

# ENGR3450 – Project Management

Week 9

The Project Execution  
Monitoring and Control

Halil POSACI – Dr. Esra Ekinci

2018, İzmir



# Agenda today

- Monitoring and Control
  - Report creation and meetings
- Earned Value Analysis
- Other reports and PMIS
- Project Control
- Design of Controls
- Go Back to your project charter

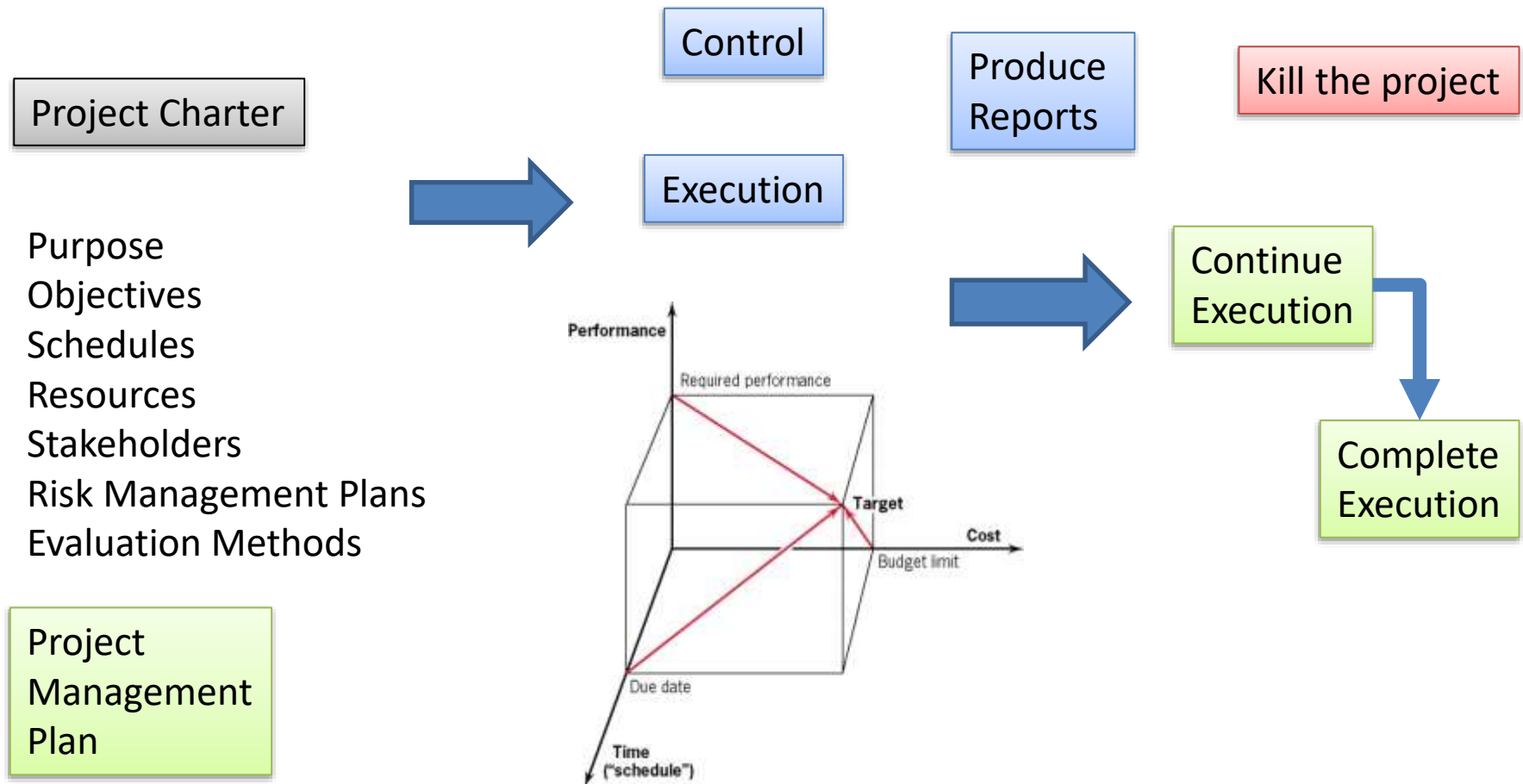
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– Problems from Ch 10-11.



# Monitoring and Control

Scope(Performance) – Time(Milestones) – Cost(On Budget)



# Define Scope well

## Then you may control well

Project Charter

**Purpose**  
**Objectives**

Schedules

Resources

Stakeholders

Risk Management Plans

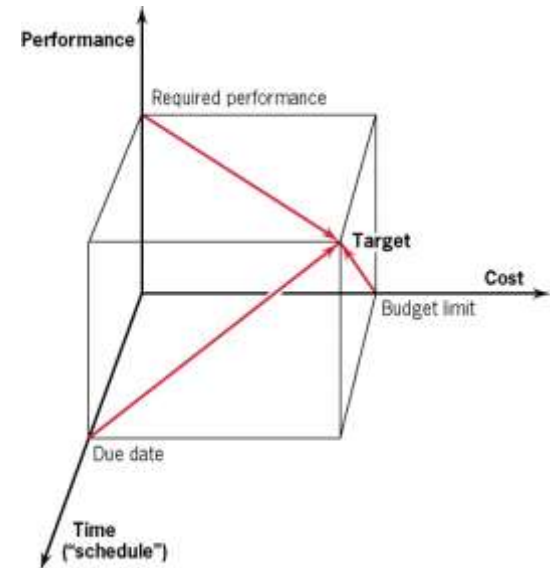
Evaluation Methods

Project  
Management  
Plan

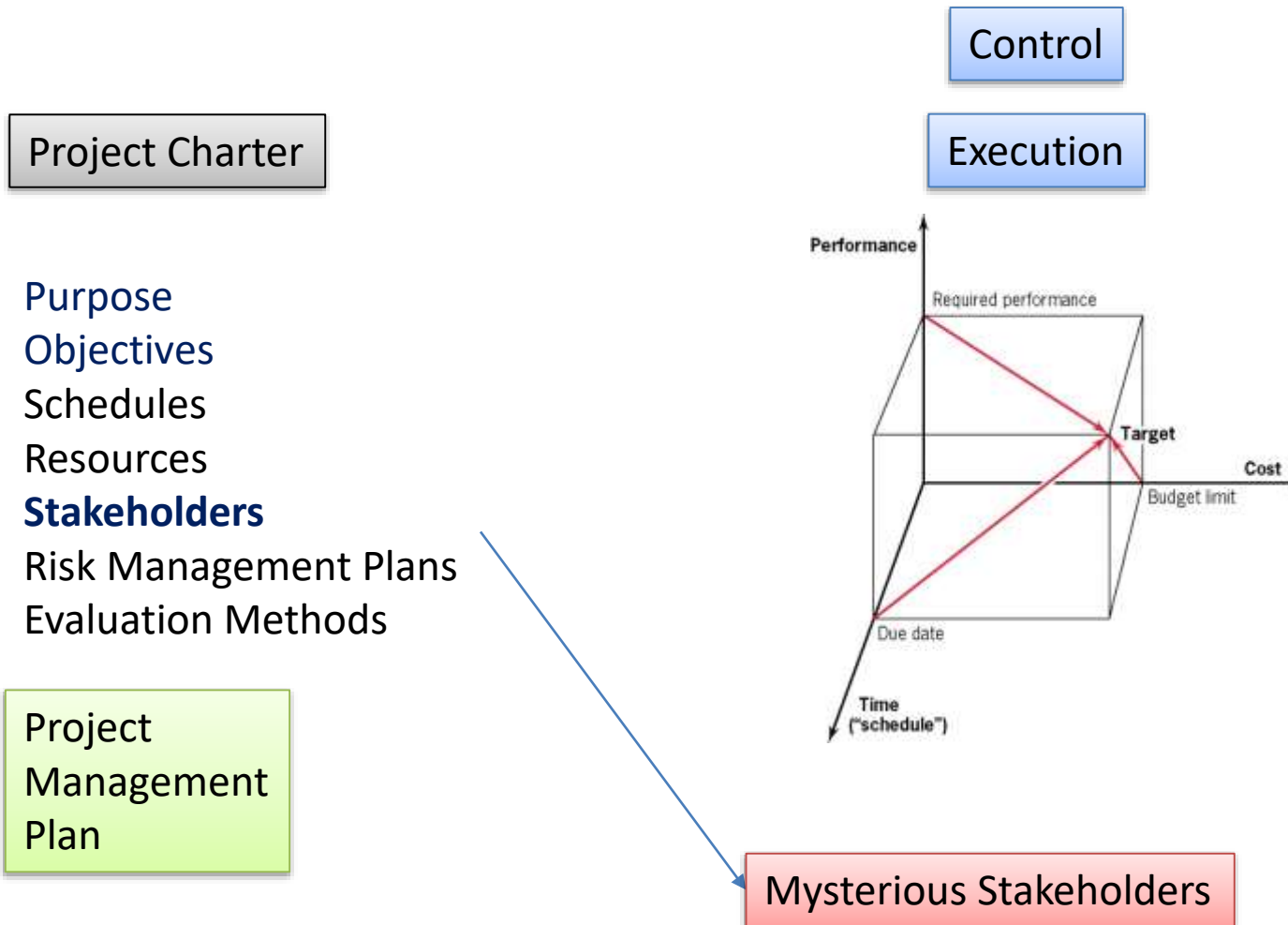
Scope

Muddy Waters

Scope not well defined



# Report to whom and when



## Know the constraints well

## Project Charter

- Purpose
- Objectives
- Schedules**
- Resources**
- Stakeholders
- Risk Management Plans
- Evaluation Methods

