Project Cost Management

Project Cost Management

Project Cost Management- A Thought

- If you don't plan, it doesn't work. If you do plan, it doesn't work either. Why plan!
- The same work under the same conditions will be estimated differently by ten different estimators or by one estimator at ten different times. So why to estimate!
- Any project can be estimated accurately (once it's completed).
- Nothing is impossible for the person who doesn't have to do it.
- Right answers to wrong questions are just as wrong as wrong answers to right questions.

Project Cost Management

Definition

Processes involved in estimating, budgeting, and controlling costs so that the project can be completed within the approved budget

Project Cost Management

18. Estimate Costs [PLANNING]

19. Determine Budget [PLANNING]

20. Control Costs [M&C]

Components of Cost

Cost = Material + Labor
+ Expenses + Overheads

Who estimates Material cost for your project?
Who estimates Labor cost for your project?
Who estimates Expenses cost for your project?
Who estimates Overhead cost for your project?
Where do you adjust the buffer?
Where do earn profit
What is the price?

Types of Cost

- Fixed Cost vs Variable Cost
- Direct labor vs Indirect or Overhead

Types of Cost

- Direct cost: purchased, used, consumed in the project directly.
  - Material Cost: Used & finished in project. Grocery/ Bricks/ Milks/ Petrol/ Cement/Gifts
  - Labor Cost: Pay to regular worker/ consultants
  - Overheads Cost: Travelling, External testing, DJ, Audit Fee

- Indirect cost: shared cost between project.
  - Material: Cleaning material, Fan, Paints,
  - Labor: Security Staff Salary, Support staff salary
  - Overhead: Travelling, Auditor Fee, Internet, Electricity, Rent

Types of Cost

- **Sunk Cost-** Retrospective cost/ that cannot be recovered/ Cost gone and very low value or zero value was taken out. Plant developed but not of any use now additional money is required but by that money some better work can be done, so not to invest and let already invested money sunk. Software developed but it is not of any use now due any reason.
- **Perspective Cost-** cost to be occurred in future
- **Allocated Cost-** Cost of security service is shared by all division/companies of the building. Spreading the cost among those that use it.

Types of Cost

- **Apportioned Cost-** to find apportioned cost you should know % of each appraised value (land, building, machine)
- **Value Added Cost-** Sale price of a product and cost price of material is value add
- **Transfer Cost** -Cost of transfer or transaction between two entities
- **Opportunity cost-** Value lose because of exercising an option. It is just economic cost. Does not reflect in financial books

18. Estimate Costs

Definition

Developing an approximation of the costs of the resources needed to complete project activities.

Estimate Costs

Knowledge Area : Project Cost Management

Process Group : Planning Process Group

Input	Tool & Technique	Output
1. Scope baseline 2. Project schedule 3. Human resource plan 4. Risk register 5. Enterprise environmental factors 6. Organizational process assets	1. Expert Judgment 2. Analogous estimating 3. Parametric estimating 4. Bottom-up estimating 5. Three-point estimates 6. Reserve analysis 7. Cost of quality 8. Project management estimating software 9. Vendor bid analysis	1. Activity cost estimates 2. Basis of estimates 3. Project document updates

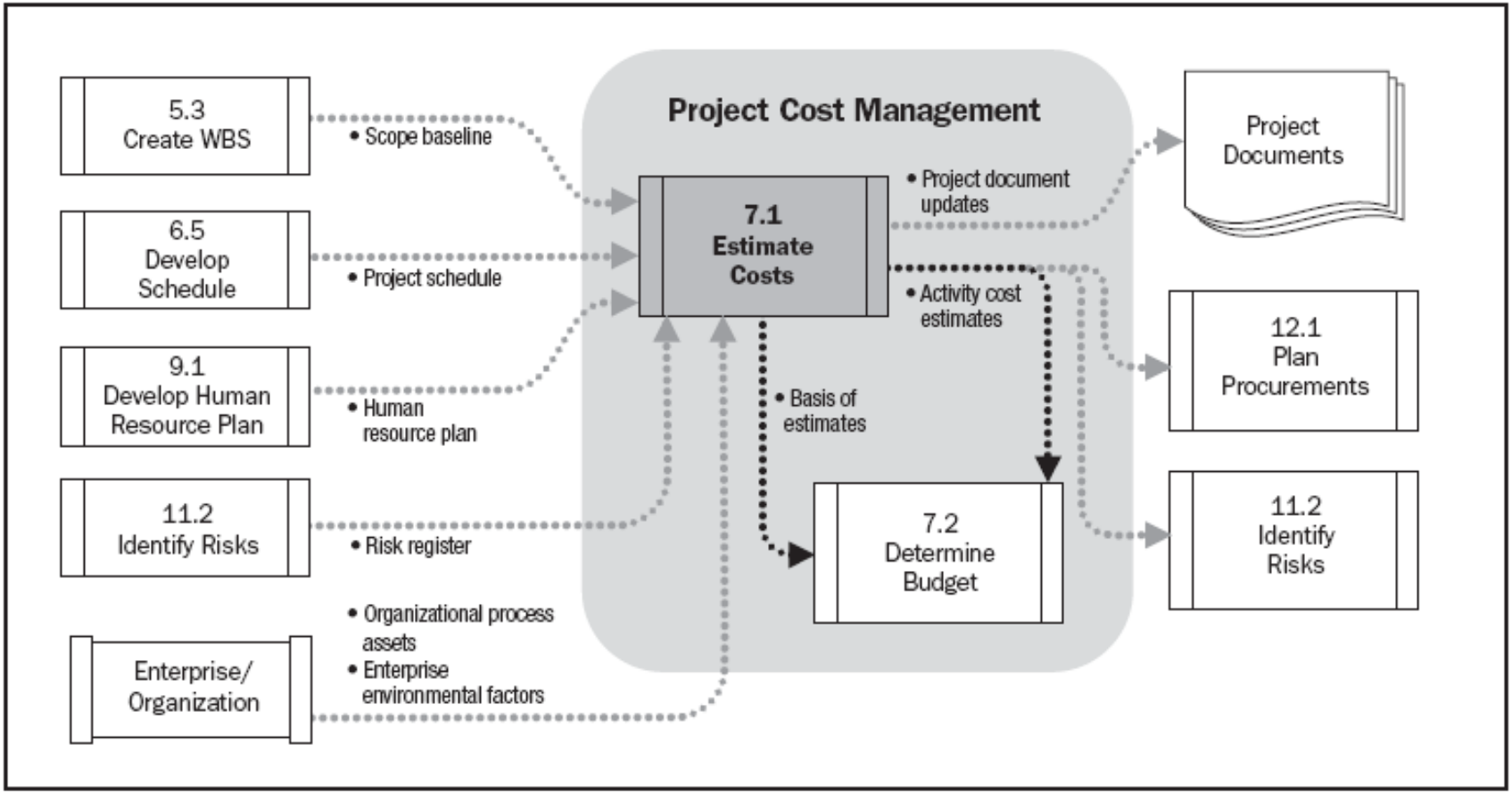
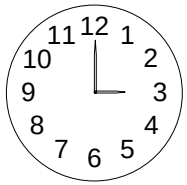


