each successive phase end.

PEVA Time Measures and Indicators

- **Phase Schedule Variance** is the difference between the planned and actual completion dates for a phase.
 $SV_P = \text{Planned phase end date} - \text{Actual phase end date}$
- **Schedule Performance Index** is planned duration divided by actual duration to a phase end.
 $SPI_P = \text{Planned duration} / \text{Actual duration}$
 - ◆ **Duration** is elapsed time from project start to any phase end



PEVA Sample Project

- Following project is purposely simple
 - Less detail to allow concept presentation within timeframe and on this screen
- Demonstration spreadsheet model contains a PEVA table and a PEVA chart
 - This Excel spreadsheet is available on request
- Not necessary to show project schedule
 - Let's assume there is one...

PEVA Sample Project

Data Entered by Project Manager

Results Calculated Automatically

Earned Value Variances and Indices by Phase

PEVA Cumulative Performance Forecast

Phase	Phase Name	Planned Phase End Date	Actual Phase End Date	Phase Planned Value	Phase Actual Cost	Actual or Forecast End	Cumul. Planned Value	Cumul. Earned Value	Actual or Forecast Cum. Cost	Phase CV	Cumul. CV	Cum. CPI	Cumul. EAC	Phase SV(t)	Cumul. SPI(t)
0	Start	2006-01-01		0	0	2006-01-01	0	0	0			1			1
1	Concept	2006-01-15	2006-01-16	11,000	12,000	2006-01-16	11,000	11,000	12,000	-1,000	-1,000	0.92	196,364	-1	0.93
2	Planning	2006-02-10	2006-02-12	15,000	16,500	2006-02-12	26,000	26,000	28,500	-1,500	-2,500	0.91	197,308	-2	0.95
3	Develop	2006-04-01		49,000		2006-04-05	75,000	75,000	82,212	0	-7,212	0.91	197,308	-5	0.95
4	Execute	2006-05-01		38,000		2006-05-07	113,000	113,000	123,865	0	-10,865	0.91	197,308	-6	0.95
5	Testing	2006-06-20		33,000		2006-06-28	146,000	146,000	160,038	0	-14,038	0.91	197,308	-9	0.95
6	Handoff	2006-07-15		19,000		2006-07-24	165,000	165,000	180,865	0	-15,865	0.91	197,308	-10	0.95
7	Closing	2006-08-12		15,000		2006-08-23	180,000	180,000	197,308	0	-17,308	0.91	197,308	-11	0.95
Total Project		As of date: 2006-02-12		180,000	28,500	Forecast Completion Date				Forecast Cost Variance			Forecast Final Cost	Days Late	