# Project Management Plan

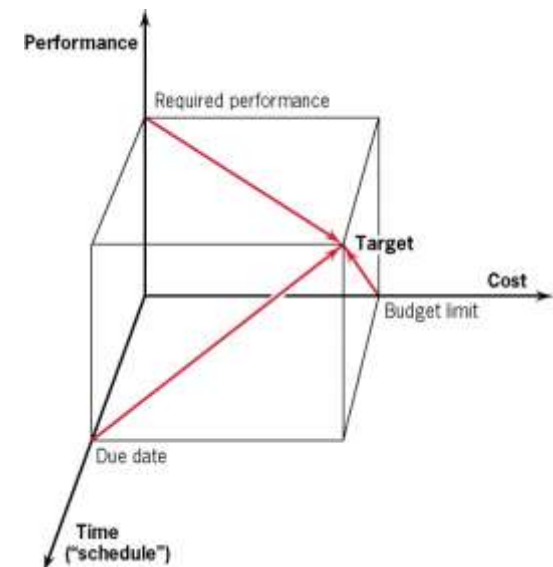
## Unconstrained Constraints

The screenshot shows the Microsoft Project interface. The top ribbon includes 'Task' and 'Resource' tabs. The 'Task' tab is active, showing a list of tasks on the left and a Gantt chart on the right. The Gantt chart displays a project timeline from 1/1/2010 to 12/31/2010. Tasks are represented by bars: 'Project Manager' (blue), 'Project Support' (red), 'Project Manager' (blue), 'Project Support' (red), and 'Project Manager' (blue). The task list on the left shows tasks with their durations and costs. The 'Project Manager' task is highlighted in blue.

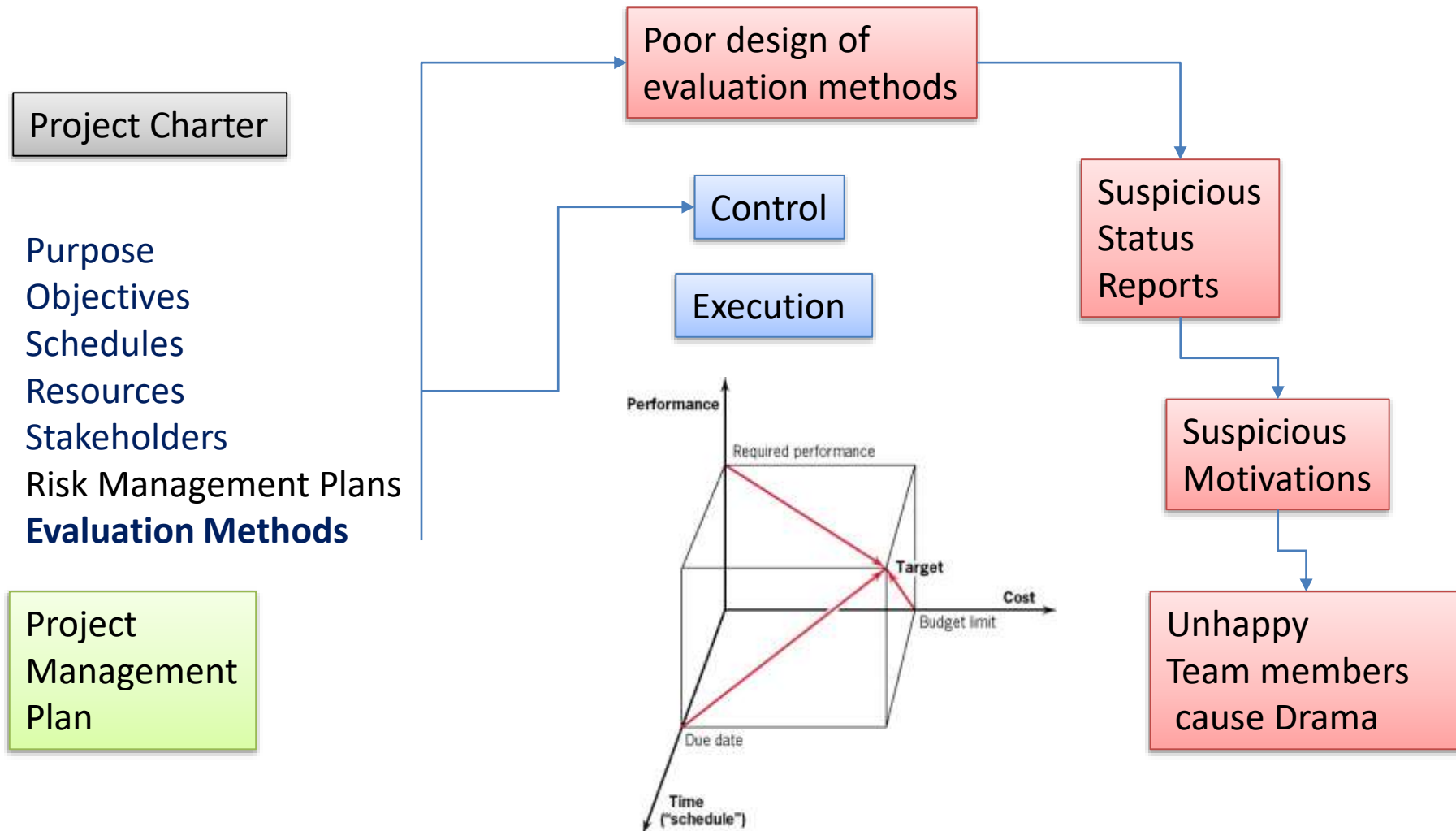
Task Name	Duration	Cost
Project Manager	1/1/2010 - 12/31/2010	\$1,000,000.00
Project Support	1/1/2010 - 12/31/2010	\$1,000,000.00
Project Manager	1/1/2010 - 12/31/2010	\$1,000,000.00
Project Support	1/1/2010 - 12/31/2010	\$1,000,000.00
Project Manager	1/1/2010 - 12/31/2010	\$1,000,000.00

Control

## Execution



# Poor design of Monitoring Controls



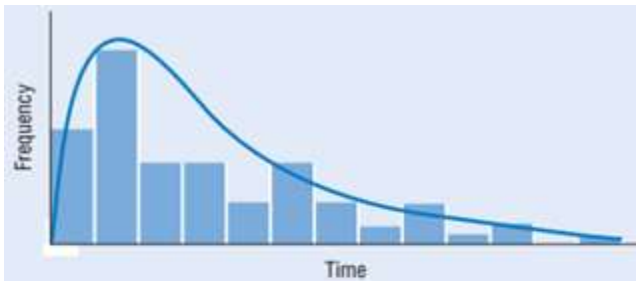
# How to collect data

- Frequency counts  
Bugs in SW, accidents , services, leakages, complaints, etc.
- Raw numbers  
Hours, units, dollars, TLs, kgs, dates or durations, etc.
- Subjective (but numeric) ratings  
Quality, ranking, motivation level, etc.
- Indicators and verbal measures (non numeric)  
(speed of response, good morale etc.)