Figure 7-3. Estimate Costs Data Flow Diagram

Exercise-18



3 Minutes

Write Activity cost estimates for 5 activities and their basis of estimates for your project

Program Evaluation Review Technique (PERT)

ESTIMATED COST = (Pessimistic + 4*(Most Likely) + Optimistic) / 6

19. Determine Budget

Definition

Aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline

Determine Budget

Knowledge Area : Project Cost Management

Process Group : Planning Process Group

Input	Tool & Technique	Output
1. Activity cost estimates 2. Basis of estimate 3. Scope baseline 4. Project schedule 5. Resource calendars 6. Contracts 7. Organizational process assets	1. Cost aggregation 2. Reserve analysis 3. Expert judgment 4. Historical relationships 5. Funding limit reconciliation	1. Cost performance baseline 2. Project funding requirements 3. Project document updates

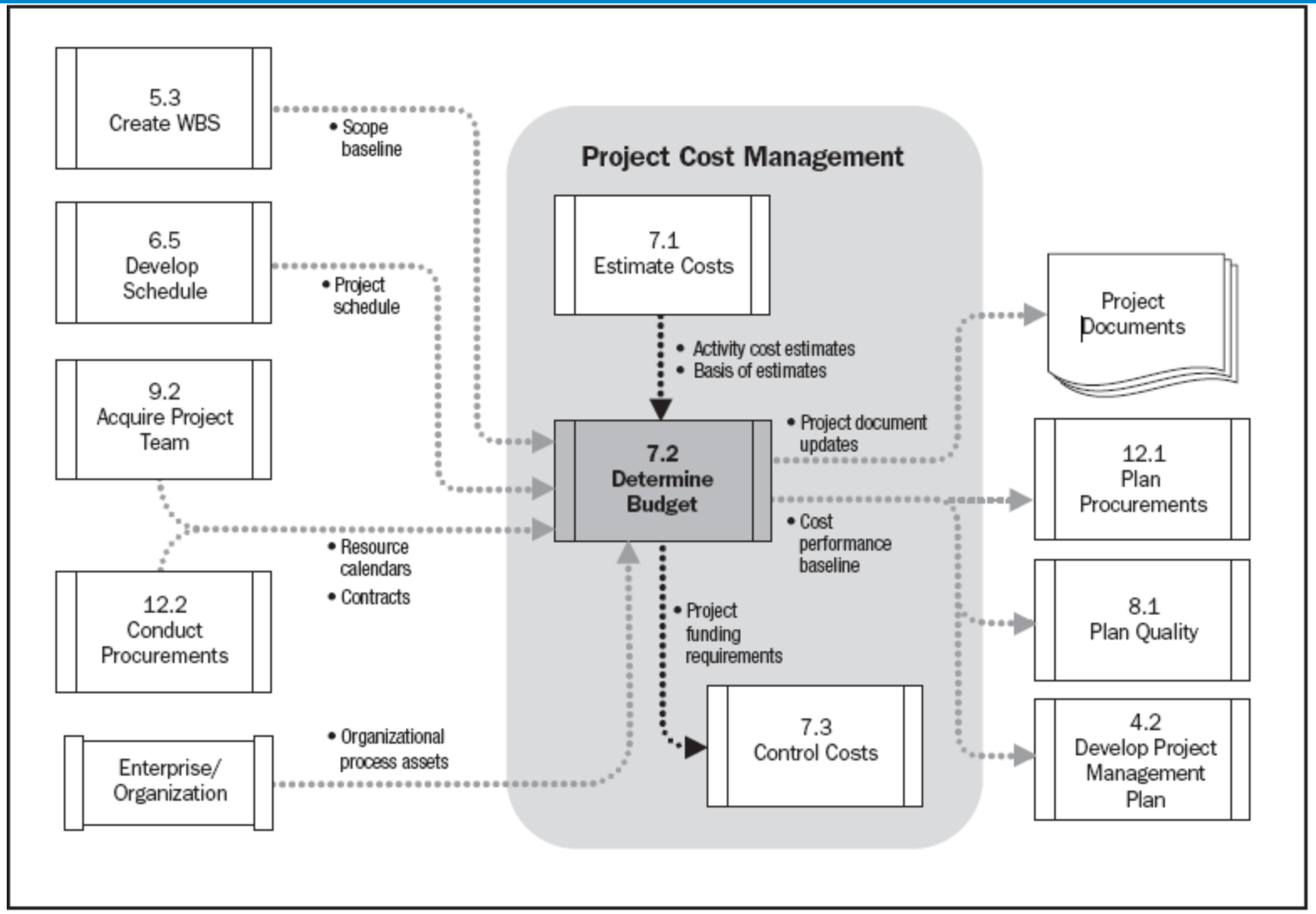
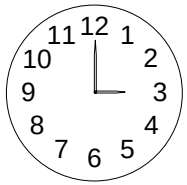


Figure 7-5. Determine Budget Data Flow Diagram

Exercise-19



3 Minutes

Establish cost performance baseline for your project & write funding requirements for your project.

20. Control Costs

Definition

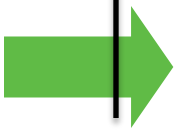
Monitoring the status of the project to update the project budget and managing changes to the cost baseline

Control Costs

Knowledge Area : Project Cost Management

Process Group : Monitoring & Controlling Process Group

Input	Tool & Technique	Output
1. Project management plan	1. Earned value management	1. Work performance measurements
2. Project funding requirements	2. Forecasting	2. Budget forecasts
3. Work performance information	3. To-complete performance index	3. Organizational process assets
4. Organizational process assets	4. Performance reviews	4. Change requests
	5. Variance analysis	5. Project management plan updates
	6. Project management software	6. Project document updates



