INTRODUCING PROJECT COST MANAGEMENT

Introducing Project Cost Management Study Guide

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COST RISK

Cost risk is best explained with an example quesiton: "Who has the cost risk in a fixed price contract, the buyer or the seller?" The answer is the seller.

INPUTS TO ESTIMATING

What do you need before you estimate costs or time? In order to create a good estimate, you need the following before you begin estimating:

- WBS
- Network diagram – Costs cannot be estimated until it is known how the project sill flow from beginning to end
- Schedule – For multi-year projects, the cost of a task is usually different if it is completed in one year compared to another. NOTE: This refers to an overall schedule, not a detailed one. The detailed schedule is created after estimating.
- Historical information
- Resource pool – An understanding of the available resources or the resources assigned
- Risk management plan – because it includes a budget for risk
- Risks – An understanding of any risk uncovered to date. Remember, a full risk analysis of the details of the project will not have been competed before costs are estimated.

RESOURCE PLANNING

The management of resources is as important as managing cost, time, quality and scope. Resources must be planned and coordinated in order to avoid common problems such as lack of resources and resources being taken away from the project. Resource planning may be a more extensive activity then you do on your projects. In a mature organization, resource planning is conducted during Portfolio Management.

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. This plan is similar to other management plans. The cost management plan can be formal or informal, but is part of the project plan.

Once again, you can see that such a plan requires thinking about how you will manage in advance. This is a concept that many project managers (most managers) miss.

COST ESTIMATING

ANALOGOUS ESTIMATING

Top or middle managers use expert judgement 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 judgement.

BOTTOM-UP ESTIMATING

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

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Notes

EXAM WATCH: Sometimes a question on the exam will cross boundaries between risk, procurement and cost.

EXAM WATCH: If time is an issue in a complex project, rely on an subject matter expert to provide input to the decision-making process. If the project team is lacking a needed project sill set, a seminar or training class is appropriate to the team member up to speed.

EXAM WATCH: Money already spent on a project is called sunk costs and should not be taken into consideration when determining if a project should continue. Instead, the cost of the work to complete is one of the elements that should be taken into consideration when considering to kill a project.

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PARAMETRICK ESTIMATING

Uses a mathematical model to predict project costs. For example, costs per line of code, cost per linear meter or cost per installation. There are two types of parametric estimates:

- Regression analysis – or scatter diagram, you do not need to know what it is.
- Learning curve – The 100th room painted will costs less than the first room because of improved efficiency

COMPUTERIZED ESTIMATIONG TOOLS

These are commercially available packages that will help estimate project in many industries.

PROGRESS REPORTING

A progress report is a useful method to control costs. Many project managers determine how much work has been accomplished by asking team members for an estimate of percent complete for each task. On projects where work cannot be measure, this estimate is simply a guess (or is what management wants to hear.) This is time consuming and almost always a complete waste of time because a guess does not provide a confident estimate of the actual percent complete.

If a project has been planned using a WBS, and tasks require about 80 hours of work, we have alternatives to percent complete. Because tasks will be completed faster and more frequently, we can forget percent complete and use on of the following:

- **50/50 Rule** – A task is considered 50% complete when it begins and gets credit for the last 50% only when it is completed.
- **20/80 Rule** – A task is considered 20% complete when it begins and gets credit for the last 80% only when it is completed.
- **0/100 Rule** – A task does not get credit for partial completion, only full completion

EARNED VALUE ANALSYS

Earned value analysis is a method to measure scope, time and project performance. Many project managers manage their project performance by comparing planned to actual results. With this method, you can easily be on time but overspend according to your plan. A better method is earned value because it integrates cost, time and scope and can be used to forecast future performance and project completion dates.

EARNED VALUE IN ACTION

Earned value is an effective tool for measuring performance and making decisions about corrective action.

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Notes

EXAM WATCH: You need to MEMORIZE the two types of parametric estimates

- Regression analysis
- Learning curve

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TERMS TO KNOW:

ACRONYM	TERM	INTERPREATION
PV	Planned Value	What is the estimated value of the work planned to be done?
EV	Earned Value	What is the value of the work actually accomplished to date?
AC	Actual Cost	What is the actual cost incurred?
BAC	Budget at Completion	How much did we 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 at the end of the project?

FORMULAS AND INTERPRETATIONS TO MEMORIZE:

NAME	FORMULA	INTERPREATION
Schedule Variance (SV)	EV – PV	What is the estimated value of the work planned to be done?
Cost Variance (CV)	EV – AC	NEGATIVE is over budget, POSITIVE is under budget.
Schedule Performance Index (SPI)	EV/PV	We are (only) progressing at ____% of the rate originally planned.
Cost Performance Index (CPI)	EV/AC	We are getting $_____ out of every $1.
Estimate at Completion (EAC)	$\frac{BAC}{CPI}$ AC+ETC AC+BAC-EV $AC+\frac{(BAC-EV)}{CPI}$	As of now, how much do we expect the total project to cost? $_____. ❖ Used if no variance form the BAC have occurred or you will continue at the same rete of spending. ❖ Actual plus a new estimate for remaining work. Used when original estimate was fundamentally flawed ❖ Actual to date plus remaining budget. Used when current variances are thought to be atypical of the future. ❖ Actual to date plus remaining budget modified by performance. Used when current variances are thought to be typical of the future.
Estimate To Complete (ETC)	EAC – AC	How much more will the project cost?
Variance At Completion (VAC)	BAC – EAC	How much under/over budget will we be at the end of the project?

