PROGRESS AND PERFORMANCE MEASUREMENT AND EVALUATION

MA in Heritage Management

Structure of a Project Monitoring Information System

- Every project needs some form of formal control
- Creating a project monitoring system involves determining:
  - What data to collect
  - How, when, and who will collect the data
  - How to analyze the data
  - How to report current progress to management

Project Monitoring Information System

- Information System Structure
  - What data are collected?
    - Current status of project (schedule and cost, activity duration times, resource usage and rates etc)
    - Remaining cost to compete project
    - Date that project will be complete
    - Potential problems to be addressed now
    - Out-of-control activities requiring intervention
    - Cost and/or schedule overruns and the reasons for them
    - Forecast of overruns at time of project completion

Project Monitoring System… (cont'd)

- Information System Structure (cont'd)
  - Collecting data and analysis
    - Who will collect project data?
    - How will data be collected?
    - When will the data be collected?
    - Who will compile and analyze the data?
  - Reports and reporting
    - Who will receive the reports?
    - How will the reports be transmitted?
    - When will the reports be distributed?

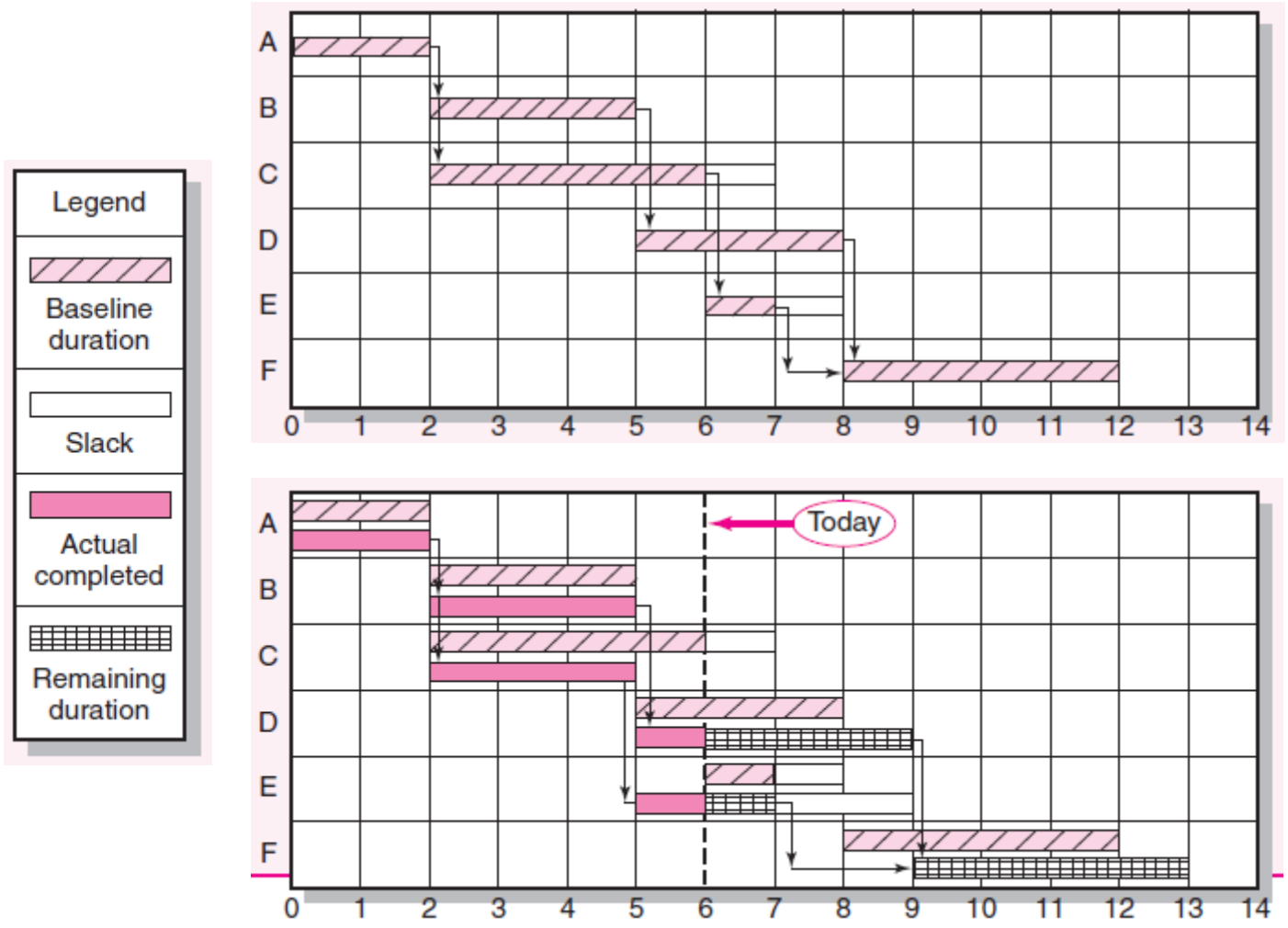
Project Monitoring System… (cont'd)

