

Chapter 7

Project Cost Management



Introduction



- An average of 12 questions on earned value.
- With a little study , the questions on cost should be easy.
- There is a strong connection between cost and time on the exam.
- You do not need to be an accountant to pass the exam.

Cost Management Definition



- Project Cost Management includes the processes required to ensure that the project is completed within the approved budget.

Processes



- **Estimate Cost:** developing an approximation of the costs of the resources needed to complete project activities.
- **Budget Cost:** aggregating the estimated costs of individual activities or work packages to establish a cost baseline.
- **Control Cost:** influencing the factors that create additional costs and controlling changes to the project budget.

Analogous estimating (Top-down):



- Top or middle managers use expert judgment or the actual time and cost of a previous, similar project as the basis for estimating the current project.
- Analogous estimating is a form of expert judgment.

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Bottom-up estimating



- With this technique, the people doing the work create cost and schedule estimates. Estimates, based on the WBS, are rolled up to get a project total.

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Parametric estimating



- It uses a mathematical model to predict project costs.

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Accuracy of estimates



There are three levels of estimating accuracy:

- a) Order of magnitude estimate:
This type of estimate is usually made during the initiating phase and is in the range of -25% to +75% from actual.
- b) Budget estimate:
This type of estimate is usually made during the planning phase and is in the range of -10% to +25% from actual.
- c) Definitive estimate:
This type of estimate is also made during the planning phase and is in the range of -5% to +10% from actual.

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Cost management plan



- Once costs are estimated, the project manager can and must put in place a plan for effectively managing the project to the cost baseline and manage cost variances.

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Difference Between Cost Estimates & Pricing



- Cost Estimates: assessing how much it will cost the organization to produce the product or service. In cost estimating cost alternatives are also identified.
- Pricing: assessing how much the organization will charge for the product or service

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10

Cost aggregation



- The activity cost estimates are aggregated by work packages in accordance with the work breakdown structure.
- The work package cost estimates are then progressively aggregated for the higher component levels of the work breakdown structure and ultimately for the entire project.

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Funding limit reconciliation



- Large variations in the periodic expenditure of funds are usually undesirable for organizational operations. Therefore, the disbursement of project funds will need to be adjusted to smooth or regulate those expenditures.
- This is accomplished by placing date constraints for some work packages or components into the project schedule.

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Types of cost



- There are several ways to look at costs when creating a budget. It is difficult to differentiate between these types of costs.

A cost can be either:

- Variable cost: any cost that change with the amount of production or the amount of work. Examples include the cost of material, supplies and wages.
- Fixed cost: costs that do not change as production changes. Examples include set up, rental, etc.

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Types of cost (Cont.)



- Direct cost: Costs that are directly attributable to the work on the project. Examples include team travel, team wages, recognition and costs of material used on the project.
- Indirect cost: Overhead items or costs incurred for the benefit of more than one project. Examples include taxes, fringe benefits and janitorial services.

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Project funding requirements



- Funding requirements, both total and periodic (e.g., quarterly or annual), are derived from the cost baseline and can exceed, usually by a margin to allow for either early progress or cost overruns, the expected expenditures during the respective time periods

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Cost Control



- Influencing the factors that create changes to the cost baseline
- Ensuring requested changes are agreed upon
- Managing the actual changes when and as they occur
- Assuring that potential cost overruns do not exceed the authorized funding periodically and in total for the project
- Monitoring cost performance to detect and understand variances from the cost baseline
- Recording all appropriate changes accurately against the cost baseline
- Preventing incorrect, inappropriate, or unapproved changes from being included in the reported cost or resource usage
- Informing appropriate stakeholders of approved changes
- Acting to bring expected cost overruns within acceptable limits.

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What is Earned Value Analysis?



- A method for reporting project status in terms of both cost and schedule
- Compares the value of work actually completed (the “Earned Value”) versus plan
- Compares the actual cost of work completed versus plan
- Provides a means to forecast cost and schedule variance at project completion

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Earned Value Analysis



Is a method of performance measurement and it integrates Cost, Schedule and scope

PV	Budgeted Cost of Work Scheduled	How much work should be done?
EV	Budgeted Cost of Work Performed Or “Earned Value”	How much work IS done on a budgeted basis Or how much we budget for the work we did?
AC	Actual Cost of Work Performed	How much the IS DONE work cost or how much did we spend to date
BAC	Budget At Completion	How much did you BUDGET for the TOTAL job
EAC	Estimate At Completion	What do we currently expect the TOTAL project to cost?
ETC	Estimate To Complete	From this point on, how much MORE do we expect it to cost to finish the job ?
VAC	Variance At Completion	How much over or under budget do we expect to be ?

