Project Monitoring and Control

E. Susy Suhendra

Project Monitoring and Control

- Monitoring – collecting, recording, and reporting information concerning project performance that project manger and others wish to know
- Controlling – uses data from monitor activity to bring actual performance to planned performance

Project Monitoring and Control

- Why do we monitor?
- What do we monitor?
- When to we monitor?
- How do we monitor?

Why do we monitor?

- Simply because we know that things don’t always go according to plan (no matter how much we prepare)
- To detect and react appropriately to deviations and changes to plans

What do we monitor?

- Men (human resources)
- Machines
- Materials
- Money
- Space
- Time
- Tasks
- Quality/Technical Performance

What do we monitor?

Inputs

- Time
- Money
- Resources
- Material Usage
- Tasks
- Quality/Technical Performance

Outputs

- Progress
- Costs
- Job starts
- Job completion
- Engineering / Design changes
- Variation order (VO)

When do we monitor?

- End of the project
- Continuously
- Regularly
- Logically
- While there is still time to react
- As soon as possible
- At task completion
- At pre-planned decision points (milestones)

Where do we monitor?

- At head office?
- At the site office?
- On the spot?
- Depends on situation and the ‘whats’

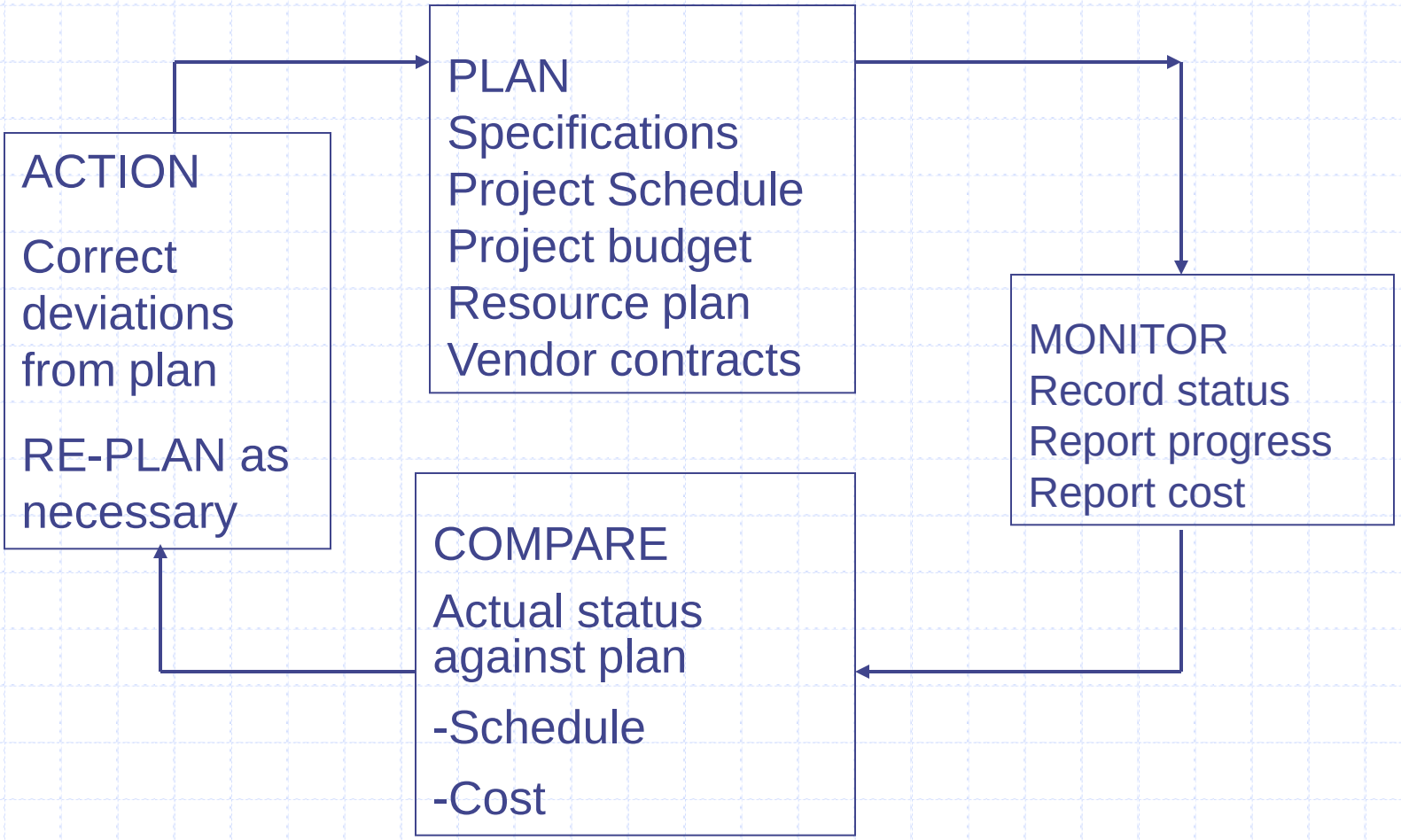
How do we monitor

- Through meetings with clients, parties involved in project (Contractor, supplier,etc.)
- For schedule – Update CPA, PERT Charts, Update Gantt Charts
- Using Earned Value Analysis
- Calculate Critical Ratios
- Milestones
- Reports
- Tests and inspections
- Delivery or staggered delivery
- PMIS (Project Management Info Sys) Updating

Meetings – Some monitoring issues

- What problems do you have and what is being done to correct them?
- What problems do you anticipate in the future?
- Do you need any resources you do not yet have?
- Do you need information you do not have yet?
- Do you know anything that will give you schedule difficulties?
- Any possibility your task will finish early/late?
- Will your task be completed under/over/on budget?

Project Control Cycle



Project Control

- Control – process and activities needed to correct deviations from plan
- Control the triple constraints
  - time (schedule)
  - cost (budget, expenses, etc)
  - performance (specifications, testing results, etc.)

Techniques for monitoring and control

- Earned Value Analysis

Earned Value Analysis

What Is It ?

Why Do I Need It ?

How Do I Do It?