- A common project report includes:
  - Progress since last report
  - Current status of the project
    - Schedule
    - Cost
    - Scope
  - Cumulative trends
  - Problems and issues since last report
    - Actions and resolution of earlier problems
    - New variances and problems identified
  - Corrective action planned

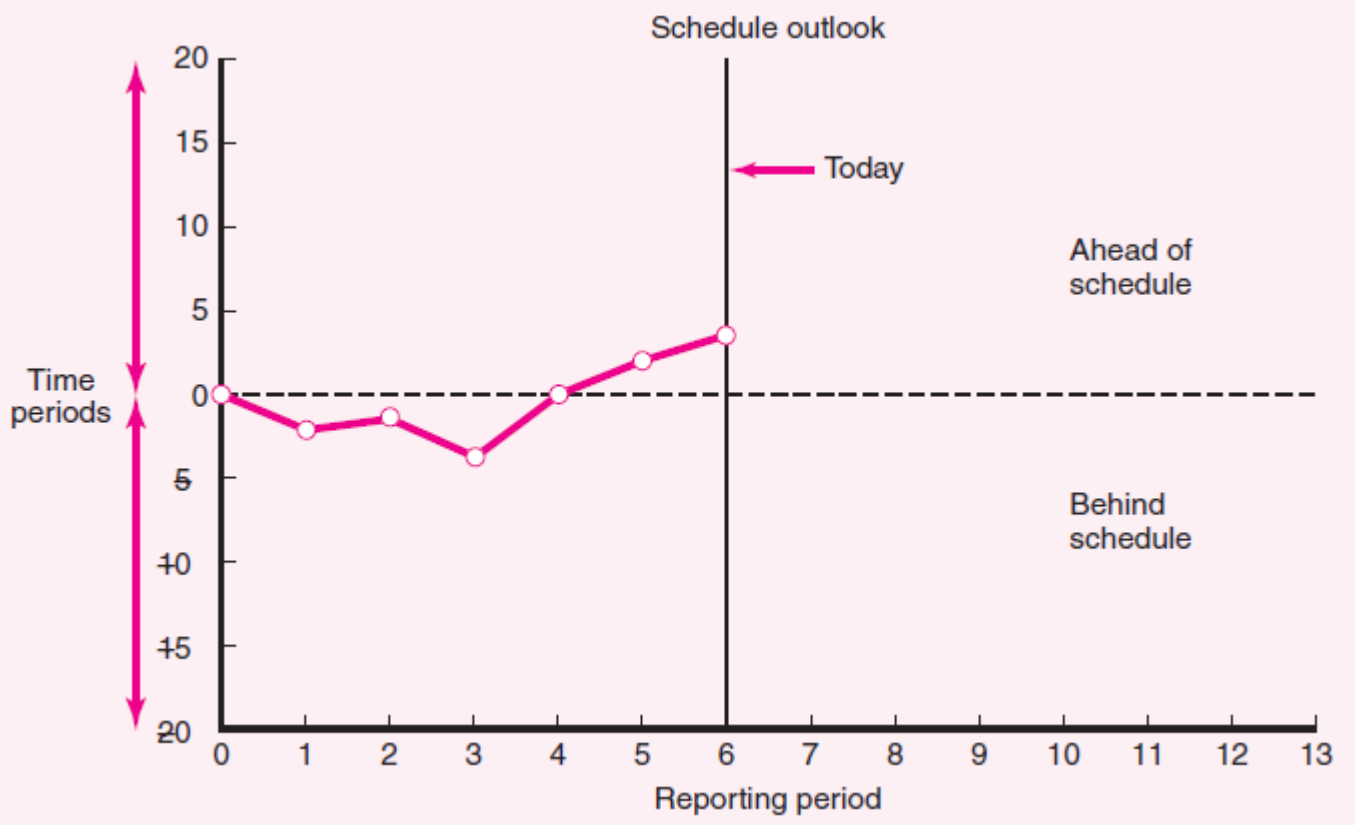
The Project Control Process

- Control
  - The process of comparing actual performance against plan to identify deviations, evaluate courses of action, and take appropriate corrective action.
- Project Control Steps
  1. Setting a baseline plan
     - WBS, project network, time sequence and resource schedule and time-phase budget
  2. Measuring progress and performance
     - Measurement of time performance
     - Measuring performance against budget (earned values against time-phase budget)
  3. Comparing plan against actual
  4. Taking action
- Tools
  - Tracking and baseline Gantt charts
  - Control charts

