

Project Cost Management

Cost control - Earned Value Analysis

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Cost and financial control

- ◆ Monitoring project performance

- ◆ Cash Flow

- What's happening out there?



Earned Value Analysis

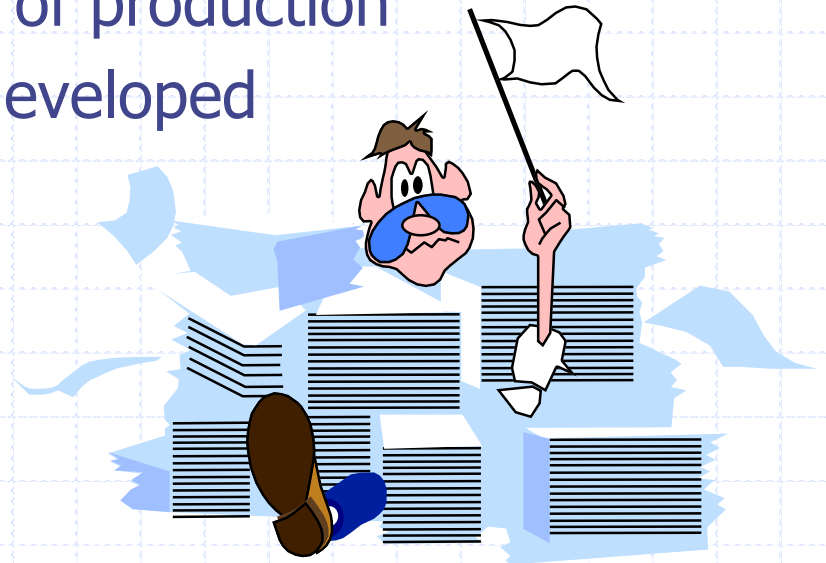
What Is It ?

Why Do I Need It ?

How Do I Do It?

Today's Situation

- ◆ Need for accurate and consistent status information
- ◆ Numerous complex (and interrelated) projects
 - Projects with many WBS activities
 - Need for better analysis of production
 - Lots of adhoc systems developed



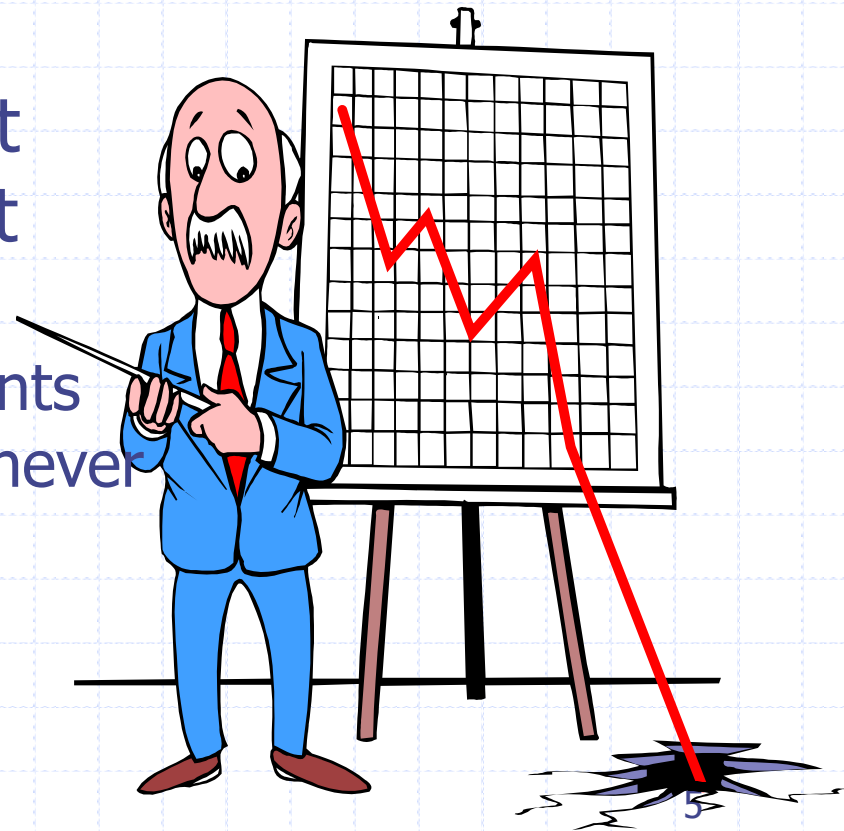
There's Room For Improvement

48% 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 completed

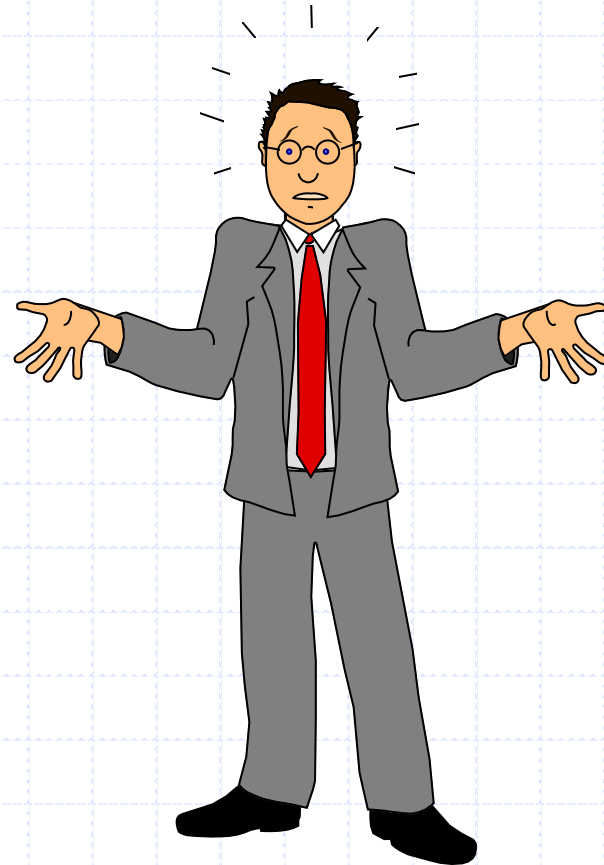


How to answer the question:

"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?



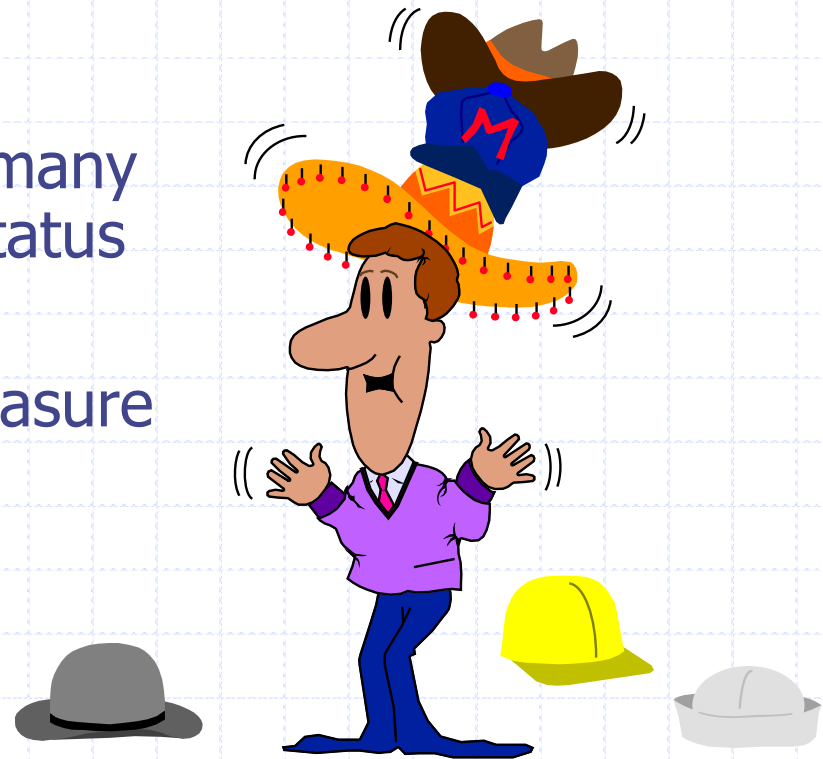
- ◆ Knowing where you are on schedule?
- ◆ Knowing where you are on budget?
- ◆ Knowing where you are on work accomplished?

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).

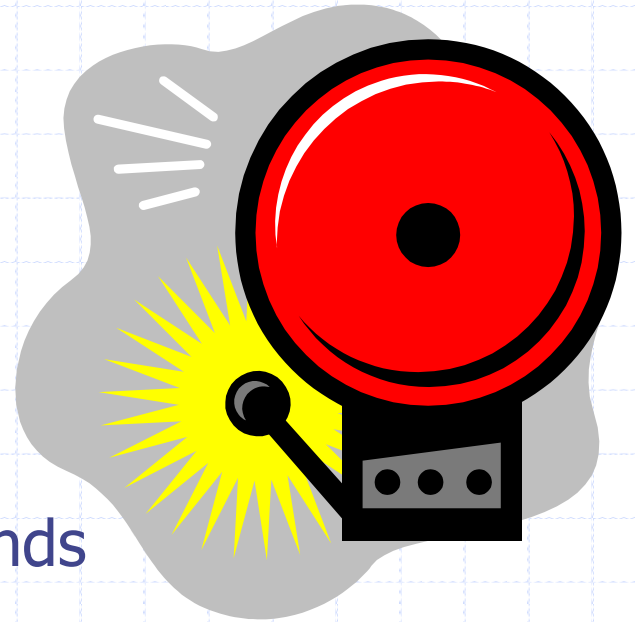


What earned value can you claim for a building project work currently at its foundation completion - DPC level, preparation for roofing level and external work level? Assume total cost of the project is £250,000.00

- ◆ foundation completion - DPC level???
- ◆ preparation for roofing level ???
- ◆ external work level ???

Earned Value needed because...

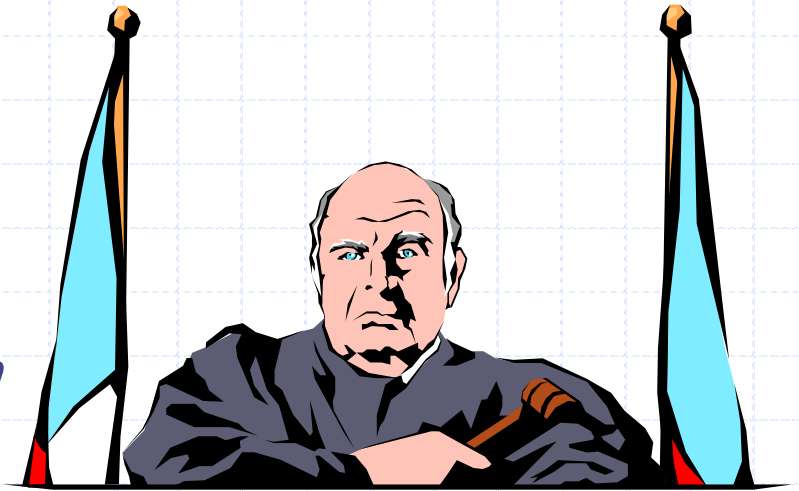
- ◆ Provides an “Early Warning” signal for prompt corrective action.
 - Bad news does not age well.
 - Still time to recover
 - Timely request for additional funds



Because You Gotta !

