PROJECT MANAGEMENT

Topic 7

Monitor & Control

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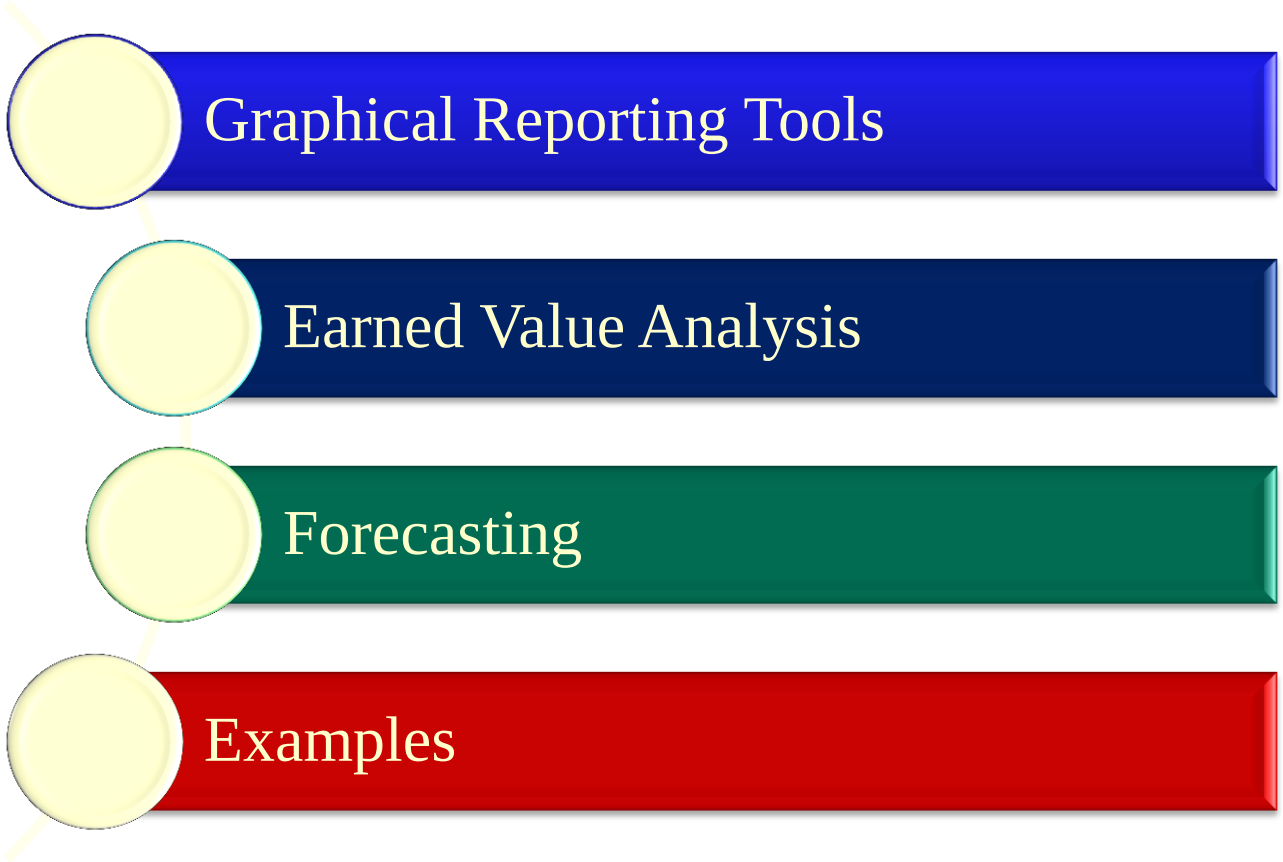
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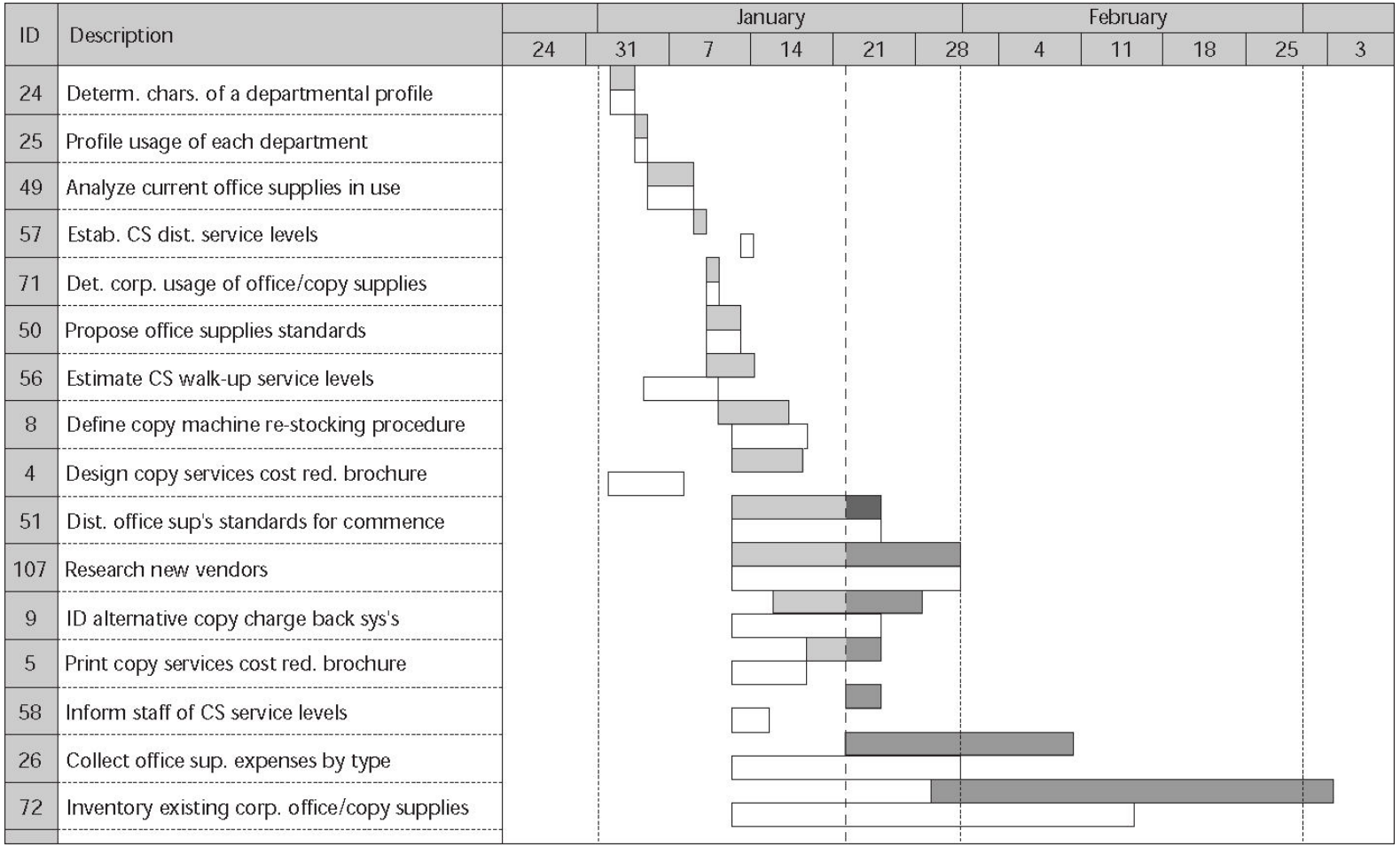
Graphical Reporting Tools

Gantt Chart



Graphical Reporting Tools

Positive and negative variances

Positive variances are deviations from the plan indicating that an **ahead-of-schedule** situation has occurred or that an actual cost was less than a planned cost.

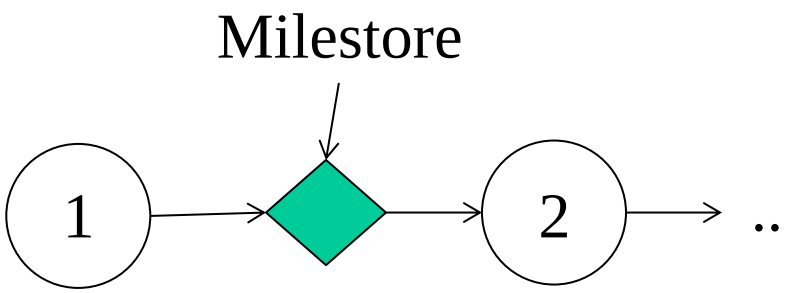
Negative variances are deviations from the plan indicating that a **behind-schedule** situation has occurred or that an actual cost was greater than a planned cost.