There are 3 Key Values:

- **Planned Value (PV)**
 - Earlier also known as *BCWS* (Budgeted cost of work scheduled)
- **Earned Value (EV)**
 - Earlier also known as *BCWP* (Budgeted cost of work performed)
- **Actual Cost (AC)**
 - Earlier also known as *ACWP* (Actual cost of work performed)

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E.V. Formulas & Interpretation

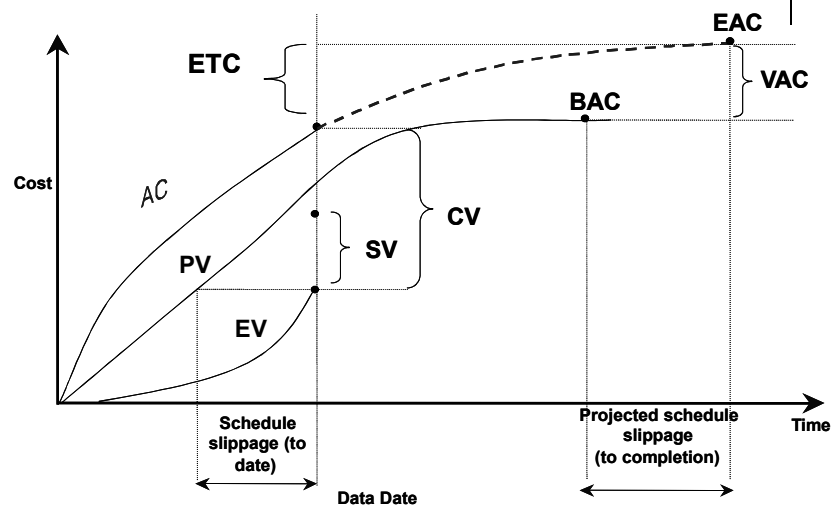
Cost Variance	$CV = EV - AC$	-VE is over Budget +VE is under Budget
Cost Performance Index	$CPI = EV / AC$	I am [only] getting ____ cents out of every 1\$
Schedule Variance	$SV = EV - PV$	-VE is behind Schedule +VE is ahead of Schedule
Schedule Performance Index	$SPI = EV / PV$	I am [only] progressing at ____ % of the rate originally planned
Estimate AT Completion	$EAC = BAC / CPI$	As of now we expect the total project to cost ____ \$
Estimate TO Completion	$ETC = EAC - ACWP$	How much it will cost from now to the completion of the project?
Variance At Completion = $BAC - EAC$ When the project is completed, how much more or less will we have spent ?		

Tricks For Questions about EV



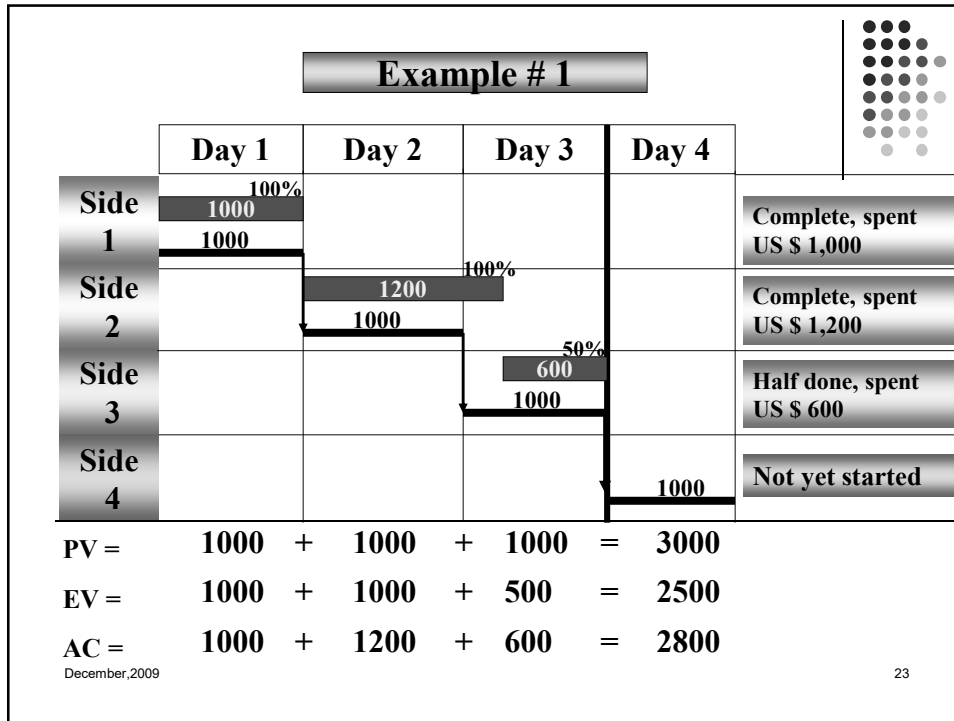
- 1- Notice that EV comes first in every formula.
- 2- If it is a variance, the formula is EV minus something
- 3- If it is an index, It is the EV divided by something.
- 4- If the formula relates to cost, use AC.
- 5- If the formula relates to schedule, use PV.
- 6- Negative is BAD and positive is GOOD. Thus -200 cost variance means that you are behind (over) budget.

