



sgs 4613

REMOTE SENSING

PROJECT MANAGEMENT

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Topic 9

Monitoring and Controlling

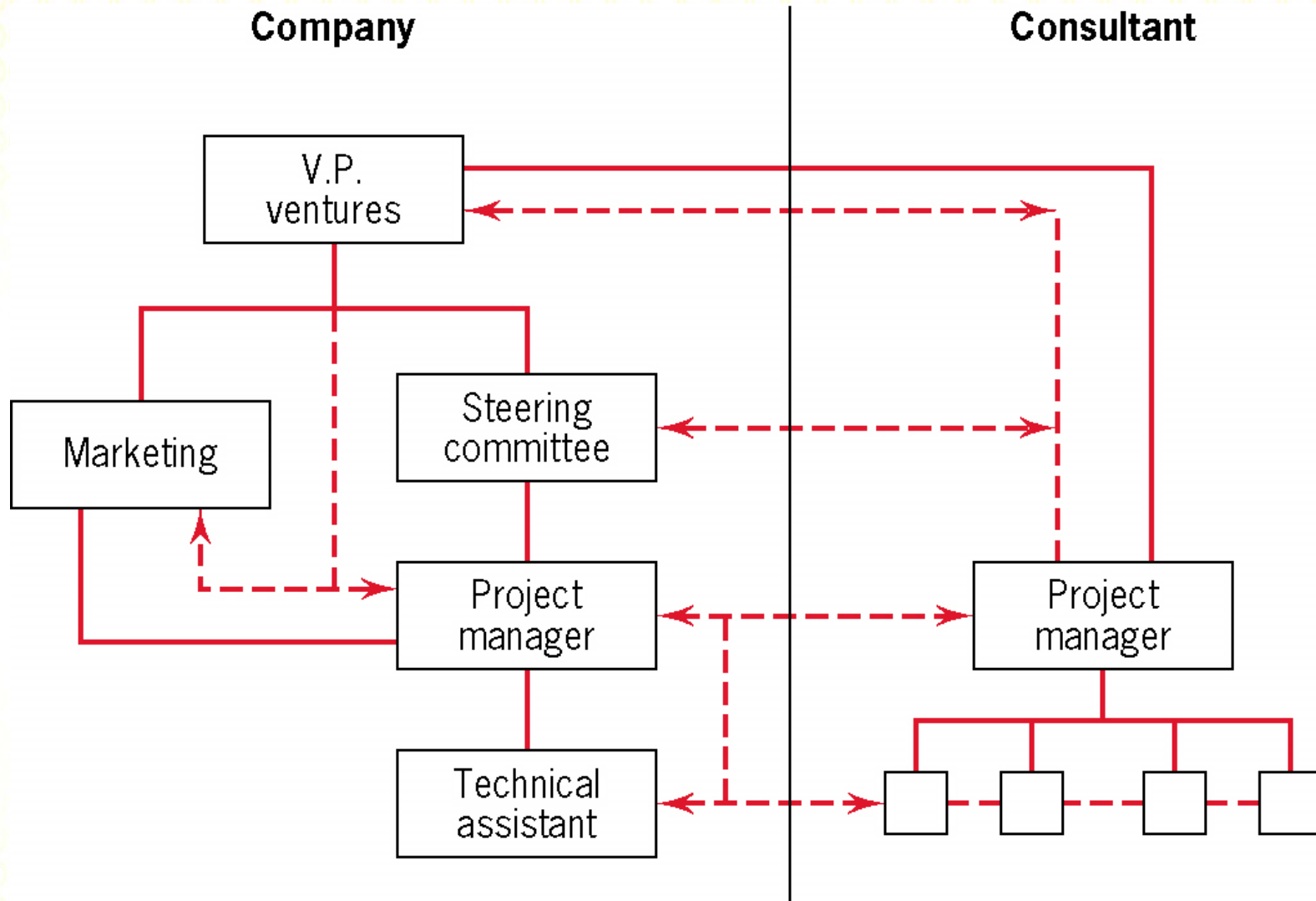


Project Management Monitoring and Controlling: Earned Value Analysis



Monitoring and Information Systems

- **Evaluation and control of projects are the opposite sides of project selection and planning**
 - **Logic of selection dictates the components to be evaluated**
 - **The details of the planning expose the elements to be controlled**
 - **Monitoring is the collecting, recording, and reporting information concerning any and all aspects of project performance**
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----- Denotes information flow