- In most cases, negative time variances affect project completion only when they are associated with critical-path activities or when the schedule slippage on noncritical-path activities **exceeds the activity's slack**.

Graphical Reporting Tools

Milestone Trend Charts

- *Milestones* are significant events that you want to track in the life of the project.
- These significant events are zero-duration activities
- They typically have finish-to-start (FS) relationships with the activities that are their predecessors and their successors.

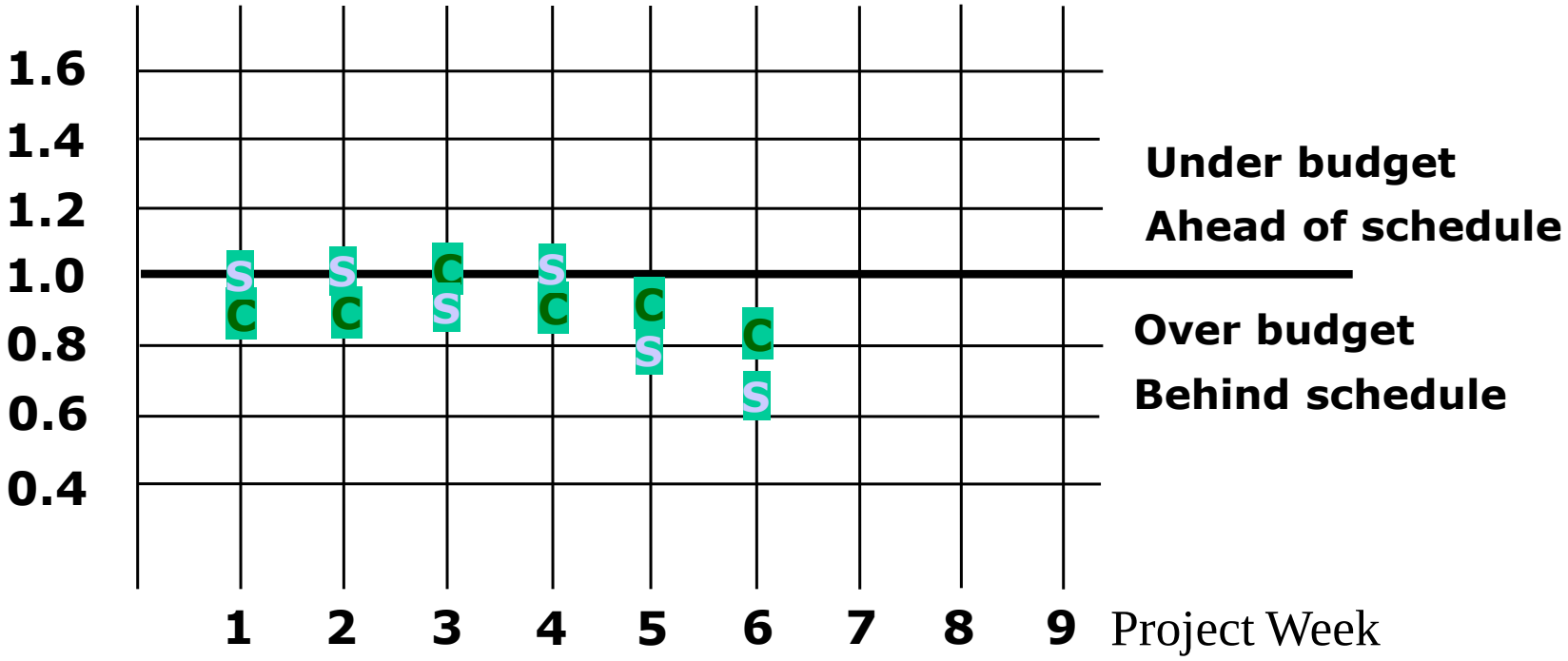


Graphical Reporting Tools

Performance Indices

The worst

Project: Alpha



Graphical Reporting Tools

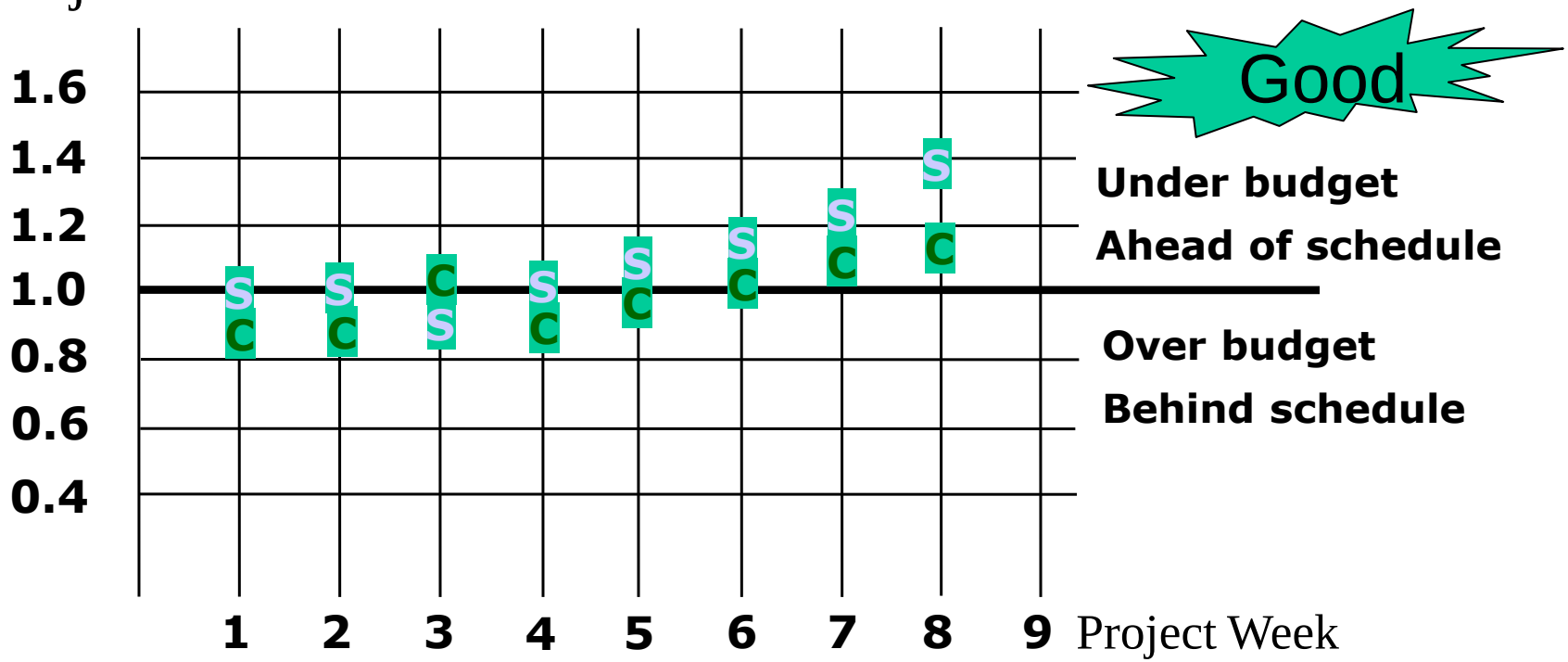
Integrating Milestone Trend Data

- The presentation of the SPI and CPI data over time can be represented using the same format that was used to report milestone trend data.
- The project has gotten Schedule (denoted by the ‘‘S’’) and budget (denoted by the ‘‘C’’).

Graphical Reporting Tools

Performance Indices

The project is ahead of schedule and under budget.

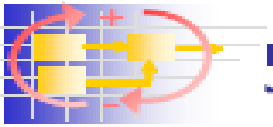


☞ Less costly ways were found to complete the work, and the work was completed in less time than was planned.

Earned value analysis (EVA)

- Earned value analysis (EVA) is used to measure project performance uses.
  - The dollar value of work.
  - As an alternative, resource person hours/day can be used.
- Forecast its completion date and final cost.
- Provide schedule and budget variances along the way.
- It provides numerical indicators with which you can evaluate and compare projects.