Tracking Gantt Chart



Control Chart



Developing an Integrated Cost/Schedule System

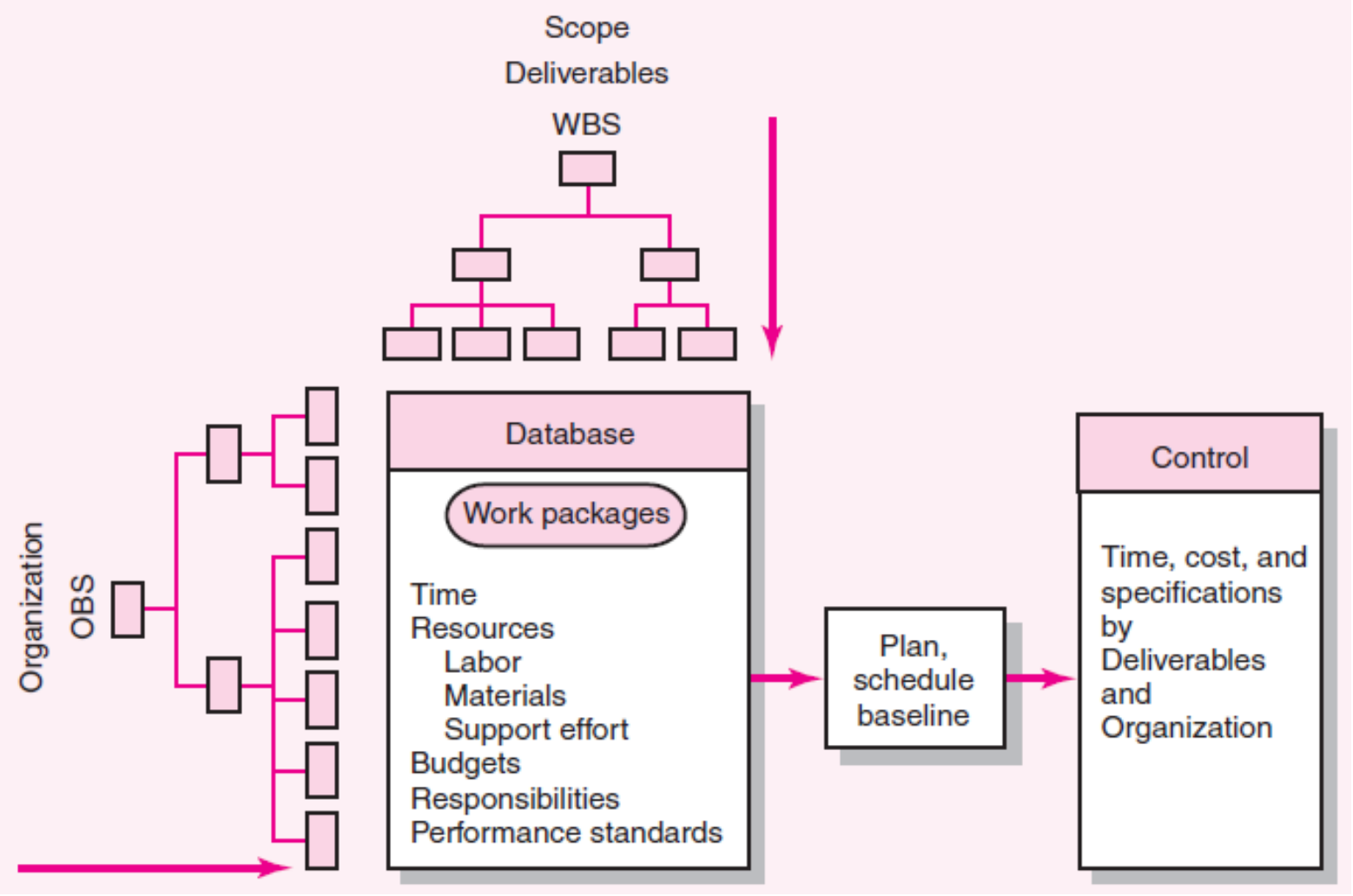
- Glossary of terms

EV	Earned value for a task is simply the percent complete times its original budget. Stated differently, EV is the percent of the original budget that has been earned by actual work completed. [The older acronym for this value was BCWP—budgeted cost of the work performed.]
PV	The planned time-phased baseline of the value of the work scheduled. An approved cost estimate of the resources scheduled in a time-phased cumulative baseline [BCWS—budgeted cost of the work scheduled].
AC	Actual cost of the work completed. The sum of the costs incurred in accomplishing work. [ACWP—actual cost of the work performed].
CV	Cost variance is the difference between the earned value and the actual costs for the work completed to date where CV = EV − AC.
SV	Schedule variance is the difference between the earned value and the baseline line to date where SV = EV − PV.
BAC	Budgeted cost at completion. The total budgeted cost of the baseline or project cost accounts.
EAC	Estimated cost at completion.
ETC	Estimated cost to complete remaining work.
VAC	Cost variance at completion. VAC indicates expected actual over- or underrun cost at completion.

Developing an Integrated Cost/Schedule System

1. Define the work using a WBS.
   a. Scope
   b. Work packages
   c. Deliverables
   d. Organization units
   e. Resources
   f. Budgets
2. Develop work and resource schedules.
   a. Schedule resources to activities
   b. Time-phase work packages into a network
3. Develop a time-phased budget using work packages included in an activity. Accumulate budgets (PV).
4. At the work package level, collect the actual costs for the work performed (AC). Multiply percent complete times original budget (EV).`
5. Compute the schedule variance (EV-PV) and the cost variance (EV-AC).

Developing an Integrated Cost/Schedule System



Development of Project Baselines

- Purposes of a Baseline (PV)
  - An anchor point for measuring performance
    - A planned cost and expected schedule against which actual cost and schedule are measured.
    - A basis for cash flows and awarding progress payments.
    - A summation of time-phased budgets (cost accounts as summed work packages) along a project timeline.
- What Costs Are Included in Baselines?
  - Labor, equipment, materials, project direct overhead costs (DOC)
    - If material and/or equipment are a significant portion, they can budgeted separately
    - Indirect overhead costs and profits are added later by accounting processes

Development of Project Baselines (cont'd)