American legislation)

"Agencies must use a performance based acquisition management system, based on ANSI/EIA Standard 748, to measure achievement of the cost, schedule, and performance goals."



So, Is This Stuff New ?

It's been around since the sixties.

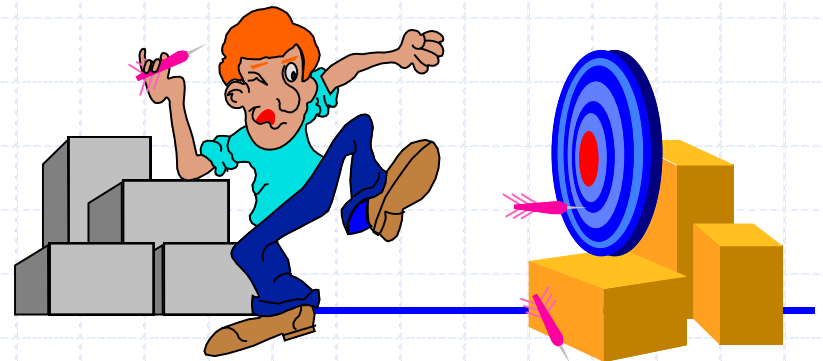
"Cost/Schedule Control Systems Criteria"
(C/SCSC)



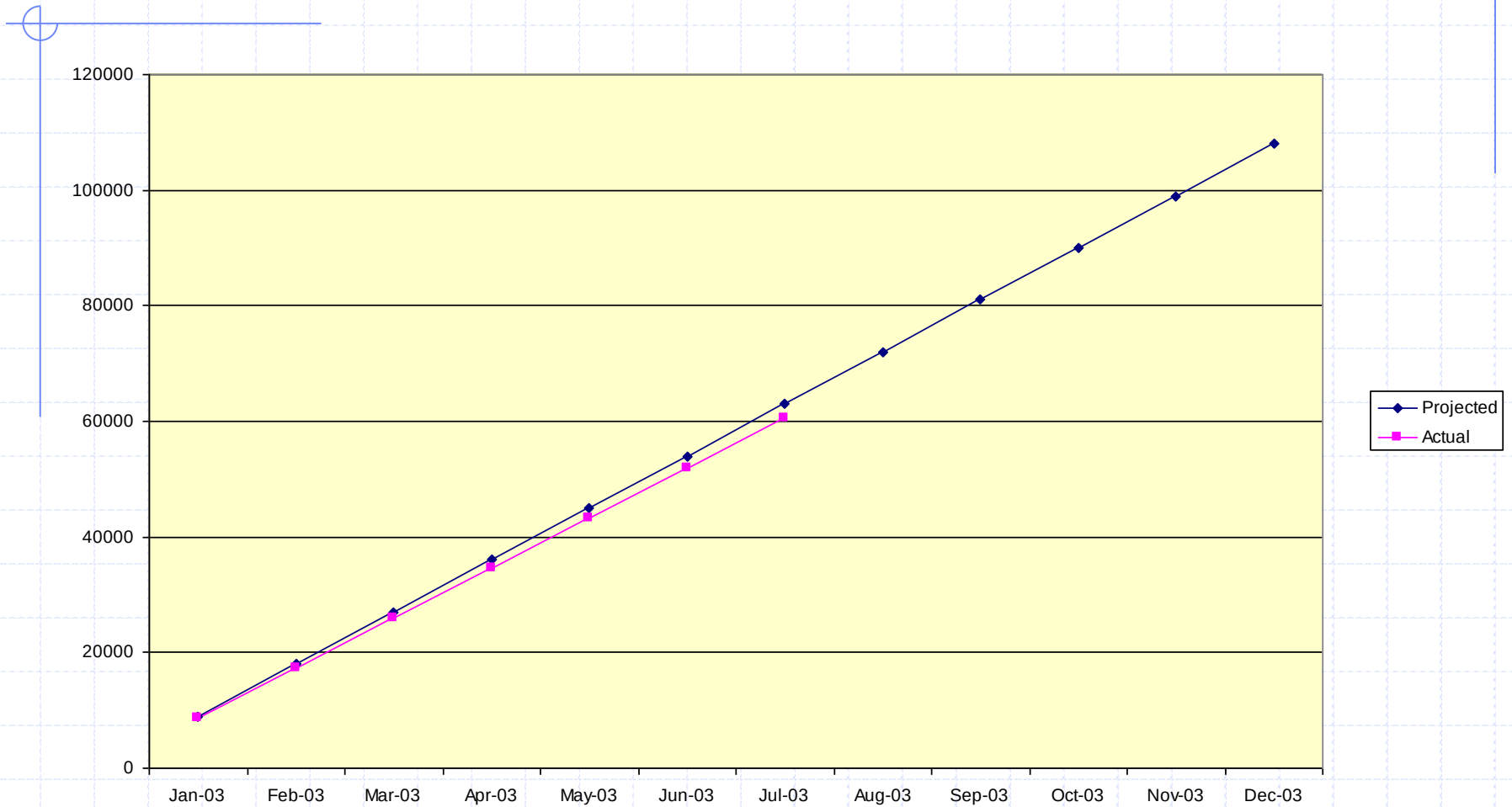
Examples of informal Earned Value Analysis

It's done informally without realizing it.

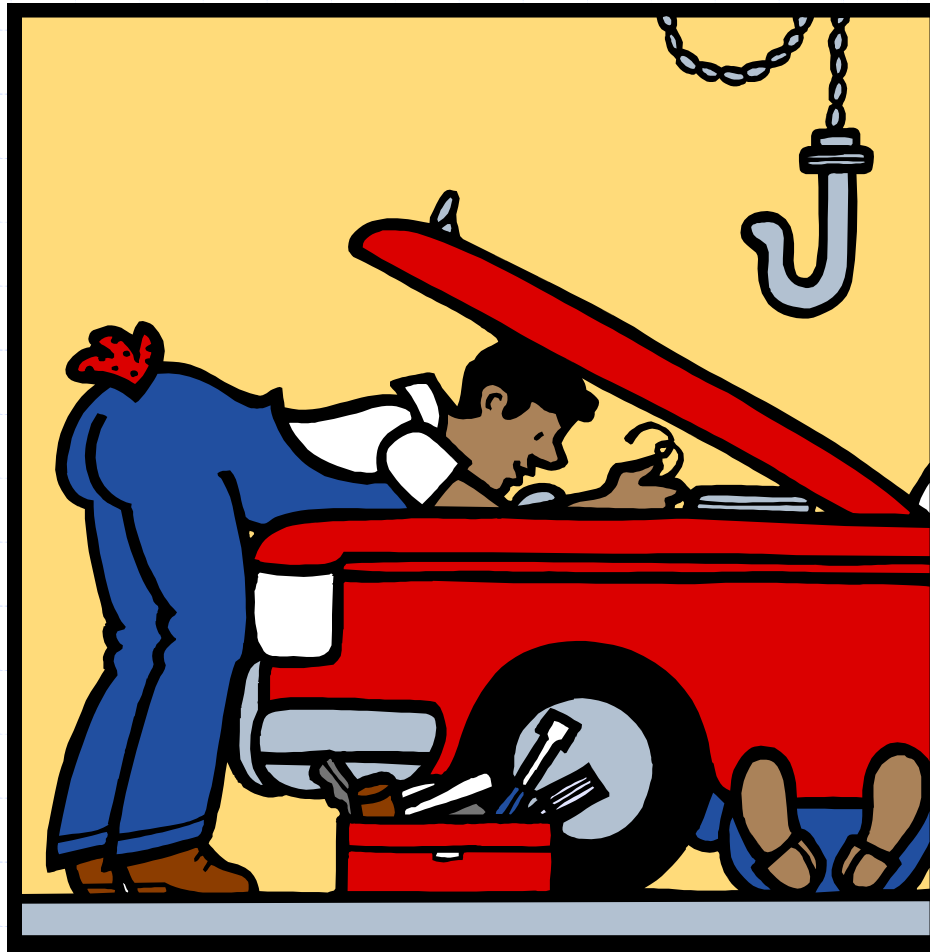
- 30% time used,
 - 30% **££** spent
 - So, if 30% of the work is done, I must be OK ??
- Shop floor estimates
 - Cost comparisons
Budget vs. Actual



How's this project doing?



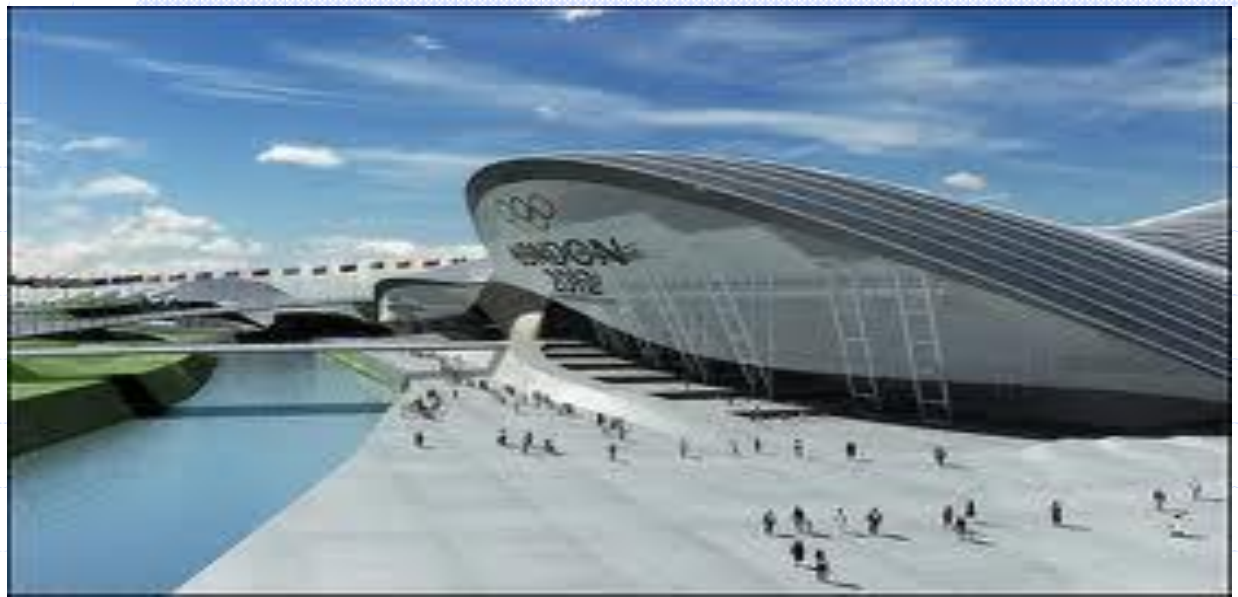
Let's Take A Look Under The bonnet



But First! - We gotta get organized



- ◆ EVA works best when work is 'compartmentalized'.
- ◆ Compartmentalization is best achieved with a well-planned Work Breakdown Structure.
- ◆ So, how do I create a WBS for a really complex project?