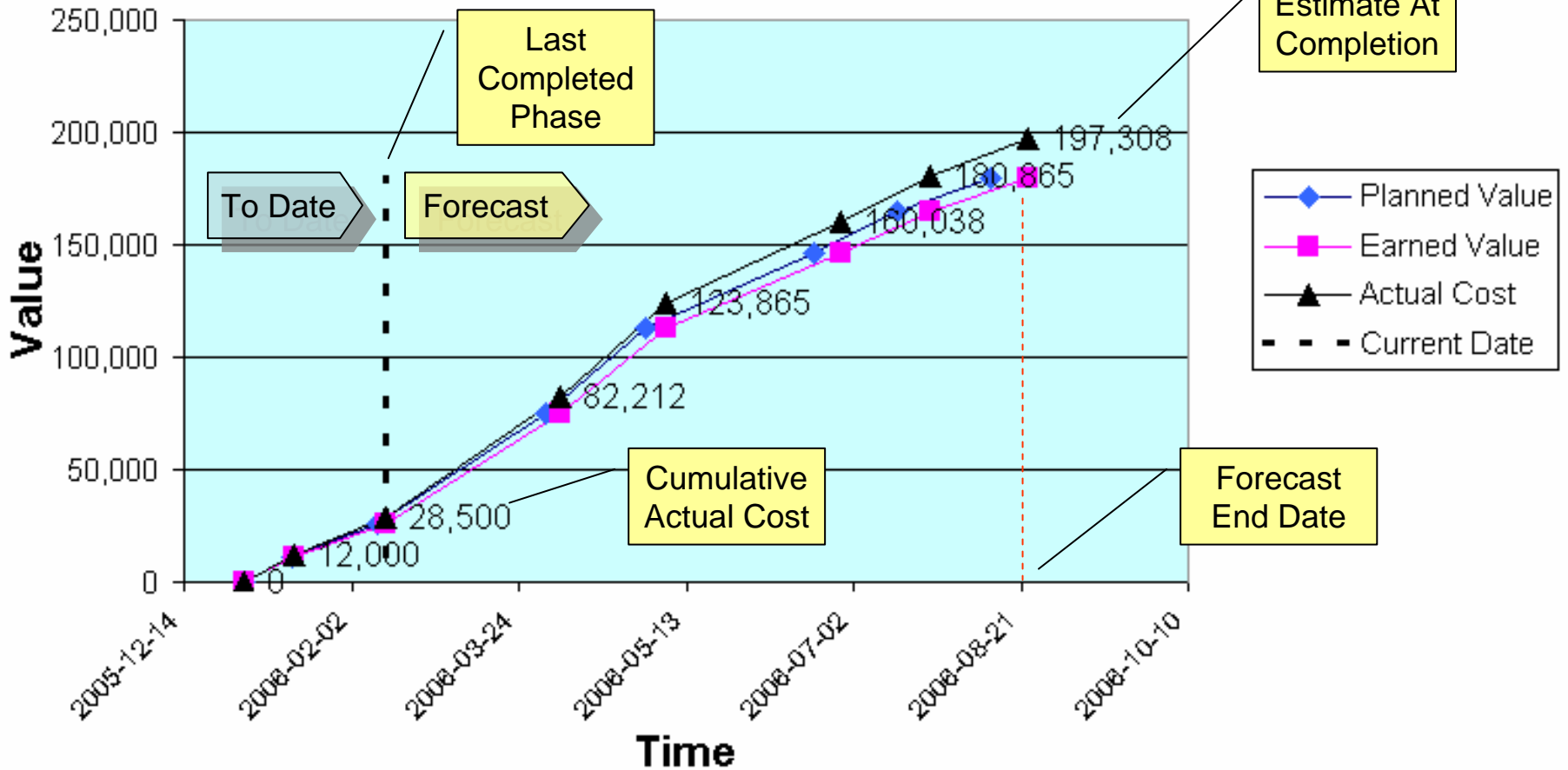
Forecast Phase End

Cumulative PV and EV

Forecast Cum. AC

Forecast Earned Value Variances and Indices by Phase

PEVA Sample Project



Implementing PEVA

1. Prepare time schedule by phases
2. Prepare budget by cost elements
3. Group budget elements by phase
4. Confirm activities and identify planned phase completion date
5. Deal with approved changes
6. Calculate actual costs
7. Track phase progress and completion
8. Review variances and take action

PEVA and Project Portfolio Management

Project Portfolio Management

- Corporate governance
 - ◆ Strategy to address corporate mission
 - ◆ Tactics to implement goals and objectives
 - ◆ Knowledge and control of corporate initiatives
- Governance of programs, projects and portfolios
 - ◆ Assessing projects and programs before, during and after delivery
 - ◆ Authorizing and launching new projects
 - ◆ Revising or canceling unsatisfactory projects

Portfolio Management Considerations

- **Resources:** required vs. availability
- **Relevance:** deliverables vs. objectives
- **Dependency:** project in relation to others
- **Progress:** meeting project schedule
 - ◆ Project planned vs. actual time
- **Performance:** meeting project budget
 - ◆ Project planned vs. actual costs

PEVA and Project Portfolio Management

- Evaluating project performance and progress by phases aids in portfolio management
- Phase and Earned Value:
 - ◆ EVM does not isolate phase milestones, cost performance and schedule progress
 - ◆ PEVA permits and encourages project assessment at each phase gate

PEVA-Portfolio Assesses Performance and Progress

Performance

How are we doing?

Earned value vs. actual
cost to the end of the last
completed phase

Where are we going?

Budget at Completion
vs.
Estimate at Completion

Progress

How are we doing?