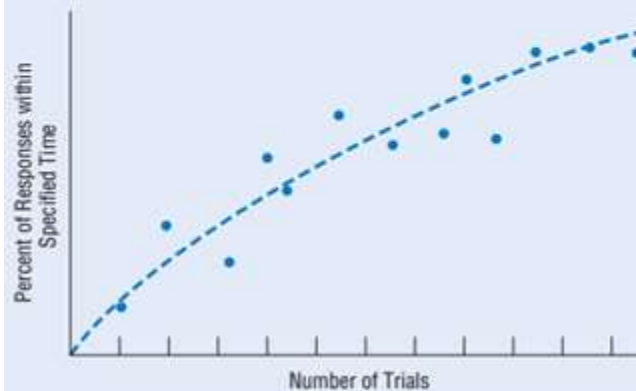




# Data to Information to report

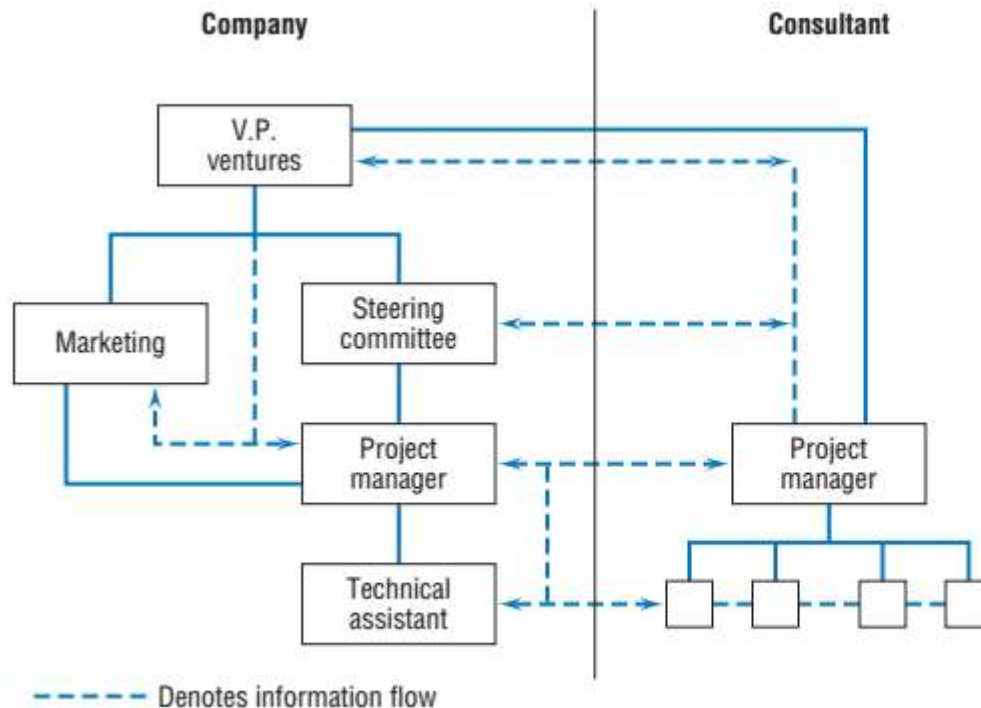


**Figure 10-2** Number of bugs found during test of Datamix program.



**Figure 10-3** Percent of specified performance met during repeated trials.

# Information Flow



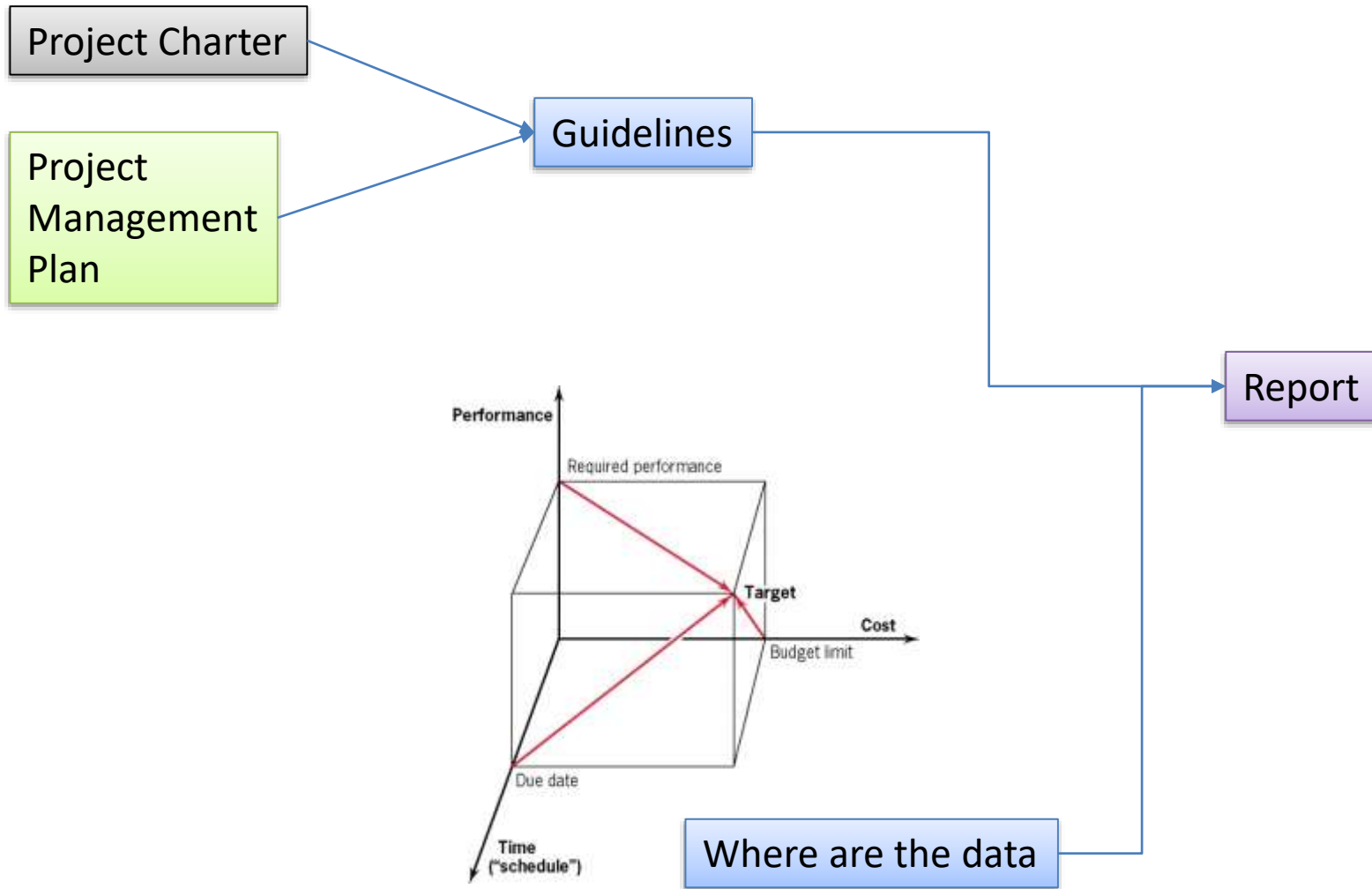
Use more graphics  
for top managers  
to make them read fast

Keep security high  
on sensitive data

**Figure 10-4** Reporting and information flows between organizations working on a common project.



# Reporting Process



# Meetings

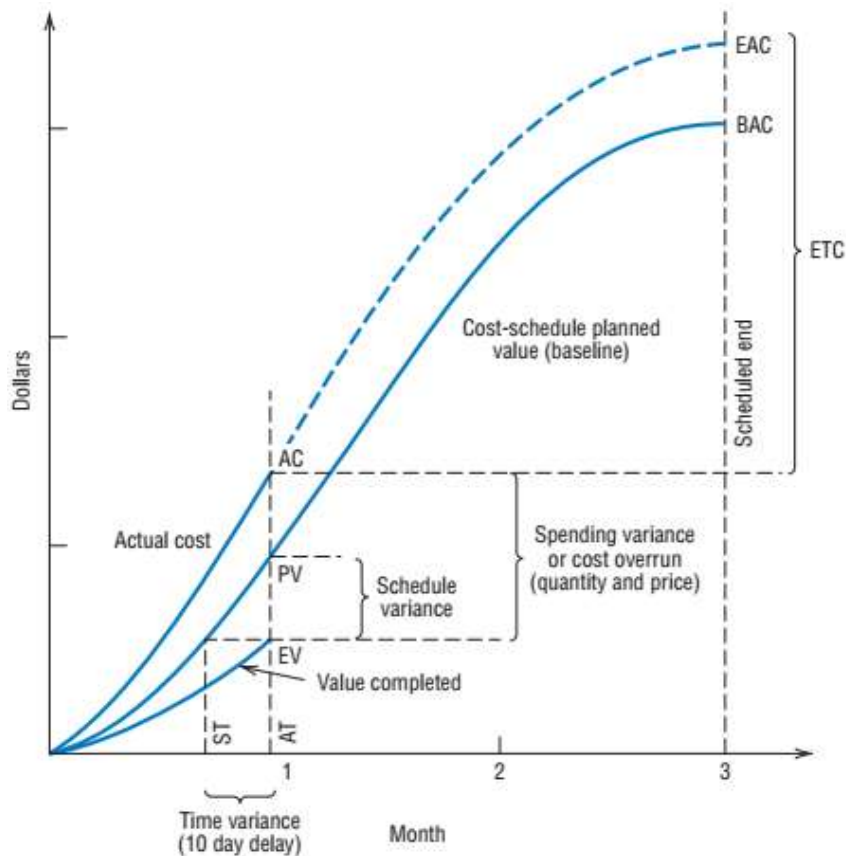
Reports are not satisfactory for giving decisions  
So plan meetings formal or informal.

- Make your team (and you) do their home-works before meeting.
- Be timely on meetings (Determined start and finish times) with durations about 30 minutes.
- Make everybody talk and use your minutes too.
- Focus on the aim of the meeting
- Don't be too formal or informal.
- In crisis times do specific meetings with no time limit (unless problem solved). Or close a selected group in a room until they find the solution.
- Sometimes it may be needed to use on-line tools to make distance colligates with you.



