Chapter 7 Project Cost Management

Project Cost Management

What is Project Cost Management?

Project Cost Management (PCM) is the process of estimating, budgeting, and controlling costs to ensure that a project is completed **within the approved budget**. It involves tracking expenses and making necessary adjustments to keep the project financially viable.

Key Objectives of Project Cost Management:

- Ensure project costs do not exceed the budget.
- ✓ Identify potential cost overruns and mitigate risks.
- Improve financial decision-making and resource allocation.
- ✓ Enhance profitability and cost efficiency.

Processes of Project Cost Management

Project Cost Management ensures that a project is completed within the approved budget. It involves planning, estimating, budgeting, controlling, and monitoring project costs.

According to the PMBOK Guide, the four key processes of Project Cost Management are:

- 1. **Plan Cost Management** Defining how to manage project costs.
- 2. **Estimate Costs** Predicting the costs of resources, labor, and materials.
- 3. **Determine Budget** Allocating costs to different project activities.
- 4. **Control Costs** Tracking, managing, and controlling project expenses.

🔟 Plan Cost Management

Definition:

The process of defining how project costs will be estimated, budgeted, managed, and controlled. It ensures cost management is aligned with the project's objectives.

Inputs, Tools & Techniques, and Outputs

Inputs	Tools & Techniques	Outputs
✓ Project Charter	Expert Judgment	✓ Cost Management Plan
✓ Project Management Plan	✓ Data Analysis	
✓ Enterprise Environmental Factors	✓ Meetings	

Inputs

Tools & Techniques Outputs

✓ Organizational Process Assets

Key Elements of a Cost Management Plan:

- **Unit of Measure** − Defines currency, hourly rates, etc.
- ★ Level of Precision Specifies rounding off cost figures.
- * Cost Control Thresholds Defines acceptable cost variations.
- **Reporting Formats** Determines how cost information will be communicated.
- rchange Control Process Details procedures for handling budget changes.

Estimate Costs

Definition:

The process of forecasting the cost of project resources such as labor, materials, equipment, and overheads.

Inputs, Tools & Techniques, and Outputs

Inputs	Tools & Techniques	Outputs
✓ Project Scope Statement	✓ Analogous Estimating	✓ Cost Estimates
✓ Work Breakdown Structure (WBS)	✓ Parametric Estimating	✓ Basis of Estimates
✓ Project Schedule	✓ Bottom-Up Estimating	√ Risk Register Updates
✓ Resource Requirements	Expert Judgment	

Cost Estimation Techniques:

- Analogous Estimating Uses historical project data for estimates. (Quick but less accurate)
- Parametric Estimating Uses statistical models to estimate costs. (More accurate than Analogous)
- **☑ Bottom-Up Estimating** Estimates each work package separately and sums them up. (*Most accurate but time-consuming*)

▼ Three-Point Estimating (PERT Method):

 $[E = \frac{(O + 4M + P)}{6}]$

Where:

- O = Optimistic Estimate
- M = Most Likely Estimate
- P = Pessimistic Estimate

Determine Budget

Definition:

The process of aggregating cost estimates to create an overall project budget and cost baseline.

Inputs, Tools & Techniques, and Outputs

Inputs	Tools & Techniques	Outputs
✓ Cost Estimates	✓ Cost Aggregation	✓ Cost Baseline
✓ Project Schedule	✓ Reserve Analysis	✓ Funding Requirements
✓ Risk Register	✓ Expert Judgment	✓ Budget Forecasts

Key Concepts in Budgeting:

- * Cost Baseline: The approved, time-phased project budget, used to measure cost performance.
- **Property Contingency Reserve:** Funds for known risks.
- Management Reserve: Funds for unforeseen risks.
- **Funding Requirements:** Specifies how funds will be allocated over time.
- **★** Formula for Cost Baseline Calculation:

[\text{Cost Baseline} = \sum (\text{Direct Costs} + \text{Indirect Costs} + \text{Contingency Reserves})]

Control Costs

Definition:

The process of tracking project costs, detecting variances, and making adjustments to keep the project within budget.

Inputs, Tools & Techniques, and Outputs

Inputs	Tools & Techniques	Outputs
✓ Cost Baseline	✓ Earned Value Management (EVM)	✓ Cost Forecasts
✓ Work Performance Data	✓ Variance Analysis	✓ Change Requests
✓ Approved Change Requests	✓ Trend Analysis	✓ Budget Updates

Earned Value Management (EVM) - Key Formulas

Formula	Definition
Planned Value (PV)	Budgeted cost of planned work.
Earned Value (EV)	Budgeted cost of completed work.
Actual Cost (AC)	Actual cost incurred.