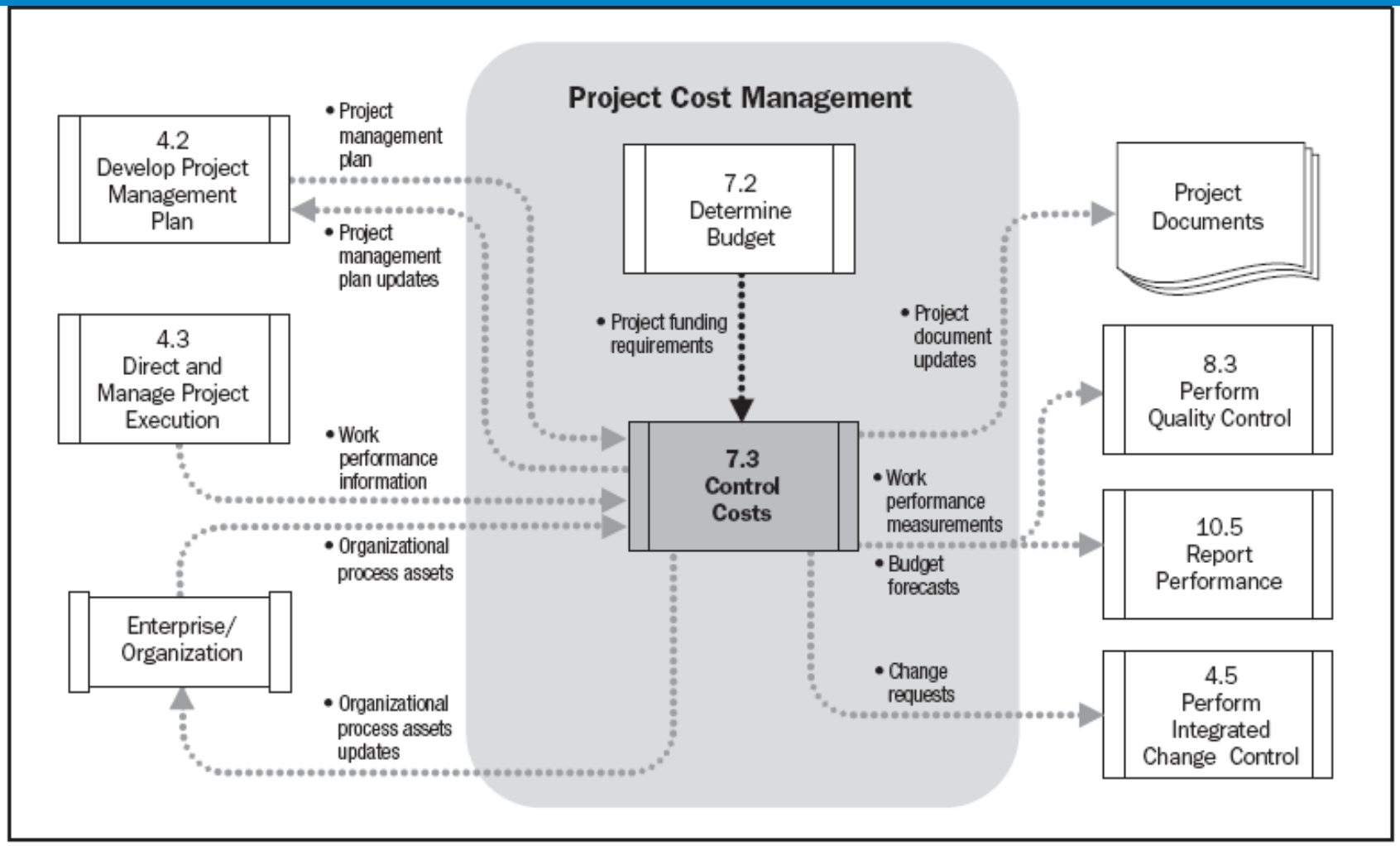


Figure 7-8. Control Costs Data Flow Diagram

Project Cost Estimation Ranges

Cost estimation may include only Direct Cost or in combination of with Indirect Costs

Class Name	%	Range
Definitive	- 5 -> +5%	10%
Capital Cost	-15 -> +10%	25%
Appropriation	-25 -> +15%	40%
Budget Estimates	-10 -> +25%	35%
Feasibility	-35 -> +25%	60%
Order of Magnitude	-50 -> +50%	100%

Earn Value Management- EVM

Earned Value Management

Planned Value (PV)

Authorized budget assigned to the work to be accomplishes for an activity or work breakdown structure component.

Earned Value (EV)

Value of work performed expressed in terms of the approved budget assigned to that work for an activity or work breakdown structure component.

Actual Cost (AC)

Total cost actually incurred and recorded in accomplishing work performed for an activity or work breakdown structure component.

Earned Value Management – Variance Analysis

Schedule Variance (SV)

SV = EV-PV

Cost Variance (CV)

CV = EV-AC

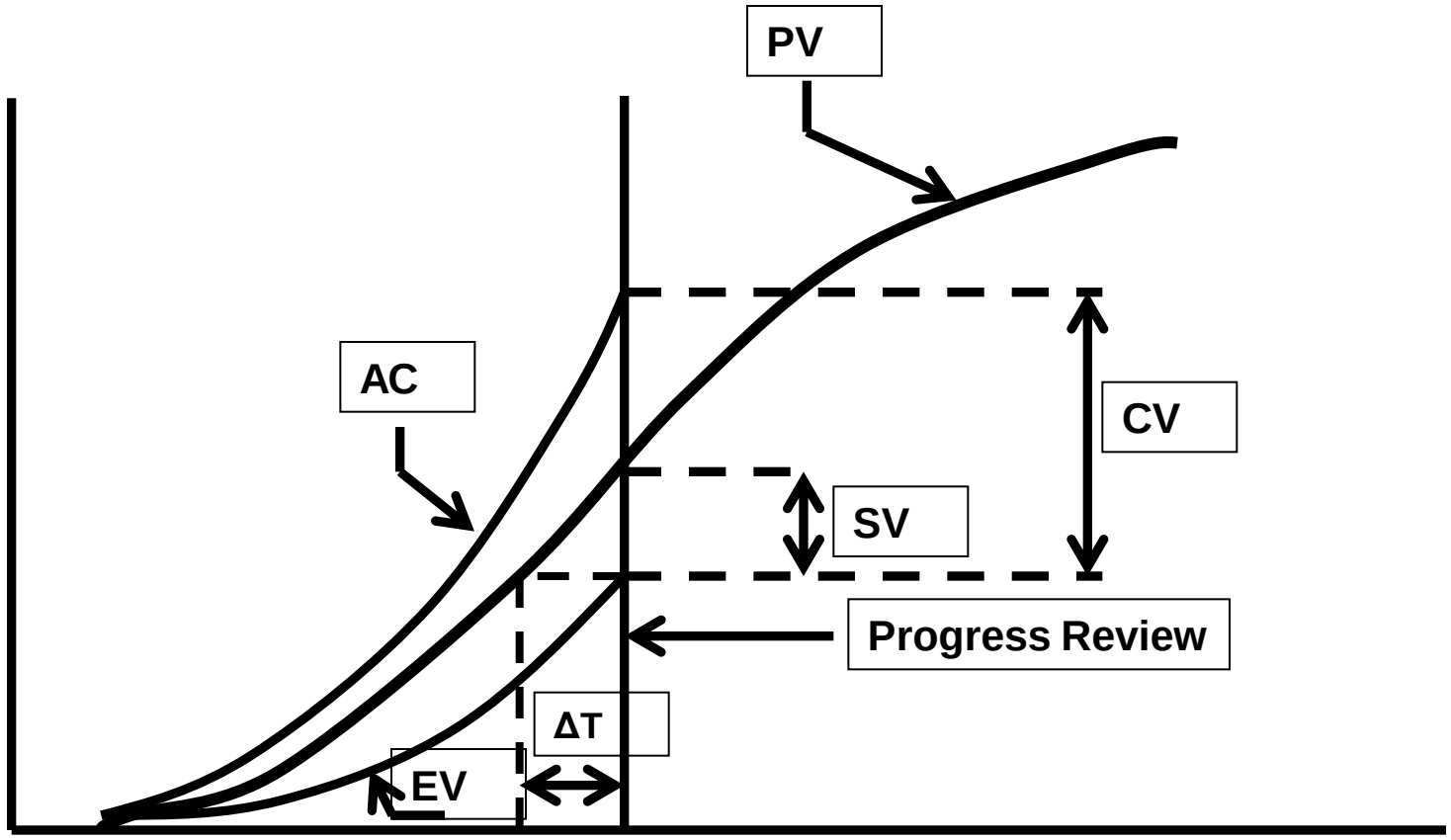
Schedule Performance Index (SPI)