# Earned Value Analysis

Expert judgement is important for estimates besides analytical measurements



BAC – Budget At Completion

EAC – Estimated cost At Completion

ETC – Estimated cost To Complete

AC – Actual Cost now (on time of measure)

PV – Planned Value for now

EV – Earned Value now

AT – Actual Time now

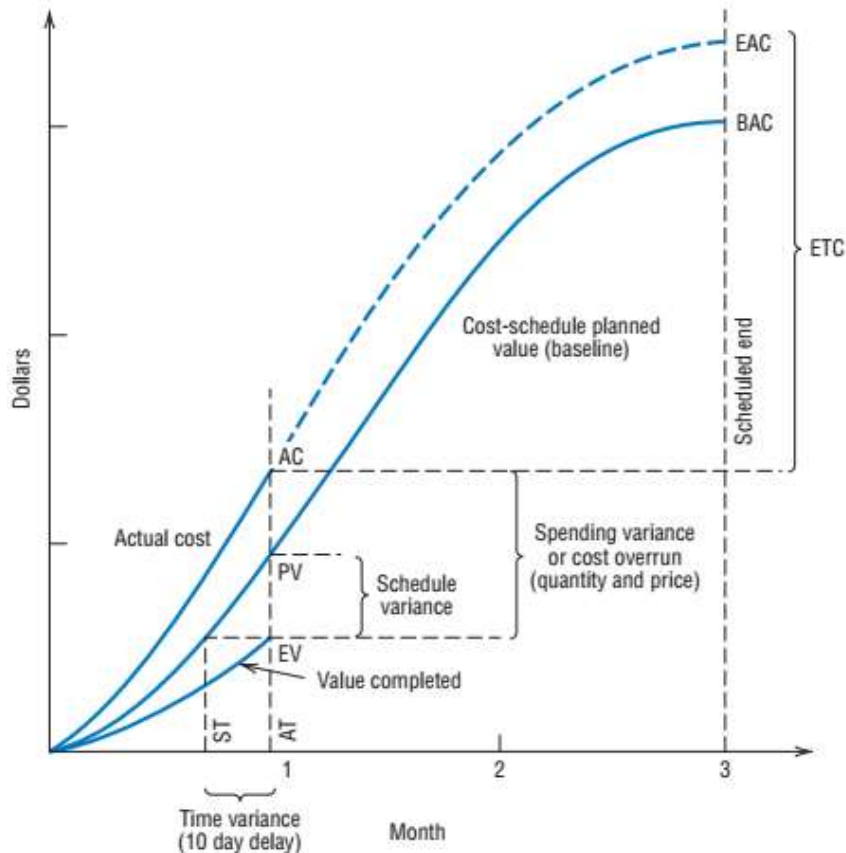
ST – Scheduled Time for the work completed

Figure 10-5 Earned value chart.



# Earned Value Analysis

BAC – Budget At Completion  
 EAC – Estimated cost At Completion  
 ETC – Estimated cost To Complete  
 AC – Actual Cost now (on time of measure)  
 PV – Planned Value for now  
 EV – Earned Value now  
 AT – Actual Time now  
 ST – Scheduled Time for the work completed



Cost Variance  $CV = EV - AC$

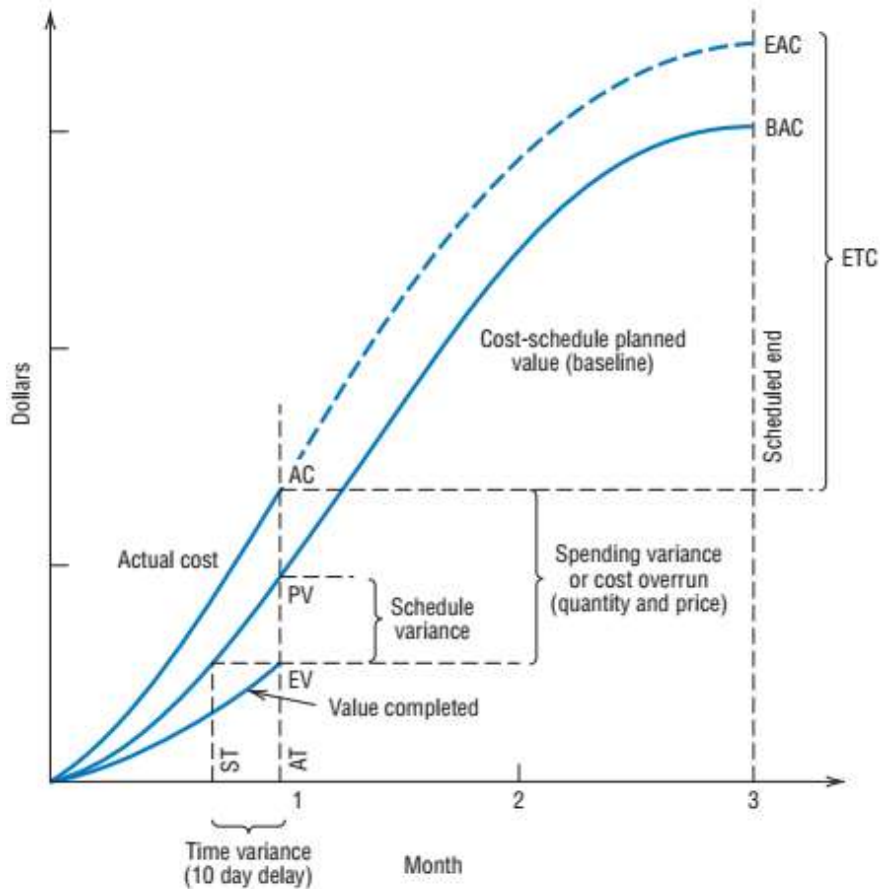
Schedule Variance  $SV = EV - PV$

Time Variance  $TV = ST - AT$

**Figure 10-5** Earned value chart.



# Earned Value Analysis



BAC – Budget At Completion  
 EAC – Estimated cost At Completion  
 ETC – Estimated cost To Complete  
 AC – Actual Cost now (on time of measure)  
 PV – Planned Value for now  
 EV – Earned Value now  
 AT – Actual Time now  
 ST – Scheduled Time for the work completed

Cost Variance	$CV = EV - AC$
Schedule Variance	$SV = EV - PV$
Time Variance	$TV = ST - AT$

Cost Performance Index  $CPI = EV/AC$

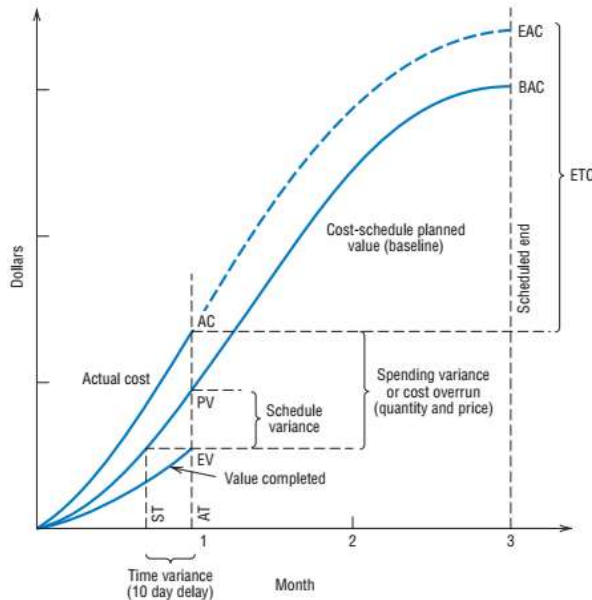
Schedule Performance Index  $SPI = EV/PV$

Time Performance Index  $TPI = ST/AT$

Cost Schedule Index  $CSI = CPI * SPI$   
 $= EV^2 / AC * PV$



# A short example



Assume that operations on a work package were expected to cost \$1,500 to complete the package. They were originally scheduled to have been finished today.

At this point, however, we have actually expended \$1,350, and we estimate that we have completed two-thirds of the work.

What are the cost and schedule variances?

$$CV = EV - AC = 1500 \cdot (2/3) - 1350 = -\$350$$

$$SV = EV - PV = 1500 \cdot (2/3) - 1500 = -\$500$$

$$CPI = EV/AC = 1500 \cdot (2/3) / 1350 = 74\%$$

$$SPI = EV/PV = 1500 \cdot (2/3) / 1500 = 67\%$$

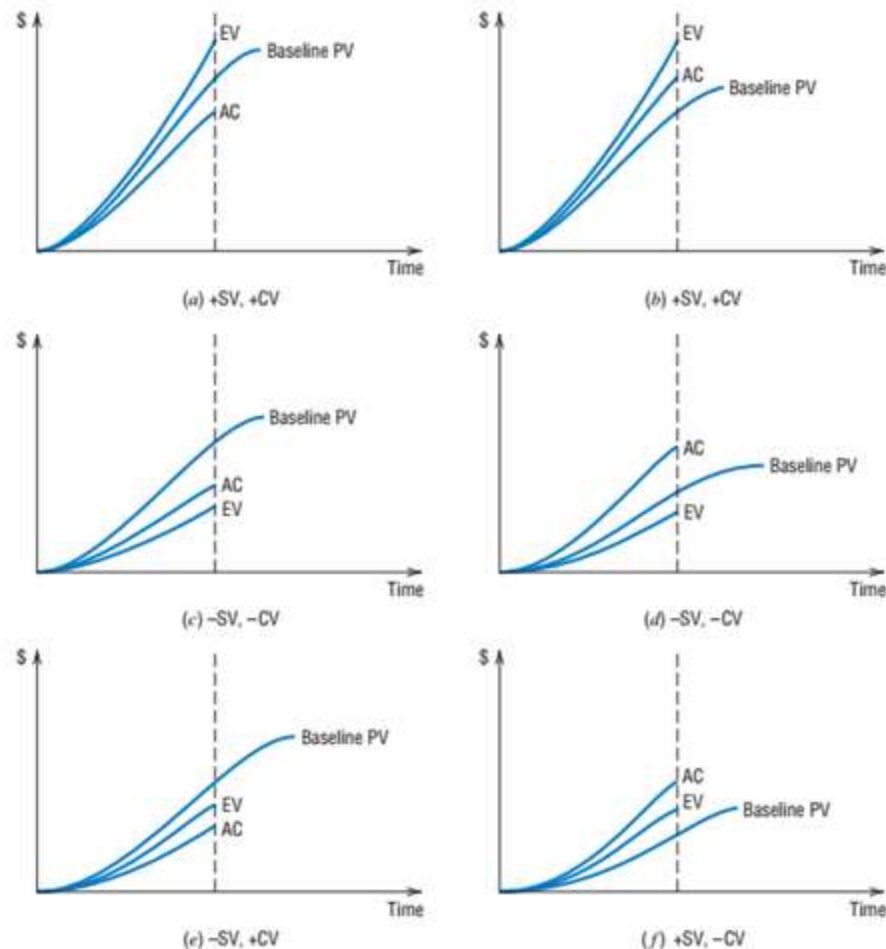
$$CSI = (1500 \cdot 2/3)^2 / (1350 \cdot 1500) = 49\% < 100\% \text{ Problem}$$