★ Cost Variance (CV):

[CV = EV - AC]

(If CV > 0, the project is under budget; if CV < 0, the project is over budget.)

right cost Performance Index (CPI):

 $[CPI = \frac{EV}{AC}]$

(If CPI > 1, the project is cost-efficient; if CPI < 1, the project is over budget.)

★ Estimate at Completion (EAC) – Forecasting Future Costs:

[EAC = BAC / CPI]

Where:

- BAC = Budget at Completion
- EAC = Estimated Total Cost of the Project

Summary of Project Cost Management Processes

Process	Purpose	Key Outputs
Plan Cost Management	Defines cost management approach.	Cost Management Plan
Estimate Costs	Predicts project costs.	Cost Estimates, Basis of Estimates
Determine Budget	Allocates cost estimates to create a budget.	Cost Baseline, Funding Requirements
Control Costs	Monitors and adjusts costs to stay within budget.	Cost Variance Reports, Budget Updates

Best Practices for Cost Management

- ✓ Use Cost Management Software Tools like MS Project, Primavera, SAP, or Excel for tracking costs.
- ✓ **Define a Clear Scope** Avoid scope creep to prevent budget overruns.
- ✓ Conduct Regular Cost Reviews Frequent monitoring helps detect financial risks early.
- ✓ Implement Risk Reserves Maintain contingency funds for unforeseen expenses.
- ✓ Use Earned Value Management (EVM) Helps measure project cost and schedule performance.

Project Cost Estimation Process

What is Project Cost Estimation?

Project cost estimation is the process of forecasting the total costs required to complete a project. It includes direct costs (labor, materials, equipment) and indirect costs (overhead, administrative expenses). The goal is to create an accurate cost estimate to ensure proper budgeting and financial control.

Objectives of Cost Estimation:

- ✓ Determine project feasibility and budget requirements.
- ✓ Identify financial risks and prepare for contingencies.
- Ensure resources are allocated efficiently.
- Help stakeholders make informed decisions.

Steps in the Project Cost Estimation Process

Define Scope and Work Breakdown Structure (WBS)

P Description:

- Clearly define the project objectives, deliverables, and work packages.
- Break the project into smaller components (Work Breakdown Structure WBS).

№ Why it's Important?

- Ensures all project activities are considered in the cost estimate.
- Reduces the risk of missing cost components.

Identify Cost Components

★ Key Cost Categories:

- 1. Direct Costs: Costs directly tied to project activities.
 - Labor (salaries, wages)
 - Materials and equipment
 - Subcontractor fees
- 2. Indirect Costs: Overhead costs not directly linked to a specific activity.
 - Administrative expenses
 - Office rent and utilities
- 3. Contingency Costs: Funds reserved for identified risks.
- 4. Inflation and Escalation: Adjustments for price increases over time.

★ Why it's Important?

· Helps create a realistic estimate by considering all cost factors.

Select Cost Estimation Method

There are several methods for estimating costs based on project complexity, available data, and accuracy requirements.

Estimation Method	Description	Best For
Analogous Estimating	Uses past project data to estimate costs.	Quick but less accurate. Useful for early-stage planning.
Parametric Estimating	Uses statistical models to estimate costs based on historical data.	More accurate than analogous estimating. Suitable for repetitive projects.
Bottom-Up Estimating	Estimates costs at the smallest work package level and sums them up.	Highly accurate but time-consuming. Best for detailed estimates.

Estimation Method	Description	Best For
Three-Point Estimating (PERT Method)	Uses optimistic, most likely, and pessimistic values to create an average estimate.	Improves accuracy by considering risk and uncertainty.
Expert Judgment	Uses insights from experienced professionals to estimate costs.	Useful when historical data is unavailable.

★ Formula for Three-Point Estimating (PERT):

 $[E = \frac{(O + 4M + P)}{6}]$

Where:

- **O** = Optimistic Estimate
- M = Most Likely Estimate
- P = Pessimistic Estimate

Develop Cost Estimates

P Description:

- Apply the selected estimation techniques to each work package.
- · Include cost assumptions, limitations, and risks.
- · Document all calculations for transparency.

★ Why it's Important?

- Creates a structured and well-documented cost estimate.
- · Helps justify budget requests to stakeholders.

Add Contingency and Management Reserves

* Types of Reserves:

- 1. **Contingency Reserve** Covers known risks (e.g., potential price fluctuations).
- 2. Management Reserve Covers unknown risks (e.g., unexpected project delays).

📌 Why it's Important?

- Helps absorb cost overruns due to uncertainties.
- Ensures the project remains financially stable.

6 Validate and Review Cost Estimates

* Key Review Activities:

- Compare estimates with past projects.
- Conduct peer reviews for accuracy.
- Adjust estimates based on stakeholder feedback.

★ Why it's Important?

- · Improves cost estimation accuracy.
- · Ensures stakeholder alignment and approval.

Document and Update Cost Estimates

★ What to Document?