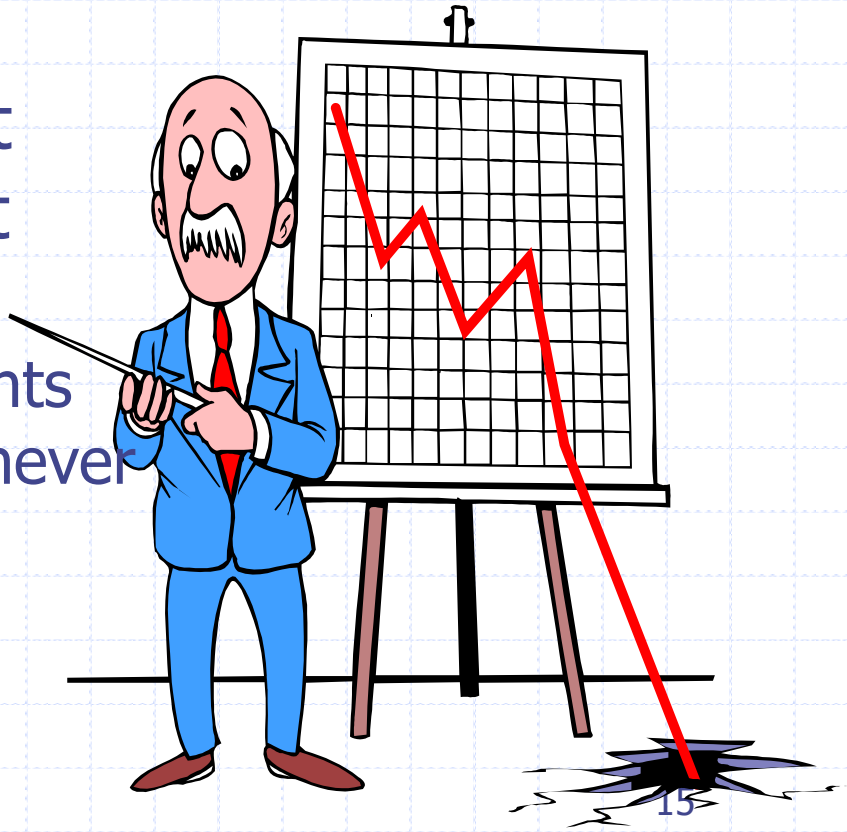
There's Room For Improvement

70% of projects are:

- Over budget
- Behind schedule

52% of all projects finish at 189% of their initial budget

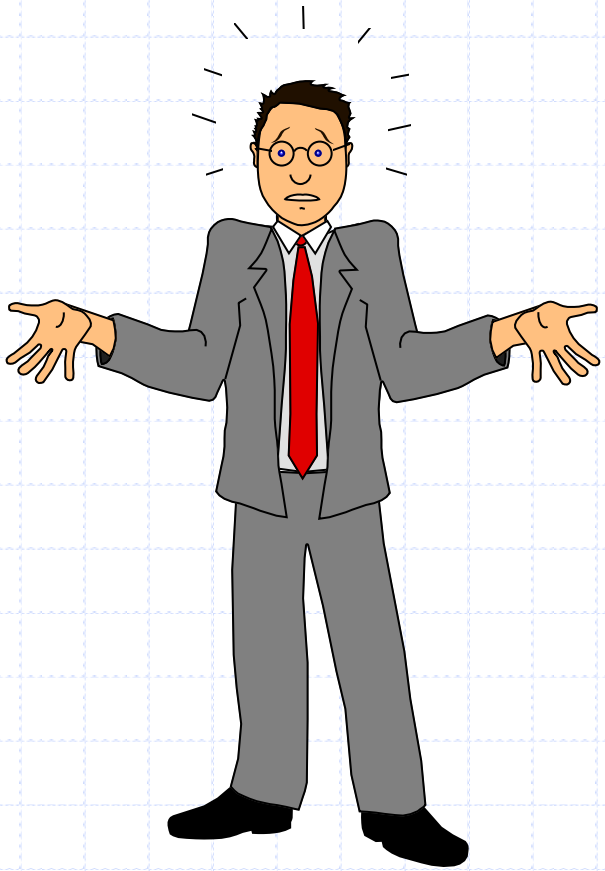
And some, after huge investments of time and money, are simply never comple



Source:The Standish Group

How to answer the question:
"Have we done what we said we'd do?"

- % complete estimating
  - % of Budget spent
  - % of work done
  - % of time elapsed
    - subjective, incomplete
    - draws false conclusions



Enter Earned Value Analysis

- "Earned Value Analysis" is:
  - an industry standard way to:
    - measure a project's progress,
    - forecast its completion date and final cost, and
    - provide schedule and budget variances along the way.
- By integrating three measurements, it provides consistent, numerical indicators with which you can evaluate and compare projects.

What's more Important?

- Knowing where you are on schedule?
- Knowing where you are on budget?
- Knowing where you are on work accomplished?

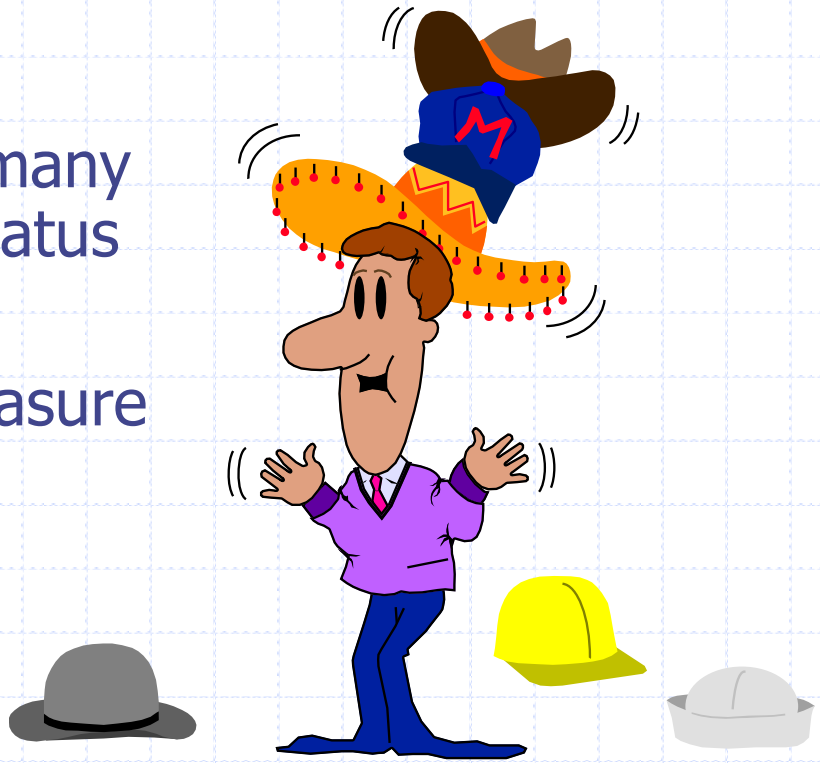
EVA Integrates All Three

- It compares the PLANNED amount of work with what has actually been COMPLETED, to determine if *COST* , *SCHEDULE, and WORK ACCOMPLISHED* are progressing as planned.