Easy to see a problem





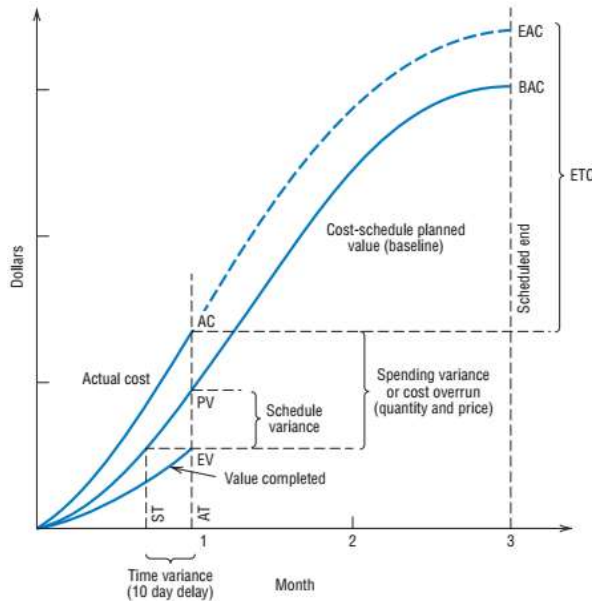
# Possible Examples for EVA



**Figure 10-6** Six possible arrangements of AC, EV, and baseline PV resulting in four combinations of positive and negative schedule variance (SV) and cost variance (CV). (Figure 10-5 is arrangement *d*.)



# Continue short example



$$\begin{aligned} ETC &= (BAC - EV) / CPI \\ &= (1500 - 1000) / 0.74 \\ &= \$676 \end{aligned}$$

$$EAC = ETC + AC = 676 + 1350 = \$2026$$

Crashing is done – A rough estimate for estimated cost to complete

$$ETC = (BAC - EV) / CPI * SPI = 676 / .67 = \sim 1000$$

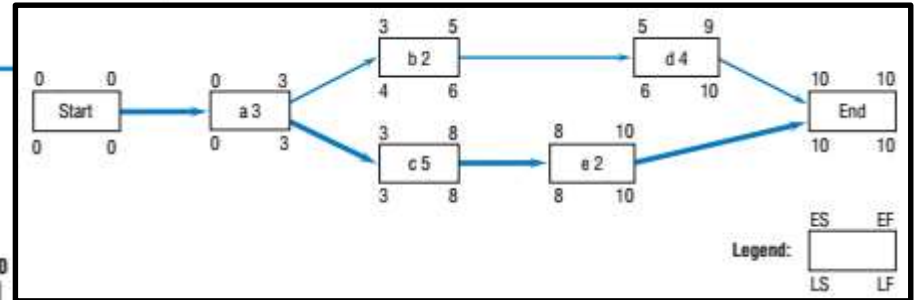


# Example

**Table 10-1** Earned Value Example (today is day 7)

Activity	Predecessors	Days Duration	Budget, \$	Actual Cost, \$
a	—	3	600	680
b	a	2	300	270
c	a	5	800	
d	b	4	400	
e	c	2	400	

	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	

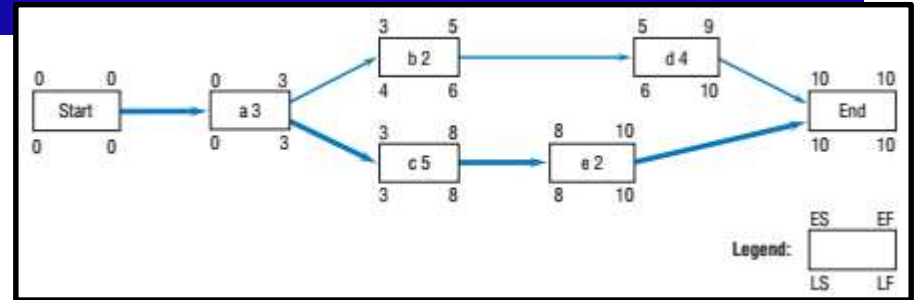
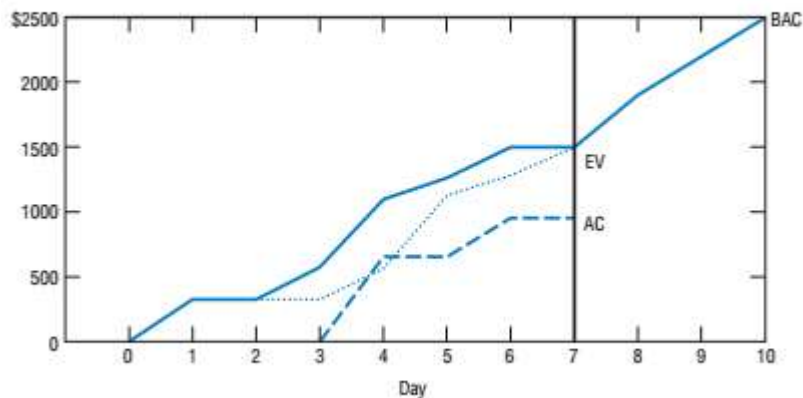


**Figure 10-8** Example baseline (PV) budget using the 50–50 rule.



# Status at day 7

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	300	300	300	600	1150	1300	1500				
Actual Cost				680		270					
Cum. AC	0	0	0	680	680	950	950				



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	

CV = \$550

Good

50-50 rule makes estimates rough



Figure 10-10 Example earned value chart at day 7.

# Earned value report

Name	PV	EV	AC	Sch. Variance	Cost Variance	BAC	FAC	Variance	QTR 1			QTR 2		
									Jan	Feb	Mar	Jan	Feb	Mar
Contact Organizations	\$3,797.00	\$3,980.00	\$3,920.00	\$183.00	\$60.00	\$3,980.00	\$3,920.00	\$60.00						
Print forms	\$645.00	\$645.00	\$645.00	\$0.00	\$0.00	\$645.00	\$645.00	\$0.00						
Contact organizations	\$840.00	\$840.00	\$728.00	\$0.00	\$112.00	\$840.00	\$728.00	\$112.00						
Collect display information	\$660.00	\$660.00	\$660.00	\$0.00	\$0.00	\$660.00	\$660.00	\$0.00						
Gather college particulars	\$520.00	\$520.00	\$520.00	\$0.00	\$0.00	\$520.00	\$520.00	\$0.00						
Print programs	\$687.00	\$870.00	\$922.00	\$183.00	(\$52.00)	\$870.00	\$922.00	(\$52.00)						
Print participants' certificates	\$445.00	\$445.00	\$445.00	\$0.00	\$0.00	\$445.00	\$445.00	\$0.00						
Banquet and Refreshments	\$1,220.00	\$1,220.00	\$1,200.00	\$0.00	\$20.00	\$1,220.00	\$1,200.00	\$20.00						
Select guest speaker	\$500.00	\$500.00	\$500.00	\$0.00	\$0.00	\$500.00	\$500.00	\$0.00						
Organize food	\$325.00	\$325.00	\$325.00	\$0.00	\$0.00	\$325.00	\$325.00	\$0.00						
Organize liquor	\$100.00	\$100.00	\$100.00	\$0.00	\$0.00	\$100.00	\$100.00	\$0.00						
Organize refreshments	\$295.00	\$295.00	\$275.00	\$0.00	\$20.00	\$295.00	\$275.00	\$20.00						
Publicity and Promotion	\$2,732.00	\$2,297.75	\$2,039.00	(\$434.25)	\$258.75	\$3,010.00	\$2,870.00	\$140.00						
Send invitations	\$700.00	\$700.00	\$660.00	\$0.00	\$140.00	\$700.00	\$660.00	\$140.00						
Organize gift certificates	\$330.00	\$330.00	\$330.00	\$0.00	\$0.00	\$330.00	\$330.00	\$0.00						
Arrange banner	\$570.00	\$570.00	\$570.00	\$0.00	\$0.00	\$570.00	\$570.00	\$0.00						
Contact faculty	\$280.00	\$280.00	\$280.00	\$0.00	\$0.00	\$280.00	\$280.00	\$0.00						
Advertise in college paper	\$165.00	\$82.50	\$65.00	(\$82.50)	\$17.50	\$165.00	\$165.00	\$0.00						
Class announcements	\$99.00	\$0.00	\$0.00	(\$99.00)	\$0.00	\$220.00	\$220.00	\$0.00						
Organize posters	\$588.00	\$335.25	\$234.00	(\$252.75)	\$101.25	\$745.00	\$745.00	\$0.00						
Facilities	\$200.00	\$0.00	\$0.00	(\$200.00)	\$0.00	\$200.00	\$200.00	\$0.00						
Arrange facility for event	\$52.00	\$0.00	\$0.00	(\$52.00)	\$0.00	\$52.00	\$52.00	\$0.00						
Transport materials	\$148.00	\$0.00	\$0.00	(\$148.00)	\$0.00	\$148.00	\$148.00	\$0.00						
Project: Career Day Date: 3/24	<div> <div></div> Critical           <div></div> Progress           <div></div> Milestone         </div> <div> <div></div> Noncritical           <div></div> Summary           <div></div> Rolled up         </div>													

Figure 10-11 MSP budget sheet for Career Day project (cf. Chapter 6).