Proper WBS Design

◆ One WBS per program

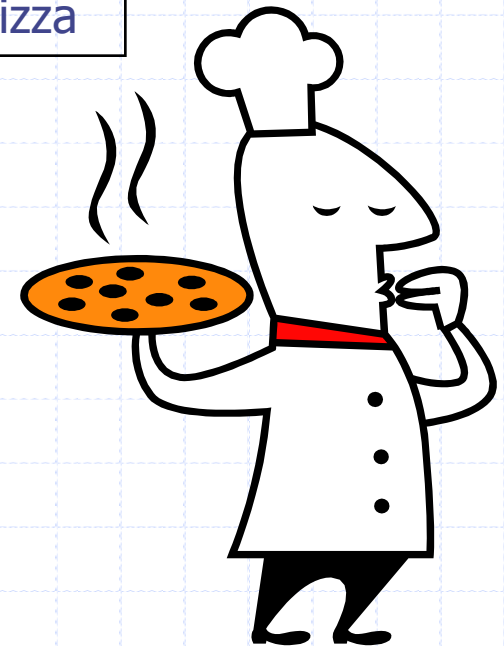
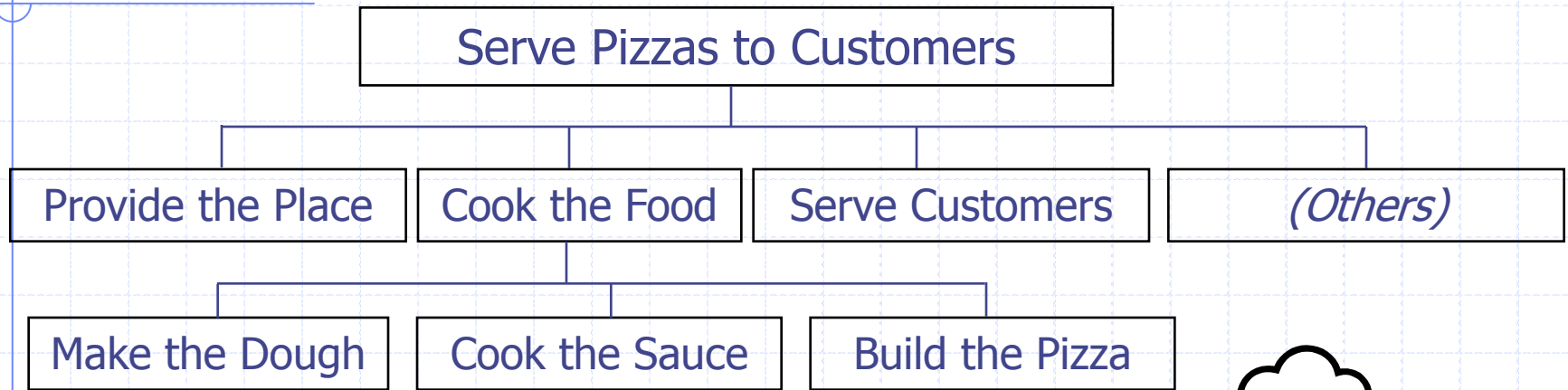
- Deliverable-oriented
- Work not in the WBS is out-of-scope
- Each descending level represents more detail

◆ Full (and accurate) definition is key

- Defined deliverable(s)
- Timeframe for delivery of product
- Total cost (direct and indirect) to deliver product

Let's Look at an example:

A sample Work Breakdown Structure



WBS Units are “Work Packages”

- ◆ Lowest level WBS elements
- ◆ Have an accompanying narrative
- ◆ Have three measurable components
 - Scope of work to be accomplished
 - Total (direct and indirect) cost
 - Timeframe for completion

Control Account Plans

- ◆ A CAP is essentially a Work Package with some added features:
 - Assignment of responsibility
 - Organization
 - Individual
 - Division (if necessary) into lower-level Work Packages.
 - Metrics for measuring EV performance
 - Milestones
 - % complete
 - Other

 The sum of the CAPs constitutes the Performance Measurement Baseline

Some New Terms

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

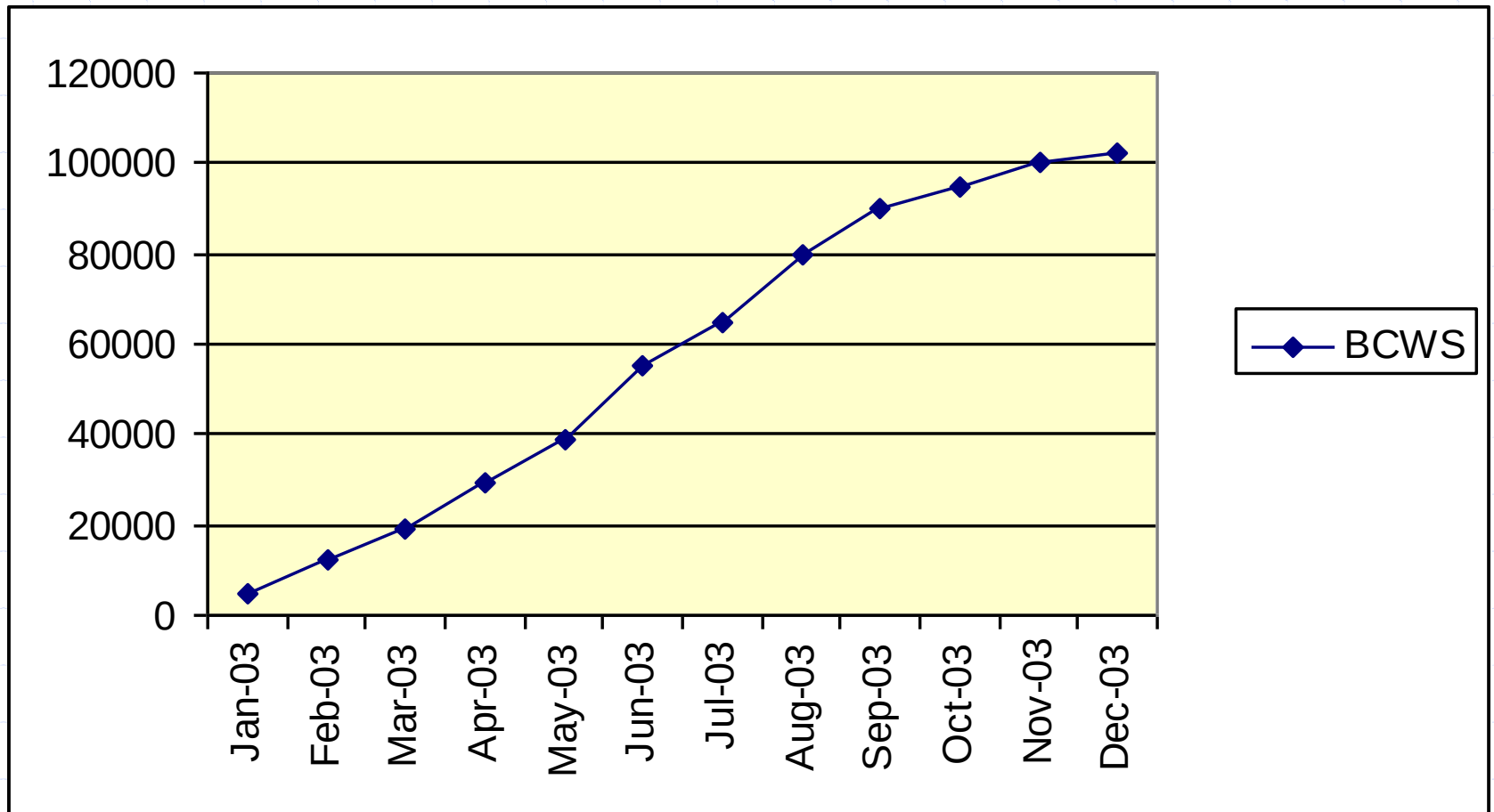


Earned Value Definitions

◆ 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

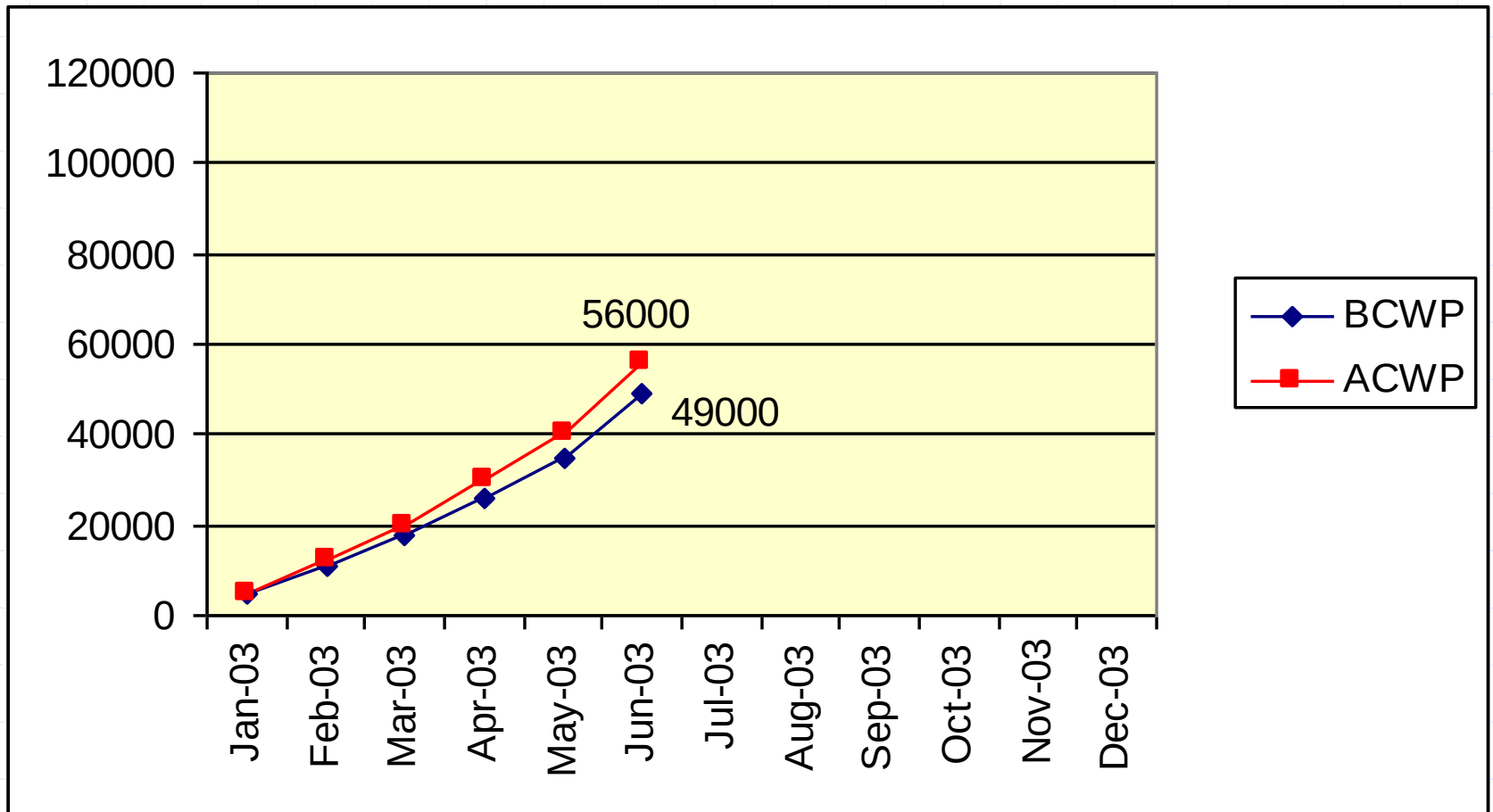


Earned Value Definitions (cont.)

