PM Notebook

Summarizing Project Management Concepts for the PMP Exam

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Road to PMP

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No great man ever complains of want of opportunity.
Ralph Waldo Emerson

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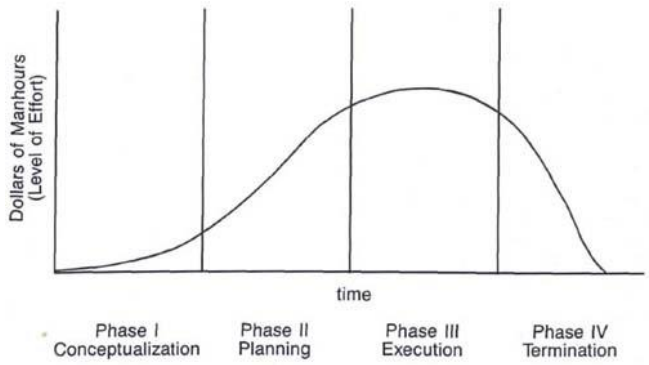
CHAPTER 7 – COST MANAGEMENT

Key Terms

Cost Baseline

- A time-phased budget that project managers use to measure and monitor cost performance.
- **It is the total project budget minus the management reserve.**
- Measures performance.
- Usually presented as **s-curve**. **Low in the beginning and end**, and **high during the middle of the project.**
- The ability to **influence** the final characteristics of the product without impacting the cost is **highest at the start**
- Large projects might have multiple cost baselines.
- Might show cash flow.
- Helps determine when the project will need cash.
- **Step Funding –** The points at which funding occurs in project.



Processes

1 – Plan Cost Management (Planning)

- Determines how the project will be funded.
- Includes decisions about how to finance project resources.
- Control thresholds.
- Level of accuracy.
- Reporting formats.
- Specifications for how estimates should be stated.

Inputs

1. **Project Management Plan**
   - **Schedule Management Plan**
   - **Risk Management Plan**

2. **Project Charter**
3. **EEFs**
4. **OPAs**

Tools

1. **Expert Judgment**
2. **Data Analysis Techniques**
3. **Meetings**

Outputs

1. **Cost Management Plan**

2 – Estimate Costs (Planning)

- Should be prepared before the budget is complete.

Level of Accuracy

Budget Estimate / Top-Down / Analogous – Usually made during **project planning**. Got a range of **-10 to +25 percent** from actual.
Definitive Estimate – As the project progresses, the estimate will become more refined. Got range of **+/-10** (sometimes **-5 to +10) percent** from actual. Used primarily for **Level 1** of the WBS. Examples of a definitive estimate are **grassroots** and **engineering** estimates.
Rough Order of Magnitude (ROM) / Ballpark Estimate – **Very early** estimation of a project's level of effort and cost to complete. Happens before fully-defining scope and requirements in the **initiating process**. **Got a range of -25% to +75%.**

Inputs

1. **Project Management Plan**
   - **Cost Management Plan**
   - **Quality Management Plan**
   - **Scope Baseline**
2. **Project Documents**
   - **Lessons Learned Register**
   - **Project Schedule**
   - **Resource Requirements**
   - **Risk Register**
3. **EEFs**
4. **OPAs**

Tools

1. **Expert Judgment**
2. **Estimating Techniques –**
   - **Analogous Estimating**
   - **Parametric Estimating**
   - **Bottom-up Estimating**
   - **3-Point Estimates**
3. **Data Analysis Techniques**
   - **Alternatives Analysis**
   - **Reserve Analysis**
   - **Cost of Quality**
   - **Vendor Bid Analysis –** Evaluating contracts and procurements.
   - **Make-or-Buy Analysis**
4. **Project Management Information System (PMIS)**
5. **Decision-Making Techniques**

Outputs

1. **Activity Cost Estimates**
2. **Basis of Estimates (BOE) –** A document that describes exactly how an estimate was calculated. It lists rates, assumptions, deviations, reasoning, and all the details of the estimate.
3. **Project Document Updates**

3 – Determine Budget (Planning)