The Earned Value Chart

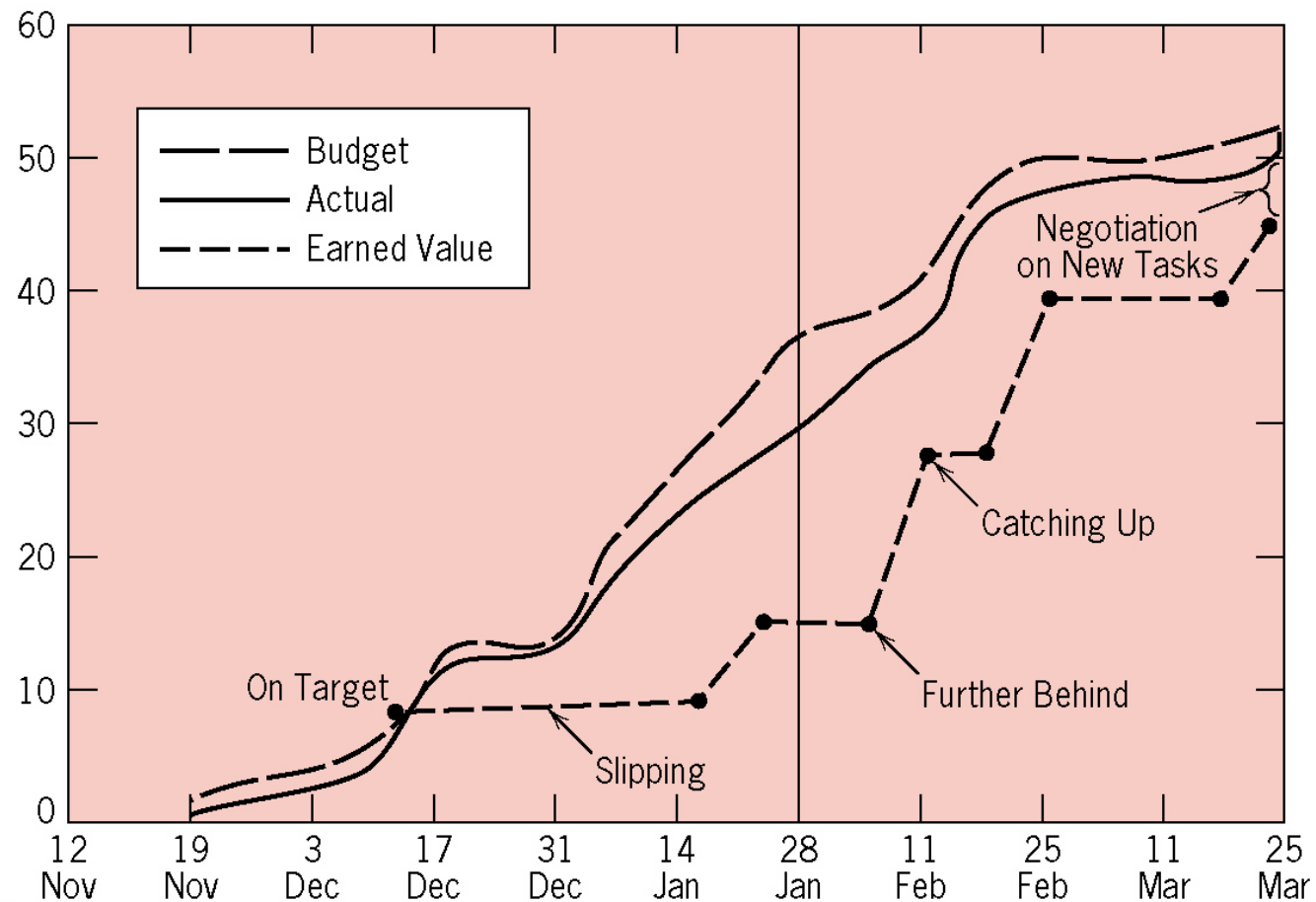
- **One way of measuring overall performance is by using an aggregate performance measure called earned value**
- **A serious difficulty with comparing actual expenditures against budgeted or baseline is that the comparison fails to take into account the amount of work accomplished relative to the cost incurred**