- ✓ Cost estimation method used.
- ✓ Key assumptions and constraints.
- Breakdowns of costs by category.
- ✓ Risk factors and contingency plans.

★ Why it's Important?

- Provides a reference for future cost control and auditing.
- Helps in tracking changes during project execution.

Inputs, Tools & Techniques, and Outputs of Cost Estimation

Inputs	Tools & Techniques	Outputs
✓ Project Scope Statement	✓ Analogous Estimating	✓ Cost Estimates
✓ Work Breakdown Structure (WBS)	✓ Parametric Estimating	✓ Basis of Estimates
✓ Project Schedule	✓ Bottom-Up Estimating	✓ Risk Register Updates
✓ Resource Requirements	✓ Three-Point Estimating	✓ Project Document Updates
✓ Historical Data	Expert Judgment	

Best Practices for Accurate Cost Estimation

- ✓ Use Multiple Estimation Techniques Increases accuracy by cross-checking results.
- ✓ Update Estimates Throughout the Project Reflects changes in scope, materials, and market prices.
- ✓ Consider Inflation and Market Trends Helps avoid budget shortages due to price changes.
- ✓ Engage Experts and Stakeholders Improves estimation reliability.
- ✓ Use Cost Estimation Software Tools like Microsoft Project, Primavera, or Excel enhance accuracy.

Question 1:**i. If SPI is 0.80 with earned value being 75 .calculate planned value and also state wheather the project is ahead or behind schedule?

ii.A project is scheduled for time for 15 months with an estimated cost of 700000.After 5 months ,the evaluation is done and identified that 40% of work is accomplished with cost of 450000.calculate cost and schedule variance for the project.

i. Calculate Planned Value (PV) and Determine Schedule Status

Given:

- SPI (Schedule Performance Index) = 0.80
- **Earned Value (EV)** = 75

We need to calculate **Planned Value (PV)** and determine whether the project is ahead or behind schedule.

Formula for SPI (Schedule Performance Index):

SPI=EV/PV

Where:

- SPI is the Schedule Performance Index.
- EV is Earned Value.
- PV is Planned Value.

Rearranging the formula to solve for PV:

PV = EV/SPI

PV = 75/0.80 = 93.750

So, the **Planned Value (PV)** is \$93,750.

Schedule Status:

- If EV > PV, the project is ahead of schedule.
- If EV < PV, the project is behind schedule.

Since the EV = \$75,000 and PV = \$93,750, the project is behind schedule because EV < PV.

ii. Calculate Cost and Schedule Variance

Let's calculate the Cost Variance (CV) and Schedule Variance (SV) using the given information.

Given Data:

- Total Duration (Planned Time, PT) = 15 months
- Total Budget (Budget at Completion, BAC) = \$700,000
- Time Passed = 5 months
- Work Accomplished = 40%
- Actual Cost (AC) = \$450,000

Formulas:

1. Earned Value (EV):

EV=Percentage of Work Accomplished×BAC *EV*=0.40×700,000=280,000 EV=0.40×700,000=280,000

2. Planned Value (PV):

Planned progress at 5 months:

Planned Progress= 15/5 = 1/3=33.33% PV=0.3333×700,000=233,333.33

3. Schedule Variance (SV):

```
[ SV = EV - PV ]

[ SV = 280,000 - 233,333.33 = 46,666.67 ]

(Positive SV → The project is ahead of schedule)
```

4. Cost Variance (CV):

```
[ CV = EV - AC ]
[ CV = 280,000 - 450,000 = -170,000 ]
(Negative CV → The project is over budget)
```

Conclusion:

- Schedule Variance (SV) = +46,666.67 → The project is ahead of schedule.
- Cost Variance (CV) = -170,000 → The project is over budget.

Question 3.Assume we are halfway through a year long project that has a total budget of 100,000. The amount budgeted through this six month mark is \$55,000. The actual cost through this six month mark is \$45,000. With this information calculate CV,SV,CPI,SPI,EAC,ETC.

Given Data:

- Total Project Duration = 1 year (12 months)
- Project Midpoint = 6 months
- Total Budget (Budget at Completion, BAC) = \$100,000
- Planned Value (PV) at 6 months = \$55,000
- Actual Cost (AC) at 6 months = \$45,000

However, we are missing Earned Value (EV). Since we are at the halfway point (6 months into a 12-month project), we assume that the **percentage of work completed** is 50% of the BAC.

```
[ EV = \text{Percentage of Work Completed} \times BAC ]
```

```
[ EV = 0.50 \times 100,000 = 50,000 ]
```

Calculations:

1. Cost Variance (CV)

```
[ CV = EV - AC ] [ CV = 50,000 - 45,000 = 5,000 ] (Positive CV \rightarrow Project is under budget)
```