Illustrative Graphic Performance Report



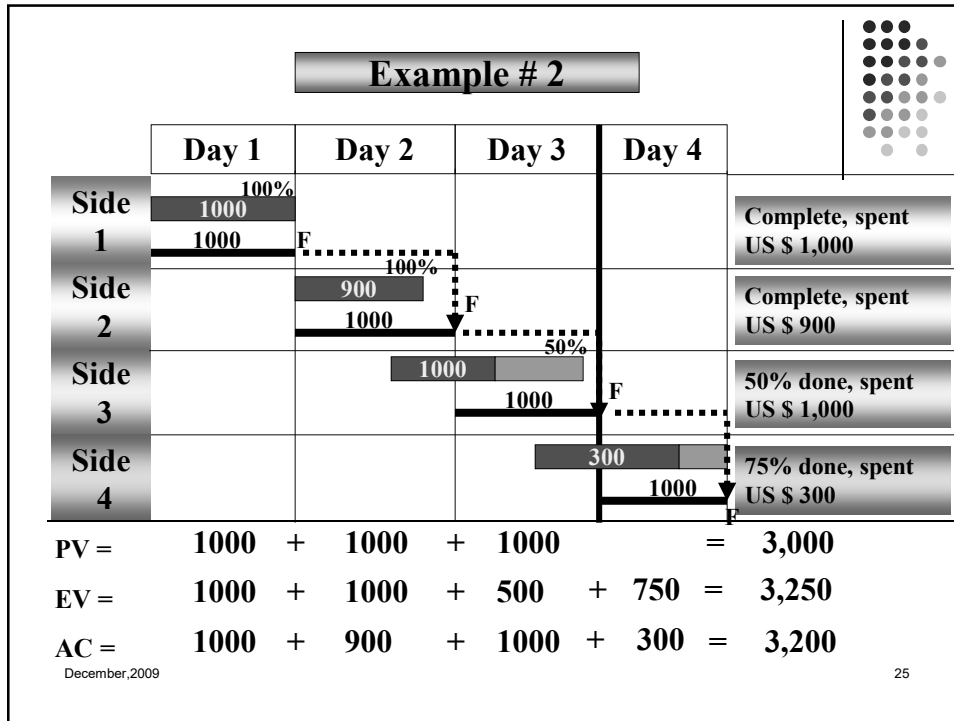
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22




WHAT IS:	CALCULATION	ANSWER	INTERPRETATION OF THE ANSWER
<input type="checkbox"/> PV	1,000 plus 1,000 plus 1,000	3,000	We should have done \$3,000 worth of work.
<input type="checkbox"/> EV	Complete, complete, half done or 1,000 plus 1,000 plus 500	2,500	We budgeted \$2,500 for the work we completed.
<input type="checkbox"/> AC	1,000 plus 1,200 plus 600	2,800	We actually spent \$2,800.
BAC	1,000 plus 1,000 plus 1,000 plus 1,000	4,000	Our project budget is \$4,000.
CV	2,500 minus 2,800	-300	We are over budget by \$300.
CPI	2,500 divided by 2,800	0.893	We are only getting 89 cents out of every dollar we put into the project.
SV	2,500 minus 3,000	-500	We are behind schedule.
SPI	2,500 divided by 3,000	0.833	We are only progressing at 83% of the rate planned.
EAC	4,000 divided by .893	4,479	We currently estimate that the total project will cost \$4,479.
ETC	4,479 minus 2,800	1,679	We need to spend \$1,679 to finish the project.
VAC	4,000 minus 4479	-479	We currently expect to be \$479 over budget when the project is completed.