The Earned Value Chart

- **The earned value of work performed (value completed) for those tasks in progress is found by multiplying the estimated percent completion for each task by the planned cost for that task**
- **The result is the amount that should have been spent on the task so far**
- **The concept of earned value combines cost reporting and aggregate performance reporting into one comprehensive chart**

The Earned Value Chart

Graph to evaluate cost and performance to date:



The Earned Value Chart

- **Variations on the earned value chart follow two primary guidelines:**
 1. A negative is means there is a deviation from plan—not good
 2. The cost variations are calculated as the earned value minus some other measure
- **EV - Earned Value: budgeted cost of work performed**
- **AC - actual cost of work performed**
- **PV - Planned Value: budgeted cost of work scheduled**
- **ST - scheduled time for work performed**
- **AT - actual time of work performed**

The Earned Value Chart

EV - AC = cost variance (CV, overrun is negative)

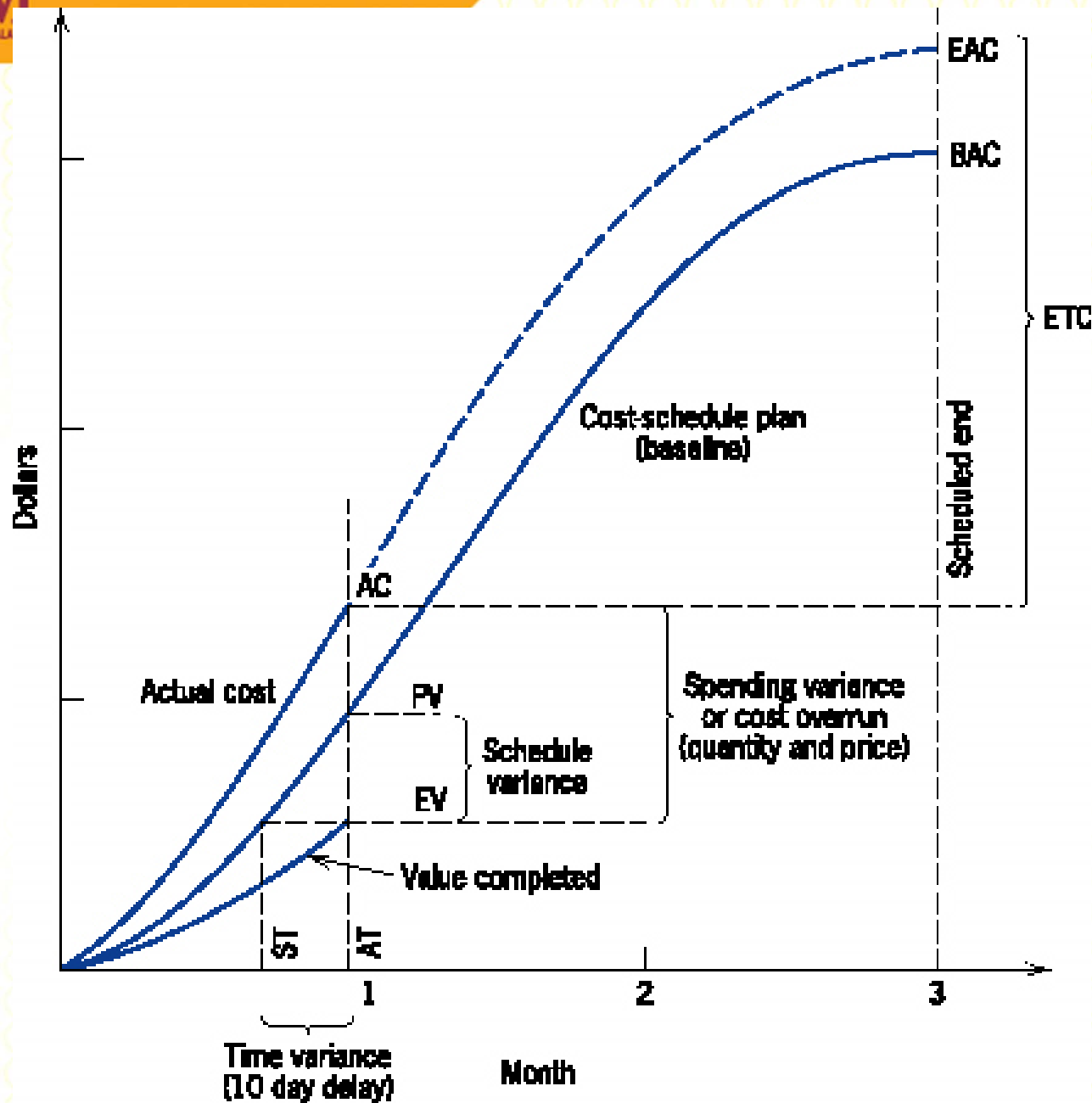
EV - PV = schedule variance (SV, late is negative)