- Work is "Earned" or credited as it is completed.

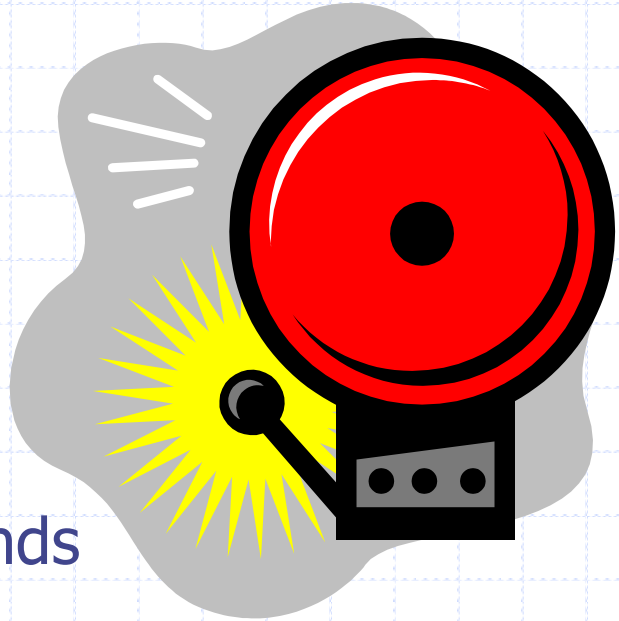
Earned Value needed because...

- Different measures of progress for different types of tasks
- Need to "roll up" progress of many tasks into an overall project status
- Need for a uniform unit of measure (dollars or work-hours).

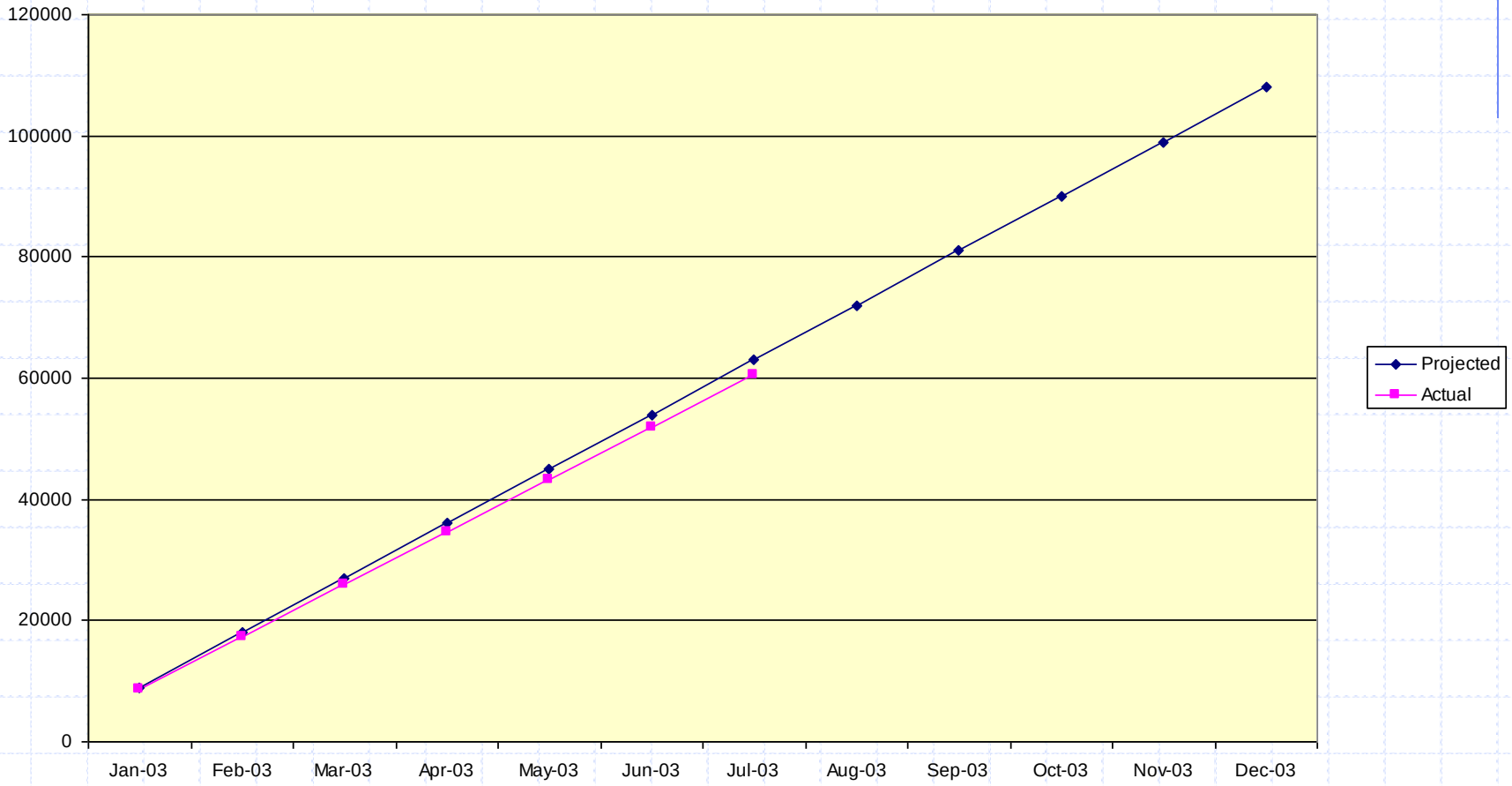


Earned Value needed because...

- Provides an "Early Warning" signal for prompt corrective action.
  - Bad news does not age well.
  - Still time to recover
  - Timely request for additional funds



How's this project doing?