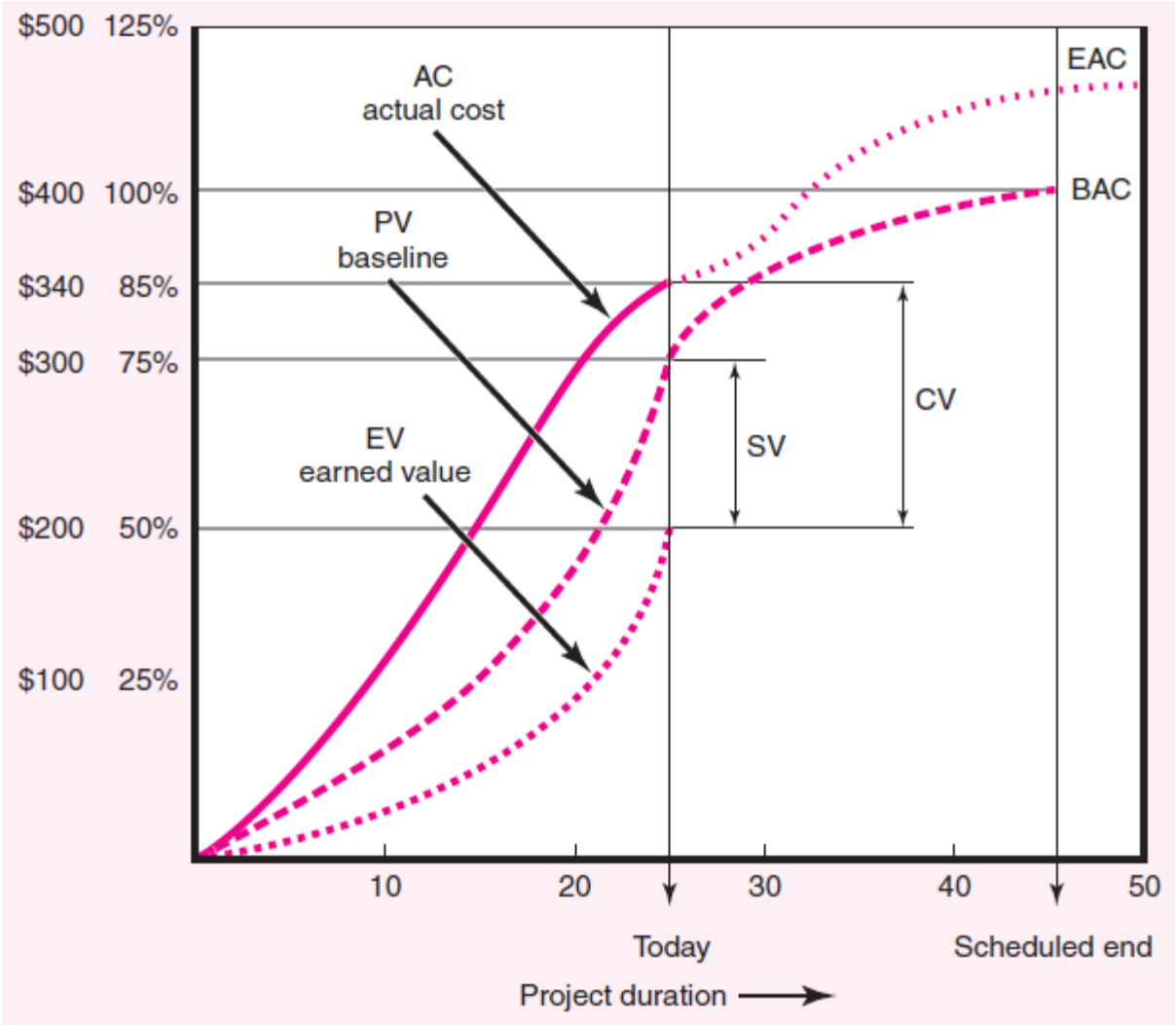
- Rules for Placing Costs in Baselines
  - Costs are placed exactly as they are expected to be "earned" in order to track them to their point of origin.
  - *Percent Complete Rule*
    - Costs are periodically assigned to a baseline as units of work are completed over the duration of a work package.