◆ ACWP: “Actual Cost of Work Performed”

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

ACWP - Actual Cost of Work Performed

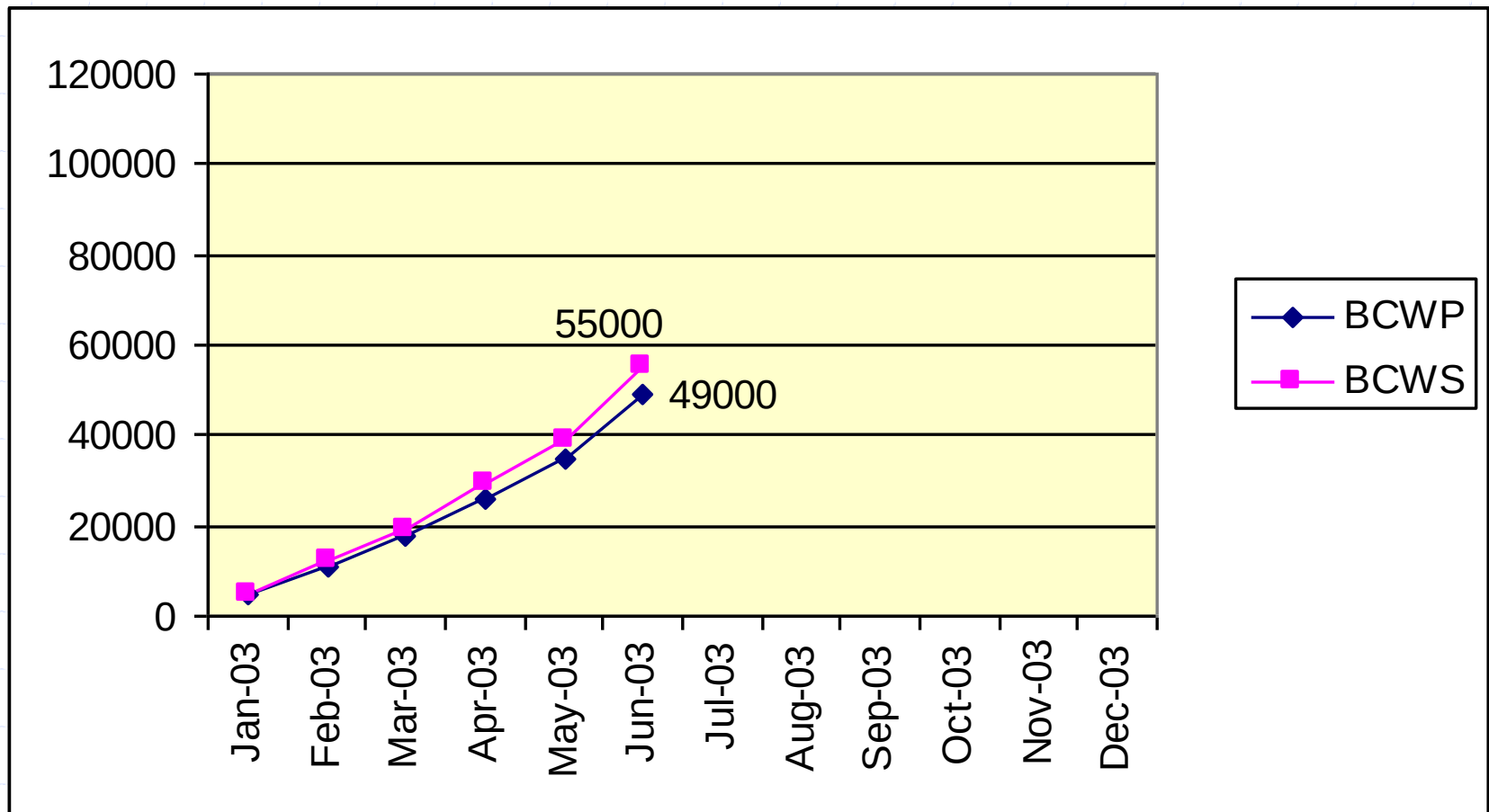


Earned Value Definitions (cont.)

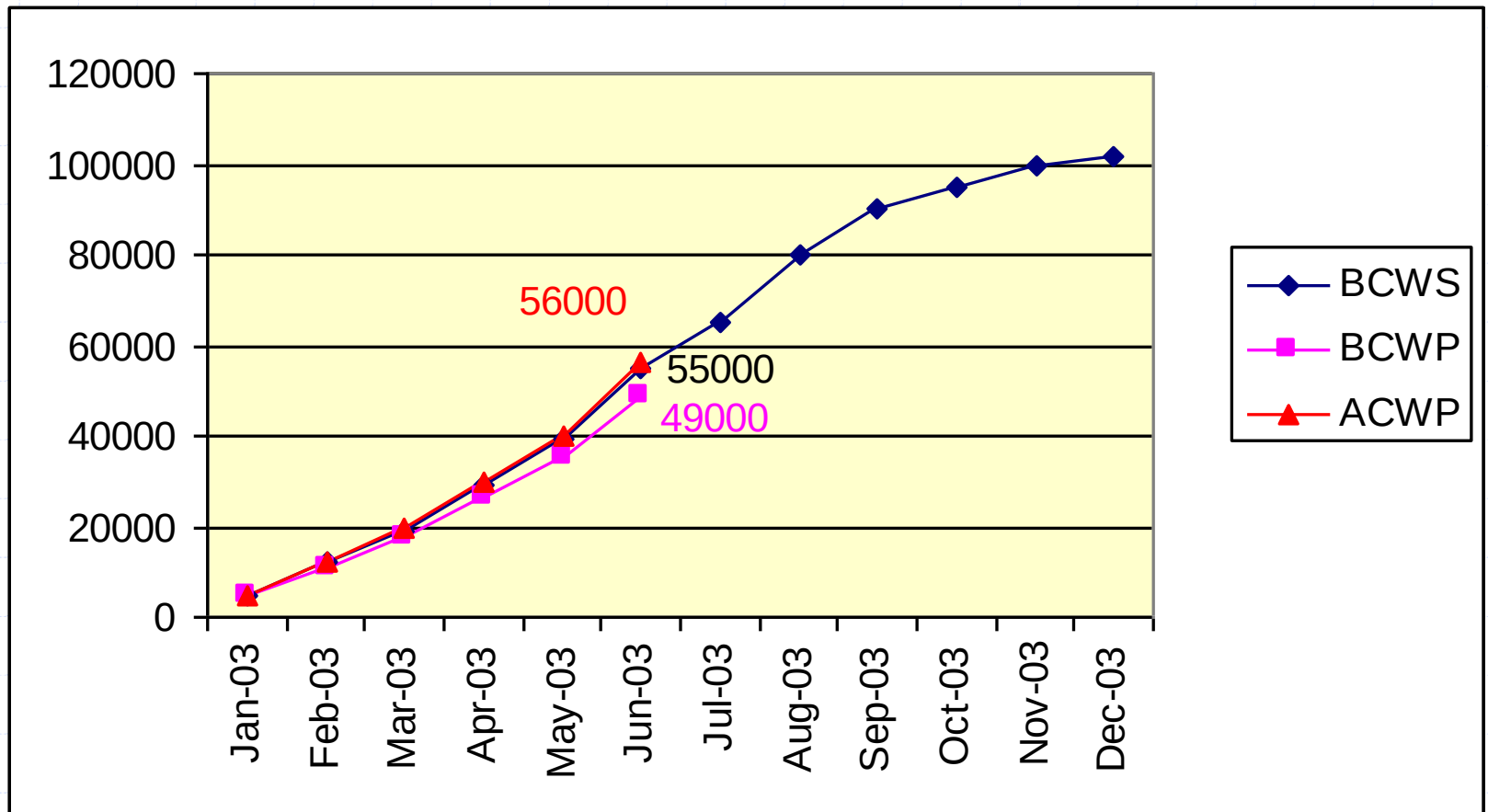
◆ BCWP: Budgeted Cost of Work Performed

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

$$\begin{array}{r} \text{£}49,000 \\ - \text{55,000} \\ \hline \text{SV} = - \text{£ } 6,000 \end{array}$$

Cost Variance = BCWP-ACWP

$$\begin{array}{r} \text{£}49,000 \\ \text{56,000} \\ \hline \text{CV} = - \text{£}7,000 \end{array}$$

Some More Derived Metrics

◆ SPI: Schedule Performance Index

$$\text{SPI} = \text{BCWP} / \text{BCWS}$$

SPI < 1 means project is behind schedule

◆ CPI: Cost Performance Index

$$\text{CPI} = \text{BCWP} / \text{ACWP}$$

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

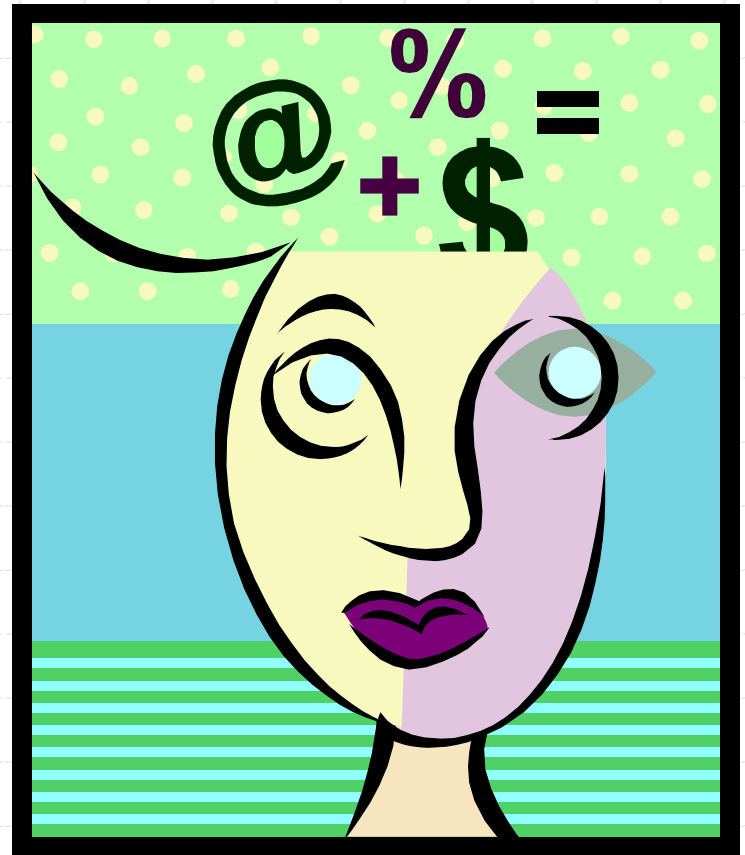
$$49,000/55,000 = 0.891$$

CPI: BCWP/ACWP

$$49,000/56000 = 0.875$$

CSI: SPI x CPI

$$.891 \times .875 = 0.780$$



Making Projections

Once a project is 10% complete, the overrun at completion will not be less than the current overrun.