Some New Terms

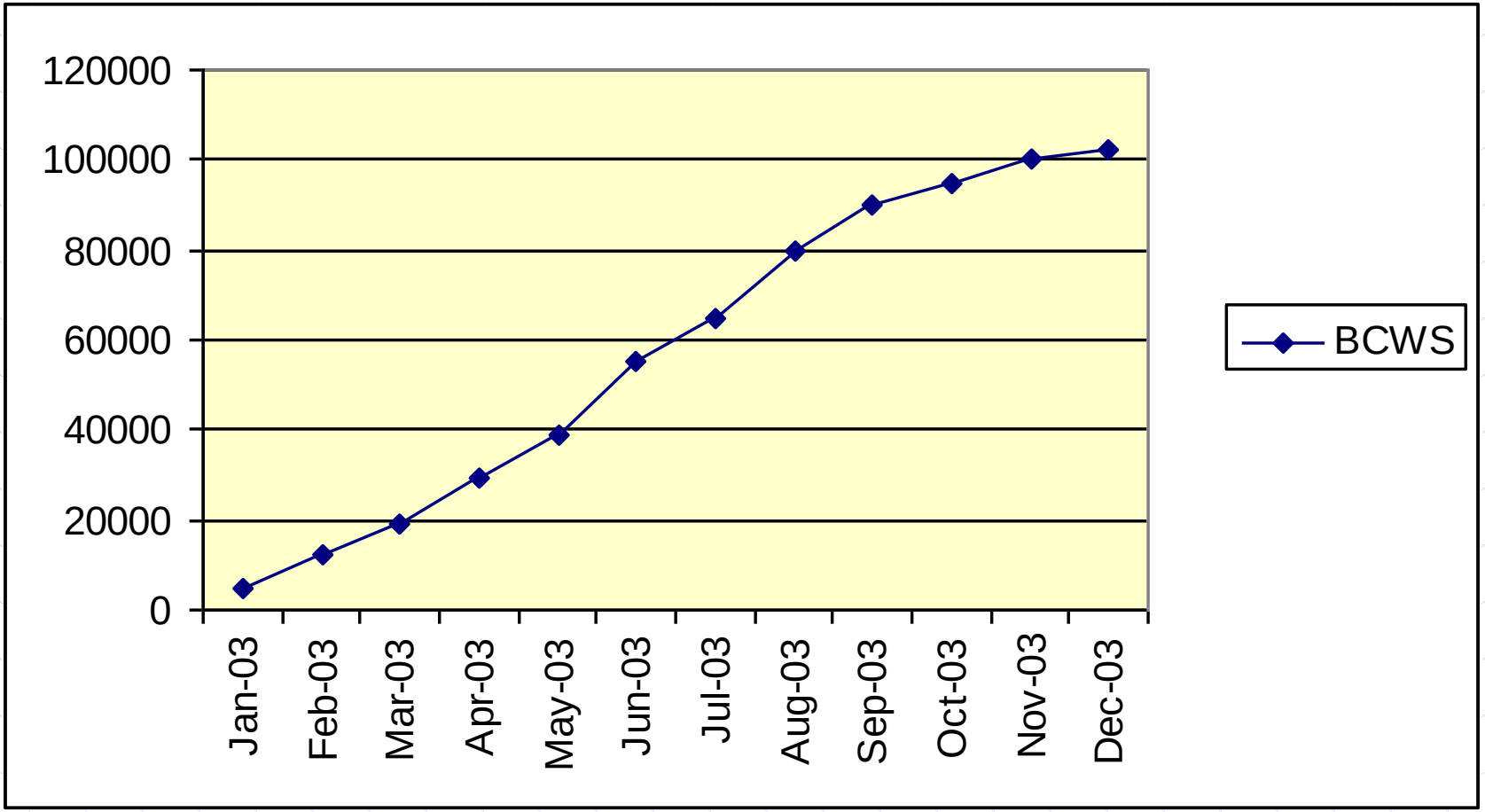
- BCWS - Budgeted Cost of Work Scheduled
- ACWP - Actual Cost of Work Performed
- BCWP - Budgeted Cost of Work Performed

Earned Value Definitions

- BCWS: "Budgeted Cost of Work Scheduled"

  Planned cost of the total amount of work scheduled to be performed by the milestone date.