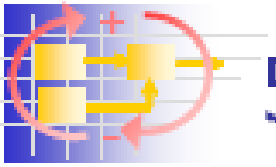
Earned Value Analysis



5 Key Elements

Symbol	Mean
BCWS	Budgeted Cost of Work Scheduled
BCWP	Budgeted Cost of Work Peromrmed
ACWP	Actula Cost of Work Performed
BAC	Budget at Completion
EAC	Estimate at Completion

Earned Value Analysis



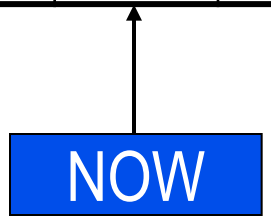
5 Basic Questions/Parameters

Question	Answer	Acronym
How much work **should** be done?	Budgeted Cost for Work Scheduled	BCWS
How much work **is** done?	Budgeted Cost for Work Performed	BCWP
How much did the **is done** work cost?	Actual Cost of Work Performed	ACWP
What was the total job **supposed** to cost?	Budget at Completion	BAC
What do we **now expect** the total job to cost?	Estimate at Completion	EAC

Earned Value Analysis

Budgeted Cost of Work Schedule (BCWS)

A	B	C	D	E	F	G	H	I	J
X1	X2	X3	X4	X5	X6	X7	X8	X9	X10



BCWS = X1 + X2 + X3 + X4 + X5 $

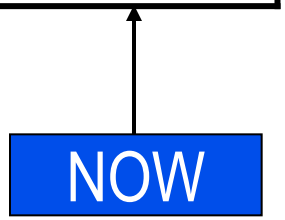
The sum of all the costs up to the specific activity that is stated in budget plan.

Earned Value Analysis

Budgeted Cost of Work Performed (BCWP)

A	B	C	D	E
100% X1	100% X2	100% X3	80% X4	50% X5

BCWP = X1 + X2 + X3 + 0.8 X4 + 0.5 X5 $



The sum of all the costs up to the specific activity in relation with its completion percentage.

Earned Value Analysis

Actual Cost of Work Performed (ACWP)

ACWP = Actual Cost of Work Done.

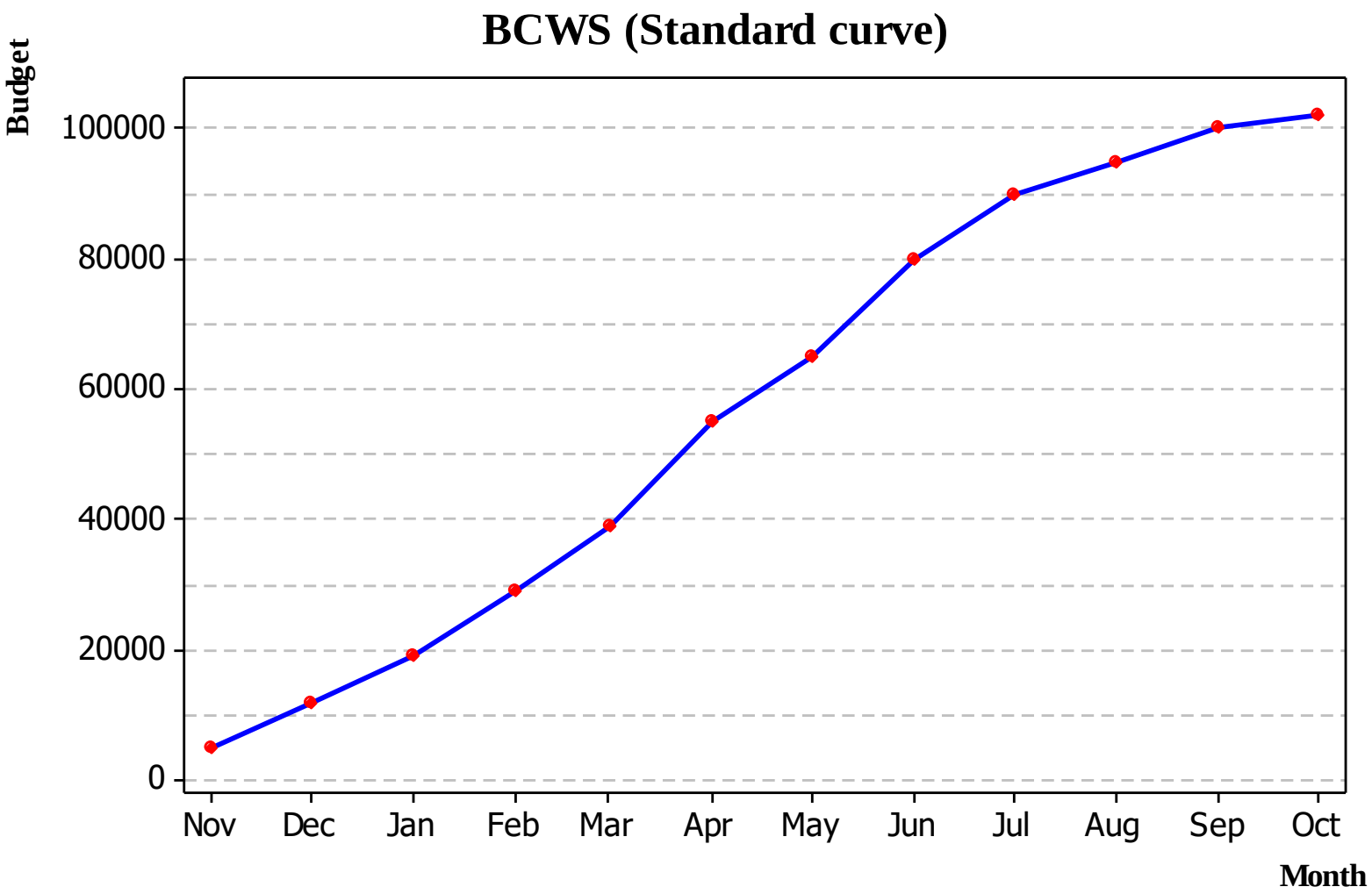
The total costs of the work done on reality provided by project manager on the financial monitor.

Budget of a project

	1/1/17	1/2/17	1/3/17	1/4/17	1/5/17	1/6/17	1/7/17	1/8/17	1/9/17	1/10/17	1/11/17	1/12/17
BCWS	5000	12000	19000	29000	39000	55000	65000	80000	90000	95000	100000	102000
BCWP	5000	11000	17500	26200	35000	49000						
ACWP	5000	12500	19600	29900	39900	56000						

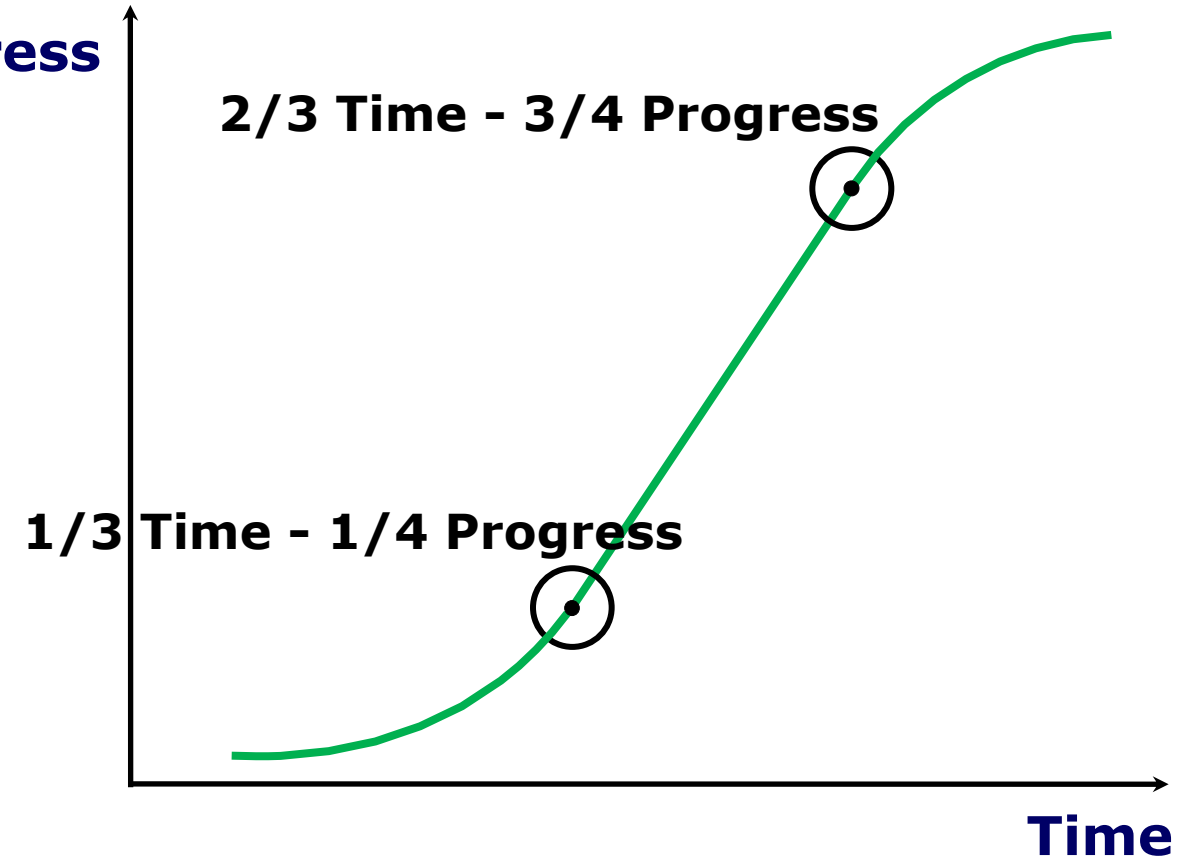
Earned Value Analysis

BCWS - Budgeted Cost of Work Scheduled



Earned Value Analysis

The Standard S-Curve (baseline)



Represents the baseline progress curve for the original project plan

Earned Value Analysis (EVA)

It is a continuous comparison between the plan of the project data and the actual data.