- Aggregation of cost estimates.
- **Authorized** cost baseline.
- **Excludes management reserves.**
- **Includes contingency reserves.**

Inputs

1. **Project Management Plan**
   - **Cost Management Plan**
   - **Resource Management Plan**
   - **Scope Baseline**
2. **Project Documents**
   - **Activity Cost Estimates**
   - **Basis of Estimates (BOE)**
   - **Project Schedule**
   - **Risk Register**
   - **Resource Documents**
3. **Business Documents**
   - **Business Case**
   - **Benefits Management Plan**
4. **Agreements**

5. **Risk Register**
6. **OPAs**

Tools

1. **Cost Aggregation/Budgeting –** Summing activity costs by **work packages**, then by **control accounts**, then by the **entire project.**
2. **Data Analysis Techniques**
   - **Reserve Analysis**
3. **Expert Judgment**
4. **Historical Relationship Review**
5. **Funding Limit Reconciliation –** Comparing project costs against funding limits to prevent large variation in the funds. Includes applying **corrective actions** when needed**.**
6. **Financing**

Outputs

1. **Cost Baseline**
2. **Project Funding Requirements**
3. **Project Document Updates**

5 – Control Costs (Monitoring & Controlling)

- Informing appropriate stakeholders of authorized changes in the cost baseline.
- Monitoring cost performance to detect variances from the cost baseline.
- Ensuring that all appropriate changes are recorded accurately in the cost baseline.
- Influence the factors that create change to the authorized cost baseline.

Inputs

1. **Project Management Plan**
   - **Cost Management Plan**
   - **Performance Measurement Baselines –** Scope, schedule and cost.
2. **Project Documents**
   - **Lessons Learned**
3. **Project Funding Requirements**
4. **Work Performance Data**
5. **OPAs**

Tools

1. **Expert Judgment**
2. **Data Analysis Techniques**
   - **Earned Value Management (EVM)** – Comparing how the project's doing compared to the plan.
   - **Variance Analysis –** focuses on cost and schedule to help explain the cause, issue, and corrective action.
   - **Trend Analysis –** examines project performance over time to determine performance status.

- **Reserve Analysis**

3. **To-Complete Performance Index (TCPI) –** Figure out how well the project needs to perform in the future in order to stay on budget.
4. **Forecasting Methods**
5. **Performance Reviews**
6. **Project Management Information System (PMIS)**

Outputs

1. **Work Performance Information**
2. **Cost Forecasts**
3. **Change Requests**
4. **Project Management Plan Updates**
5. **Project Document Updates**
6. **OPA Updates**

Cost Types

Direct / Indirect

Direct Costs – Costs are attributed directly to the project work and cannot be shared among projects. E.g. hotels, airfare, phone charges, team training, team salaries, etc.
Indirect Costs / Overhead Costs – Costs that are **shared** to more than one project. E.g. access to training rooms, software licenses, taxes, corporate executives salaries, electricity, etc.

Fixed / Variable

Fixed Costs – Costs that remain constant throughout the life of the project. E.g. The cost of consultant brought on to the project, setup costs, rent, utilities, etc.
Variable Costs – Costs that change based on the conditions applied in the project. E.g. the number of meeting participants, the supply of and demand for materials, wages, etc.