BCWS - Budgeted Cost of Work Scheduled

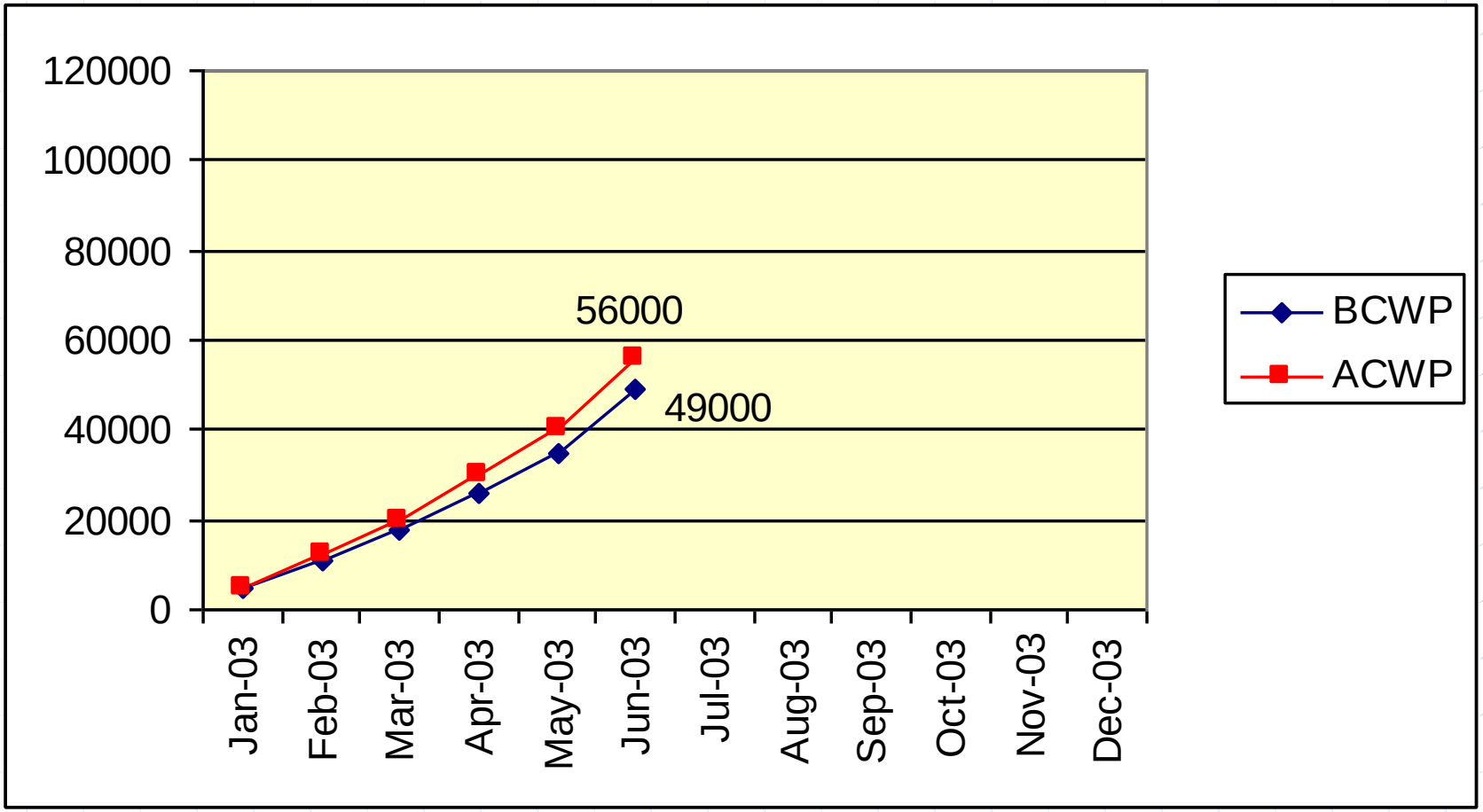


Earned Value Definitions (cont.)

- ACWP: "Actual Cost of Work Performed"

  Cost incurred to accomplish the work that has been done to date.

ACWP - Actual Cost of Work Performed

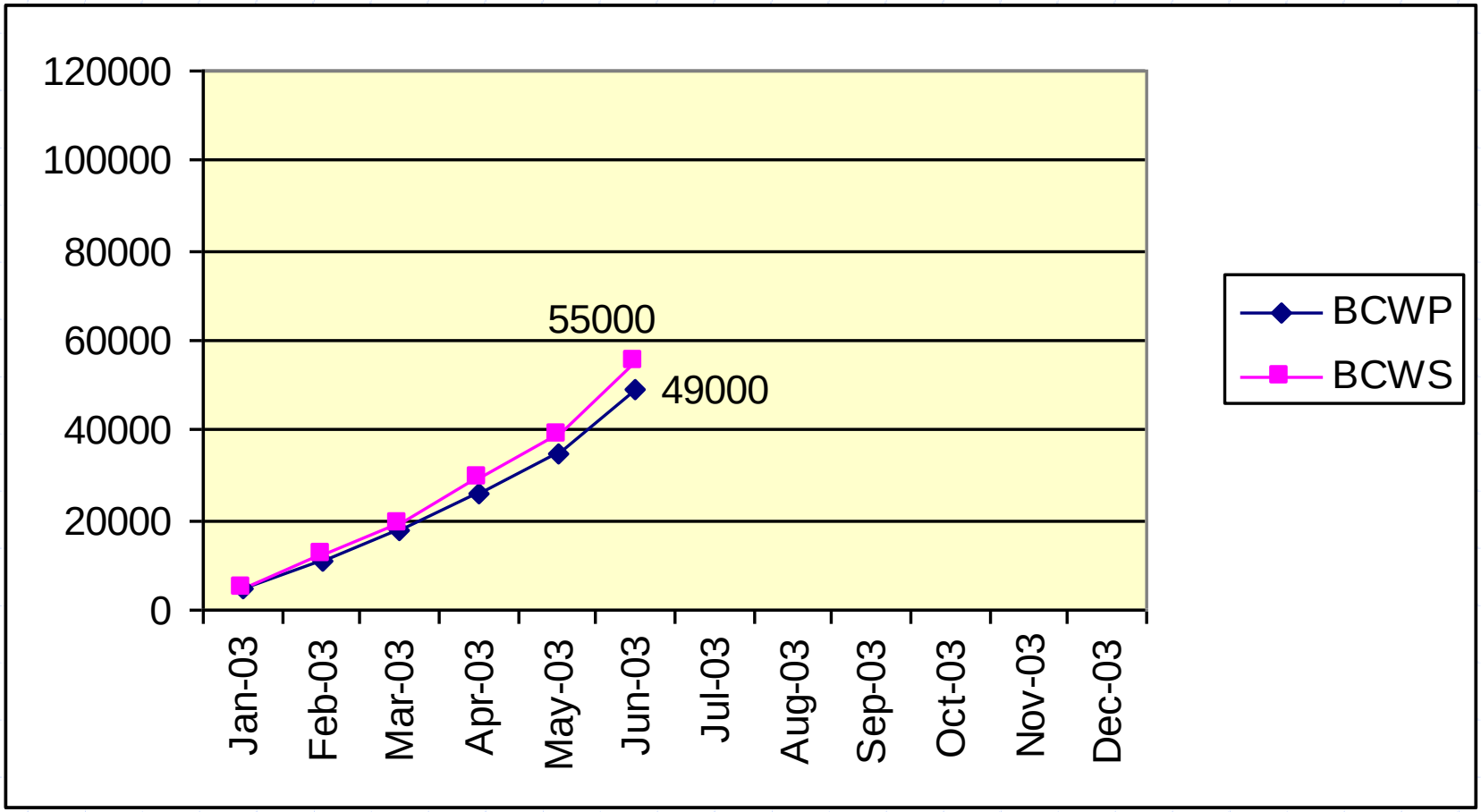


Earned Value Definitions (cont.)