Budgeted and Committed Cost

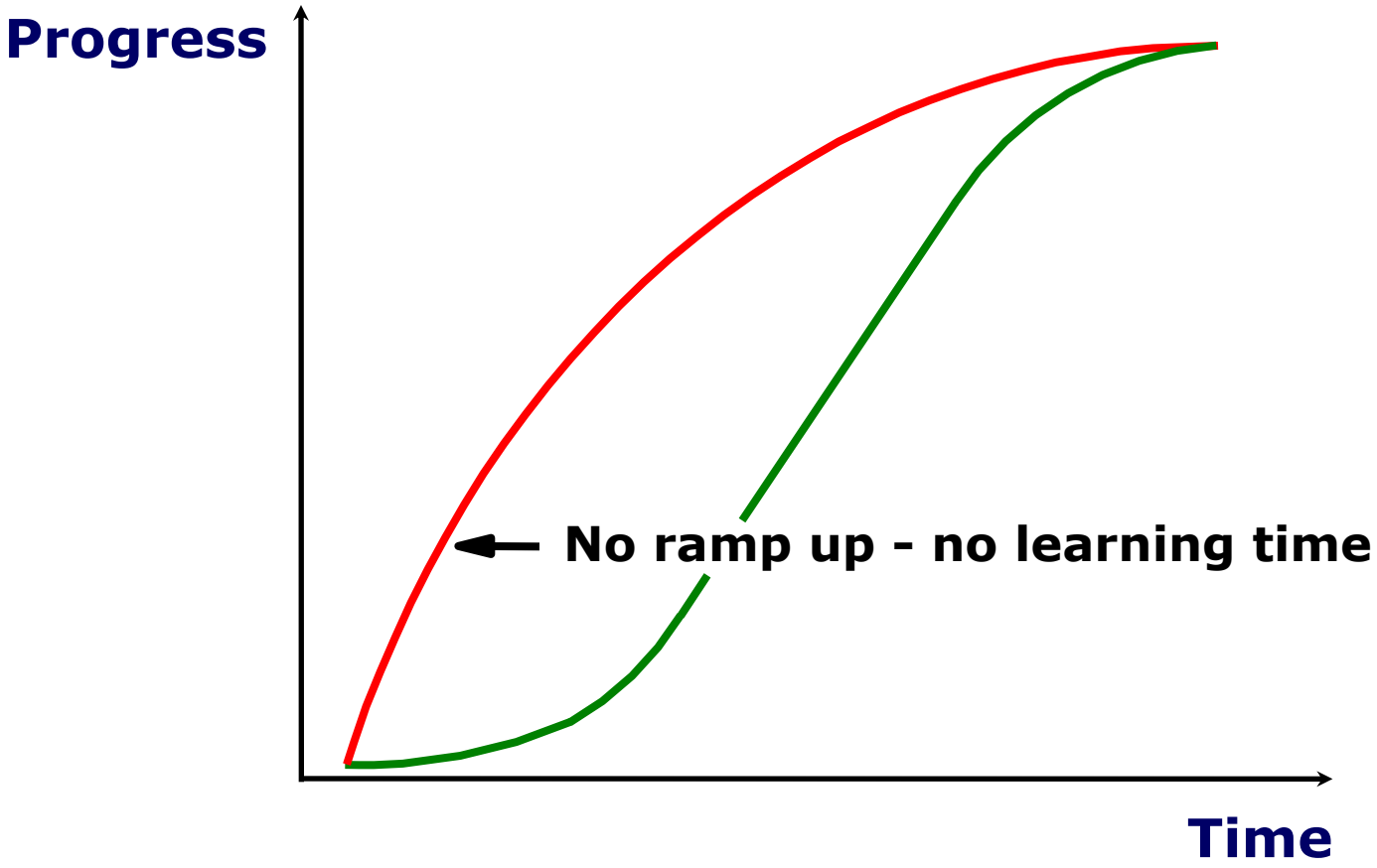
Variance = Budgeted cost – Committed cost

Variance (+ve) = Underconsumed Cost

Variance (-ve) = Overspent activities

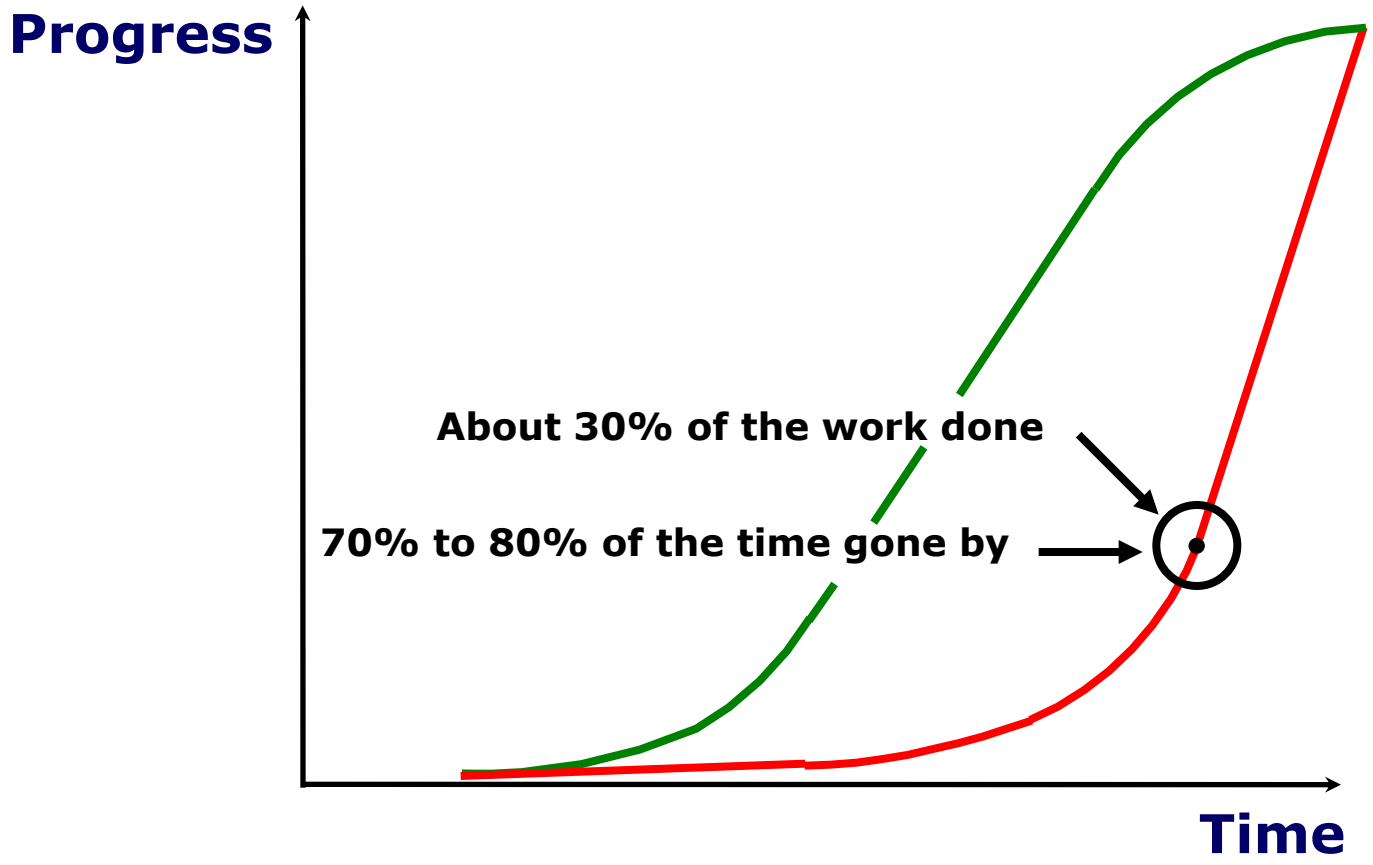
Earned Value Analysis

The Aggressive Curve

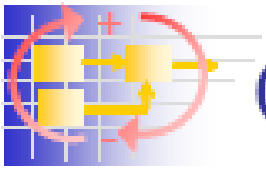


Earned Value Analysis

The Curve to Avoid



Earned Value Analysis



Cost Variance

BC WP — of the work I actually performed, how much did I budget for it to cost?