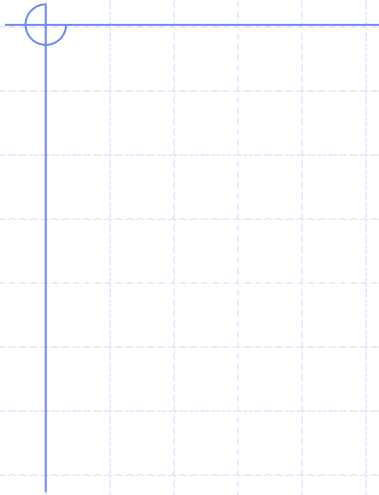
Once a project is 20% complete, the CPI does not vary from its current value by more than 10%.



The CPI and SPI are statistically accurate indicators of final cost results.

Source: Defense Acquisition University, USA

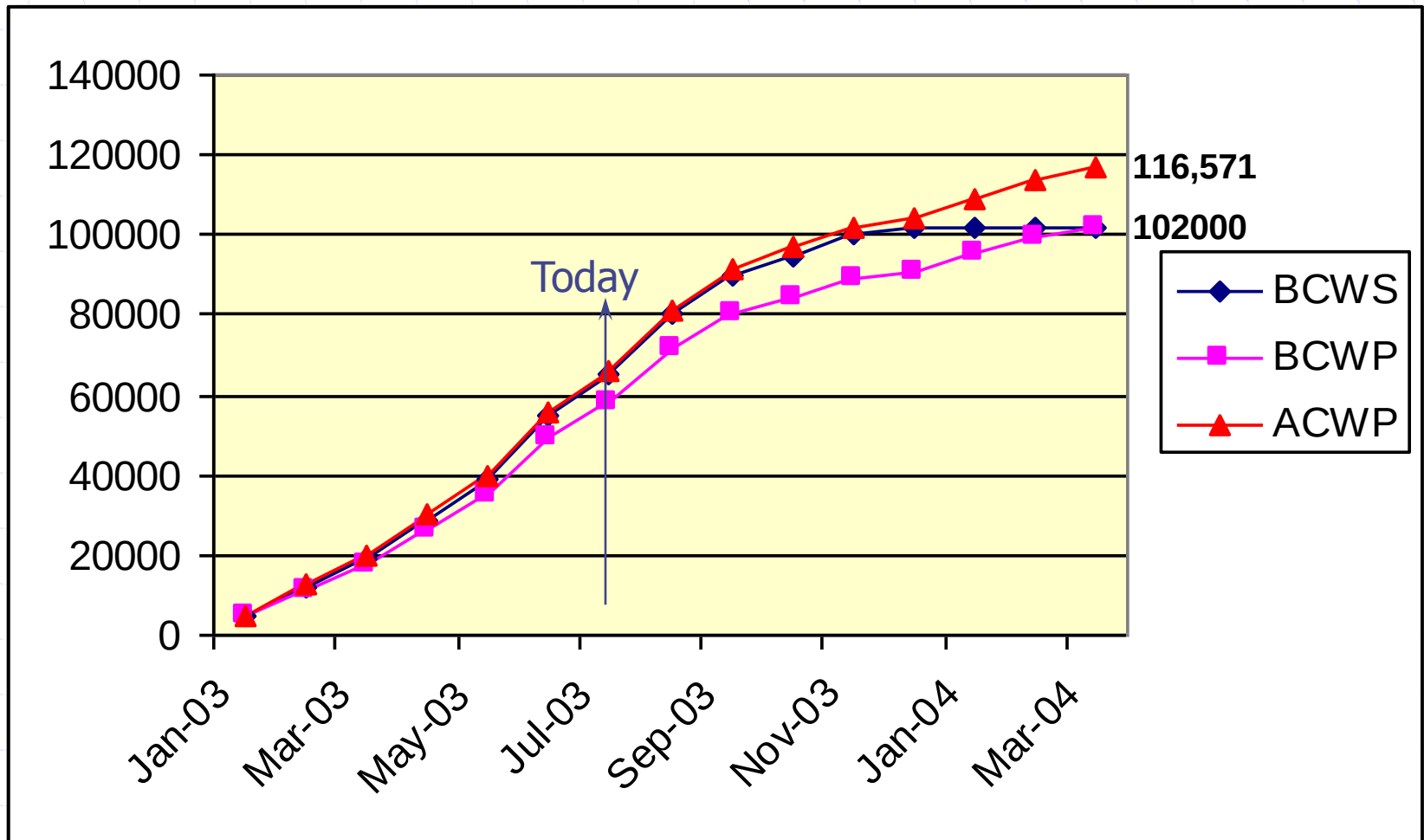
Making Projections



Today



Estimate to Complete

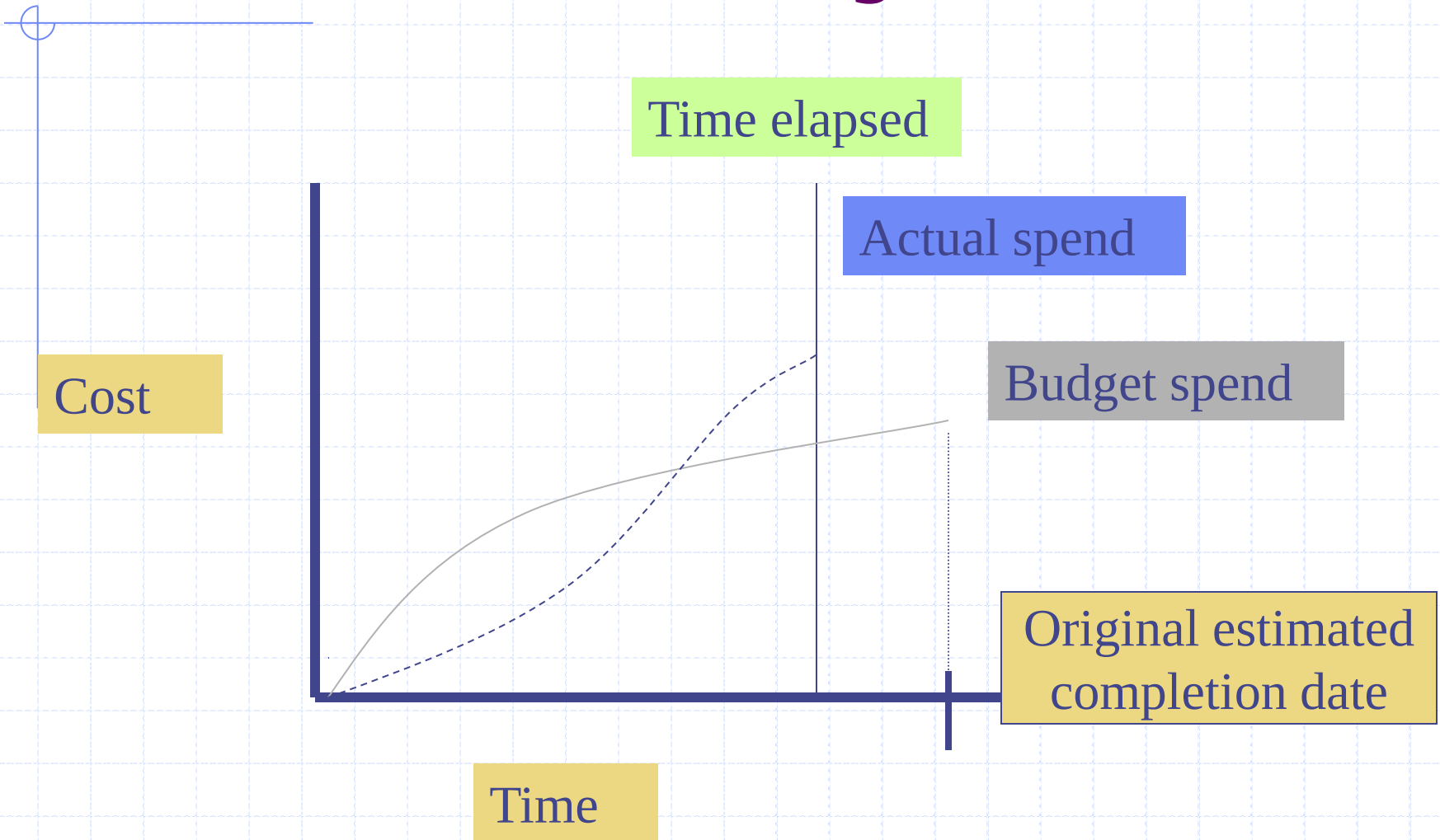


A New Criteria

Activities "earn value" as they are completed.

- ◆ *The value earned is the WBS budgeted cost of the activity completed to date.*

What is the problem with this method of monitoring?