SPI = EV / PV

Cost Performance Index (CPI)

CPI = EV / AC

Earned Value Management – S Curve



Earned Value Management - Forecasting

Estimate at Completion (EAC)

EAC = AC + bottom up Estimate to Complete (ETC)

EAC forecast for ETC work performed at the budgeted rate

EAC = AC + (BAC – EV)

EAC forecast for ETC work performed at present CPI

EAC = BAC / cumulative CPI

EAC forecast for ETC work considering both SPI and CPI factors

EAC = [(BAC – EV) / (cumulative CPI x cumulative SPI)]

To Complete Performance Index

To-Complete Performance Index (TCPI)

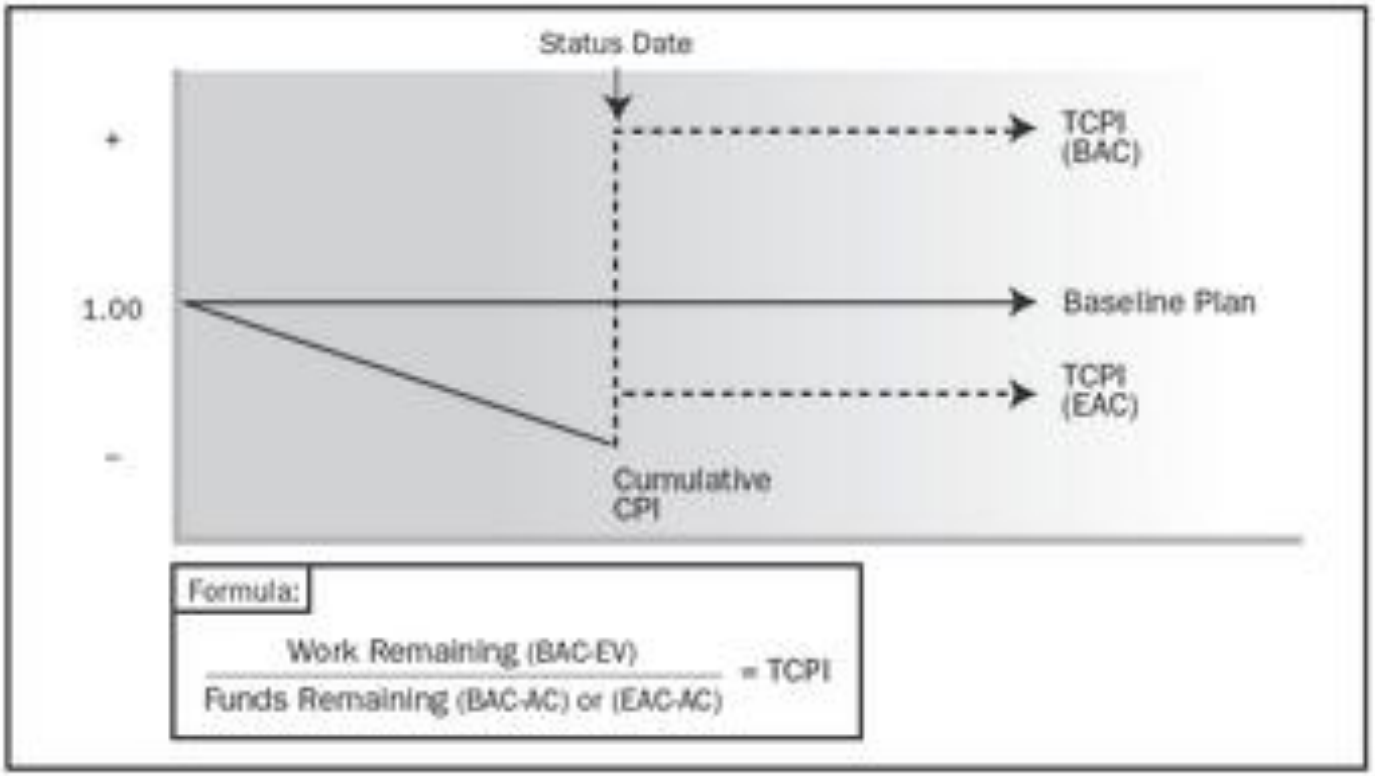
Calculated projection of cost performance that must be achieved on the remaining work to meet a specified management goal, such as BAC or EAC.

