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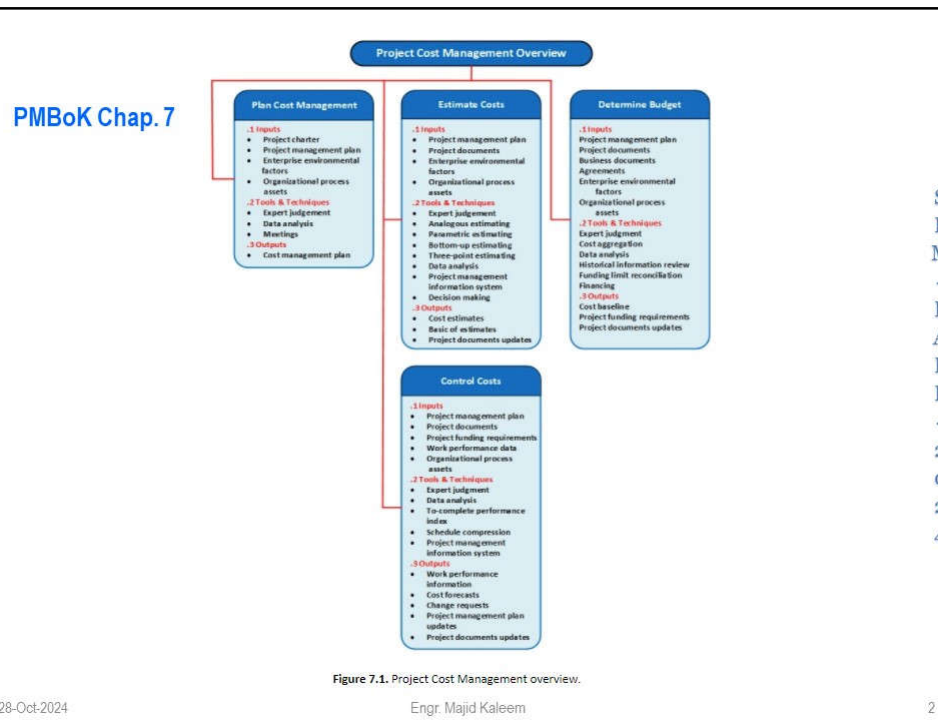
Software Project Management

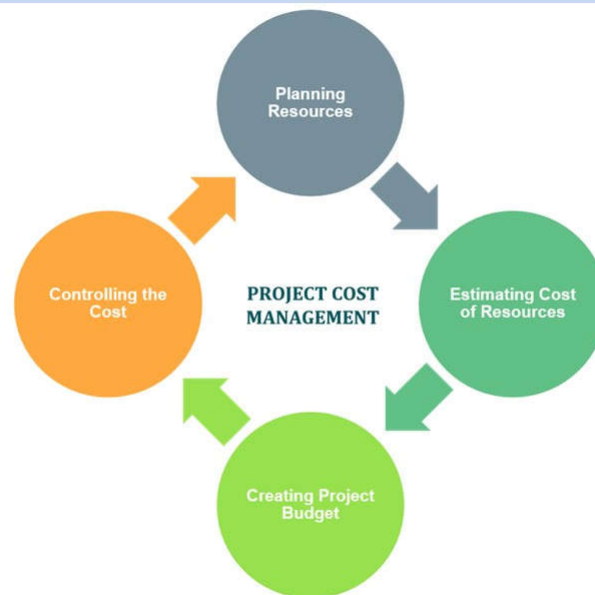# Fall-2024
Week 06
Engr. Majid Kaleem

مدرس: مہندس ماجد کلیم

جامعہ بحریہ، واقعگاہ کراچی

PMBoK Chap. 7

Figure 7.1. Project Cost Management overview.

PROJECT COST MANAGEMENT

PROJECT COST MANAGEMENT

- The **process of Project Cost Management** takes place when the project scope, timelines, and deliverables are clear.

- Beginning WBS, **Resource Planning** is the *first step* in Project Cost Management.

- Here the resources necessary to complete the project's planned objectives (broken down into activities and tasks, as analyzed before) are estimated.

- Research data and historical information of comparable cases can be used to determine which resources shall be required to complete the project. Such resources include:

PROJECT COST MANAGEMENT

- Such resources include:

    – **Staffing**: Who are the project team members, what specific capabilities are needed, and what is their relation to the project team (are they staff members or are they external collaborators?).

    – **Equipment**: What kind of equipment, infrastructure, and materials are needed (e.g. machinery, software, supplies, input for deliverable production, etc.)?