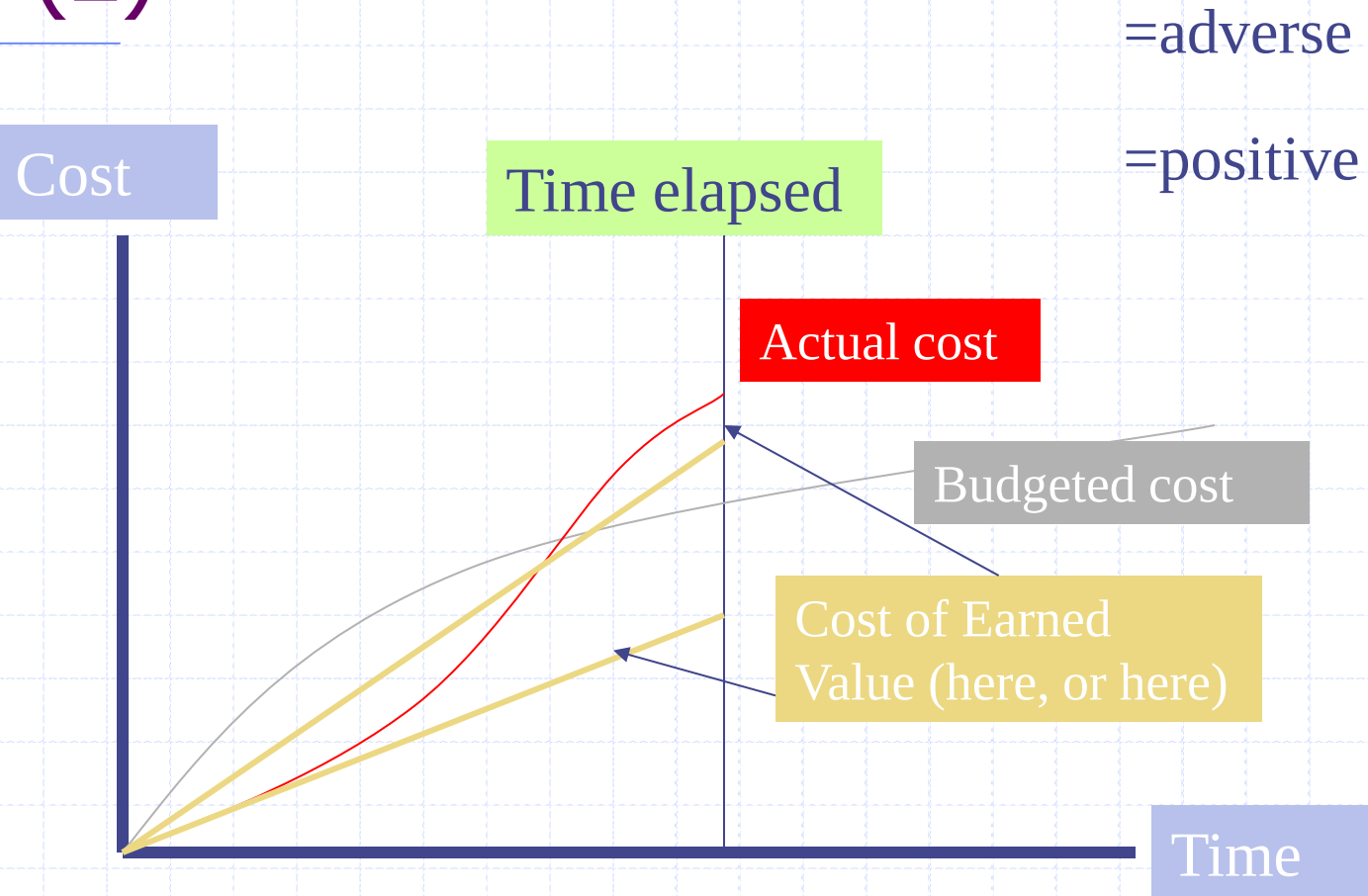
Answer

- ◆ The project may be on time and over-spent
- ◆ The project may be actually ahead of time and therefore
 - on budget?
 - over-spent?
 - under-spent who knows?
- ◆ To know this we need more data - what?

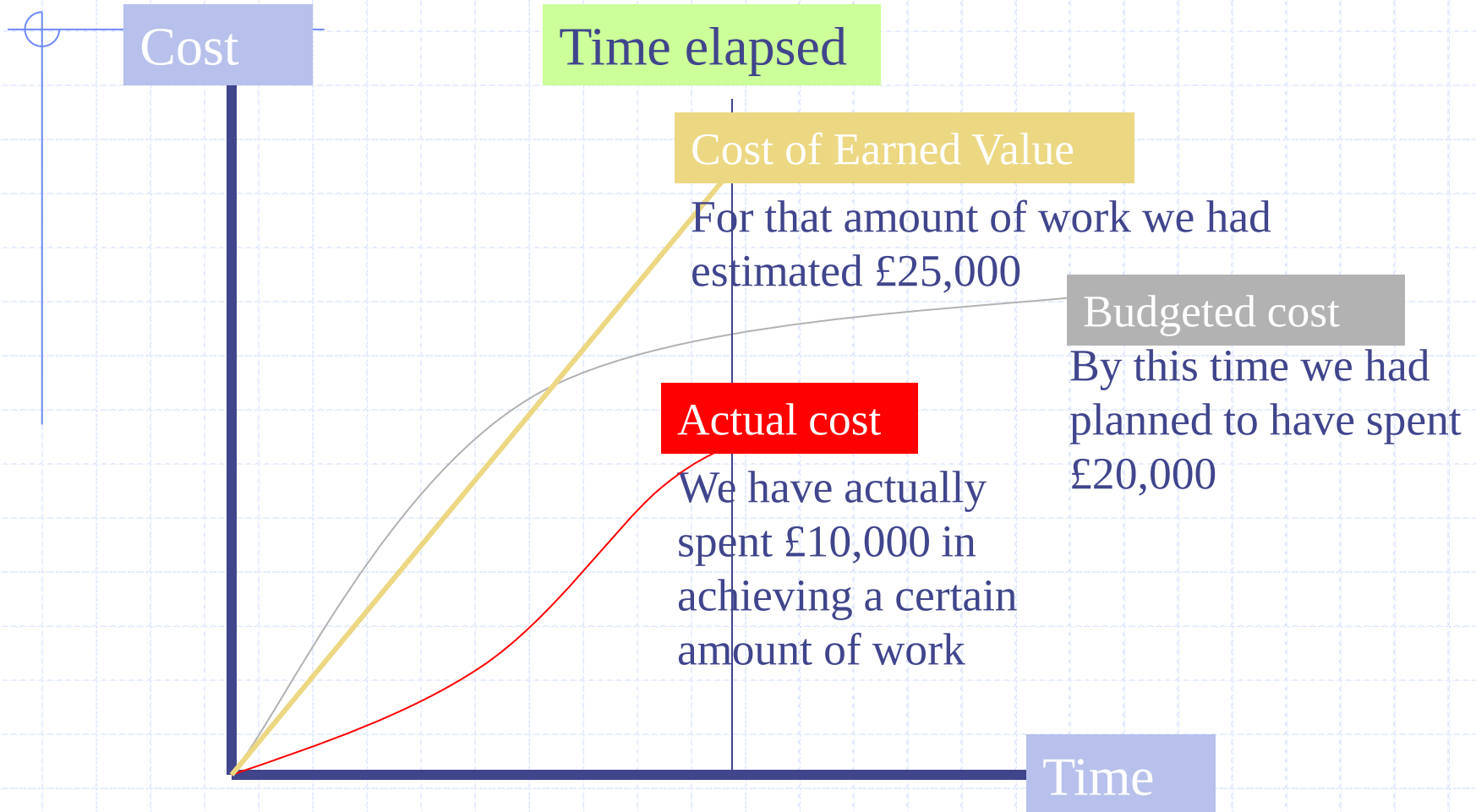
What do we need to know, to do this? (1)

- ◆ The actual **time** that has elapsed
- ◆ The **actual cost** of work produced in that time
- ◆ The **budgeted (i.e. planned) cost** at that time (irrespective of the work done)
- ◆ The **budgeted (i.e. planned) cost** of that value of work (irrespective of time)

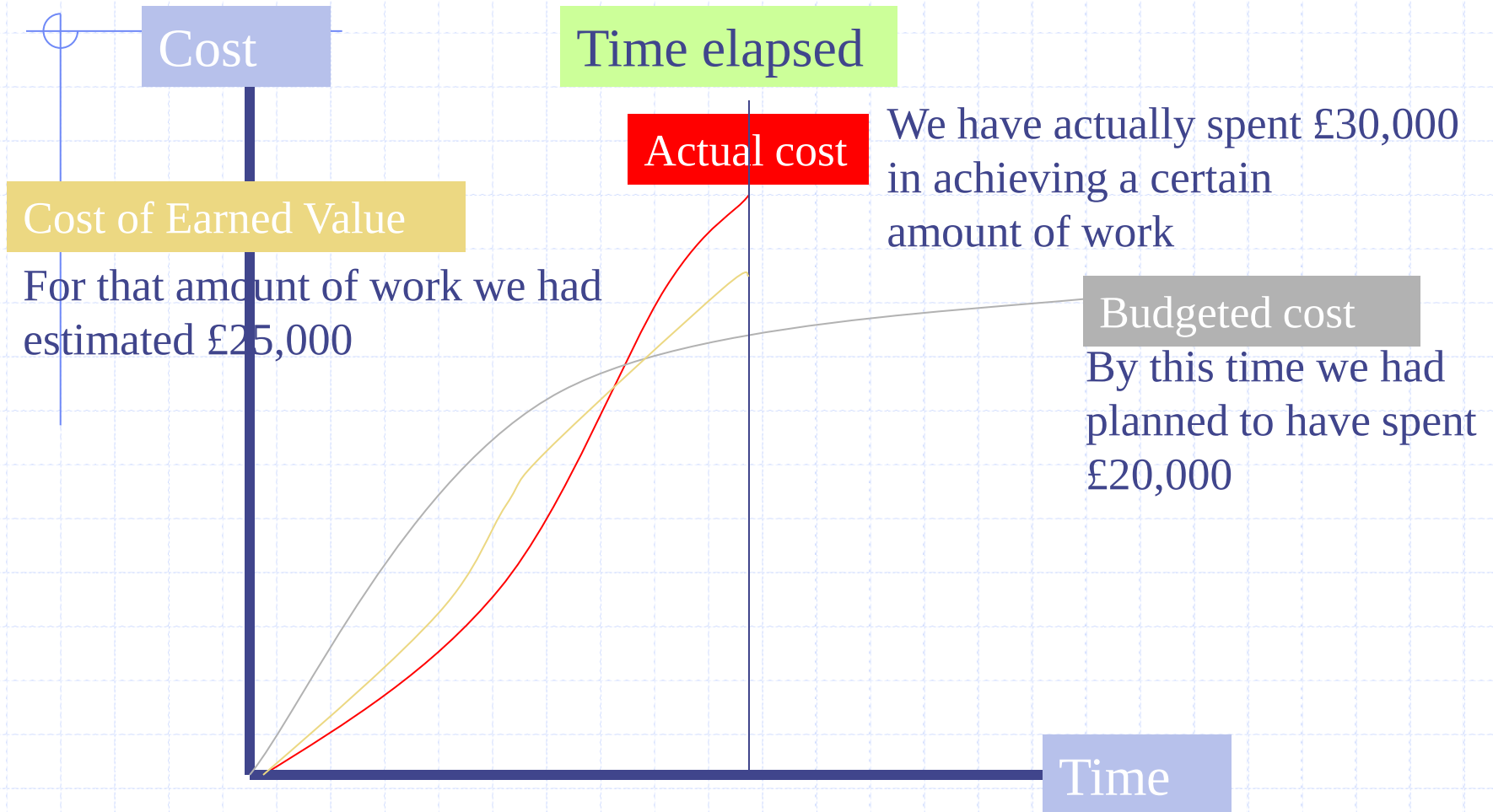
What do we need to know, to do this? (2)