TCPI = (BAC – EV) / (BAC – AC)

Using the Estimate-at-completion formula,

TCPI = (BAC – EV) / (EAC – AC)

To Complete Performance Index



Source : PMI PMBOK® ***Fourth Edition***

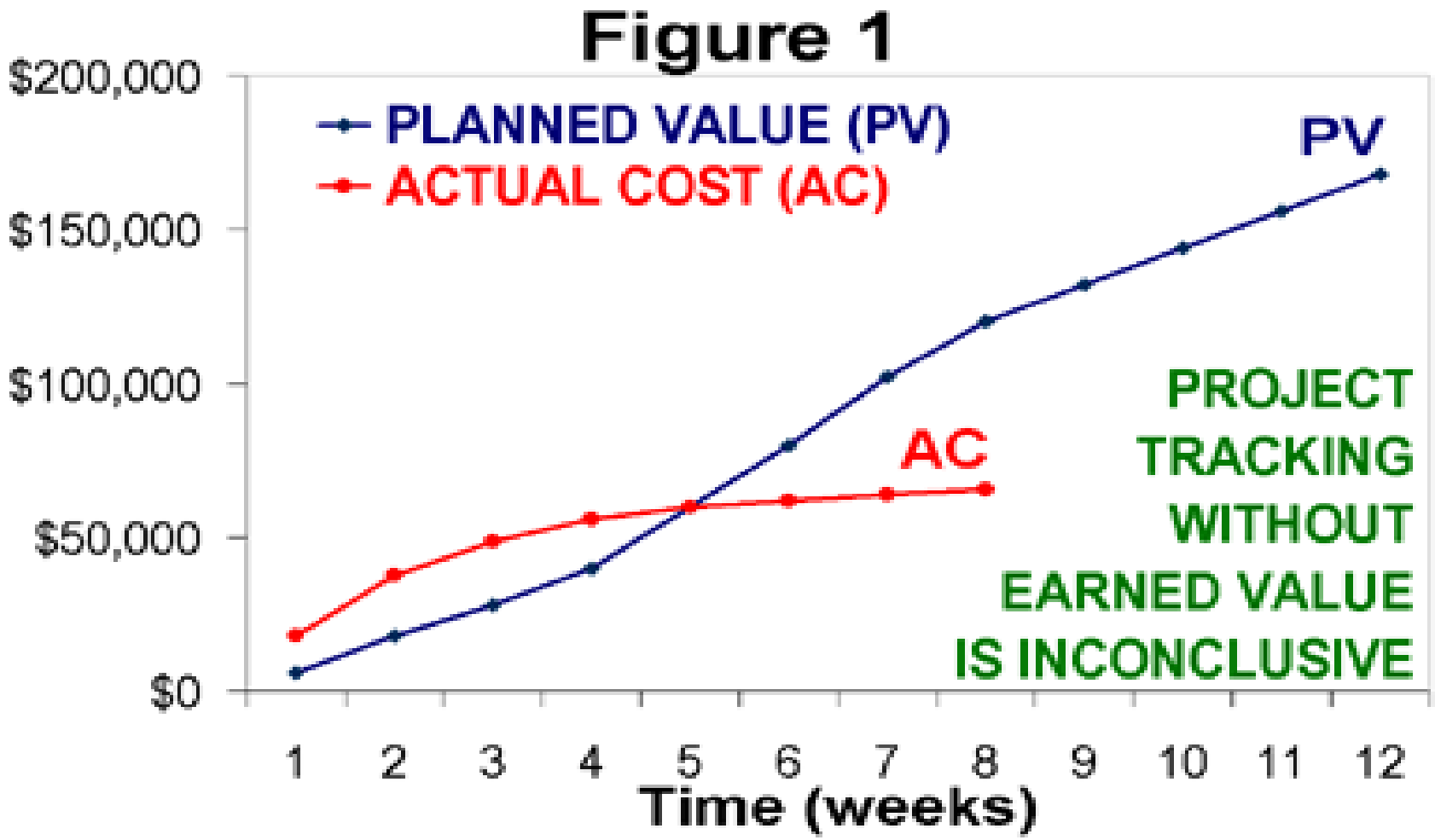


Figure 1
$200,000
$150,000
$100,000
$50,000
$0
PLANNED VALUE (PV)
ACTUAL COST (AC)
PV
AC
PROJECT
TRACKING
WITHOUT
EARNED VALUE
IS INCONCLUSIVE
1
2
3
4
5
6
7
8
9
10
11
12
Time (weeks)