AC WP — of the work I actually performed, how much did it actually cost?

PERFORMANCE BASED

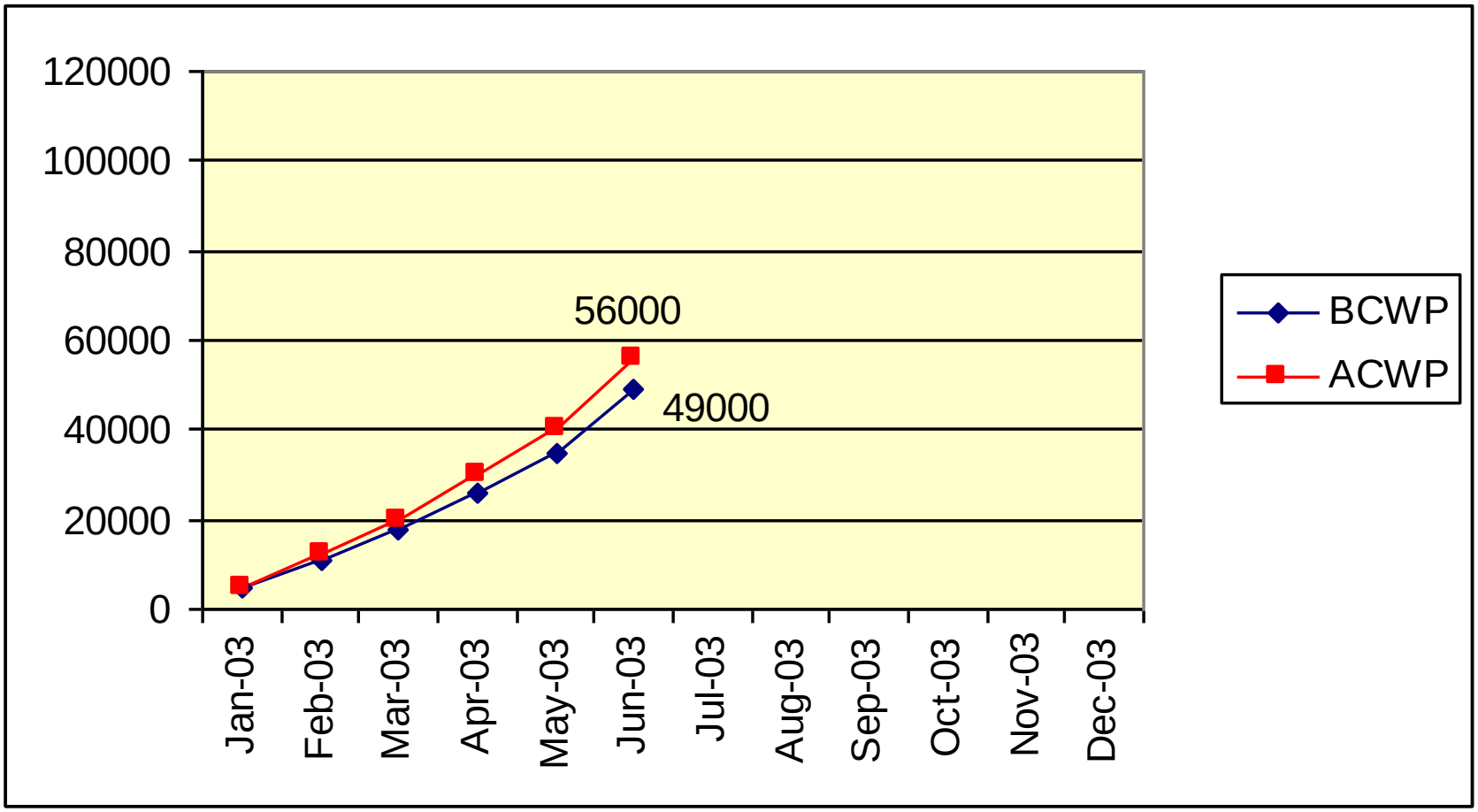
COST VARIANCE is the difference between budgeted cost and actual cost

formula: **CV $ = BCWP - ACWP**

example: CV = BCWP - ACWP = $1,000 - $2,400
CV= -$1,400 (negative = cost overrun)

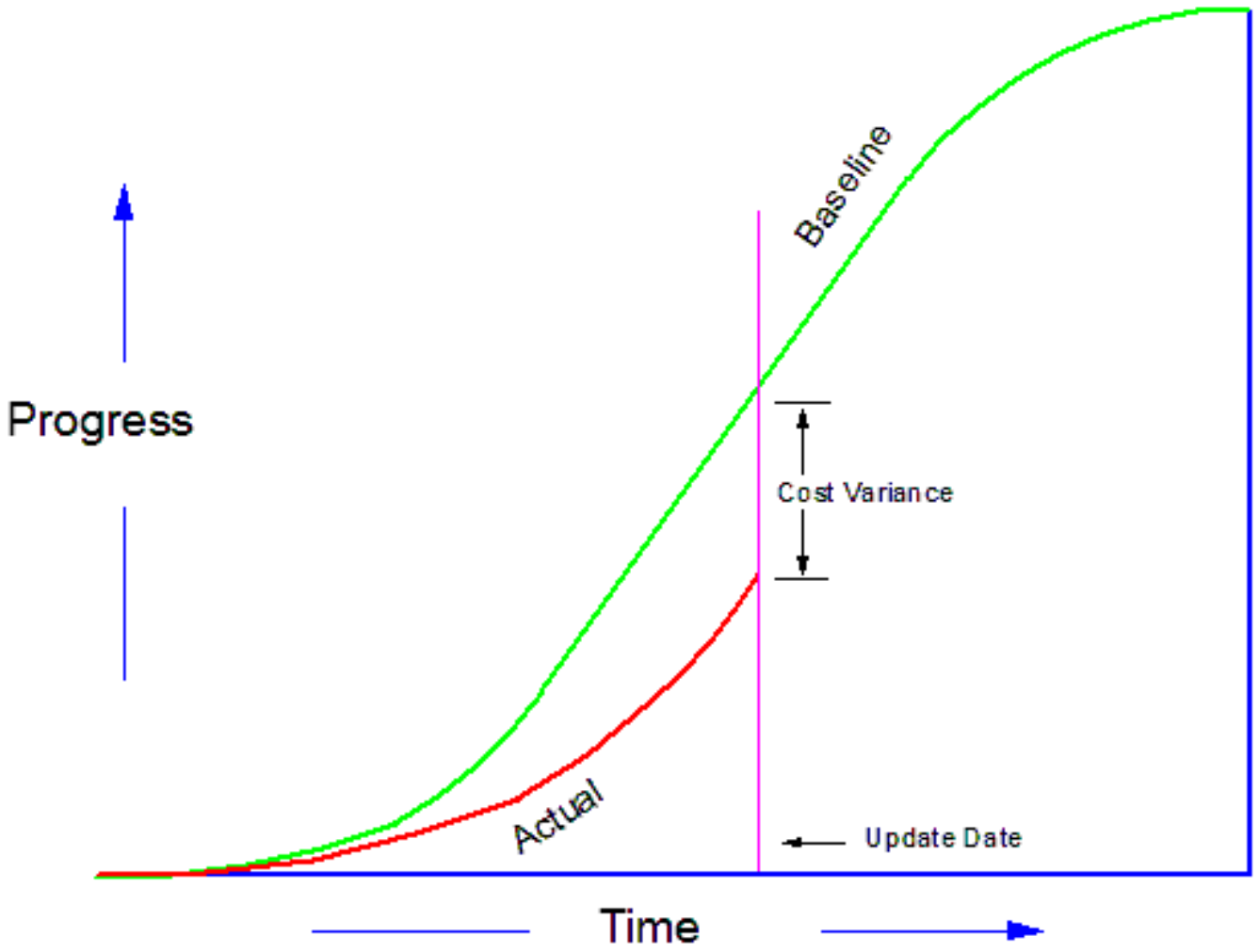
Earned Value Analysis

ACWP - Actual Cost of Work Performed

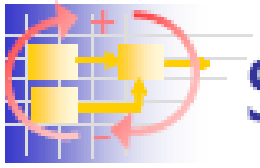


Earned Value Analysis

Cost Variance CV



Earned Value Analysis



Schedule Variance

BUDGET BASED

BCWS	of the work I scheduled to have done, how much did I budget for it to cost?
BCWP	of the work I actually performed, how much did I budget for it to cost?