    – **Marketing**: What resources are needed to promote project objectives and results and carry out communications?

    – **Training**: Will additional training be required to cope with potential organizational changes arising from the project?

    – **Miscellaneous items**: These are project-specific resource considerations (e.g. required traveling, engagement of external collaborators or counseling services, etc.).

PROJECT COST MANAGEMENT

- The *second step* is to **Estimate Cost**. Here, a variety of **cost estimation techniques** can be used to predict how much each work package and activity (e.g. historical information, market research, parametric models, etc.).

- As estimates are based on data as well as on (informed) hypotheses, they should be continuously refined according to the information occurring during the project. To cover uncertainties, a contingency cost should also be estimated.

PROJECT COST MANAGEMENT

- In **Cost Budgeting**, the *third step*, the cost estimates are allocated across time depending on when each cost will be incurred according to the project schedule. This way a financial document for the execution of the project is created (budget).

- Finally, note the difference between the project budget and the *cost baseline*. The latter is the approved, time-phased project budget.

- Elaborating, once the budget is set, for instance, 4 million, the sponsor *isn't* going to hand you 4 million on day one of the projects.

- They'll provide funds *periodically* during the project when they are needed. The time-phased budget tells them when you shall need these funds.

PROJECT COST MANAGEMENT

- Baseline Cost Example:

- The baseline cost, often referred to as the cost baseline, is a specific version of the project budget that is used as a *reference* point for measuring and controlling project performance.

- It includes the approved budget for different time periods (usually monthly or quarterly) and helps track how actual costs *compare* to what was originally planned.

PROJECT COST MANAGEMENT

- The cost baseline for each month would detail the portion of the project budget allocated to that specific timeframe. For instance:

  – Month 1: $80,000
  – Month 2: $90,000
  – Month 3: $85,000
  – Month 4: $75,000
  – Month 5: $70,000
  – Month 6: $100,000

- This cost baseline is used to measure actual costs against planned costs during each month. If, at the end of Month 3, the actual cost is $90,000, you can compare it to the baseline cost of $85,000 to assess whether the project is within budget or if corrective actions are needed.

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PROJECT COST MANAGEMENT

- The final step, the *fourth step*, is **Cost Control**, namely the consequent monitoring of the cost baseline, to identify variances on time, take corrective action, and follow up on results.

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PROJECT COST MANAGEMENT

- Project Cost Management is one of the ten knowledge areas defined by the Project Management Institute (PMI) in the Project Management Body of Knowledge (PMBOK) Guide.

- It is a critical aspect of project management that involves planning, estimating, budgeting, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget.

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PROJECT COST MANAGEMENT

- The PMBOK Guide outlines the following key processes within the Project Cost Management knowledge area:

1. Plan Cost Management
2. Estimate Costs
3. Determine Budget
4. Control Costs
5. Cost Change Control
6. Close Project or Phase

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PROJECT COST MANAGEMENT

1. Plan Cost Management:

- *Example:* In the planning phase, the project team outlines how costs will be estimated, budgeted, and controlled for the e-commerce website development.

- They may decide to use a combination of historical data, expert judgment, and vendor quotes to estimate costs.

- The plan will detail the frequency of cost monitoring, the level of accuracy required in estimates, and the thresholds for cost control.

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PROJECT COST MANAGEMENT

2. Estimate Costs:

- *Example:* During the estimation process, the project team assesses the costs associated with various components of the e-commerce website, such as web development, graphic design, database setup, server hosting, and security features.

- For instance, they might estimate the cost of web development by considering factors like the number of pages, complexity of features, and development time required.

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PROJECT COST MANAGEMENT

3. Determine Budget:

– *Example:* Once the costs are estimated, the project team aggregates these estimates to determine the overall budget for the e-commerce website project.

– This budget may include costs for software development tools, server hosting services, payment gateway integration, marketing efforts, and ongoing maintenance.

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PROJECT COST MANAGEMENT

4. Control Costs:

– *Example:* As the e-commerce website development progresses, the project team continuously monitors costs. If there are deviations from the budget, corrective actions are taken.

– For instance, if the development of a particular feature is taking longer than expected, the team may need to allocate additional resources or adjust the project schedule to control costs and prevent budget overruns.

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PROJECT COST MANAGEMENT

5. Cost Change Control:

– *Example:* Changes to the e-commerce website project, such as adding new features or modifying existing ones, may impact costs.

– The change control process ensures that any changes are properly evaluated, and their cost implications are considered before approval.

– For example, if a stakeholder requests an additional feature that was not originally planned, the team will assess the impact on development costs and adjust the budget accordingly.