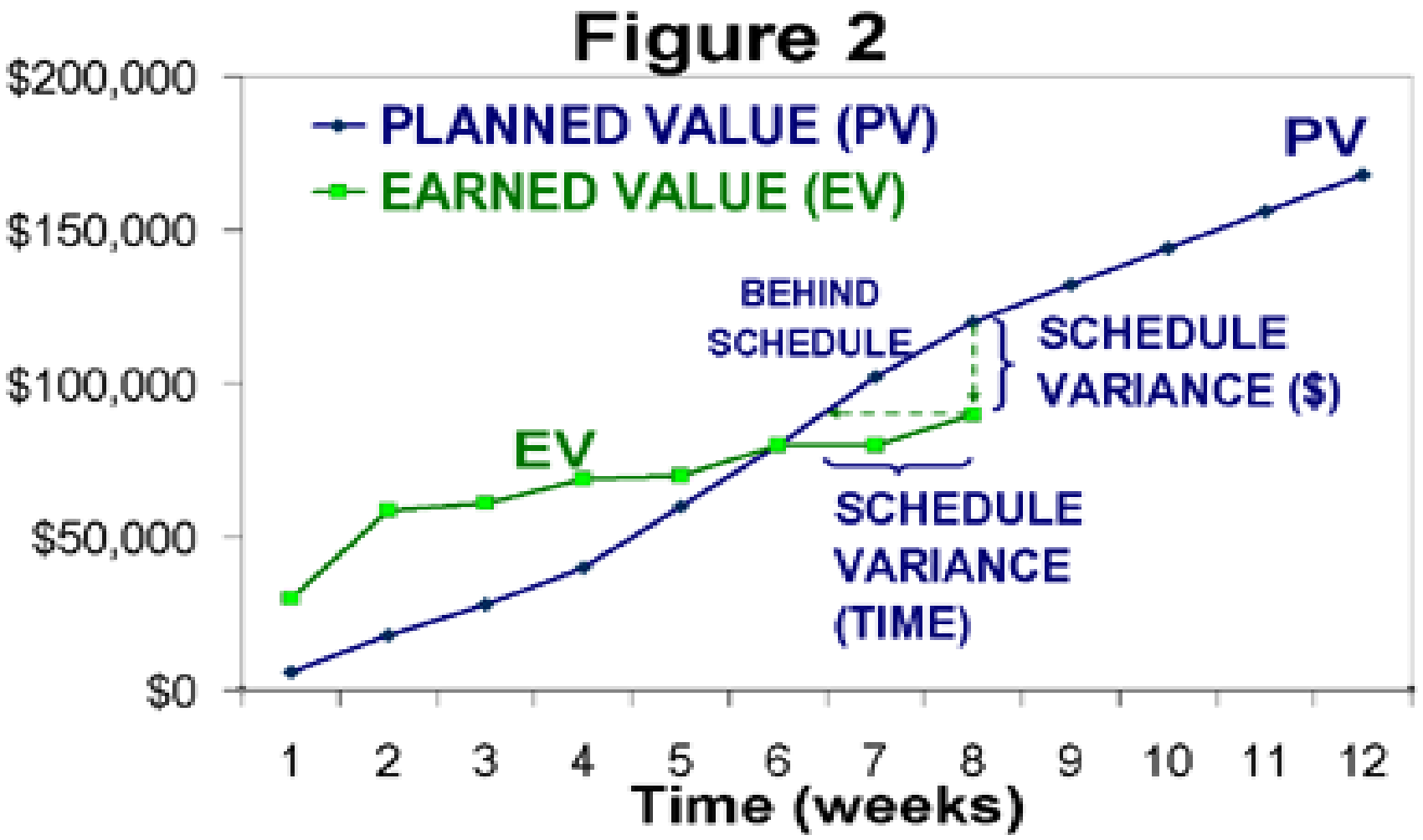


Figure 2
$200,000
$150,000
$100,000
$50,000
$0
PLANNED VALUE (PV)
EARNED VALUE (EV)
PV
BEHIND SCHEDULE
SCHEDULE VARIANCE ($)
EV
SCHEDULE VARIANCE (TIME)
1
2
3
4
5
6
7
8
9
10
11
12
Time (weeks)

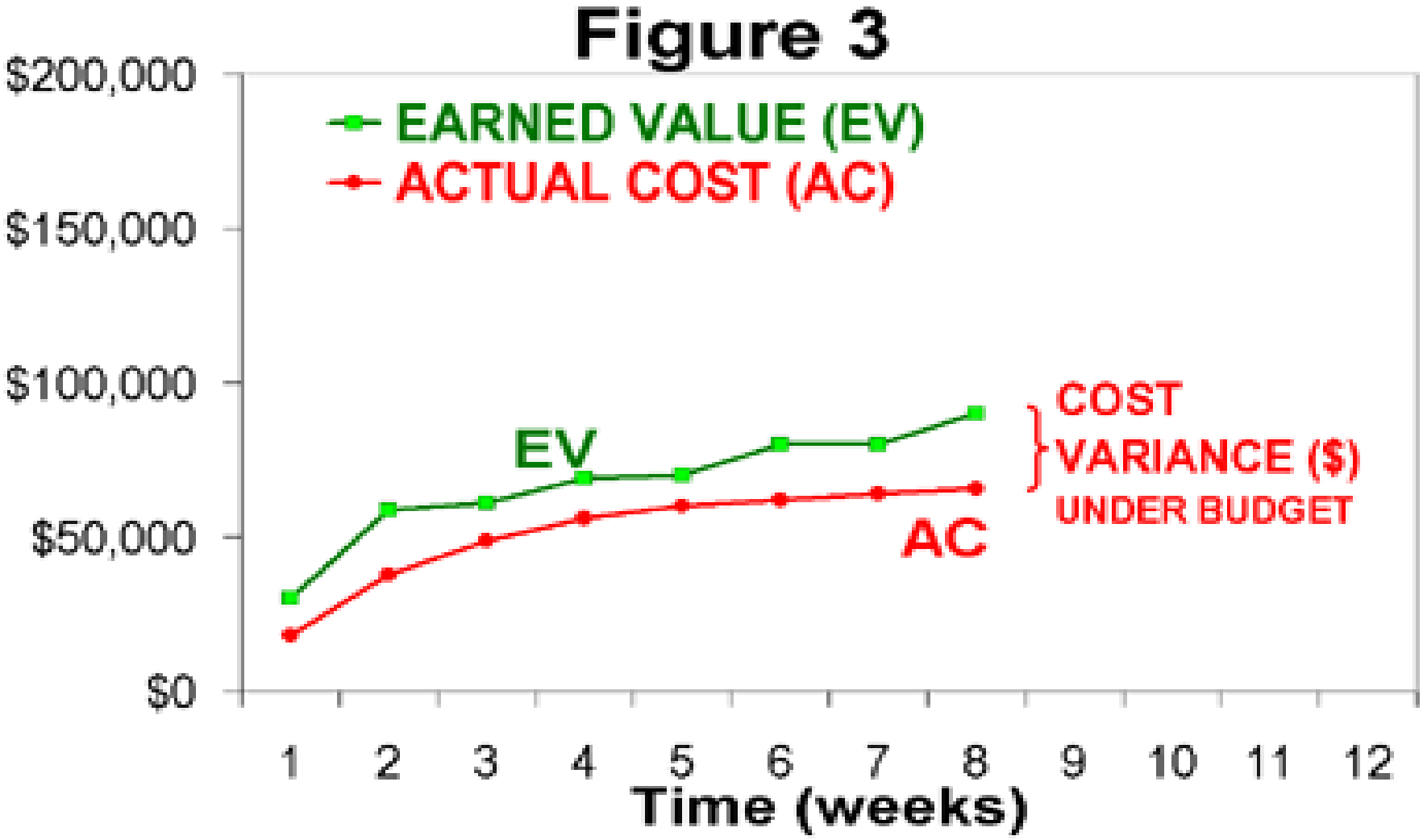
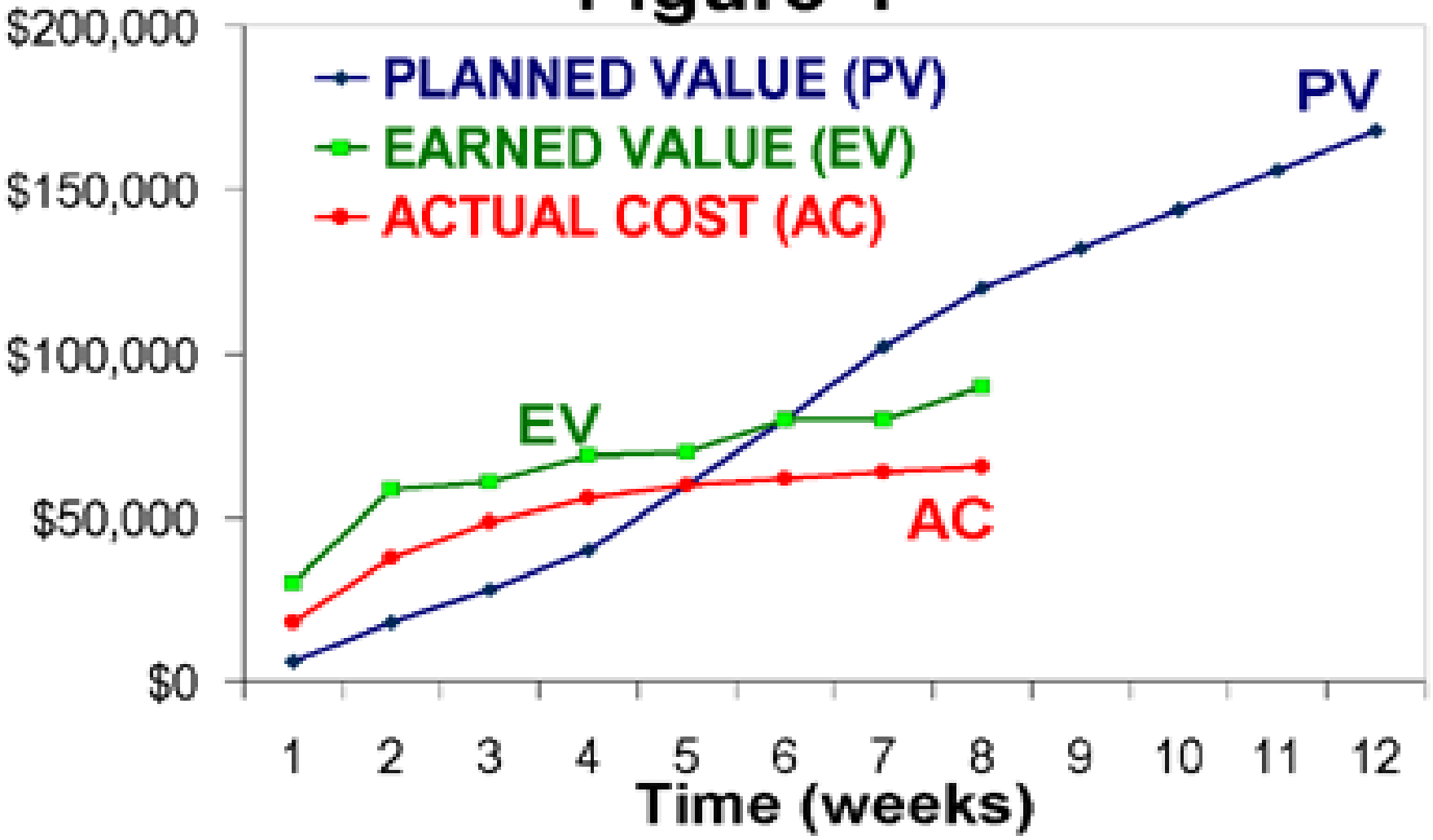