SCHEDULE VARIANCE is the difference between work scheduled and work performed (expressed in terms of budget dollars)

formula: **SV $ = BCWP - BCWS**

example: SV = BCWP - BCWS = $1,000 - $2,000
SV= -$1,000 (negative = behind schedule)

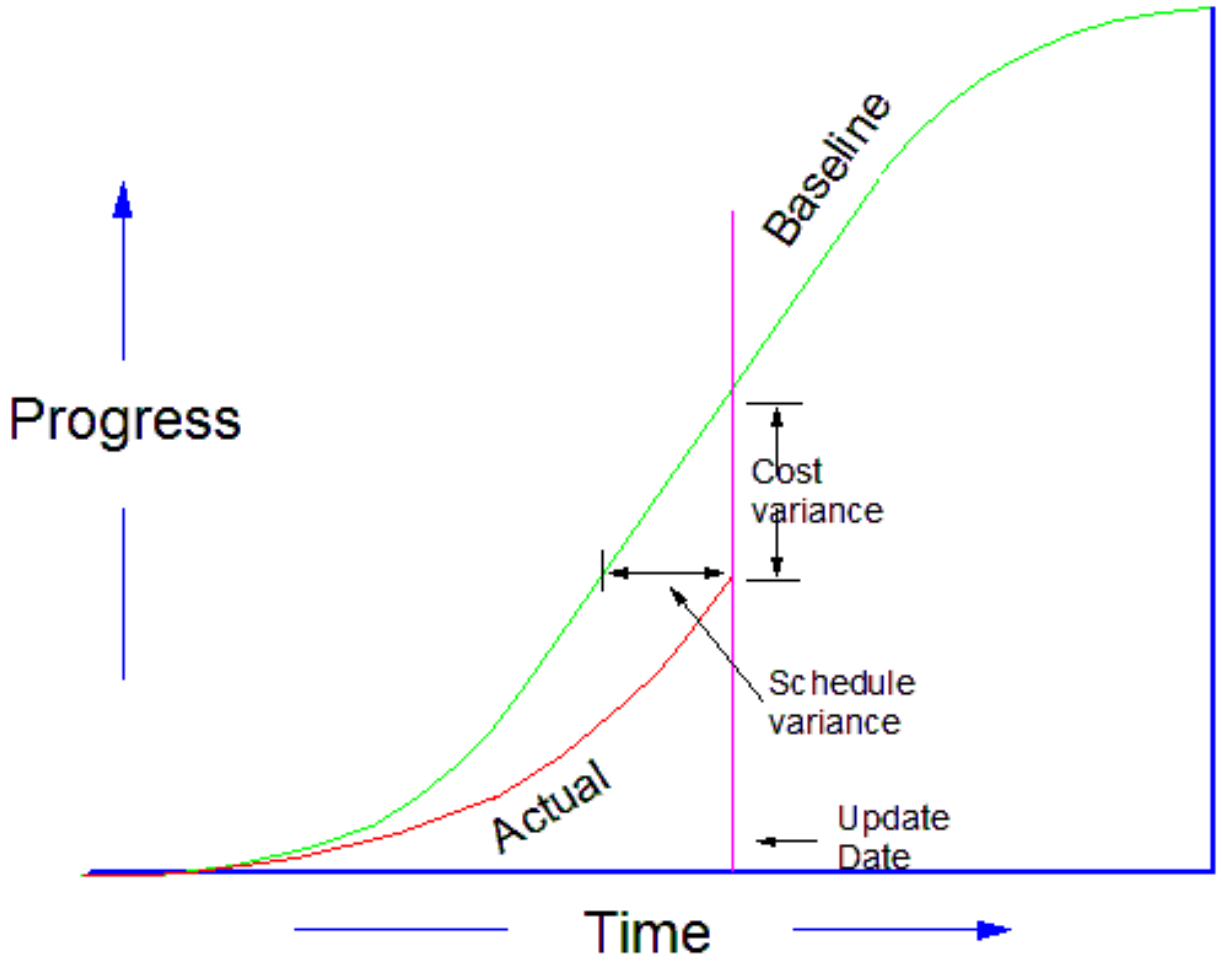
Earned Value Analysis

Schedule Variance SV

BCWP > BCWS: over spend

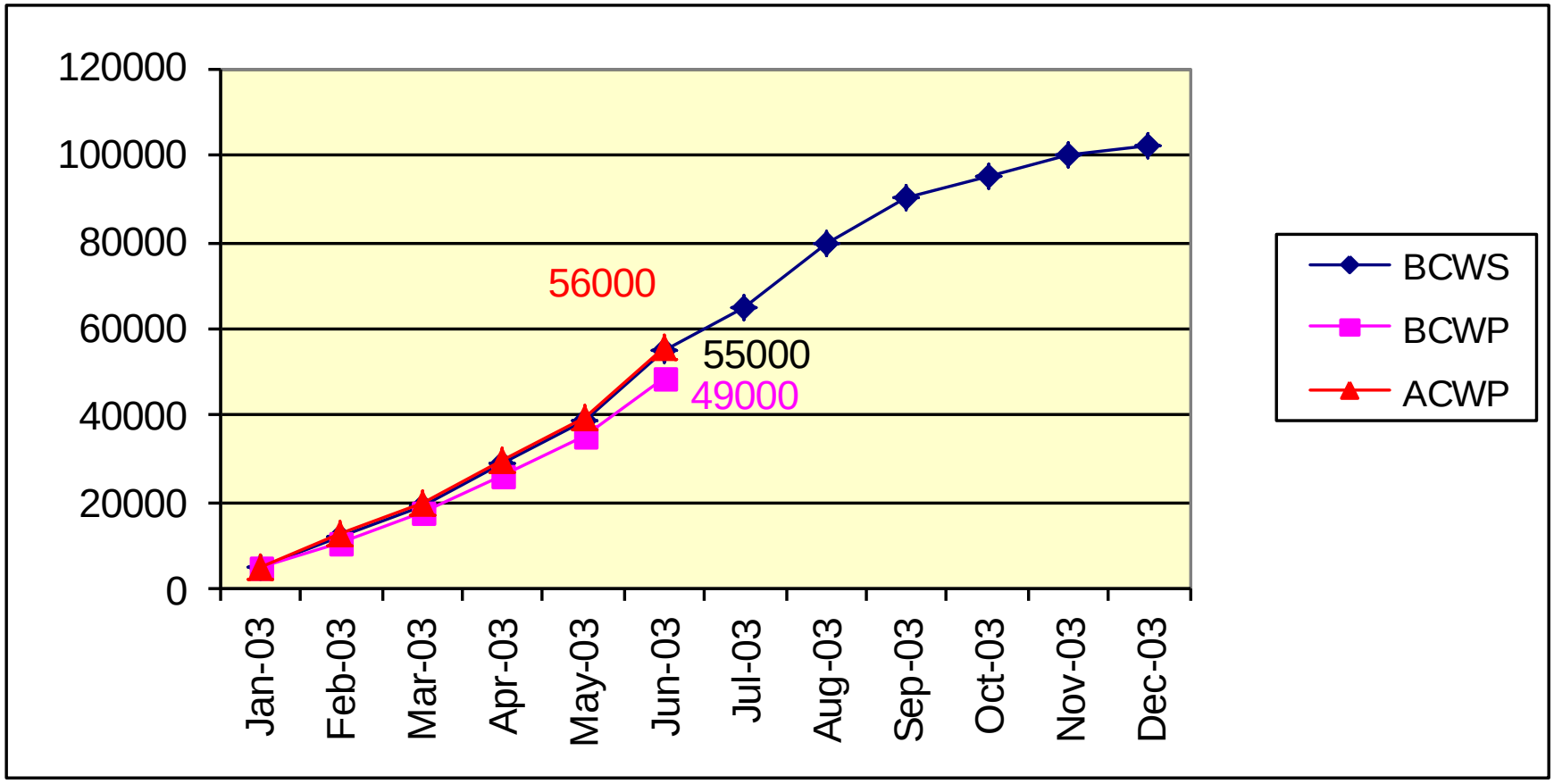
BCWP < BCWS: time is late: -ve

BCWP > BCWS: time is more than sufficient: +ve



Earned Value Analysis

The Whole Story



Forecasting

- It is the process of prediction of the future events.
- *Benefits*

1. To estimate the cost of remaining parts of a project (forecasted value).
2. To identify the source and places of certain problems in the budget plan.
3. It is a tool for corrective actions.