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PROJECT COST MANAGEMENT

6. Close Project or Phase:

– *Example:* Upon completion of the e-commerce website project, the team conducts a financial closure.

– This involves ensuring that all costs associated with the project, including development costs, testing costs, and operational costs, are accurately accounted for.

– Financial closure also involves settling accounts with vendors and closing out financial records related to the project.
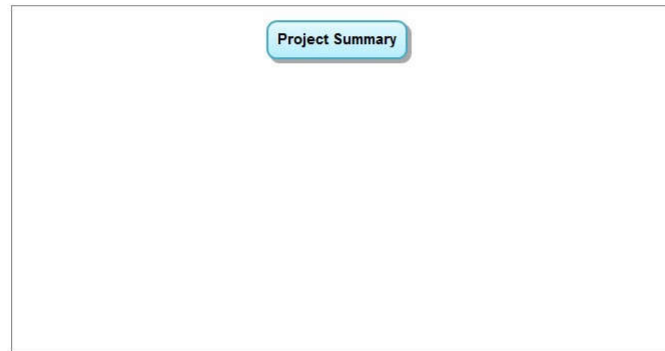
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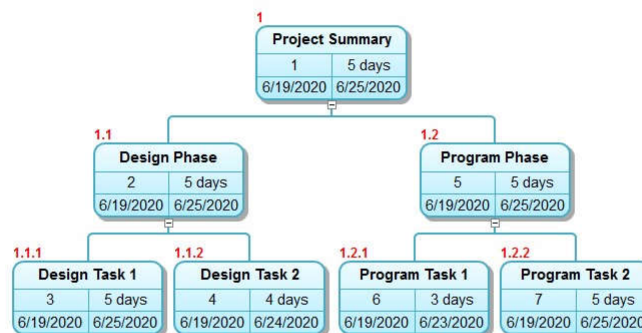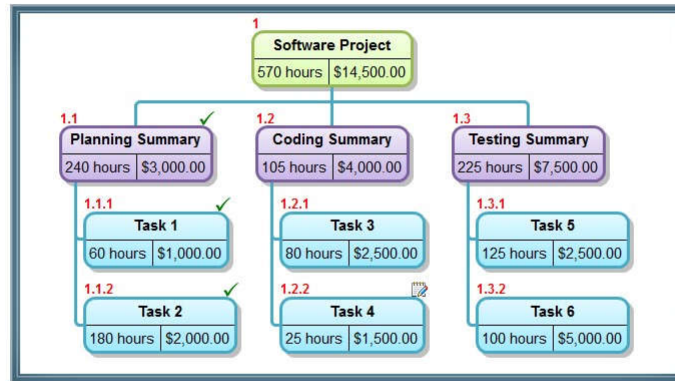
PROJECT COST MANAGEMENT

- WBS & Cost Estimation:
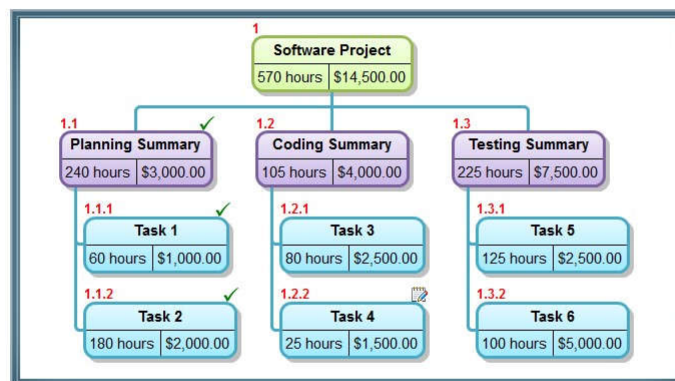
PROJECT COST MANAGEMENT

- WBS & Cost Estimation:

PROJECT COST MANAGEMENT

- Gantt Chart & Cost Estimation
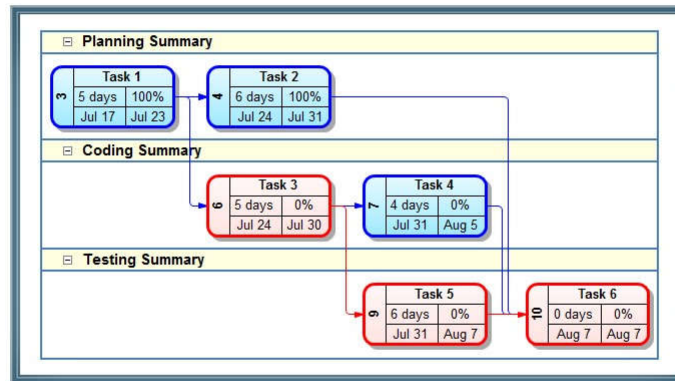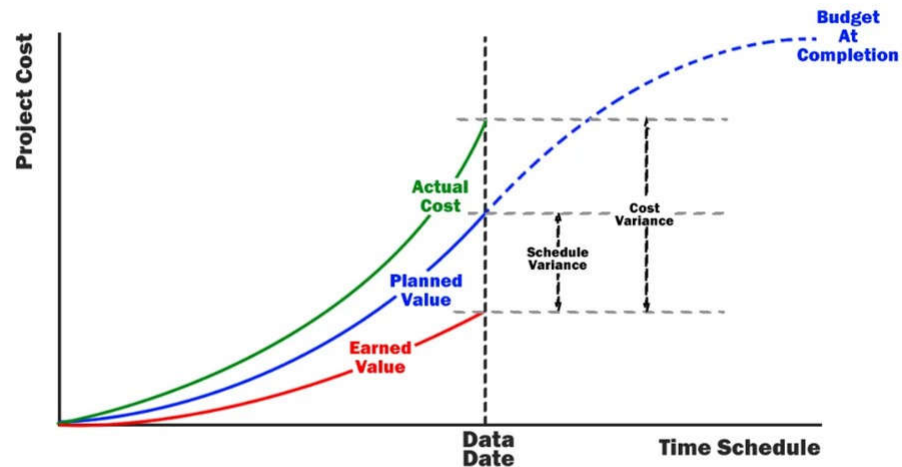
EARNED VALUE ANALYSIS

- Earned value is a monetary value that shows the amount of work achieved on a project. Regardless of how much you planned to spend or actually spent, earned value indicates the value of *the project's progress*.
- Earned value management requires 3 basic elements for its calculations: **Planned Value (PV)**, **Earned Value (EV)**, and **Actual Cost (AC)**.
  1. **Planned Value (PV)** is the budget for the work scheduled to be completed by a specified date. This is sometimes also referred to as the budgeted cost of work scheduled. This is how much you plan to spend on the project based on the assigned resources and expenses.
  2. **Earned Value (EV)** is a monetary value for the *progress* of work completed. Put simply, this is the amount of money that you should have spent on the amount of work that you have completed.
  3. **Actual Cost (AC)** is the actual monetary value spent on the project. The actual cost of the project will come about as the project progresses and you add actual cost values to activities.

EARNED VALUE ANALYSIS

EARNED VALUE ANALYSIS

- The four pieces of information that the project manager must gather for each task are:

  1. Budget at Completion (BAC)
  2. Planned Value (PV)
  3. Earned Value (EV)
  4. Actual Cost (AC)

- These are the *inputs* to earned value management.

EARNED VALUE ANALYSIS

1. Budget at Completion (BAC)

ID	Name	Start	End	BAC
100	Set up Database	Mar 01	Mar 10	**$10,000**

2. Planned Value (PV)

- It is the amount that the project is supposed to be completed up to *some* status point.
- Let's say it's March 3 today. The planned percentage complete is 30% based on the start and end dates. Therefore,

PV = 30% x $10,000 = $3,000

ID	Name	Start	End	BAC	PV
100	Set up Database	Mar 01	Mar 10	$10,000	**$3000**

EARNED VALUE ANALYSIS

3. Earned Value (Budget Cost of Work Performed/BCWP)

- The EV is the measure of the work performed at a specific point in time, expressed in terms of the approved budget authorized for that work.
- It is the amount that the project is *actually complete* up to that status point.
- For our example, let's say that after discussions with the applicable project team members and inspection of the progress, we determine that the task is actually 20% complete.

EV = 20% x $10,000 = $2,000

ID	Name	Start	End	BAC	PV	EV
100	Set up Database	Mar 01	Mar 10	$10,000	$3000	**$2000**

EARNED VALUE ANALYSIS

4. Actual Cost (AC)

- Also called the Actual Cost of Work Performed (ACWP), the AC is the realized cost for the work performed during a specific time period.
- It is the actual cost of the work up to that *status* point.
- Let's say that after reviewing our time and expense software and compiling any miscellaneous expenses, we determine that the actual cost of the task is $4,500.