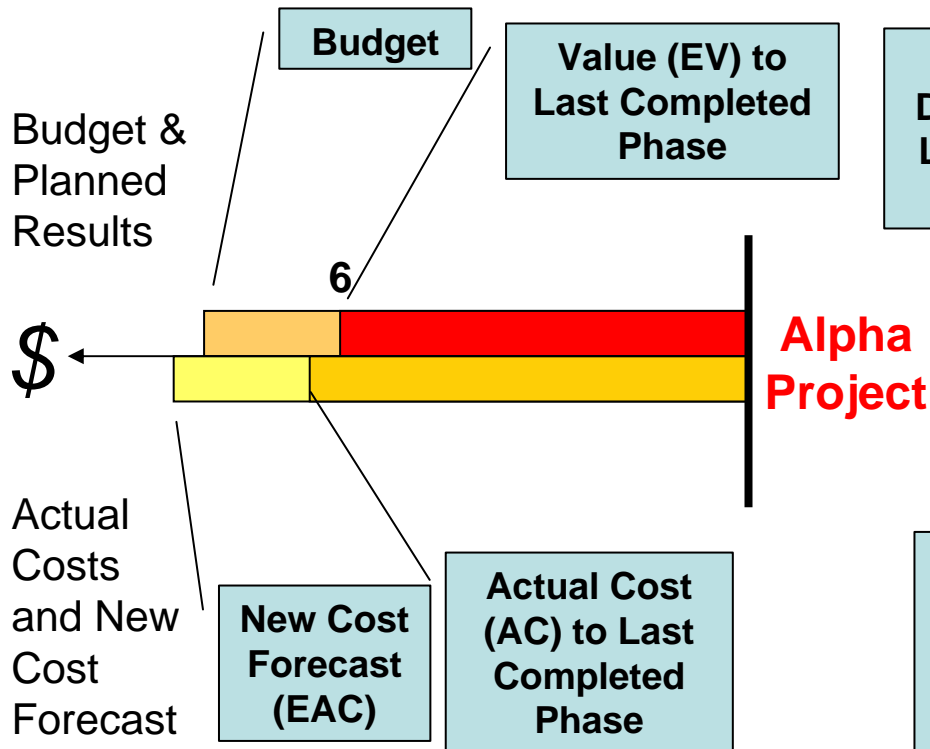
Planned vs. actual
duration to the end of the
last completed phase

Where are we going?

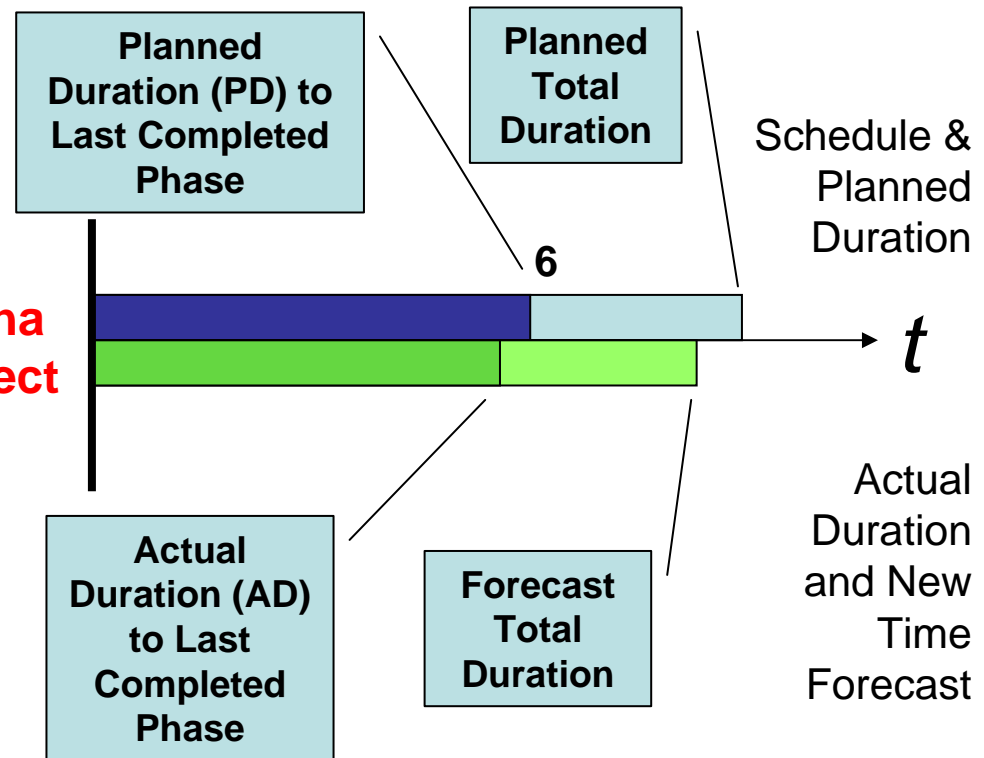
Planned Total Duration
vs.
Forecast Total Duration