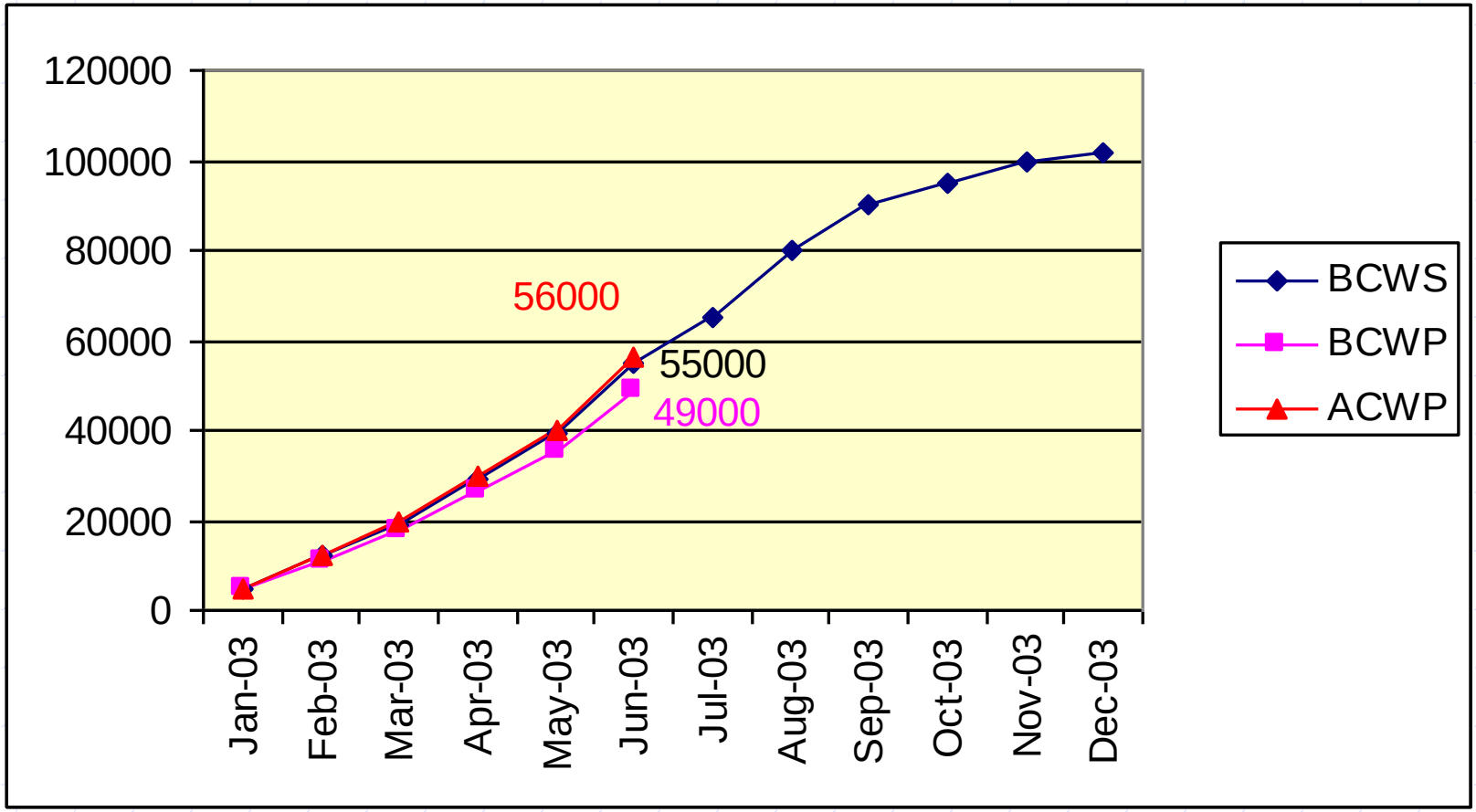
- BCWP: Budgeted Cost of Work Performed

  The planned (not actual) cost to complete the work that has been done.

BCWP - Budgeted Cost of Work Performed



The Whole Story



Some Derived Metrics

- SV: Schedule Variance (BCWP-BCWS)
  - A comparison of amount of work performed during a given period of time to what was scheduled to be performed.
  - A negative variance means the project is behind schedule
- CV: Cost Variance (BCWP-ACWP)
  - A comparison of the budgeted cost of work performed with actual cost.
  - A negative variance means the project is over budget.

Schedule Variance & Cost Variance

Schedule Variance = BCWP-BCWS

$49,000
- 55,000
SV = - $ 6,000

Cost Variance = BCWP-ACWP

$49,000
56,000
CV = - $7,000

Some More Derived Metrics

- SPI: Schedule Performance Index
  - SPI=BCWP/BCWS
  - SPI<1 means project is behind schedule
- CPI: Cost Performance Index
  - CPI= BCWP/ACWP
  - CPI<1 means project is over budget
- CSI: Cost Schedule Index (CSI=CPI x SPI)
  - The further CSI is from 1.0, the less likely project recovery becomes.