# Other control charts

## Milestone monitoring

NAME					PROJECT PLAN	ENGR. REVIEW	DESIGN REVIEW	QUOTE QUES.	PAT SCULP. COMPL.	PAT SCULP. COMPL.	QUOTES DUE	MAKE BUY
PROJECT NO.	PRODUCT NO.	MFG SOURCE	TURNOVER	ORIGINAL								
A = PRICE	QUOTA	POTENTIAL		CURRENT								
				ACTUAL								

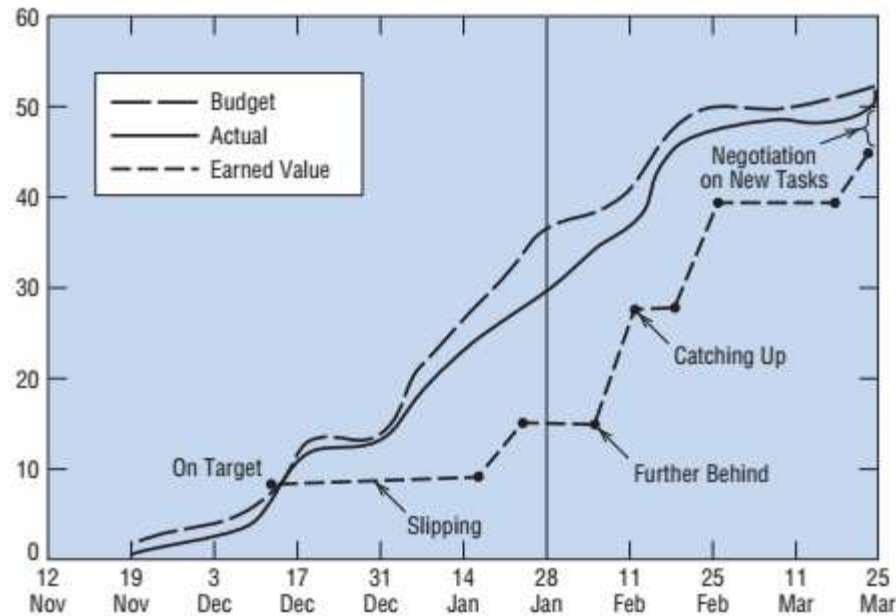
ENGR. RELEASE	PROJECT REVIEW	RELEASE DWGS.	TOOL START	PHOTO SAMPLES	INSIDE SAMPLES	PKG. FILM	INSTR. LAYOUT	INSTR. FILM ART	FINAL PARTS	FIRST EP	FINAL EP	EP SIGN-OFF	ORIENT PS	OBS	PROD. PILOT	PT SIGN-OFF	PROD. START	ATS

**Figure 10-13** Milestone monitoring chart for Figure 10-11.

# Other Control Charts

## Burnup and burndown charts

Scope



time



# PMIS – PM Information System

## Software for Project Management

- Establish criteria
  - Easy to use, friendly, keep schedules, communicate team for meetings and more
- Conduct with vendors
- Create shortlist
- Evaluate and negotiate on prices





# Project Control

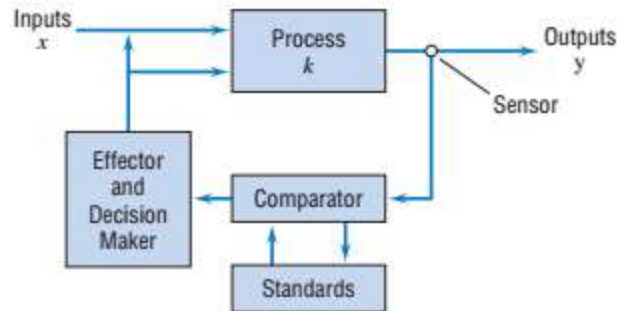
## What to control

- Physical Assets and Inventory
  - Spreadsheets or SW
- Human Resource control
  - Use sheets or electronic tools and other methods (preferably analytic) of your own.
  - Create chances to improve your team but do not hesitate fire cheaters that harm financially and emotionally your team.
- Financial resource control
  - Keep control of your accounts besides accounting department if necessary (it is most of the time)



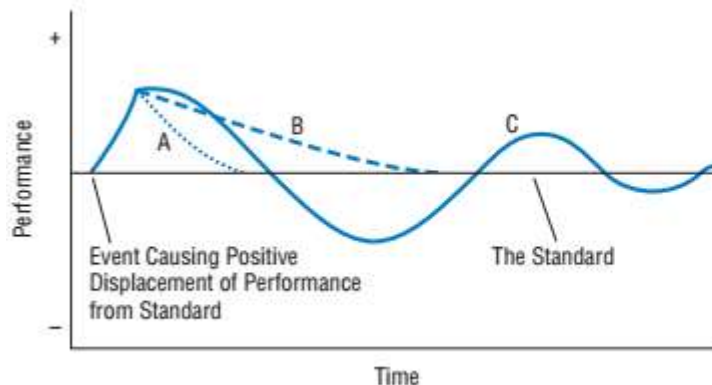
# Control Processes

## Cybernetic



- Investment cost should be justified.
- Corrective action should be immediate

**Figure 11-1** A cybernetic control system.



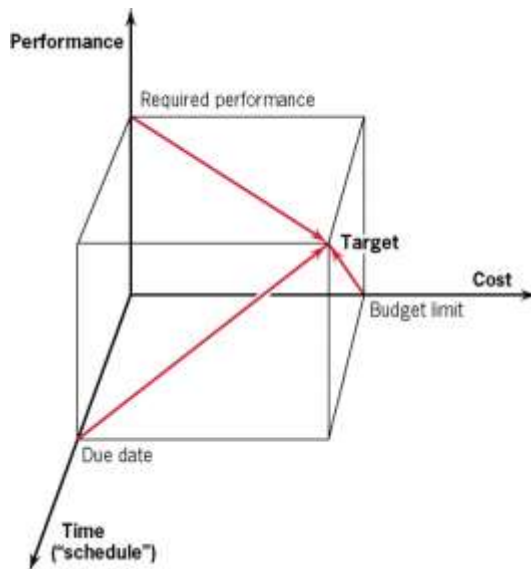
**Figure 11-2** Typical paths for correction of deviation of performance from standard.

# Control Processes

## Go – No-Go controls

Team is in Muddy Water – False scope  
Customers not happy  
Competitors do better

- Against Predetermined Specifications
- But bosses decides about No-Go



Cost overrun

Can be negotiated with stakeholders

Time overruns

Can be negotiated with stakeholders



# Control Processes

## Phase gate process

- Against Predetermined Specifications
- Done at each task and/or milestone
- It is a Go No-Go decision for the next step

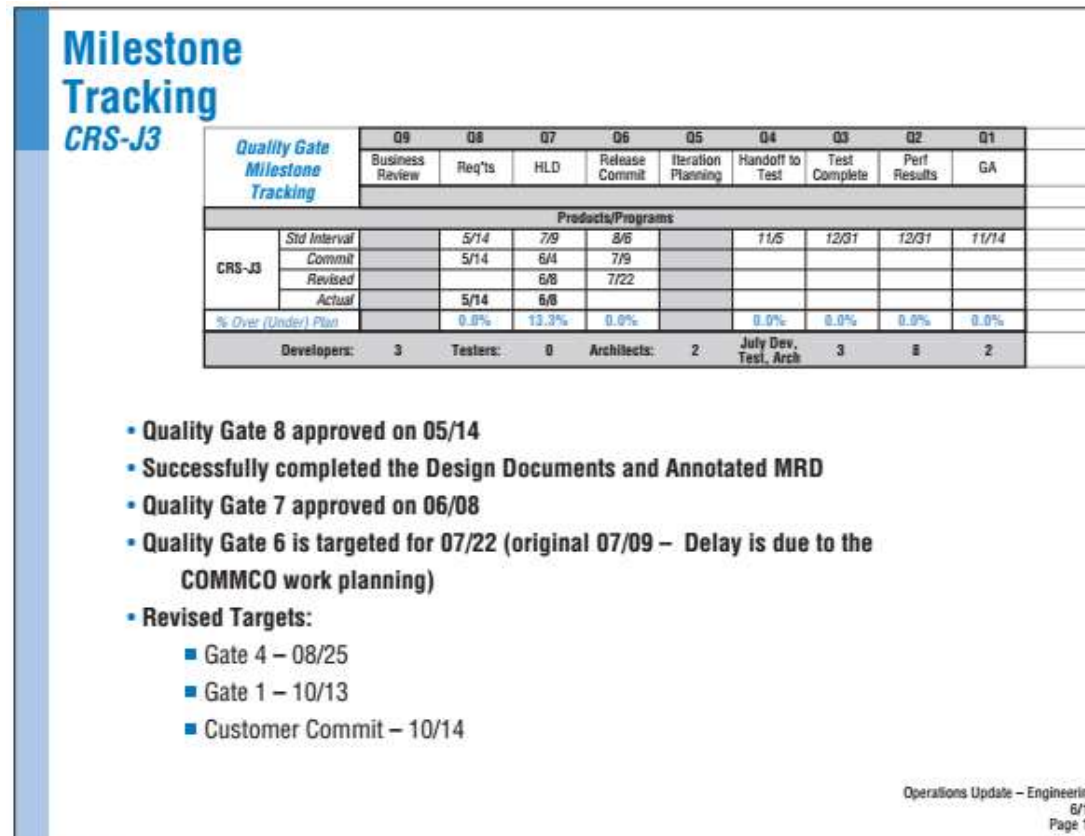


Figure 11-3 A quality-gate application.