PEVA and Portfolio Management

Cost Performance



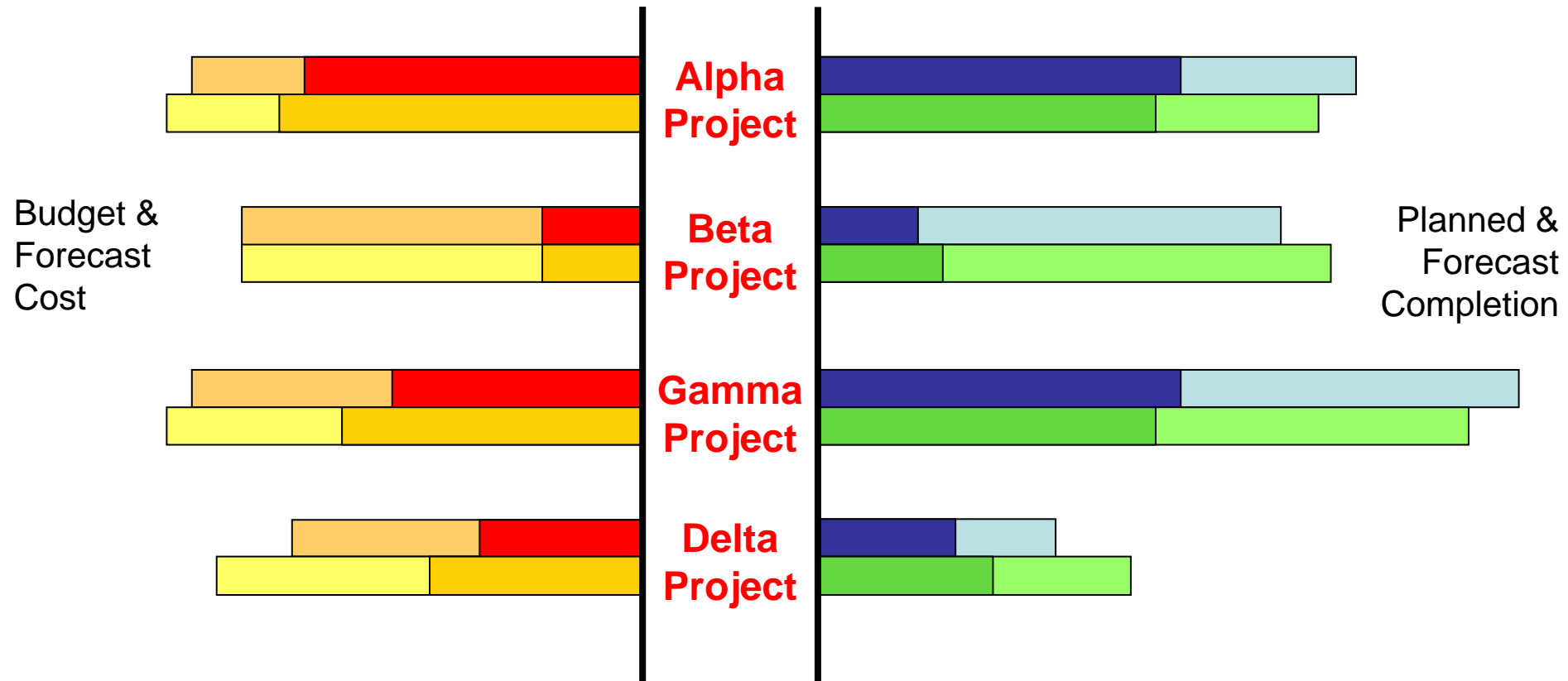
Schedule Progress



PEVA and Portfolio Management

Cost Performance (\$)

Schedule Progress (t)



PEVA and Portfolio Management

- Graphical presentation provides visual indication of status of individual projects
 - ◆ Indicates relative size and duration
 - ◆ Shows degree of progress and performance
- Permits side-by-side comparison of all current projects
- Depicts related projects within a program



Conclusions

- EVM has been effective where fully applied, but
 - ◆ Standard EVM methodology has numerous issues
- Phase Earned Value Analysis can simplify the adoption of performance management
 - ◆ PEVA also provides features not found in EVM
- PEVA requires application in a range of projects
 - ◆ Demonstrate its use and identify improvements
- PEVA facilitates review of a project portfolio
 - ◆ Provides graphical image of project status & forecast

Thank You!
Further questions?

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