ST - AT = time variance (TV, delay is negative)

- **If the earned value chart shows a cost overrun or performance underrun, the project manager must figure out what to do to get the system back on target**
- **Options may include borrowing resources, or holding a meeting of project team members to suggest solutions, or notifying the client that the project may be late or over budget**

The Earned Value Chart

- **Variances are also formulated as ratios rather than differences**
 - Cost Performance Index (CPI) = EV/AC
 - Schedule Performance Index (SPI) = EV/PV
 - Time Performance Index (TPI) = ST/AT
- **Use of ratios is particularly helpful when comparing the performance of several projects**



Variance Analysis Questions

- **What is the problem causing the variance?**
 - **What is the impact on time, cost, and performance?**
 - **What is the impact on other efforts, if any?**
 - **What corrective action is planned or under way?**
 - **What are the expected results of the corrective action?**
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Example

Planned \$1500 to complete work package.

Scheduled to have been finished today.

Actual expenditure to date is \$1350.

Estimate work is 2/3 complete.

What are cost and schedule variances?

Cost variance

$$\begin{aligned}\text{Cost variance} &= EV - AC \\ &= \$1500(2/3) - \$1350 \\ &= \$1000 - \$1350 \\ &= -\$350\end{aligned}$$

Schedule variance

$$\begin{aligned}\text{Schedule variance} &= EV - PV \\ &= \$1500(2/3) - \$1500 \\ &= -\$500\end{aligned}$$

CPI (cost performance index)

$$\begin{aligned}\text{CPI} &= \text{EV} / \text{AC} \\ &= (\$1500 / (2/3)) / \$1350 \\ &= 1000 / 1350 \\ &= 0.74\end{aligned}$$