Forecasting

The Cost Performance Index (CPI)

A measure of how close the project is to spending on the work performed to what was planned to have been spent.

CPI = BCWP / ACWP

It gives a good indication whether the project is performing financially well or not.

CPI > 1 : Good performance (under budget).

CPI < 1 : Bad performance (over budget or behind schedule).

Forecasting

The Schedule Performance Index (SPI)

A measure of how close the project is to performing work as it was actually scheduled.

SPI = BCWP / BCWS

It is a good indicator for the project timing.

SPI > 1 : Good performance.

SPI < 1 : Bad performance (late).

Forecasting

Budgeting Cost to Completion (BCC)

The Amount of money needed to completion.

BCC = BAC – BCWP

It is defined as the amount of money required to complete a project where it is partially completed (remaining money).

Forecasting

Estimated Cost to Completion (ECC)

Its more realistic value than budgeted.

ECC = BCC / CPI

It depends on CPI which is a by product of the actual cost of work performed.

Forecasted Cost to Completion (FCC)

FCC = ACWP + ECC

Forecasting

Data Analysis Relationships

Term	Symbol	Formula	Checklist Actions
Percent complete	% Done	BCWP/BAC	Ratio of work accomplished in terms of the total amount of work done
Cost performance Index	CPI	BCWP/ACWP	Ratio of work accomplished against money spent.
Schedule Performance Index	SPI	BCWP/BCWS	Ratio of work accomplished against what should have been done.
Estimate Cost to Complete	ECC	(BAC-BAWP)/CPI	Calculation of the budgeted work remaining against the performance factor.

Forecasting

Performance Metrics

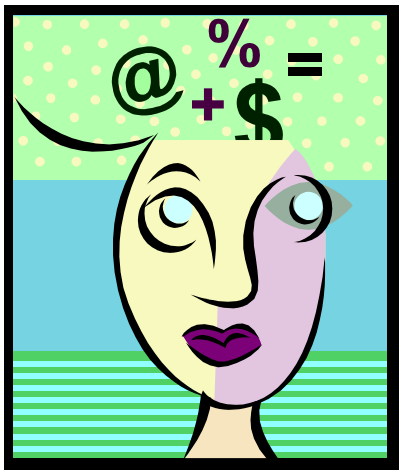
CSI: Cost Schedule Index

CSI = CPI × SPI

SPI: Schedule Performance Index

CPI: Cost Performance Index

The further CSI is from 1.0, the less likely project recovery becomes.