# Control Processes

## Discovery Driven

- How valid initial assumptions appear now.
- If no plan satisfies revised assumptions one option is to kill the project.

Task	Project		
	#1	#2	#3
Priorities set	C	C	C
PM selected	C	C	C
Key members briefed on RFP	C	C	C
Proposal sent	C	C	C
Proposal accepted as negotiated	C	C	C
Preliminary design developed	C	W/10	C
Design accepted	C	W/12	C
Software developed	C	NS/NR	N/A
Product test design	C	W/30	W/15
Manufacturing scheduled	C	NS/HR	W/8
Tools, jigs, fixtures designed	W/1	NS/HR	W/2
Tools, jigs, fixtures delivered	W/2	NS/HR	W/8
Production complete	NS/HR	NS/HR	NS/HR
Product test complete	NS/HR	NS/HR	NS/HR
Marketing sign-off on product	NS/HR	NS/HR	NS/HR

Notes:

N/A—Not applicable  
C—Completed

W—Work in progress  
(number refers to month required)

NS—Not started  
NR—Need resources  
HR—Have resources

**Figure 11-4** Sample project status report.



# Post Controls – Lessons learned

## Includes

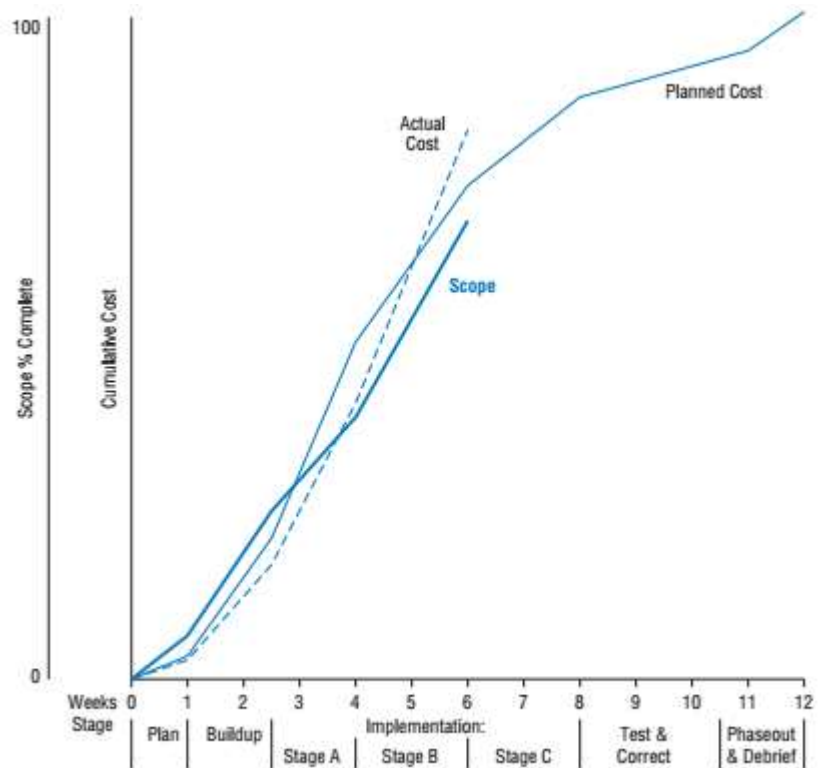
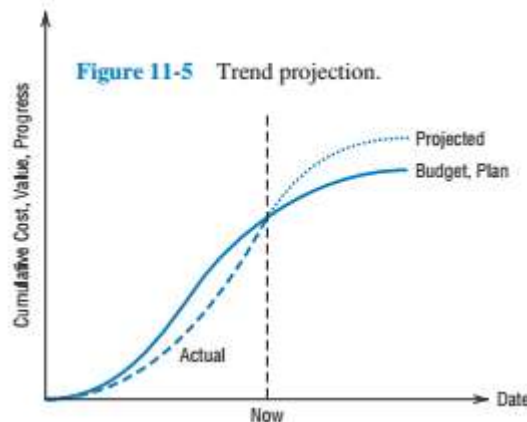
- Project objectives
- Milestones gates and budgets
- The final report on Project Results
- Recommendations



# Design of Controls

## Back to your project charter

Flexible  
Cost effective  
Useful  
Ethical  
Timely  
Accurate  
Simple  
Maintainable  
Documented



**Figure 11-6** Integrated scope/cost/time chart. Source: Murdick (1984).



# Critical ratio Control Charts

Back to your project charter

**Table 11-1** (Actual Progress/Scheduled Progress) × (Budgeted Cost/Actual Cost)

<b>Task Number</b>	<b>Actual Progress</b>				<b>Scheduled Progress</b>				<b>Budgeted Cost</b>				<b>Actual Cost</b>				<b>Critical Ratio</b>
1	(2	/	3)	×	(3	/	2)	=	(3	/	2)	=					1.00
2	(2	/	3)	×	(6	/	6)	=									0.67
3	(3	/	3)	×	(4	/	6)	=									0.67
4	(3	/	2)	×	(6	/	6)	=									1.50
5	(3	/	3)	×	(6	/	4)	=									1.50





# Critical ratio Control Charts

Back to your project charter

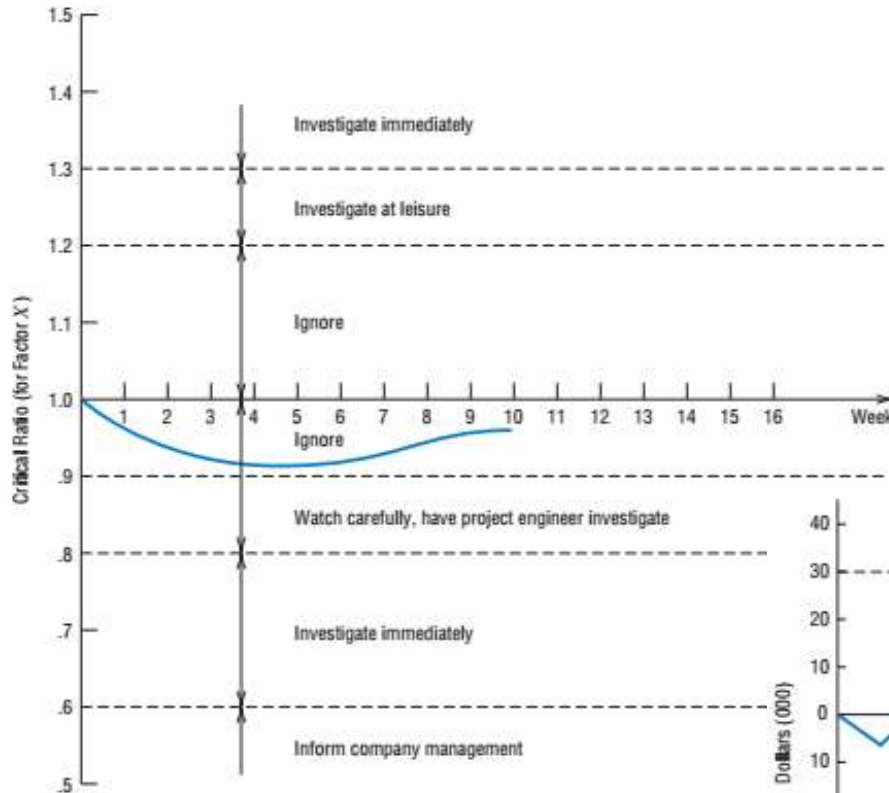


Figure 11-7 Critical ratio control limits.



Figure 11-8 Cost control chart.



# Go back to your project charter

- Make the scope clear if it is not
  - In purpose, objectives and schedules  
(Not to drop your team to muddy water)
- Re-observe your resources
  - In timely manner to design control structures
- Re-write Evaluation Methods
  - Considering what you have learned in this lecture
- Observe your risk management plans
  - To prevent your project to be killed  
during execution



# Problems – Ch 10

- Find the schedule and cost variances for a project that has an actual cost at month 22 of \$540,000, a scheduled cost of \$523,000, and an earned value of \$535,000.
- A sales project at month 5 had an actual cost of \$34,000, a planned cost of \$42,000, and a value completed of \$39,000. Find the cost and schedule variances and the CPI and SPI.
- A software development project at day 70 exhibits an actual cost of \$78,000 and a scheduled cost of \$84,000. The software manager estimates a value completed of \$81,000. What are the cost and schedule variances and CSI? Estimate the time variance.
- A project to develop a county 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.
- A consulting project has an actual cost in month 10 of \$23,000, a scheduled cost of \$17,000, and a value completed of \$20,000. Find the schedule and cost variances and the three indexes.
- A project to develop technology training seminars is 5 days behind schedule at day 65. It had a planned cost of \$735,000 for this point in time, but the actual cost is only \$550,000. Estimate the schedule and cost variances. Re-estimate the variances if the actual cost had been \$750,000.
- Given an activity in an advertising project whose planned cost was \$12,000 but actual cost to date is \$10,000 so far and the value completed is only 70 percent, calculate the cost and schedule variances. Will the client be pleased or angry?
- For the following test marketing project at week 6:
  - Ignore the far right “% Complete” column and using the 50–50 percent completion rule for PV and EV, calculate the cost, schedule, and time variances. Also calculate the CPI, SPI, CSI, and the ETC and EAC.
  - Repeat the calculations in a, but now using the “% Complete” column. Assume that the PV values are based on time proportionality but the “% Complete” values for EV are from the workers actually doing the tasks.