Performance Metrics

SPI: BCWP/BCWS

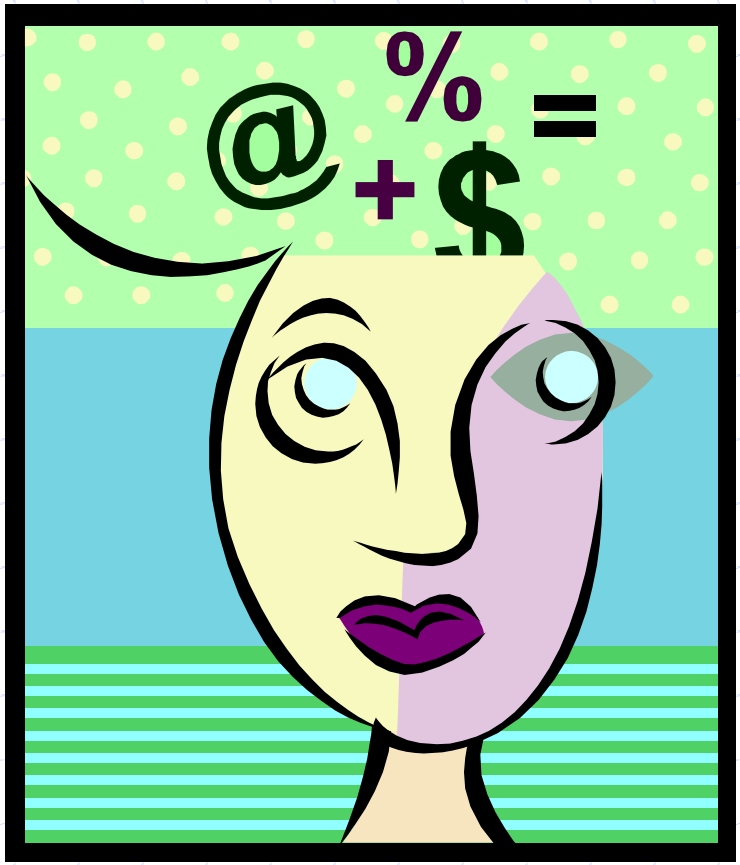
49,000/55,000 = 0.891

CPI: BCWP/ACWP

49,000/56,000 = 0.875

CSI: SPI x CPI

.891 x .875 = 0.780

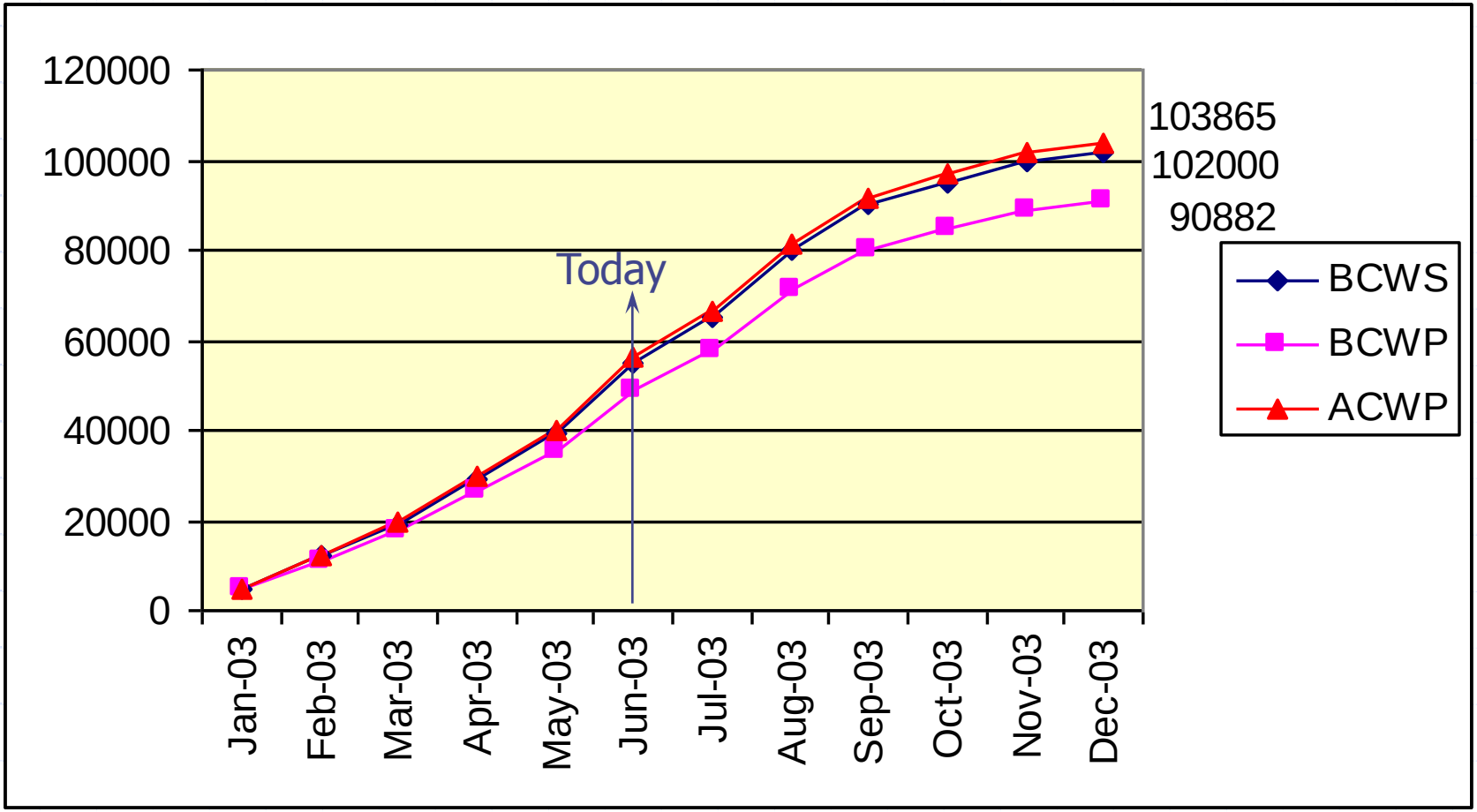


Assume that operations on a Work Package cost $ 1,500 to complete. They were originally scheduled to finish today. At this point, we actually spent $1,350. And we estimate that we have completed two thirds (2/3) of the work. What are the cost and schedule variances?

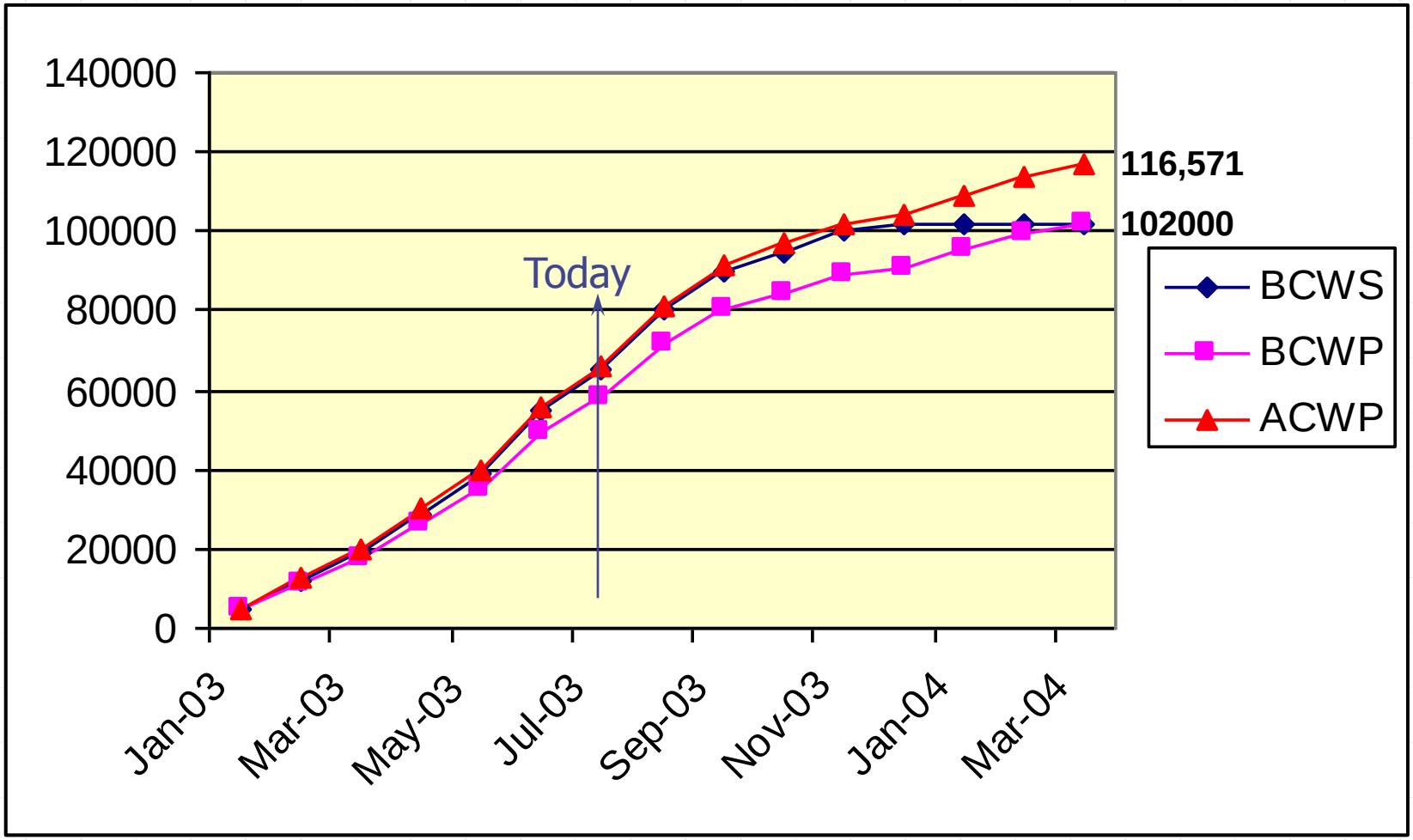
CV = BCWP – ACWP = 1500 (2/3) – 1350 = **- 350**
SV = BCWP – BCWS = 1500 (2/3) – 1500 = **- 500**
CPI = BCWP/ACWP = 1500(2/3)/1350 = **0.74**
SPI = BCWP/BCWS = 1500(2/3)/1500 = **0.67**