Methods of Variance Analysis

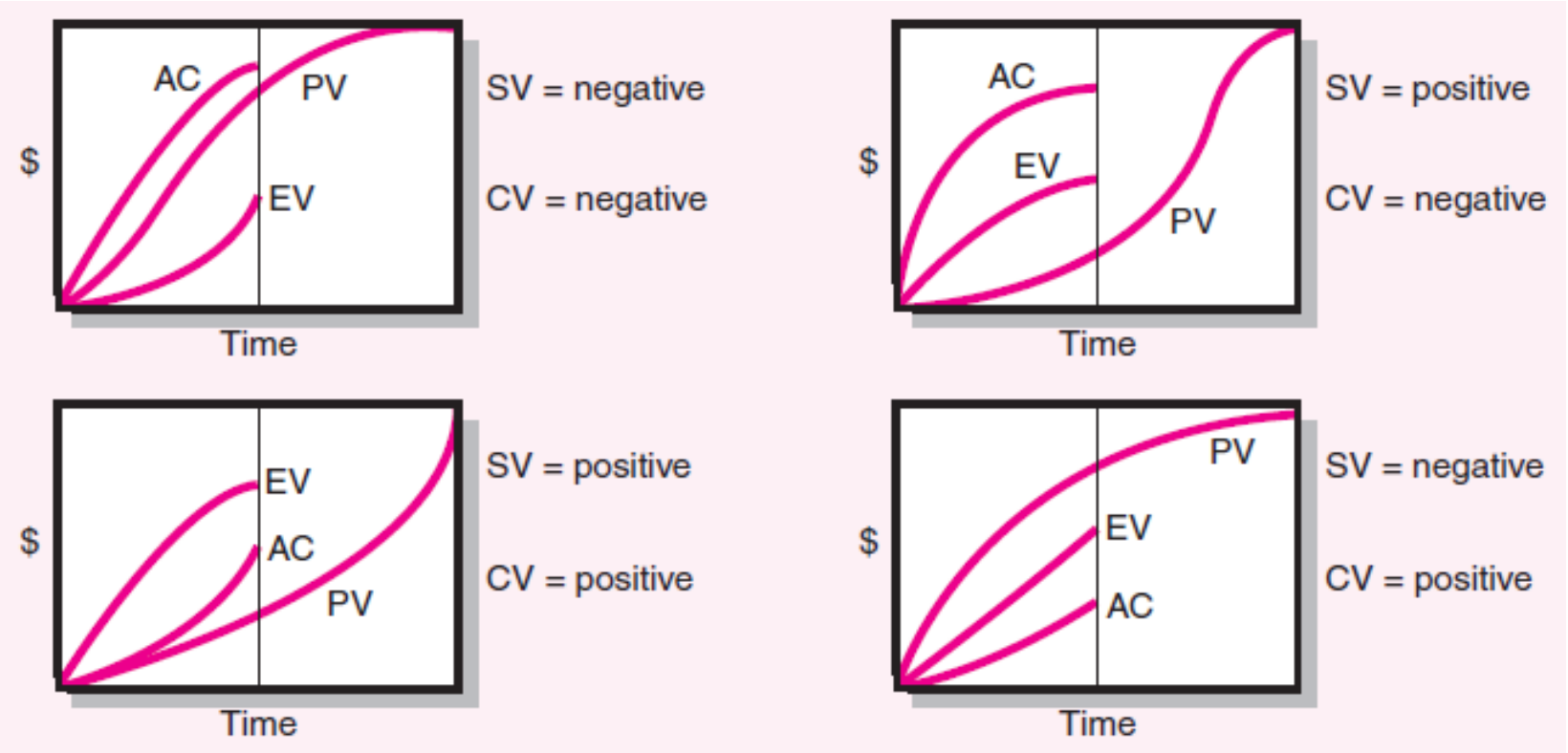
- Comparing Earned Value
  - With the expected schedule value.
  - With the actual costs.

- Assessing Status of a Project
  - Required data elements
    - Budgeted cost of the work scheduled (PV)
    - Budgeted cost of the work completed (EV)
    - Actual cost of the work completed (AC)
  - Calculate schedule and cost variances
    - A positive variance indicates a desirable condition, while a negative variance suggests problems or changes that have taken place.

Cost/Schedule Graph



Cost/Schedule Graphs



Developing A Status Report: A Hypothetical Example

- Book page 464
- Assumptions
  - Each cost account has only one work package, and each cost account will be represented as an activity on the network.
  - The project network early start times will serve as the basis for assigning the baseline values.
  - From the moment work an activity begins, some actual costs will be incurred each period until the activity is completed.