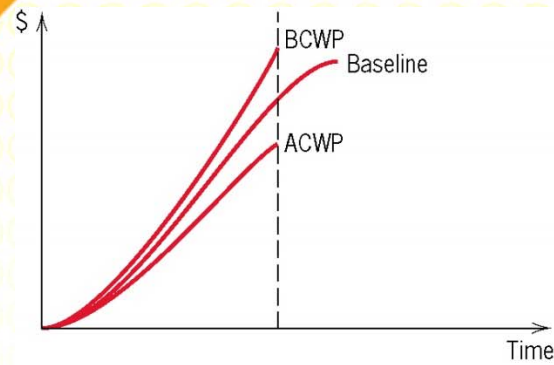
SPI (schedule performance index)

$$\begin{aligned} \text{SPI} &= \text{EV}/\text{PV} \\ &= (\$1500(2/3))/\$1500 \\ &= \$1000/\$1500 \\ &= 0.67 \end{aligned}$$

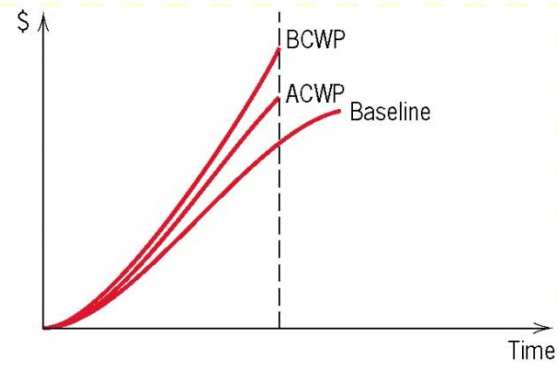
ETC and EAC

$$\begin{aligned}\text{Estimate to complete} &= (\text{BAC}-\text{EV})/\text{CPI} \\ &= (1500-1000)/.74 \\ &= \$676\end{aligned}$$

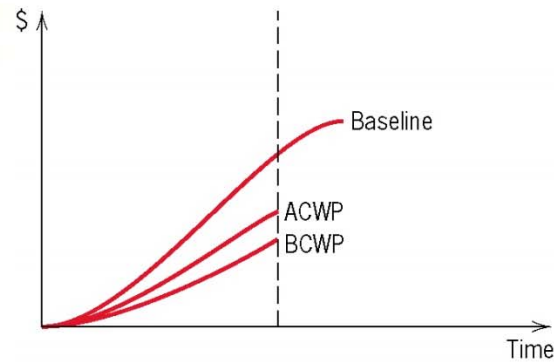
$$\begin{aligned}\text{Estimate at completion} &= \text{ETC} + \text{AC} \\ &= \$676 + \$1350 \\ &= \$2026\end{aligned}$$