Figure 3
$200,000
$150,000
$100,000
$50,000
$0
EARNED VALUE (EV)
ACTUAL COST (AC)
EV
AC
COST
VARIANCE ($)
UNDER BUDGET
1
2
3
4
5
6
7
8
9
10
11
12
Time (weeks)

Figure 4


$200,000
$150,000
$100,000
$50,000
$0
PLANNED VALUE (PV)
EARNED VALUE (EV)
ACTUAL COST (AC)
PV
EV
AC
1
2
3
4
5
6
7
8
9
10
11
12
Time (weeks)

EVM

- Cost Variance (CV)

$$CV = EV - AC$$

If CV = 0, the Project is proceeding as per plan on cost

CV < 0, the Project is underperforming on cost

CV > 0, the Project is ahead on cost parameters.

EVM

- Cost Performance Index (CPI)

$$CPI = EV/AC$$

If CPI = 1, the project is on plan, costwise

CPI < 1, the project is underperforming on cost

CPI > 1, the project is overperforming on cost

- As PM, CPI tells you how *much worth of job* you are getting for every $ being spent.

EVM

- Schedule Variance (SV)

$$SV = EV - PV$$

If SV = 0, the project is on plan, time-wise

SV < 0, the project is BEHIND schedule

SV > 0, the project is AHEAD of schedule

- As PM, CPI tells you how *much worth of job* you are getting for every $ planned.

EVM

- Schedule Performance Index (SPI)

  SPI = EV / PV

If SPI = 1, the project is on schedule

SPI < 1, the project is BEHIND schedule

SPI > 1, the project is AHEAD of schedule

- SPI tells the PM how *much worth of job* has been completed against planned work

Forecasting - EAC

- EAC forecast for ETC work performed at the budgeted rate *(Atypical situation)*

$$EAC = AC + BAC - EV$$

  - It is assumed that
    - All future work will be completed at the budgeted rate
    - The present variation is a ATYPICAL. and will not apply to the work to be performed in the future.

Forecasting - EAC

- EAC forecast for ETC work performed at the present CPI (*Typical situation)*

  EAC = BAC / Cumulative CPI

  - *It is assumed that*
    - *All the future work will be completed at the present cost efficiency*
    - *The present variation in cost is typical and will apply to all the works to be performed in the future.*

Forecasting - EAC

- EAC forecast for ETC work considering both SPI and CPI *(I.e. work performed at the present efficiency)*

  EAC = AC+ {(BAC-EV) / (cumulative CPI x cumulative SPI)}

  - *It is assumed that*
    - *All the future work will be performed at the present cost and schedule efficiency*
    - *The present variation in cost and schedule is typical and will apply to all the works to be performed in the future.*

Forecasting

- Estimate to Complete (ETC)

  $ETC = EAC - AC$

- Variance at Completion (VAC)

  $VAC = BAC - EAC$

To complete Performance Index (TCPI)

TCPI can be calculated using BAC or EAC

- TCPI using BAC = (BAC-EV) / (BAC-AC)
- TCPI using EAC = (BAC-EV) / (EAC-AC)

Case Study — Case 1

- PV = $ 1,900
- EV = $ 1,900
- AC = $ 1,900

This is the ideal situation where everything goes as per plan.

Case Study — Case 2

- PV = $ 1,800
- AC = $ 1,700

Here, not considering EVM, it appears we're in good shape. Expenditures are less than planned.

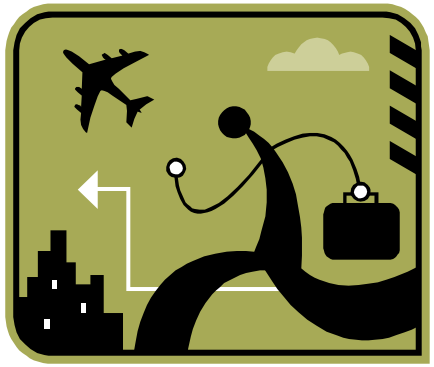
- Spending Variance = - $ 100

Case Study — Case 2(a)

- PV = $ 1,800
- EV = $ 1,500
- AC = $ 1,700

- CV = EV – AC = - $ 200
- SV = EV – PV = - $ 300
- CPI = EV/AC = 0.88
- SPI = EV/PV = 0.83

With EVM we can see that $400 worth of work is behind schedule! We are 21 percent behind where we planned to be.