Example

SPI: BCWP/BCWS

49,000/55,000 = 0.891

CPI: BCWP/ACWP

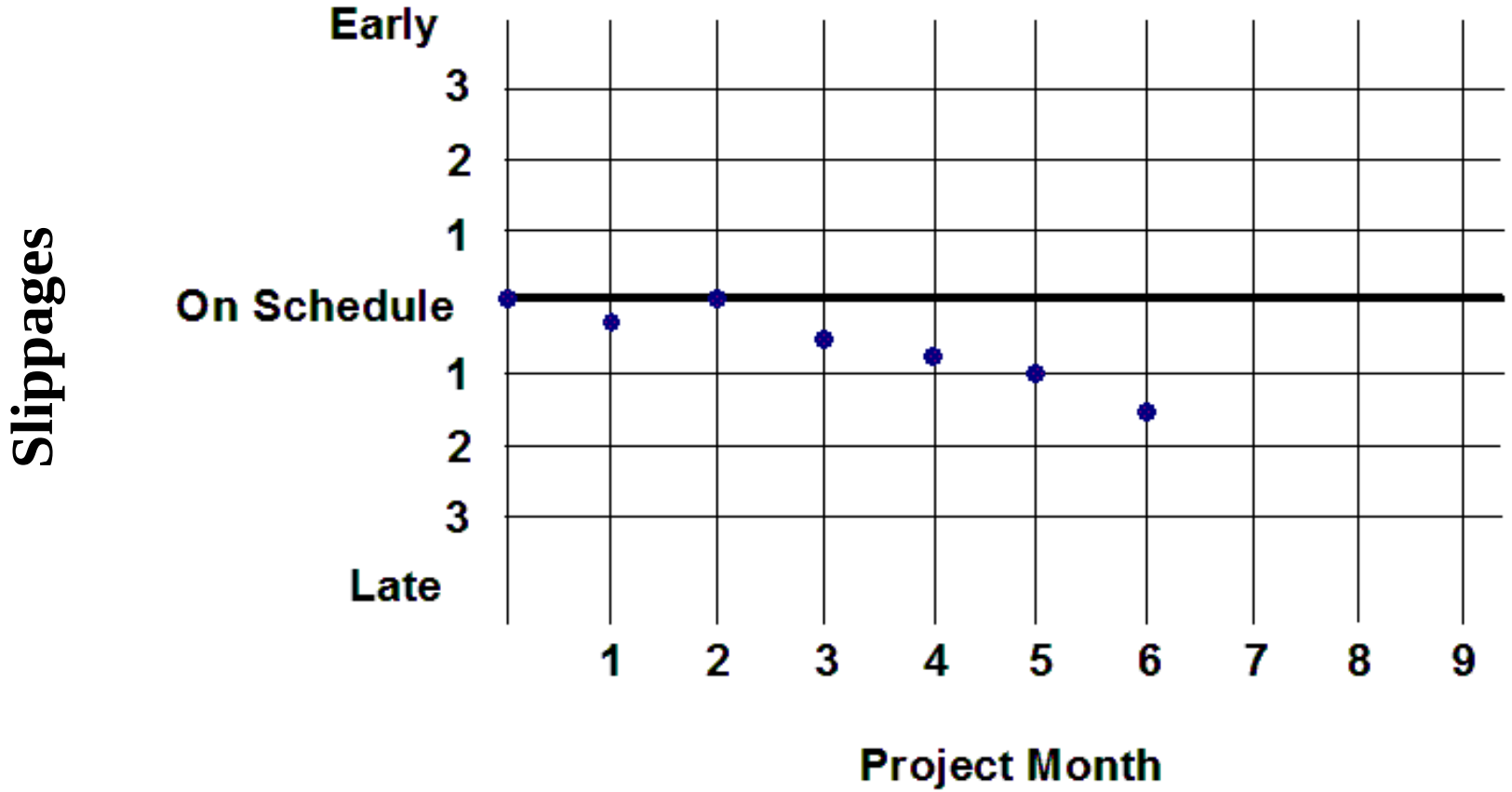
49,000/56000 = 0.875

CSI: SPI × CPI

.891 × .875 = 0.780

Graphical Reporting Tools

Milestone Trend Charts

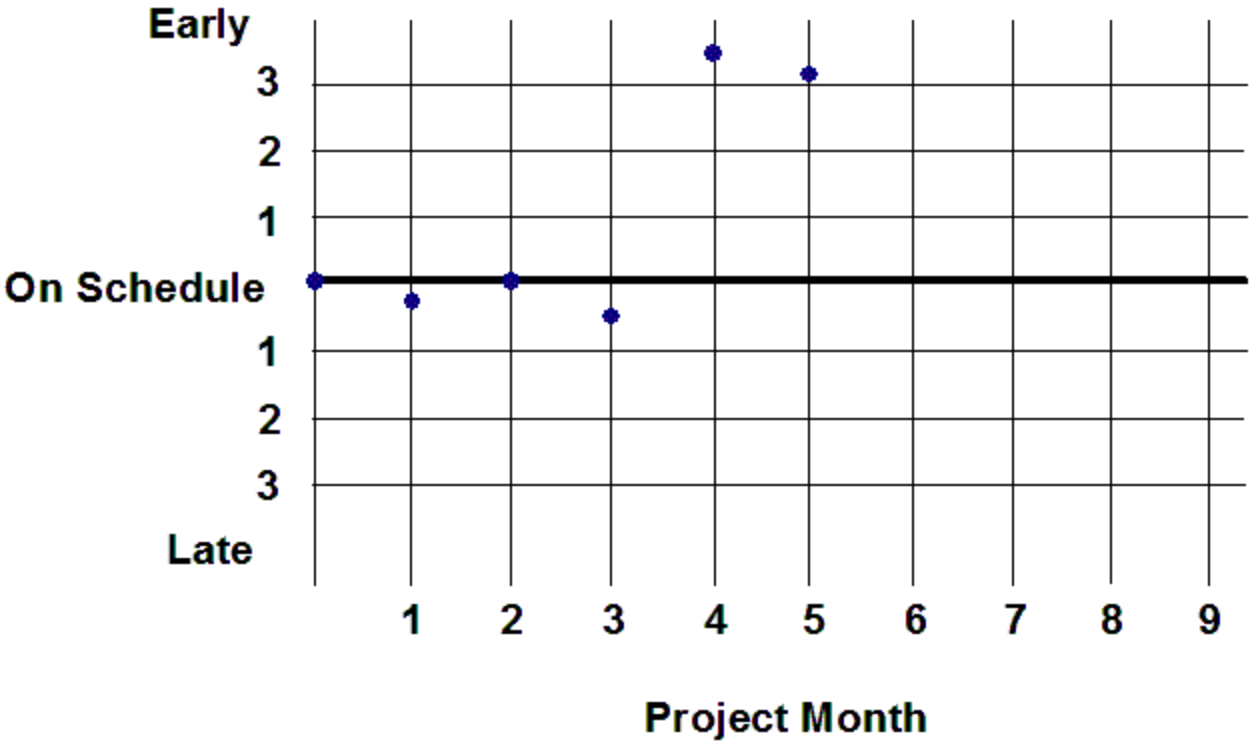


A run up or down of successive data points

Graphical Reporting Tools

Milestone Trend Charts

Radical change

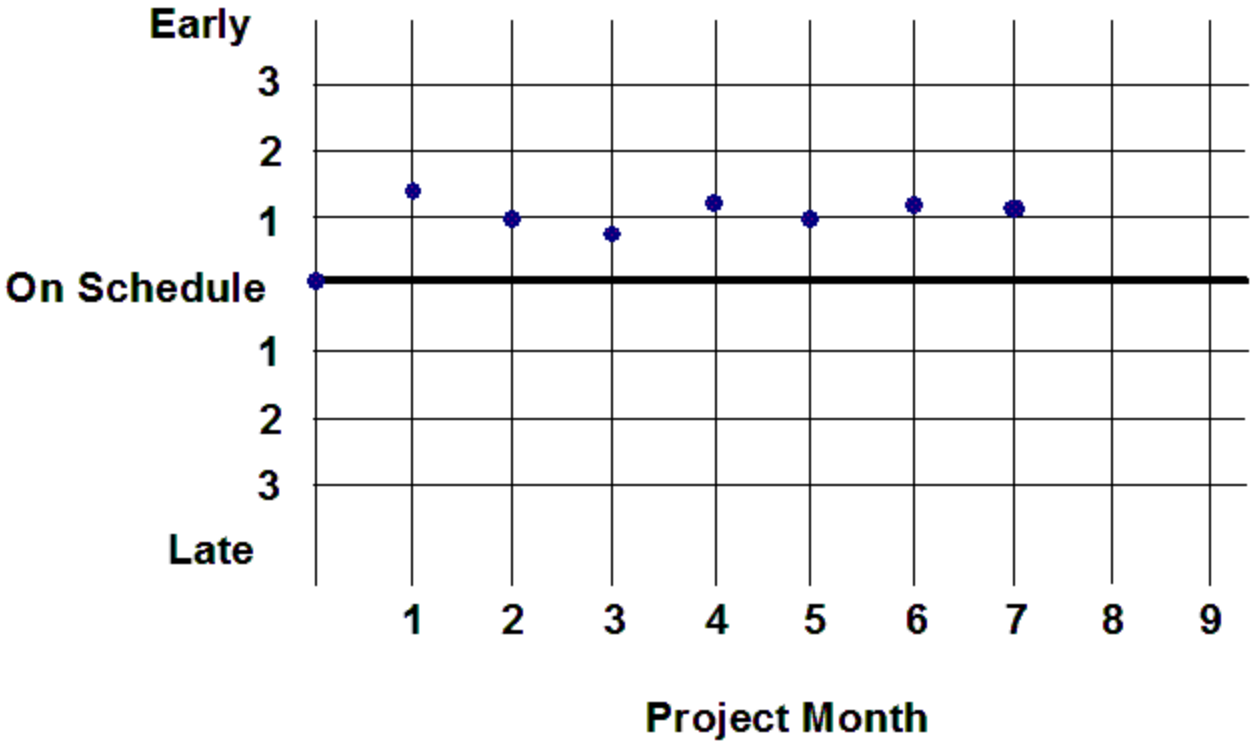


- A change of more than 3 standard deviations
- There may be a data error; requires further investigation.

Graphical Reporting Tools

Milestone Trend Charts

Successive runs



☞ Seven or more successive data points above or below the planned milestone date.

Example

The R&D department of a company has been developing new product line. The project manager is concerned whether the following provided data is exhibiting a good project performance.

→ Calculate the following and comment on the project status to convince the project manager: *CPI*,*BCC*, *ECC*, *SPI*, *FCC*.

Example

Work Package	Budgeted Cost	Completion Time month	Actual Cost	% Complete
B49	20000	1	23500	100%
B50	20000	2	20500	100%
B51	37000	3	23000	70%
B52	27000	4	27000	100%
B53	12000	5	4500	60%
B54	28000	6	18500	75%
B55	40000	7	----	----
	184000			

Example

Solution (the sixth period)

- BCWS = 20000 + 20000 + 37000 + 27000 + 12000 + 28000
  = 144000$
- ACWP = 23500 + 20500 + 23000 + 27000 + 4500 + 18500
  =117000 $
- BCWP = 20000 + 20000 + (37000×0.7) + 27000 +
  (12000×0.6) + (28000×0.75) = 119900 $
- CPI = BCWP / ACWP = 119900 / 117000 = 1.02

→ Good performance.

Example

- BAC = Budget at Completion = 184000
- BCC = BAC – BCWP = 184000 – 119900 = 64100$
- ECC = BCC / CPI = 64100/1.02 = 62843.14 $
- SPI = BCWP / BCWS = 119900 / 144000 = 0.832 < 1

  → Poor performance according to time.
- FCC = ACWP + ECC = 117000 + 62843.14 = 179843.14 $

Comments

We do not have any financial problem i.e the budgeted cost (money resources) is larger than the forecasted values, we conclude that the money is available , it is more than sufficient as the indicators were positive, the only problem we have is the time.

Example

Comparing Projects

Project	SPI	CPI
A	0.78 (2)	0.68 (2)
B	0.96 (1)	0.98 (1)
C	0.46 (3)	0.51 (4)
D	0.46 (4)	0.64 (3)

Example

Problem : Compare between the following projects according to the time and cost consumed?

Project A

WP	Budget	Actual	%Comp
A	435	395	100%
B	320	409	90%
C	125	-	
D	570	-	

Project B

WP	Budget	Actual	%Comp
A	820	800	100%
B	750	920	90%
C	1000	730	65%
D	700	--	--
E	850	---	---

Exercise

- Suppose you have a budgeted cost of a project at $900,000.
- The project is to be completed in 9 months.
- After a month, you have completed 10 % of the project at a total expense of $100,000.
- The planned completion should have been 15 %.
- Now, let's see how healthy the project by computing the CPI index and SPI index?

Home work

House Building Project Data

No.	Activity	Predecessor	Duration (Mo)	Res. Requi.
1.	Design house and obtain financing	-	3	6
2.	Lay foundation	1	2	5
3.	Order Materials	1	1	2
4.	Build house	2, 3	3	6
5.	Select paint	2, 3	1	2
6.	Select carpet	5	1	2
7.	Finish work	4, 6	1	6

Home work

WP	Budget	Actual	%Comp
1	14.400	16.128	100%
2	8.000	8.640	90%
3	1.600	1.164	65%
4	14.400	-	-
5	1600	-	-
6	1600	-	-
7	4.800	-	-
	46.400		

a. Inserting 3 milestores (checking points) after Activity 1, 2, 3 then draw AON, find CPM?

b. Draw the Graphical chart (Gantt chart, S-curve, and Milestore trend chart) and explain the results?