Spending higher than budget, and given what we have spent, we are not as far along as we should be (have **not completed as much work as we should have**)

Making Projections

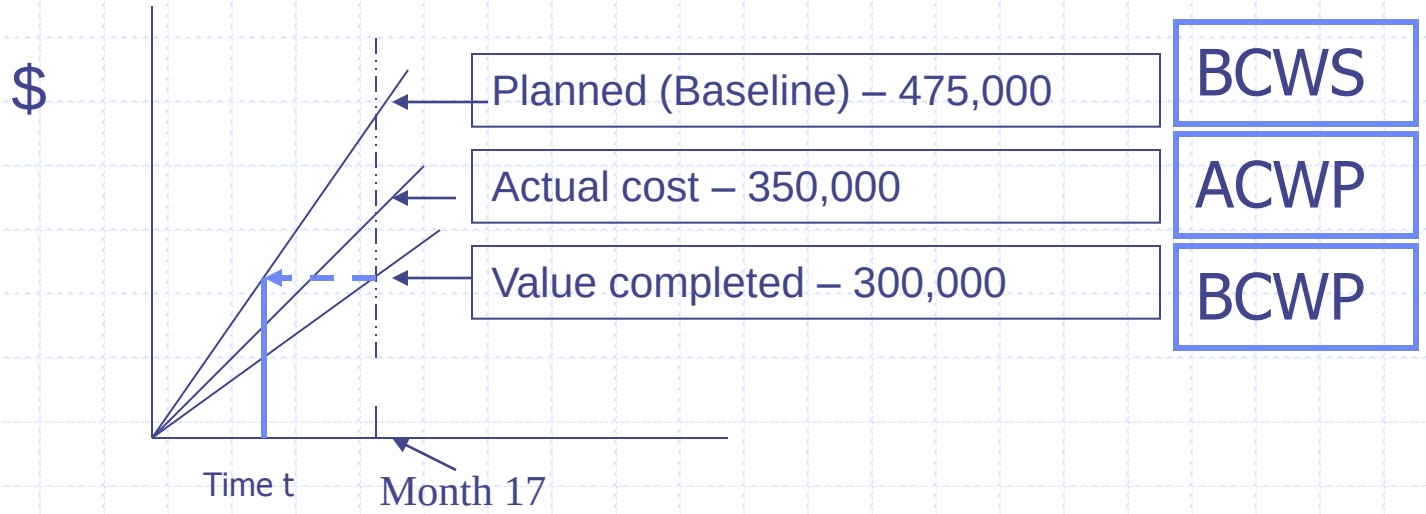


Estimate to Complete



EXERCISE

A project to develop a country park has an actual cost in month 17 of $350,000, a planned cost of $475,000, and a value completed of $300,000. Find the cost and schedule variances and the three indexes.



Solution

BCWS = 475,000
BCWP = 300,000
ACWP = 350,000

CV = BCWP – ACWP
SV = BCWP – BCWS

CV = 300,000 – 350,000 = -50,000 (negative value - cost overrun)
SV = 300,000 – 475,000 = -175,000 (negative value - behind schedule)
Cost Performance Index (CPI) = BCWP/ACWP = 300/350 = 0.86
Schedule Performance Index (SPI) = BCWP/BCWS = 300/475 = 0.63
Time t = Schedule Variance/Slope of Planned costs =
-175,000/ (475,000/17) = - 6.26 months
∴ Time Difference= 17- 6.26 = 10.74
TV = 10.74/17 = 0.63

Critical ratio

- Sometimes, especially large projects, it may be worthwhile calculating a set of critical ratios for all project activities
- The critical ratio is

$$\frac{\text{actual progress}}{\text{scheduled progress}} \times \frac{\text{budgeted cost}}{\text{actual cost}}$$

- If ratio is 1 everything is probably on target
- The further away form 1 the ratio is, the more we may need to investigate

Critical ratio example

Calculate the critical ratios for the following activities and indicate which are probably on target and need to be investigated.

Activity	Actual progress	Scheduled Progress	Budgeted Cost	Actual cost	Critical ratio (CR)
A	4 days	4 days	60	40	
B	3 days	2 days	50	50	
C	2 days	3 days	30	20	
D	1 day	1 day	20	30	
E	2 days	4 days	25	25	

Critical ratio example

- Can be on schedule and below budget (Act A) Why so good?
- Can be behind schedule but below budget (Act C)
- Can be on budget but physical progress lagging (Act E)
- Can be on schedule but cost running higher than budget (Act D)
- On budget ahead of schedule (Act B)

Summary

- Need proper project monitoring and control mechanisms
- Tools available to help in monitoring and controlling activities
- There are human control and management aspects not covered here