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WHAT IS:	CALCULATION	ANSWER	INTERPRETATION OF THE ANSWER
<input type="checkbox"/> PV	1,000 plus 1,000 plus 1,000	3,000	We should have done \$3,000 worth of work.
<input type="checkbox"/> EV	Complete, complete, half done, 75% done or 1,000 plus 1,000 plus 500, plus 750	3,250	We budgeted \$3,250 for the work we completed.
<input type="checkbox"/> AC	1,000 plus 900, plus 1,000, plus 300	3,200	We actually spent \$3,200.
BAC	1,000 plus 1,000 plus 1,000 plus 1,000	4,000	Our project budget is \$4,000.
CV	3,250 minus 3,200	50	We are under budget by \$50.
CPI	3,250 divided by 3,200	1.016	We are getting 1.016 dollars out of every dollar we put into the project.
SV	3,250 minus 3,000	250	We are ahead of schedule.
SP1	3,250 divided by 3,000	1.083	We are progressing at 108% of the rate planned.
EAC	4,000 divided by 1.016	3,937	We currently estimate that the total project will cost \$3,937.
ETC	3,937 minus 3,200	737	We need to spend \$737 to finish the project.
VAC	4,000 minus 3,937	63	We currently expect to be \$63 under budget when the project is completed.



Step1: Calculate the Three Key Values

(1)	(2)	(3)
Planned Value (PV)	Earned Value (EV)	Actual Cost (AC)

Step 2: Calculate The Variance

- Cost Variance (CV) = EV-AC
- Schedule Variance (SV) = EV-PV

Step 3: Identify the Performance Indicator

- Cost Performance Indicator (CPI) = EV/AC
- Schedule Performance Indicator (SPI) = EV/PV

Step 4: Forecasting

- Budget At Completion (BAC) = cumulative PV at Completion
- Estimate To completion (ETC) estimate to complete remaining work for scheduled Activity
 = BAC – EV or = BAC – EV/CPI
- Estimate At Completion (EAC) is the final total value for schedule activity when the work is completed
 = ETC + AC or = AC + (BAC – EV) or = AC + (BAC – EV)/CPI


Step 5: Evaluation

- Variance at Completion (VAC) = BAC - EAC

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To-Complete Performance Index:

- Please refer to page 185-186 of PMBOK

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EAC formulas:



- Formula 1:
(AC/EV) X BAC

- Formula 2:
AC + budgeted cost of remaining work

- Formula 3:
AC + new estimate

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Some Definitions



- Value analysis: "Value engineering":
Find a less costly way to do the same scope of work.
- Opportunity cost:
The opportunity given up by selecting one project over another.
- Sunk costs:
Expended costs where sunk costs should not be considered when deciding whether to continue with a troubled project.

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Some Definitions (Cont.)



- Cost risk:
Cost risk is best explained with an example question: "Who has the cost risk in a fixed price contract, the buyer or the seller?" The answer is the seller.
- Law of diminishing returns:
The more you put into something, the less you get out of it.
- Working capital:
Current assets minus current liabilities, or the amount of money the company has to invest, including investment in projects.

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Some Definitions (Cont.)



- Depreciation:
Large assets (e.g., equipment) purchased by a company lose value over time. Accounting standards call this depreciation.
- There are two forms of depreciation:
 - 1- Straight line depreciation: the same amount of depreciation is taken each year.
 - 2- Accelerated depreciation:

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Question 1



- **One common way to compute Estimate at completion (EAC) is to take the budget at completion (BAC) and:**
 - A. Divide by SPI
 - B. Multiply by SPI
 - C. Multiply by CPI
 - D. Divide by CPI

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Answer D



- **This question is asking for the formula for EAC, which is BAC/CPI . Notice how you will have to remember the formulas to get the answers correct.**

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Question 2



- **Estimate at completion (EAC) is a periodic evaluation of:**
 - A. Cost of work completed.
 - B. Value of work performed
 - C. Anticipated total cost at project completion
 - D. What it will cost to finish the job

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Answer C



- **When you look at earned value, many of the terms have similar definitions. This could get you into trouble. Since the EAC means the estimate at completion, choice C is the best answer. Choice D is the definition of ETC, estimate to complete.**

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Question 3



- If earned value (EV) = 350, actual cost (AC) = 400, planned value (PV) = 325, what is cost variance (CV)?
 - A. 350
 - B. -75
 - C. 400
 - D. -50

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Answer D



- $CV = EV - AC$

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Question 4



- **Double declining balance is a form of:**
 - A. Decelerated depreciation
 - B. Straight line depreciation
 - C. Accelerated depreciation
 - D. Life cycle costing

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Answer C



- **We need to know that double declining balance is a form of depreciation. That eliminates choice D. We also know that double declining balance is a form of accelerated depreciation, eliminating choices A and B. Therefore, C is the correct response.**

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Question 5



- **Analogous estimating:**
 - Uses bottom-up estimating techniques
 - Is used most frequently during the executing phase of the project
 - Uses top-down estimating techniques
 - Uses actual detailed historical costs

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Answer C



- **Analogous estimating is used most frequently during the planning processes, not the executing processes (choice B). You do not need to use historical costs (choice D) for an analogous estimate. Therefore, choice C is the correct answer.**

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42