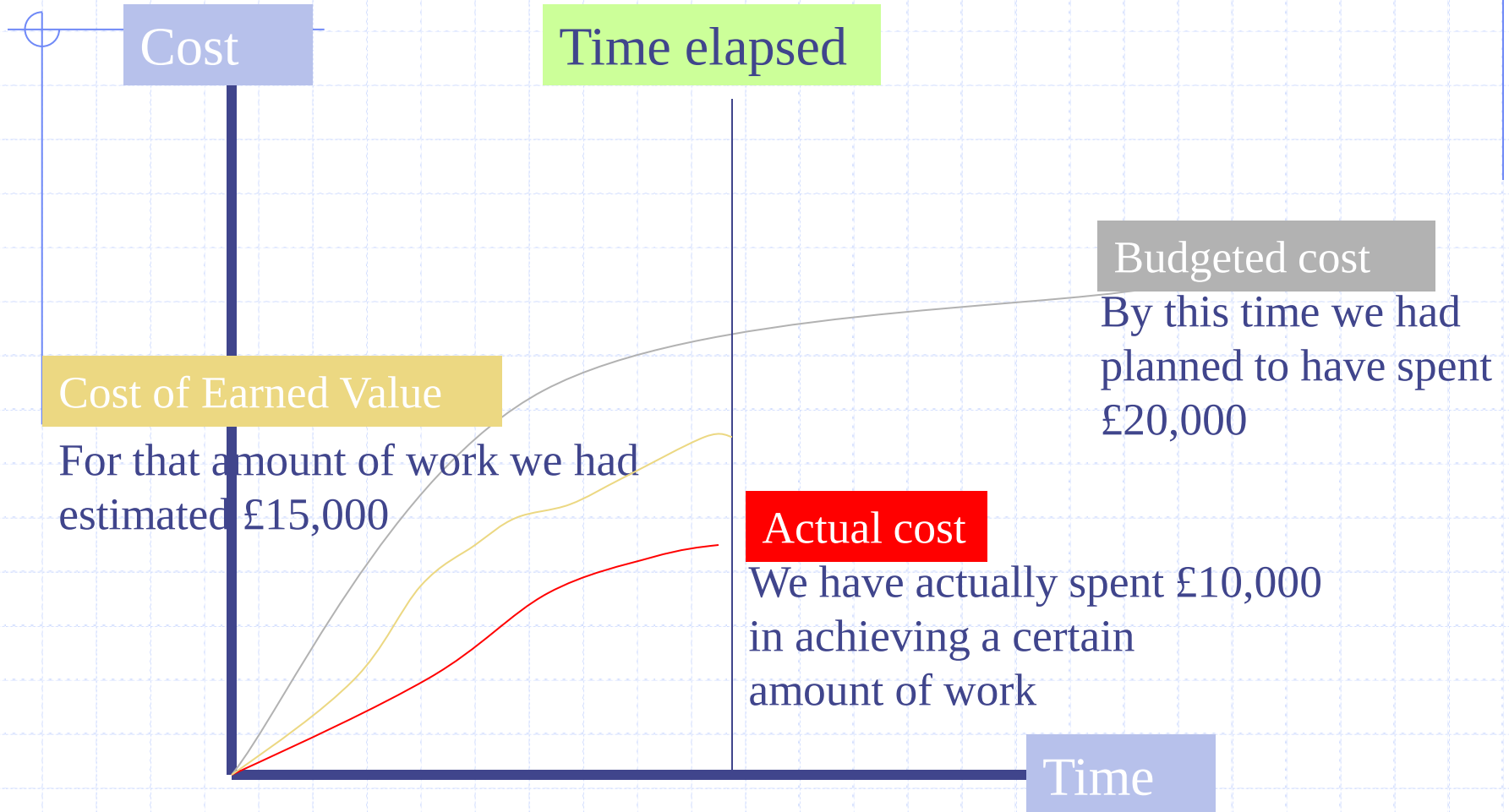
Possibility 1: Early and underspent



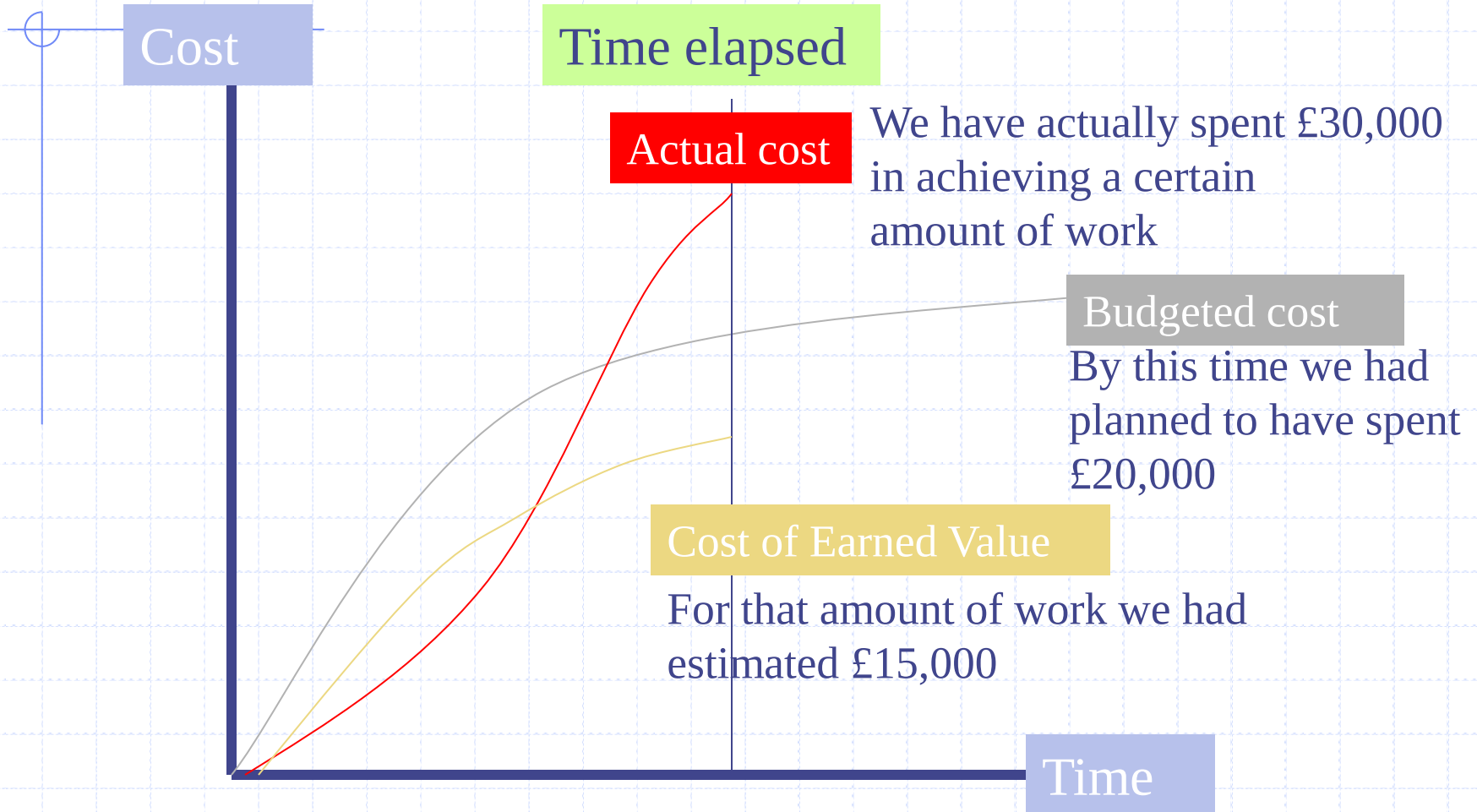
Possibility 2: Early and overspent



Possibility 3: Late and underspent



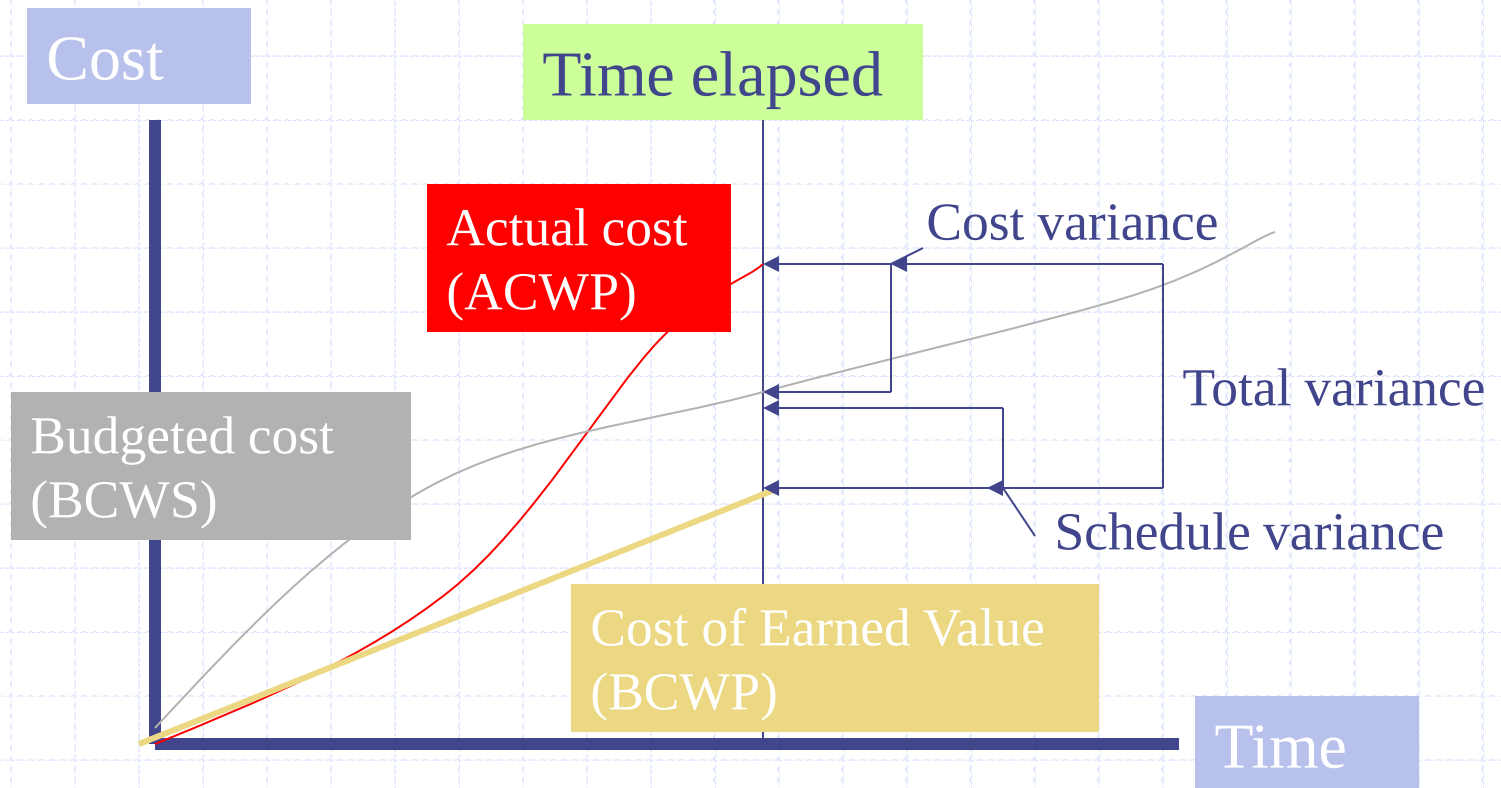
Possibility 4: Late and overspent



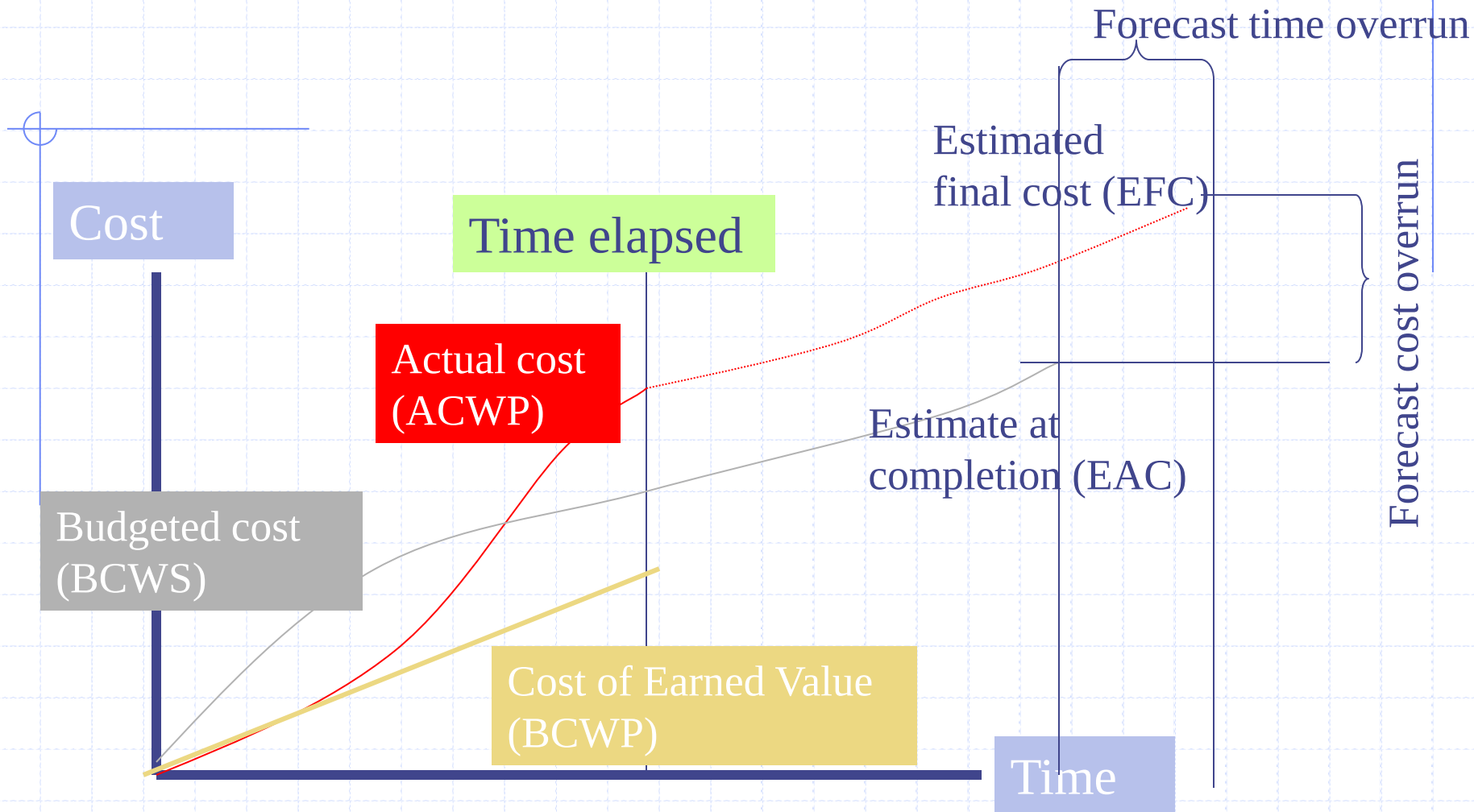
The analysis (1)

- ◆ What is the total variance?
- ◆ How much is due to difference in cost?
- ◆ How much is due to difference in schedule?
- ◆ What will happen in the variance is projected?

The analysis (2)

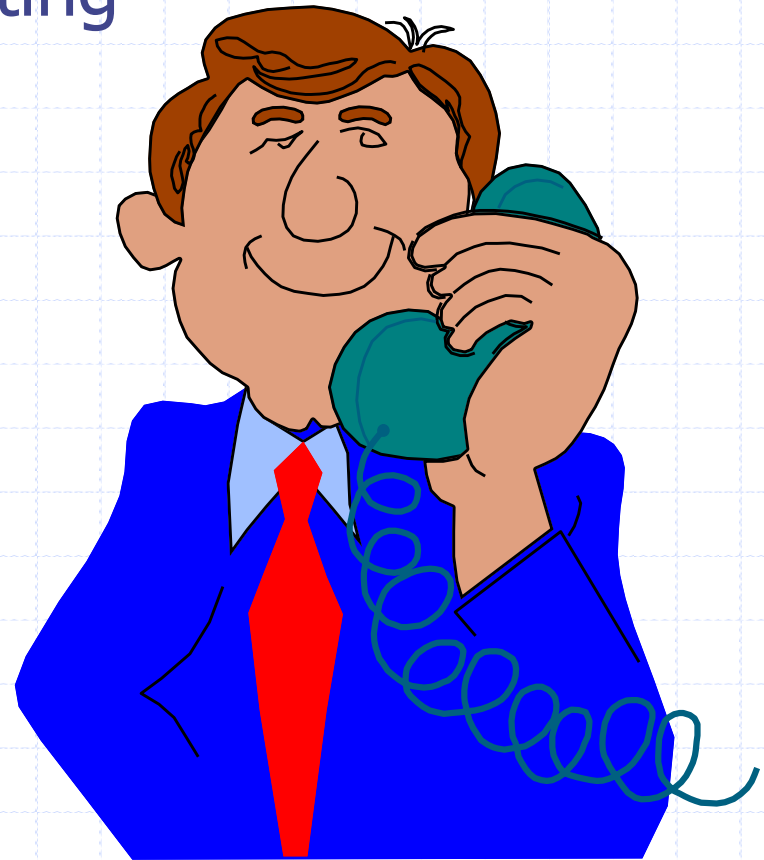


The analysis (3): projection

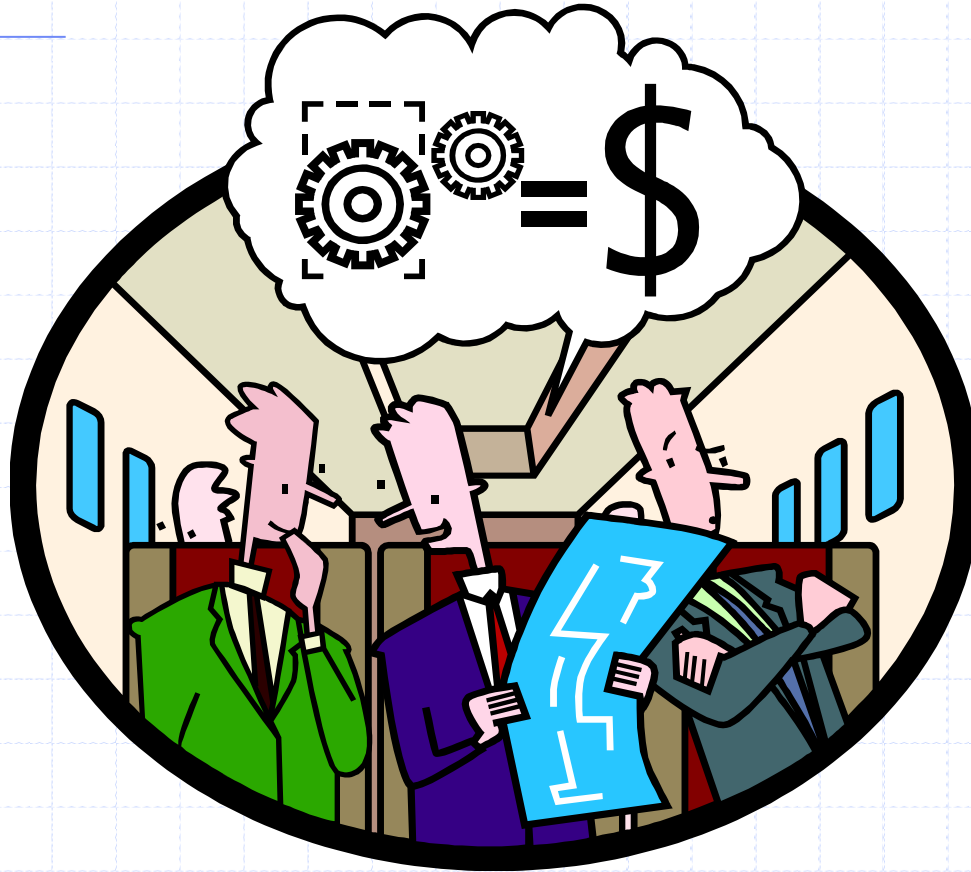


Value of Earned Value

- ◆ Schedule Status Reporting
- ◆ Cost Status Reporting
- ◆ Forecasting



But How Do I Do All This Stuff ?



With an Earned Value Management System

A-11, Part 7 Requires an EVMS

“ . . . *based on ANSI/EIA Standard 748*”

And what does that mean?

➤ ANSI/EIA 748 provides a list of guidelines

- Organization
- Planning, Scheduling, and Budgeting
- Accounting Considerations
- Analysis and Management Reports
- Revisions and Data Maintenance

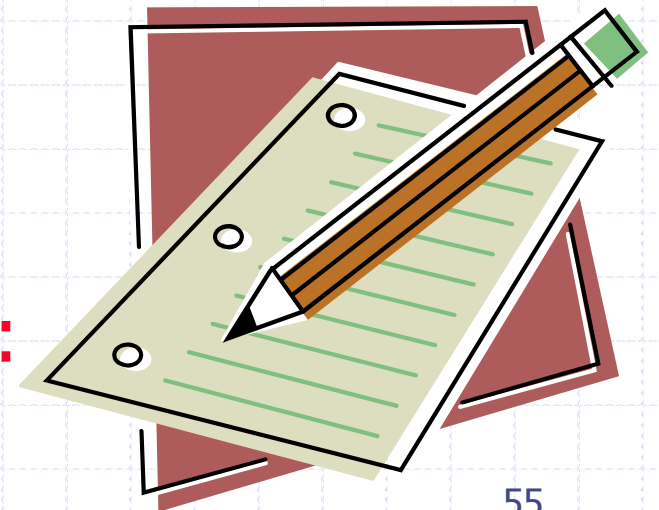
➤ But, ANSI/EIA 748 doesn't identify 'approved systems'

A-11, Part 7 Requires an EVMS

So where do I get one?