Additional Cost Types

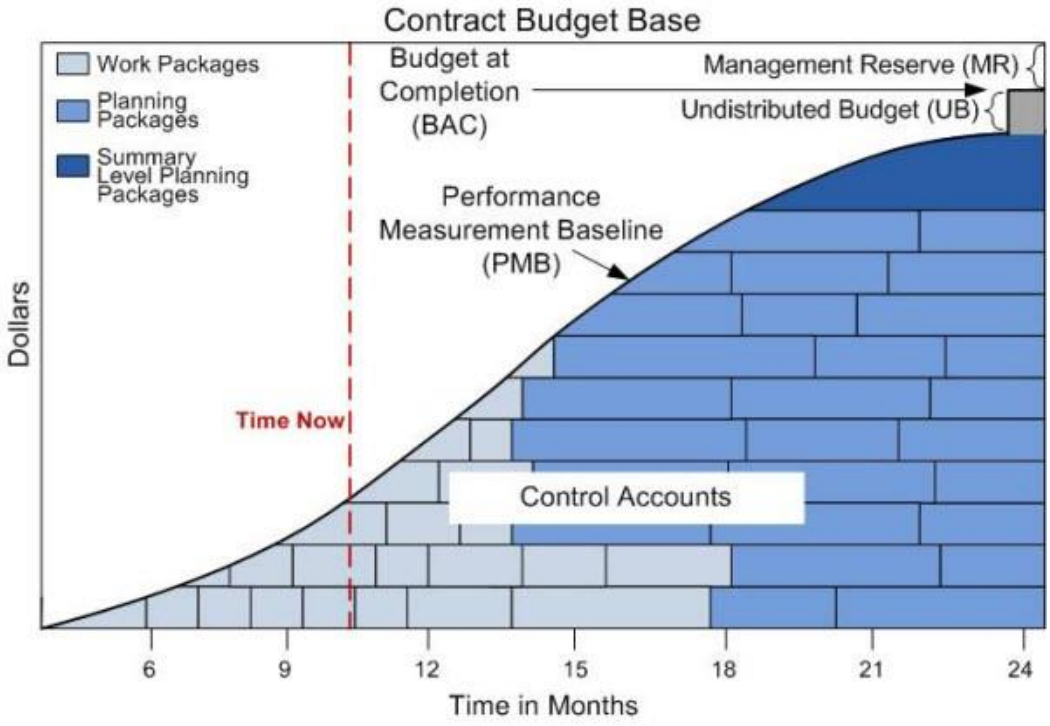
Implicit Costs – costs that has already occurred but is not necessarily shown or reported as a separate expense. It represents an opportunity cost that arises when a company allocates internal resources toward a project without any explicit compensation for the utilization of resources.
Lifecycle Costing (LCC) / Total Cost of Ownership (TCO) – The total cost of its ownership, and includes all the costs that will be incurred during the life of the item to acquire it, operate it, support it and finally dispose it.

- It provides the lowest long-term cost of ownership and should be used as a management decision tool, in case of alternatives
- It includes **direct and indirect costs**.
- It includes **periodic or continuing costs** of operation and maintenance.
- In the selection criteria for two projects, even if one project has a lower NPV, it may be selected if it has a lower life cycle cost.

Marginal Costs – the cost added by producing one additional unit of a product or service.

Sunk/Retrospective Costs – Monies that have already been invested in a project and cannot be recovered. **They should not be considered when deciding whether to continue on a troubled project.**

Undistributed Budget (UB) –A temporary holding account for budget associated with specific work scope or contract changes that have not been distributed to a WBS, control account (CA) or summary level planning package (SLPP). It is part of Performance Measurement Baseline (PMB).



Earned Value Management (EVM)

Involves:

1. Determining the **EAC calculation** to be used on the project.
2. Establishing the **earned value measurement techniques**. E.g. **weighted milestones**, **fixed formula**, or **percent complete**.
3. Defining the **WBS level** at which the measurements of control account will be performed.

Techniques

0/100 Rule – No credit is earned for an element until it is finished.

50/50 Rule – means 50% credit is earned when an element of work is started, and the remaining 50% is earned upon completion.

25/75 and 20/80 Rules – assign more weight to finishing work than for starting it, but they also motivate the project team to identify when an element of work is started, which can improve awareness of work-in-progress.

Milestone Method –

- Helpful for work packages of long duration or groups of activities with milestones.
- Value is earned when the milestone is completed.
- Budget is assigned to the milestone rather than to the work package.
- Can be **basic** or **weighted**.

Performance

1. **WBS Level –** Define the **points in the WBS** where measurements of control accounts will be performed.
2. **Measurement Techniques / Formulas –** Establish the EV **measurement techniques** such as weighted milestones, fixed-formula, percent complete, etc. to be used.
3. **Tracking Methods and Equations –** for calculating EAC forecasts to provide a validity check on the bottom-up estimates.