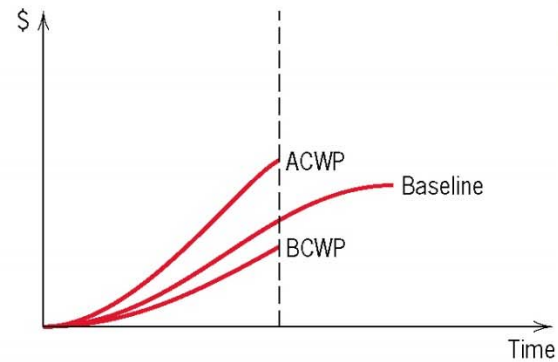
(a) +SV, +CV



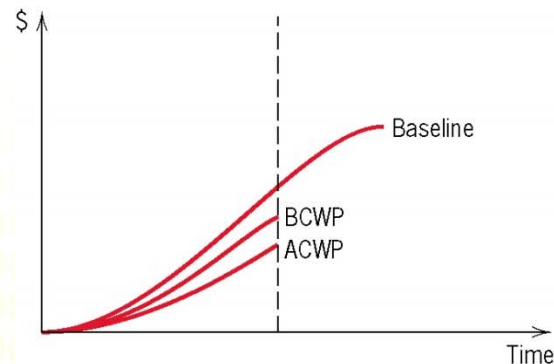
(b) +SV, +CV



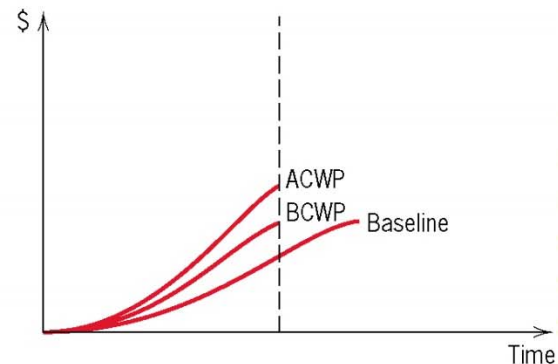
(c) -SV, -CV



(d) -SV, -CV



(e) -SV, +CV

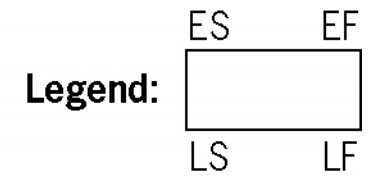
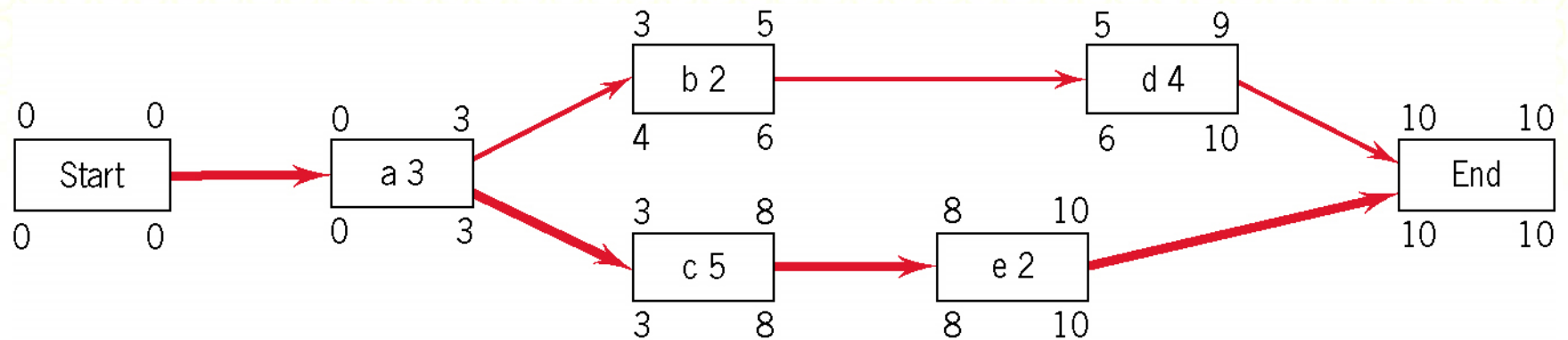


(f) +SV, -CV



Earned Value Example (today is day 7)