Indexes to Monitor Progress

- Performance Indexes
  - Cost Performance Index (CPI)
    - Measures the cost efficiency of work accomplished to date.
    - CPI = EV/AC
  - Scheduling Performance Index (SPI)
    - Measures scheduling efficiency
    - SPI = EV/PV

Index	Cost (CPI)	Schedule (SPI)
>1.00	Under cost	Ahead of schedule
=1.00	On cost	On schedule
<1.00	Over cost	Behind schedule

Indexes to Monitor Progress

- Performance Indexes
  - Percent Complete Indexes
    - Indicates how much of the work accomplished represents of the total budgeted (BAC) and actual (AC) dollars to date.
    - **PCIB = EV/BAC**
      - It is based on the original budget estimates
    - **PCIC = AC/EAC**
      - It is based on the actual costs and the estimated cost at completion
    - Compared to PCIB, PCIC includes newer, more complete information; however, sometimes is difficult to calculate EAC

Additional Earned Value Rules

- Rules applied to short-duration activities and/or small-cost activities
  - 0/100 percent rule
    - Assumes 100 % of budget credit is earned at once and only when the work is completed.
  - 50/50 rule
    - Allows for 50% of the value of the work package budget to be earned when it is started and 50% to be earned when the package is completed.
  - Percent complete with weighted monitoring gates
    - Uses subjective estimated percent complete in combination with hard, tangible monitoring points.

Forecasting Final Project Cost

- Methods used to revise estimates of future project costs:
  - EAC_{re}
    - Allows experts in the field to change original baseline durations and costs because new information tells them the original estimates are not accurate.
  - EAC_f
    - Uses actual costs-to-date plus an efficiency index to project final costs in large projects where the original budget is unreliable.

Forecasting Final Project Cost

EACre = AC + ETCre

EACre = revised estimated cost at completion

AC = cumulative actual cost of work completed to date

ETCre = revised estimated cost to complete remaining work

EACf = ETC +AC

ETC = work remaining / CPI = BAC – EV / (EV/AC)

To Complete Performance Index (TCPI)

= (BAC -EV)/(BAC - AC)

Measures the amount of value each remaining dollar in the budget must earn for the project to stay within the budget

An example

Project number: 163 **Project manager:** Connor Gage
Project priority now: 4
Status as of: April 1, 2010
Earned value figures:

PV	EV	AC	SV	CV	BAC
588,240	566,064	596,800	−22,176	−30,736	1,051,200
EAC	**VAC**	**EAC_f**	**CPI**	**PCIB**	**PCIC**
1,090,640	−39,440	1,107,469	.95	.538	.547

Project description: A computer-controlled conveyor belt that will move and position items on the belt with accuracy of less than one millimeter.
Status summary: The project is approximately 25 days behind schedule. The project has a cost variance of ($30,736).
Explanations: The schedule variance has moved from noncritical activities to those on the critical path. Integration first phase, scheduled to start 3/26, is now expected to start 4/19, which means it is approximately 25 days behind schedule. This delay is traced to the loss of the second design team which made it impossible to start utilities documentation on 2/27 as planned. This loss illustrates the effect of losing valuable resources on the project. The cost variance to date is largely due to a design change that cost $21,000.
Major changes since last report: The major change was loss of one design team to the project.
Total cost of approved design changes: $21,000. Most of this amount is attributed to the improved design of the serial I/O drivers.
Projected cost at completion: EAC_f is estimated to be $1,107,469. This represents an overrun of $56,269, given a CPI of .95. The CPI of .95 causes the forecast to be greater than the VAC −$39,440.
Risk watch: Nothing suggests the risk level of any segments has changed.

Key Terms

Baseline budget
Control chart
Cost performance index (CPI)
Cost variance (CV)
Earned value (EV)
Estimated Cost at Completion—Forecasted (EAC_f)
Estimated Cost at Completion—Revised Estimates (EAC_{re})
Percent complete index—budget costs (PCIB)
Percent complete index—actual costs (PCIC)
Schedule performance index (SPI)
Schedule variance (SV)
Scope creep
To complete performance index (TCPI)
Tracking Gantt chart
Variance at completion (VAC)