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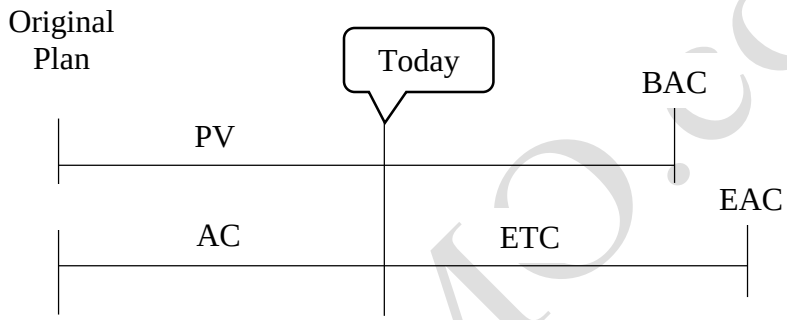
Notes

EXAM WATCH: TRICKS: Make sure you understand and MEMORIZE THE FOLLOWING:

- Notice that EV comes first in every formula. Remembering this one fact alone should help you get about half the earned value question right
  - If it is a variance, the formula is EV minus something.
  - If it is an index, it is EV divided by something
  - If the formula relates to cost, use AC
  - If the formula relates to schedule, use PV
- For interpretation: negative is bad and positive is good. Thus a -200 cost variance means that you are behind (over) budget.
- For interpretation: greater than one is good, less than one is bad
- One of the earned value questions people often answer incorrectly requires that you differentiate between EAC and ETC and the other terms. The following should help:



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ACCURACE OF ESTIMATES

When one estimates, the estimate should come with an indication of the range of possible results, especially at the project detail level. The three levels o estimating accuracy are:

- 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
- BUDGET ESTIMATE –this type of estimate is usually made during the planning phase and is in the range of -10% to +25% from actual
- DEFINITIVE ESTIAMTE – this type of estimate is also made during the planning phase and is in the range of -5% to +10% from actual

Project managers should watch out for number three. The project manager should create the project time and cost estimates, not senior management. Most project managers wish this would always be true because they are tired of dealing with unrealistic schedules and estimates. However, project managers should not the difficulty of estimating with -5% and +10% of actual.

ACCOUNTING STANDARDS

PRESENT VALUE:

Present value means the value today of future cash flows and can be found by the formula:

$$\frac{FV}{(1+r)^n}$$

FV = future value
r = interest rate
n = number of time periods

In a simple example, without using the formula, see if you can guess at the following question.

What is the present value of US $300,000 received three years from now if we expect the interest rate to be 10%? Should the answer be more or less than US $300,000?

The answer is less

You can put an amount of money less than US $300,000 in the bank and in three years have US $300,000. To solve the problem:

$$\frac{300}{(1+.1)3^n} = \frac{300}{1.331} = \text{US } \$225{,}394$$

NET PRESENT VLAUE

This means the present value of the total benefits (income or revenue) less the costs. Let us see if you already have a good understanding of this topic by asking you a question.

You have two project to choose from. Project A will take three years to complete and has an NPV of US $45,000. Project B will take six years to complete and has an NPV of US $85,000. Which one would you prefer?

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EXAM WATCH: Remember that you do not have to be an accountant to pass this exam.

EXAM WATCH: Present value is only mentioned one or two times on the exam. You will have to calculate, just understand the concept.

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The answer is Project B.

The number of years would have been taken into account in the calculation of the net present value. To calculate net present value, you need to calculate the present value of both income and revenue figures and then add up the present values. The following example should help.

Time period	Income/ Revenue	Present value at 10% interest rate	Costs	Present value at 10% interest rate
0	0	0	200	200
1	50	45	100	91
2	100	83	0	0
3	300	225	0	0
TOTAL		**353**		**291**

NET PRESENT VALUE: = 353 – 291 = 62

INTERNAL RATE OF RETURN:

To explain this concept, think of a bank account. You put money in a bank account and expect to get a return of 2% in the USA. You can think of a project in the same way. If a company has more than one project in which to invest, the company may look at the project's returns and then select the highest one.

Internal Rate of Return does get confusing when you give it a formal definition. DEFINITION: the rate (read it as interest rate) at which the project inflows (revenues) and project outflows (costs) are equal. Calculating internal rate of return is complex and requires the aid of a computer.

PAYBACK PERIOD:

The number of time periods it takes to recover your investment in the project before you start accumulating profit. For example:

You have two project to choose from; Project A with a payback period of six months or Project B with a payback period of eighteen months. Which one would you prefer?

The answer is Project A.