Formulas

Term	Definition	Formula
BAC (Budget at Completion)	Total project budget.	
Planned % Complete	How much **percentage** of the work you **should have** done according to schedule.	
Actual % Complete	How much **percentage** of the work you have **actually** done.	
PV (Planned Value) / BCWS (Budgeted Cost for Work Scheduled)	The **budgeted value** of the work completed.	$PV = BAC * Plan\ \%\ Compl$
EV (Earned Value) / BCWP (Budgeted Cost for Work Performed)	The **actual value** of the work completed.	$EV = BAC * Actual\ \%\ Compl$
		$EV = CV + AC$
		$EV = SV + PV$
		$EV = CPI * AC$
		$EV = SPI * PV$
AC (Actual Cost) / ACWP (Actual Cost for Work Performed)	Total expenditure (money spent) for the work.	
SPI (Schedule Performance Index)	**Ratio** reflects whether the project work is ahead of **(> 1.0)** / on / behind **(<1.0) schedule**. **Cumulative.**	$SPI = EV / PV$
SV (Schedule Variance)	How much time **ahead of (positive)** / **behind (negative)** schedule.	$SV = EV - PV$
CPI (Cost Performance Index)	**Ratio** reflects whether the project work is over **(< 1.0)** of / on / under **budget (> 1.0). Cumulative.** It measures how much dollars you get for each dollar spent.	$CPI = EV / AC$

	Researchers have found that the cumulative CPI **does not change by more than 10%** once a project is approximately **20% complete**.	
CV (Cost Variance)	How much $ **under (positive)** / **over (negative)** budget.	$\mathrm{CV} = \mathrm{EV} - \mathrm{AC}$
EAC (Estimate at Completion)	Estimates the planned cost at project finish.	If **no variances** or you will continue at the **same rate** of spending (when current variances are seen as **regular/typical** of the future) – $$\boldsymbol{EAC = BAC / CPI}$$
		Original rate calculation. I.e. when **variances are irregular/atypical** (when there are variances but the rest of the project will continue at the **normal behavior**) – $\boldsymbol{EAC = AC + (BAC - EV)}$ Or $\boldsymbol{EAC = BAC - CV}$
		Considering SPI and CPI (**when variances are regular/typical**) – $$\boldsymbol{EAC = AC + \frac{(BAC - EV)}{(SPI * CPI)}}$$
		New rate or the original rate **was fundamentally flawed** – $\mathrm{EAC} = \mathrm{AC} + \mathrm{New\ Estimate}$
ETC (Estimate to Complete)	Estimates the additional cost needed for the project finish.	$\mathrm{ETC} = \mathrm{EAC} - \mathrm{AC}$

VAC (Variance at Completion)	Estimates the difference between EAC and original planned value.	$\mathrm{VAC} = \mathrm{BAC} - \mathrm{EAC}$
TCPI (To-Complete Performance Index)	Ratio estimates efficiency needed to finish the project on budget. **Higher value means stricter cost management.**	**Budget-based** (when we need project to get back to budget) – $\boldsymbol{TCPI = \frac{(BAC - EV)}{(BAC - AC)}}$
		Estimation-based (to meet the new estimate) – $\boldsymbol{TCPI = \frac{(BAC - EV)}{(EAC - AC)}}$
Project Variance	The final variance, which is discovered only at the project's completion.	$\boldsymbol{VAR = BAC - AC}$

Additional Terms

Capital Expenditure – Money spent by a business or organization on acquiring or maintaining fixed assets, such as land, buildings, and equipment.

Commercial Database – A cost-estimating approach that uses a database, typically software-driven, to create the cost estimate for a project.

Cumulative Cost Curve / S-Curve –

- Enables PM to monitor cost variance at a glance.
- Shows the difference in height between the planned expenditure curve and the actual expenditure curve representing the monetary value of variances at any given time.

Marginal Analysis – Study of the cost of improvements to a project or service and how the costs contribute to an increase in revenue. Part of marginal analysis is calculating **marginal costs.**

Working Capital – Current assets minus current liabilities for an organization. I.e. the amount of money the company has available to invest, including investments in projects.