<i>Activity</i>	<i>Predecessors</i>	<i>Duration (weeks)</i>	<i>Budget, \$</i>	<i>Actual Cost, \$</i>	<i>% Complete</i>
a: Build items	—	2	300	400	100
b: Supply stores	—	3	200	180	100
c: Create ad program	a	2	250	300	100
d: Schedule ads	a	5	600	400	20
e: Check sale results	b, c	4	400	200	20

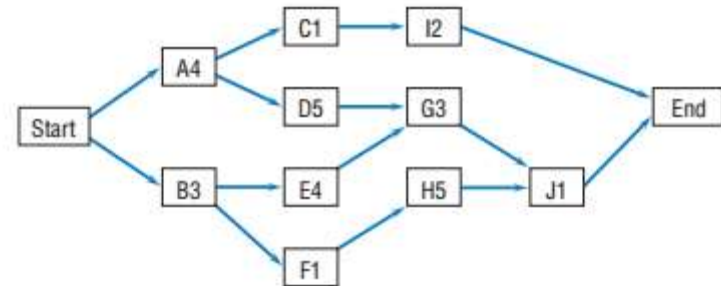


# Problems – Ch 10

9. At week 24 of a project to shoot a television commercial, what should the expenditures be? If the earned value is right on schedule but the actual expenses are \$9,000, what are the cost and schedule variances? What are the three indexes, the ETC, and the EAC? Use the proportionality rule.

<b>Activity</b>	<b>Pre-decessors</b>	<b>Duration (weeks)</b>	<b>Budget, \$</b>
a: Write script	—	6	900
b: Screen actors	—	6	1200
c: Select actors	a	6	1200
d: Contract studio	a	12	1800
e: Obtain props	b, c	14	1400
f: Schedule date	b, c, d	10	1500
g: Shoot commercial	d, e	16	800

13. Draw an earned value chart for the end of the first week (5 days) assuming the time proportionality rule for the project illustrated in the following network diagram given the following costs and percentage completions:



<b>Activity</b>	<b>Budget, \$</b>	<b>Actual, \$</b>	<b>% Complete</b>
A	600	400	100
B	300	450	100
C	150	100	100
D	750	60	10
E	400	150	30
F	100	50	100
G	200	0	0
H	400	0	0
I	100	0	0
J	100	0	0

## Problems – Ch 10

14. The following project is at the end of its sixth week. Find the cost and schedule variances. Also find the CPI, SPI, ETC, and EAC for the project.

<b>Activity</b>	<b>Pre-decessors</b>	<b>Duration (weeks)</b>	<b>Budget, \$</b>	<b>Actual Cost, \$</b>	<b>% Complete</b>
a	—	2	300	400	100
b	—	3	200	180	100
c	a	2	250	300	100
d	a	5	600	400	20
e	b, c	4	400	200	20



# Problems – Ch 11

1. Given the following information, calculate the critical ratios, and indicate which activities are on target and which need to be investigated. Comment on the situation for each of the activities.

<b>Activity</b>	<b>Actual Progress</b>	<b>Scheduled Progress</b>	<b>Budgeted Cost</b>	<b>Actual Cost</b>
A	2 days	2 days	\$40	\$35
B	4 days	6 days	\$30	\$40
C	1 day	3 days	\$50	\$70
D	3 days	2 days	\$25	\$25

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

<b>Activity</b>	<b>Actual Progress</b>	<b>Scheduled Progress</b>	<b>Budgeted Cost</b>	<b>Actual Cost</b>
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

3. Given the following information about a showroom renovation, which activities are on time, which are early, and which are behind schedule?

<b>Activity</b>	<b>Budgeted Cost</b>	<b>Actual Cost</b>	<b>Critical Ratio</b>
A: Plan changes	\$60	\$40	1.0
B: Solicit bids	\$25	\$50	0.5
C: Select contractor	\$45	\$30	1.5
D: Schedule date	\$20	\$20	1.5
E: Start renovation	\$50	\$50	0.67

4. Design and plot a critical ratio for a computer installation project that had planned constant, linear progress from 0 to an earned value of 200 over a 100-day duration. In fact, progress for the first 20 days has been: 2, 3, 4, 6, 7, 9, 12, 14, 15, 17, 20, 21, 21, 22, 24, 26, 27, 29, 31, 33. What can you conclude about this project?
5. Design and plot a critical ratio for a Web site project that has planned constant, linear spending from 0 to a total of 1000 over a 100-day duration. In fact, daily spending for the first 15 days has been: 11, 10, 9, 10, 11, 12, 11, 9, 8, 9, 10, 12, 14, 11, 7. What can you conclude about this project?





# Problems – Ch 11

6. Industrial Building, Inc., has two project teams installing virtually identical, four-story commercial buildings for a customer in two separate cities. Both projects have a planned daily cost of 100 and a planned daily earned value of 100. The first 6 days for each team have progressed as follows:

<b>Day</b>	<b>Team A: Earned Value</b>	<b>Team B: Earned Value</b>	<b>A: Cost</b>	<b>B: Cost</b>
1	90	90	95	95
2	92	88	98	94
3	94	95	101	102
4	98	101	106	109
5	104	89	116	99
6	112	105	126	118

Compare the two projects in terms of general progress and according to critical ratios.

8. The following information (in AOA format) concerns progress at day 40 of an Internet marketing project. Determine if the project is in control based on time and cost to date. If not, what is the cost overage or underage?

<b>Activity</b>	<b>Days Duration</b>	<b>Budget</b>	<b>Actual Cost</b>	<b>% Completed</b>
1-2: Contact sites	10	300	250	100
2-3: Solicit costs	8	400	450	100
2-4: Design ads	12	350	380	100
4-3: Evaluate budget	0	0	0	—
3-5: Shoot ads	18	405	400	70
5-6: Place ads	16	450	—	0



# Problems – Ch 11

9. Determine if the following test marketing project at week 6 is in control. If not, what is out of control? If it is in control, are both budget and schedule in control?

<i>Activity</i>	<i>Prede- cessors</i>	<i>Dura- tion (weeks)</i>	<i>Bud- get, \$</i>	<i>Actual Cost, \$</i>	<i>% Com- pleted</i>
a: Build items	—	2	300	400	100
b: Supply stores	—	3	200	180	100
c: Create ad program	a	2	250	300	100
d: Schedule ads	a	5	600	400	20
e: Check sale results	b, c	4	400	200	20

10. At week 24 of a project to shoot a television commercial, the project manager is worried about her budget since costs have risen to \$7,500. Is there a cost overage? If so, how much is it? Is the schedule ahead or behind? Overall, does the project appear to be in control?

<i>Activity</i>	<i>Prede- cessors</i>	<i>Duration (weeks)</i>	<i>Bud- get, \$</i>	<i>% Completed</i>
a: Write script	—	6	900	100
b: Screen actors	—	6	1200	100
c: Select actors	a	6	1200	100
d: Contract studio	a	12	1800	100
e: Obtain props	b, c	14	1400	100
f: Schedule date	b, c, d	10	1500	40
g: Shoot commercial	d,e	16	800	0



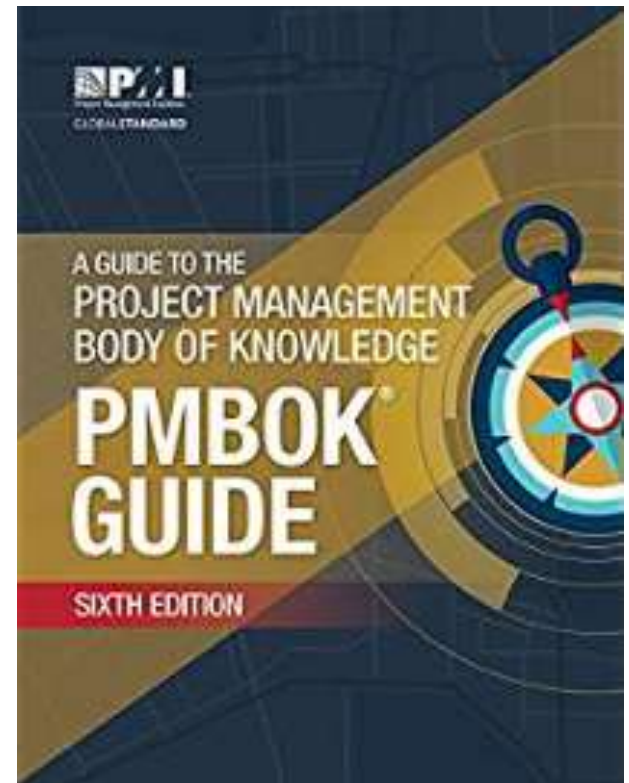


# Resources



**PAUL E.  
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2013 & 2016**





# Questions

- Questions

[hp@quiztechnology.com](mailto:hp@quiztechnology.com)

NEXT WEEK: Project Execution – Auditing