- Buy a prepackaged one. (Lot of 'em around)
- Make your own.
 - Microsoft Project
 - Microsoft Excel

Or it could be as simple as this:



Requirements of Earned Value

- ◆ Proper WBS Design
- ◆ Baseline Budget Control Accounts
- ◆ Baseline Schedule
- ◆ Work measurement by Control Account
 - work-hours, pounds, units, etc.
- ◆ Good Project Management Practices

Shortcomings of Earned Value

- ◆ Quantifying/measuring work progress can be difficult.
- ◆ Time required for data measurement, input, and manipulation can be considerable.

Summary

- ◆ EVA & EVMS will help reduce guesswork in:
 - Measuring performance
 - forecasting
- ◆ Need to get beyond misleading measures of progress.
- ◆ Reasons to use EVA and EVMS:
 - Good project management practice
 - OMB requirement
- ◆ Incorporate into contracts

Earned Value Resources

◆ <http://www.pmi.org/>

◆ <http://www.acq.osd.mil/pm/>

◆ ANSI/EIA 748 is available from:
Global Engineering Documents
800-854-7179

Some “Compliant” Systems

Welcom “Cobra”

<http://www.welcom.com/>

Schedulemaker

<http://www.schedulemaker.com/>

Planisware “OPX2”

<http://www.planisware.com/>

RiskTrak

<http://www.risktrak.com/index.htm>

Winsight

<http://www.cs-solutions.com>

Primavera Systems

<http://www.primavera.com>