Case Study — Case 3

- PV = $ 2,900
- EV = $ 2,700
- AC = $ 2,500

Case Study — Case 3(a)

- PV = $ 2,900
- EV = $ 2,700
- AC = $ 2,500

- SV = -200
- SPI = 0.92

The bad news is that our work efficiency slightly low. We are getting only 92 cents of work per dollar done. We're BEHIND schedule.

Case Study — Case 3(b)

- PV = $ 2,9
- EV = $ 2,
- AC = $ 2,500

The good news is that we're overperforming on budget. We're getting $1.08 worth of work done for each $1.00 spent.

- CV = 200
- CPI = 1.08

EVM- Exercise- 20A

Exercise – Solution

Activity	Budgeted Man hours	% Complete	Actual Man hours	Earned Value
A	120	75	103	**90**
B	200	80	190	**160**
C	100	50	60	**50**
D	300	90	260	**270**
Sum	720		613	**570**
	CPI= Earned Value/Actual Value		= 570/613 **=.93**	
	EAC = BAC/CPI = 720/.93 = **774.32**			
	Overall % Complete = (EV/PV)*100 = (570/720)x100 = **79.17**			

BAC = Budget at Completion
EAC = Estimate at Completion
VAC = Variance at Completion
CV = Cost Variance
SV = Schedule Variance
Cost Performance Index: CPI = EV/AC

EVM- Exercise- 20B

- PV = $ 1,700
- BAC = 4000
- EV = $ 1,500
- AC = $ 1,700

EVM- Exercise- 20C

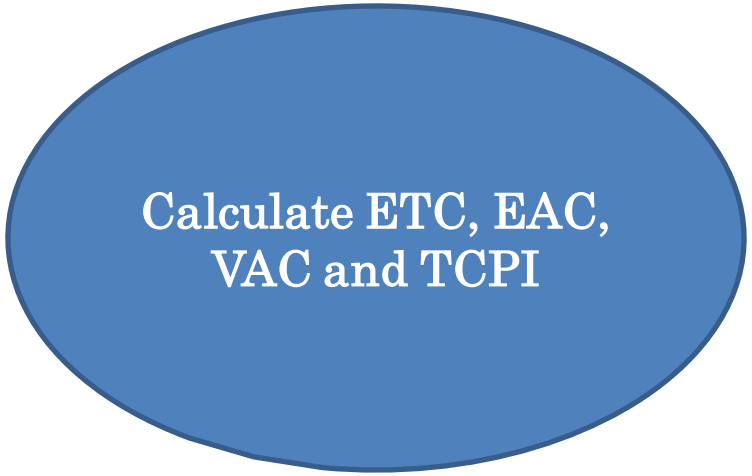
- PV = $ 1,700
- BAC = 4000
- EV = $ 1,500
- AC = $ 1,700

The project is in bad shape with respect to both Cost & Schedule. The Project is now forecast to cost $4545

- CV = -200 CPI = 0.88
- SV = -200 SPI = 0.88
- EAC = BAC/CPI = $ 4545

EVM- Exercise- 20D

- PV = $ 1,700
- BAC = $ 5000
- EV = $ 1,800
- AC = $ 1,600



EVM- Exercise- 20E

- PV = $ 1,700 BAC = $ 5000
- EV = $ 1,800 AC = $ 1,600

- CV = 200 CPI = 1.125
- SV = 100 SPI = 1.058
- EAC = $4444 ETC = $2844 VAC = 556
- TCPI using BAC = 5000-1800/5000-1600 = 0.941
- TCPI using EAC = 5000-1800/4444-1600 = 1.125

EAC is $4444 and ETC is $ 2844.

EVM- Exercise- 20F

- PV = $ 2,000
- EV = $ 2,000
- AC = $ 2,200

Can you crack this EVM problem?

SV = EV – PV
SV % = SV / PV
CV = EV – AC
CV % = CV / EV
SPI = EV / PV
CPI = EV / AC

EVM- Exercise- 20G

- PV = $ 2,000
- EV = $ 2,000
- AC = $ 2,200

We're on schedule. But to continue on schedule, it is costing us $1.00 for every 91 cents worth of work. So there is a $200 overrun.

- SV = EV – PV = 2000-2000 = 0.00
- CV = EV – AC = 2000-2200 = - 200
- SPI = EV / PV = 2000/2000 = 1
- CPI = EV / AC = 2000/2200 = 0.91

EVM- Exercise- 20H

- PV = $ 1,700
- EV = $ 1,500
- AC = $ 1,900

Let's see you crack THIS ONE!

SV = EV – PV
SV % = SV / PV
CV = EV – AC
CV % = CV / EV
SPI = EV / PV
CPI = EV / AC

EVM- Exercise- 20I

- PV = $ 1,700
- EV = $ 1,500
- AC = $ 1,900

Negative scenario:
We are 12% behind schedule & under-performing on cost by 27%

- SV = - $ 200; SV % = - 12 %
- CV = - $ 400; CV% = - 27 %

Case Study — Case 6

- PV = $ 1,000
- EV = $ 0.00
- AC = $ 800

Let's try one more!!!

SV = EV – PV
SV % = SV / PV
CV = EV – AC
CV % = CV / EV
SPI = EV / PV
CPI = EV / AC

EVM- Exercise- 20J

- PV = $ 1,000
- EV = $ 0.00
- AC = $ 800

A tough situation!
Of $1,000 worth of scheduled work, no measurable milestone has yet been accomplished. $800 has been spent just getting started.

- SV = - $ 1,000; SV % = - 100 %
- CV = - $ 800; CV % = N/A

EVM- Exercise- 20K

- PV = $ 0.00
- EV = $ 700
- AC = $ 900

Just one last EVM scenario!

SV = EV – PV
SV % = SV / PV
CV = EV – AC
CV % = CV / EV
SPI = EV / PV
CPI = EV / AC

EVM- Exercise- 20L

- PV = $ 0.00
- EV = $ 700
- AC = $ 900

Work began before it was scheduled to start. While $700 worth of work was completed ahead of schedule, it cost $900 to do it. (A 29% overrun.)

- SV = + $ 700; SV % = N/A
- CV = - $ 200; CV % = -29 %

Questions & Discussions !