ID	Name	Start	End	BAC	PV	EV	AC
100	Set up Database	Mar 01	Mar 10	$10,000	$3000	$2000	**$4500**

EARNED VALUE ANALYSIS

- **Schedule Variance** – It tells:
- → *How far ahead or behind schedule is the project.*

$$SV = EV - PV$$

  - If SV is negative, the task is behind schedule.
  - If SV is zero, the task is on schedule
  - If SV is positive, the task is ahead of schedule.
- For example,
  - SV = -$500 means the project is behind schedule.
  - SV = $0 means the project is right on schedule.
  - SV = $500 means the project is ahead of schedule.

ID	Name	Start	End	BAC	PV	EV	AC	SV
100	Set up Database	Mar 01	Mar 10	$10,000	$3000	$2000	$4500	**-$1000**

  - This task has a schedule variance of -$1,000 on a task value of $10,000, therefore it is 10% behind schedule.

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EARNED VALUE ANALYSIS

- **Schedule Performance Index (SPI)**
- The Schedule Performance Index, normally abbreviated SPI, answers the question:

  → *How efficiently are we using time?*

- It is similar to the Schedule Variance (SV). It also tells you how far ahead or behind schedule the task is, but it is a relative measure rather than an absolute one. The formula is:

  SPI = EV/PV

  - If SPI is less than 1, the task is behind schedule.
  - If SPI is zero, the task is on schedule
  - If SPI is greater than 1, the task is ahead of schedule.
- For example,
  - SPI = 0 means the project work has not started.
  - SPI = 0.5 means the project has performed half the work it was supposed to at this point.
  - SPI = 1.0 means the project is on schedule.
  - SPI = 2.0 means the project has performed twice the work it was supposed to at this point.

EARNED VALUE ANALYSIS

- *SPI = EV / PV*
  SPI = $2,000 / $3,000 = 0.67.

ID	Name	Start	End	BAC	PV	EV	AC	SV	SPI
100	Set up Database	Mar 01	Mar 10	$10,000	$3000	$2000	$4500	-$1000	0.67

- It is easy to see that the example task has accomplished only *two-thirds* of what it should have done at this point.

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EARNED VALUE ANALYSIS

- **Cost Variance (CV)**
- The Cost Variance, usually abbreviated CV, answers the following question:

→ *How far over or under budget is the project?*

- The formula is:

  CV = EV - AC

  – If CV is negative, the task is over budget.
  – If CV is zero, the task is on budget.
  – If CV is positive, the task is under budget.

- For example,
  – CV = -$1,000 means the project is over budget.
  – CV = $0 means the project is right on budget.
  – CV = $1,000 means the project is under budget.

EARNED VALUE ANALYSIS

- According to the given example:

- *CV = EV – AC*
  CV = $2,000 – $4,500 = -$2,500.

ID	Name	Start	End	BAC	PV	EV	AC	SV	SPI	CV
100	Set up Database	Mar 01	Mar 10	$10,000	$3000	$2000	$4500	-$1000	0.67	-&2500

- The task is $2,500 over budget on a task value of $10,000.
- If everything goes according to plan from here on, the task will finish at $12,500.
- There is clearly a budget problem as well as a schedule one.

EARNED VALUE ANALYSIS

- **Cost Performance Index (CPI)**
- It answers the question:
- *How efficiently are we using our resources?*
- The formula is:
- *CPI = EV/AC*
    - If CPI is less than 1, the task is over budget.
    - If CPI is zero, the task is on budget.
    - If CPI is greater than 1, the task is under budget.
- For example,
    - CPI = 0 means the project work has not started.
    - CPI = 0.5 means the project has spent twice the amount that it should have at this point.
    - CPI = 1.0 means the project is on schedule.
    - CPI = 2.0 means the project has spent half the amount that it should have at this point.

EARNED VALUE ANALYSIS

- *CPI = EV / AC*
  CPI = $2,000 / $4,500 = 0.44.

ID	Name	Start	End	BAC	PV	EV	AC	SV	SPI	CV	CPI
100	Set up Database	Mar 01	Mar 10	$10,000	$3000	$2000	$4500	-$1000	0.67	-&2500	0.44

- CPI shows how effectively the project sticks to its budget.
- For example, a CPI of 0.5 indicates you have spent twice the sum you should have by a certain point in time.
- On the other hand, a CPI of 2 means you have spent only half the sum you should have at this point.

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EARNED VALUE ANALYSIS

- EV is the money you *should* have spent on the work that was actually done.

- Example: Imagine a project consisting of 3 activities. You have completed activities 1 and 2 so far. The planned cost for activity 1 is $2,500 and $1,000 for activity 2. You have spent $3,700 up to now. Then the Earned Value for the project at the current point in time is $2,500 + $1,000 = $3,500

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To be continued...

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