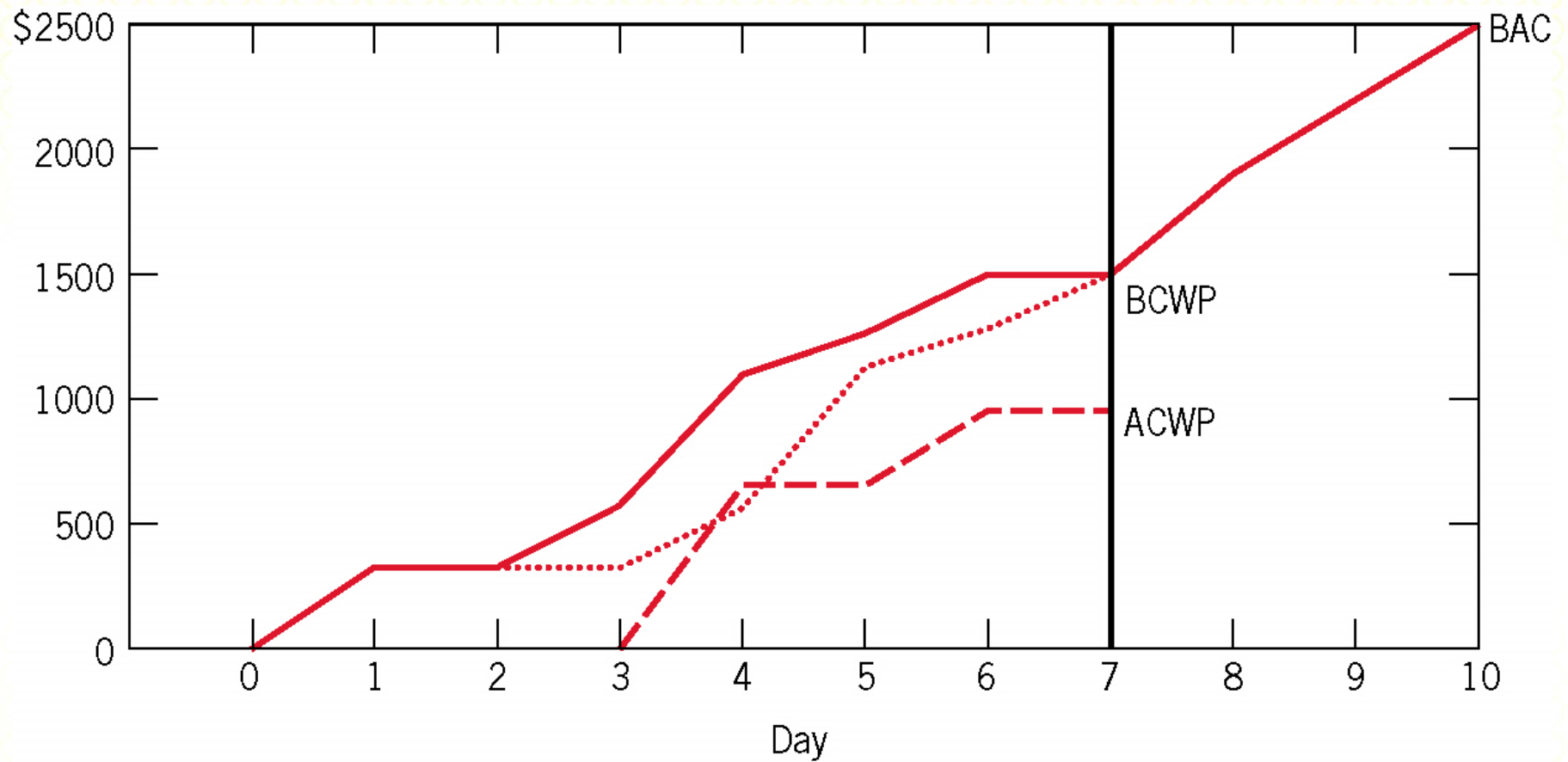
<i>Activity</i>	<i>Predecessor</i>	<i>Days Duration</i>	<i>Budget, \$</i>	<i>Actual Cost, \$</i>	<i>% Complete</i>
a	—	3	600	680	100
b	a	2	300	270	100
c	a	5	800		80
d	b	4	400		25
e	c	2	400		0



Day

Activity	0	1	2	3	4	5	6	7	8	9	10
a	300		300								
b				150	150						
c				400				400			
d						200			200		
e									200	200	
Total	300		300	550	150	200		400	400	200	
Cum. Total	300	300	600	1150	1300	1500	1500	1900	2300	2500	

	Day										
Activity	0	1	2	3	4	5	6	7	8	9	10
a		300			300						
b						150	150				
c						400					
d								200			
e											
EV		300			300	550	150	200			
Cum. EV (BCWP)		300	300	300	600	1150	1300	1500			
Actual Cost					680		270				
Cum. Cost (ACWP)		0	0	0	680	680	950	950			



Reference

- **Meredith, R. J. & Mantel, J. S. (1995). *Project Management – A Managerial Approach*. John Wiley & Sons, 5th Edition.**