BENEFIT COST RATIO:

Compares the benefits to the costs of different projects where benefits are the same as revenue, or sometimes referred to as "payback." Remember that revenue is not the same as profit. A Benefit Cost Ratio of >1 means the benefits are greater than the costs. A Benefit Cost Ratio of <1 means the costs are greater than the benefits. A Benefit Cost Ratio of 1 means the costs and benefits are the same.

If the Benefit Cost Ratio of project A is 2.3 and the Benefit Cost Ratio of project B is 1.7, which project would you select? The answer is A, the project with the higher Benefit Cost Ratio.

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Notes

EXAM WATCH: You should not need to calculate net present value for the exam, but you must understand what it means.

EXAM WATCH: You will not have to perform any internal rate of return calculations on the exam. You will need to understand the definition and be able to answer questions like:.

> *You have two projects to choose from; Project A with an Internal Rate of Return of 21% or Project B with an Internal Rate of Return of 15%. Which one would you prefer?*
>
> *The answer is Project A.*

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A Benefit Cost Ratio of 1.7 means?

- *The costs are greater than the benefits*
- *Payback is 1.7 times the costs*
- *Profit is 1.7 times the costs*

Costs are 1.7 times the profit

The answer is B. Benefit Cost Ratio is talking about revenue (payback) not just the smaller figure of profits.

OPPORTUNITY COSTS:

The opportunity given up by selecting one project over another. This does not require any calculation see the example below.

You have two projects to choose from; Project A with a Net Present Value of US $45,000 or Project B with a Net Present Value of US $85,000. What is the opportunity costs of selecting project B

The answer is $45,000.

SUNK COST:

Expanded costs. People unfamiliar with accounting standards might have trouble with the following question:

You have a project with an initial budget of US $1,000,000. You are halfway through the project and have spent US $2,000,000. Do you consider the US $1,000,000 over budget when determining whether to continue with the project?

The answer is no! Be aware that accounting standards say that sunk costs should not be considered when deciding whether to continue with a troubled project.

LAW OF DIMINISHING RETURNS:

The more you put into something, the less you get out of it. For example, adding twice as many resources to a task may not get the task done in half the time.

WORKING CAPITAL:

Current assets minus current liabilities or the amount of money the company has to invest, including investment in projects.

PROJECT SELECTION METHODS:

The following items were described above and also are considered techniques to help select which projects will be undertaken:

- Present Value
- Net Present Value
- Internal Rate of Return
- Payback Period
- Benefit Cost Ratio

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> *The answer is Project A.*

EXAM WATCH: Regarding Types of Costs, feedback form people taking the exam indicates that it is difficult to differentiate between these types of costs. Therefore, it would be wise to spend time studying these types of costs even through only about three questions on the exam reference them.

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TYPES OF COST:

There are several ways to look at costs when creating a budget. The examples below should help you answer questions about these types of costs.

A cost can be either variable or fixed

- VARIABLE COST – Any cost that change with the amount of production or the amount of work. Examples include the costs of material, supplies and wages.
- FIXED COST – Costs that do not change as production changes. Examples include set up, rental, etc.

A cost can be either direct or indirect:

- DIRECT – Cost that are directly attributable to the work on the project. Examples are team travel, team wages, recognition and costs of material used on the project.
- INDIRECT COSTS – Overhead items or costs incurred for the benefit of more than one project. Examples include taxes, fringe benefits and janitorial services.

DEPRECIAION:

Large assets (e.g., equipment) purchased by an organization lose value over time. Accounting standards call this depreciation. Several methods are used to account for depreciation. There are two forms of depreciation:

- STRAIGHT LINE DEPRECIAION – the same amount of depreciation is taken each year.

  Example: A US $1,000 item with a ten-year useful life and no salvage value (how much the item is worth at the end of its life) would be depreciated at US $100 per year

- ACCELERATED DEPRECIATION – There are two forms of accelerated depreciation. Accelerated depreciation depreciates faster than straight line.
  - Double Declining Balance
  - Sum of Years Digits

  Example: A US $1,000 item with a ten-year useful life and no salvage value (how much the item is worth at the end of its life) would be depreciated at US $180 the first year, $150 the second, $130 the next, etc.

LIFE CYCLE COSTING:

The project we are working on has a life after it is completed. The project manager and the organization want the project costs to be as low as possible. However, if the project manager does not consider the life cycle costs, project costs may be low at the expense of greater overall costs for the rest of the life of the project – the operations and maintenance phase.

VALUE ANALYSIS:

(Sometimes referred to as value engineering in the real world.) Find a less costly way to do the same scope of work. It requires the systematic use of techniques to identify the required project functions, assign values to these functions and provide functions at the lowest overall

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cost without loss of performance. If a team or someone else is looking at decreasing project cost but maintaining the same scope of work, they are performing value analysis.

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Notes

EXAM WATCH: Regarding DEPRECIATION, The exam asks you what they are. You do not have to perform any calculations.

EXAM WATCH: Regarding LIFE CYUCLE COSTING, This is an interesting concept that slips into the exam every once in awhile. By including this concept on the exam, PMI® is effectively warning us that we should look at and manage life cycle costs instead of just project costs.

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