2. Schedule Variance (SV)

[SV = EV - PV][SV = 50,000 - 55,000 = -5,000]

(Negative SV → Project is behind schedule)

3. Cost Performance Index (CPI)

```
[CPI = \frac{EV}{AC}][CPI = \frac{50,000}{45,000} = 1.11]
```

(CPI > 1 → Project is cost-efficient, spending less than planned)

4. Schedule Performance Index (SPI)

```
[SPI = \frac{EV}{PV}][SPI = \frac{50,000}{55,000} = 0.91]
```

(SPI < 1 → Project is behind schedule)

5. Estimate at Completion (EAC)

Using formula:

```
[EAC = \frac{BAC}{CPI}][EAC = \frac{100,000}{1.11} = 90,090.09]
```

(EAC < BAC → Project is expected to cost less than planned, meaning savings)

6. Estimate to Complete (ETC)

```
[ETC = EAC - AC] [ETC = 90,090.09 - 45,000 = 45,090.09]
```

(ETC → The remaining estimated cost to complete the project)

Question: What is cost Estimation? .What are the different types of estimating techniques used in estimating cost? Explain in brief.

Cost Estimation

Cost estimation is the process of predicting the total cost required to complete a project, task, or product. It helps in budgeting, planning, and decision-making by assessing all direct and indirect costs involved. Cost estimation is crucial for project management, financial forecasting, and resource allocation.

Types of Cost Estimation Techniques

Cost estimation techniques can be broadly categorized into **analogous**, **parametric**, **bottom-up**, **and three-point estimation methods**. Below are the different types of cost estimating techniques explained briefly:

1. Analogous Estimating (Top-Down Estimation)

- Uses past project data to estimate the cost of a new project.
- · Relies on historical information from similar projects.
- Suitable for early-stage estimations when limited details are available.

• **Example:** If a similar project was completed for \$1 million, the new project is estimated to have a similar cost.

Pros: Quick, simple, cost-effective.

Cons: Less accurate, depends on historical data.

2. Parametric Estimating

- Uses mathematical models and statistical relationships between variables to estimate costs.
- Based on unit costs, productivity rates, or other measurable parameters.
- **Example:** If painting one square foot costs \$5, and the total area is 1,000 square feet, the estimated cost is \$5 × 1000 = \$5,000.

Pros: More accurate than analogous estimating, scalable for different project sizes.

Cons: Requires reliable data and defined parameters.

3. Bottom-Up Estimating

- Breaks down the project into smaller components (Work Breakdown Structure WBS).
- Estimates cost at the smallest work level and sums up for the total cost.
- **Example:** Estimating labor, materials, and equipment separately and then adding them up.

Pros: Highly accurate, detailed, and specific.

Cons: Time-consuming, requires extensive data.

4. Three-Point Estimating (PERT – Program Evaluation and Review Technique)

- Uses three cost estimates to account for uncertainties:
 - Optimistic (O): Best-case scenario (lowest cost)
 - Most Likely (M): Most probable cost
 - Pessimistic (P): Worst-case scenario (highest cost)
- The expected cost is calculated as:

 $[\text{text}(E) = \frac{(O + 4M + P)}{6}]$

• Example: If O = \$8,000, M = \$10,000, and P = \$15,000, then: [E = \frac{(8000 + 4(10000) + 15000)} {6} = 10,500]

Pros: Reduces risk by considering uncertainty.

Cons: Requires multiple estimates, making it complex.

5. Expert Judgment

- Based on expert opinions and industry experience.
- · Useful when no historical data is available.
- Often used in combination with other techniques.

Pros: Quick and applicable to new projects.

Cons: Subjective and may lead to biased estimations.

6. Reserve Analysis

- · Adds contingency reserves for unexpected risks.
- · Used to manage cost overruns.

Pros: Helps in risk management. **Cons:** May lead to overestimation.

7. Vendor Bid Analysis

- Uses cost estimates from vendors or suppliers for project components.
- · Helps in negotiating contracts.

Pros: Real-world data from suppliers.

Cons: Cost varies based on market conditions.

Question: Descirbe about Earned value Analysis

Earned Value Analysis (EVA)

Earned Value Analysis (EVA) is a project management technique used to measure project performance and progress in terms of cost and schedule. It integrates scope, cost, and schedule to assess how well a project is performing compared to the initial plan.

EVA helps project managers answer key questions such as:

- · Are we ahead or behind schedule?
- · Are we over or under budget?
- · How much work has been completed relative to the plan?
- · What is the expected total cost at completion?

Key Components of Earned Value Analysis

EVA relies on three fundamental metrics:

1. Planned Value (PV)

- PV represents the authorized budget assigned to scheduled work at a specific point in time.
- Also known as Budgeted Cost of Work Scheduled (BCWS).
- Formula:

[PV = \text{Planned % of work} \times \text{Total Budget (BAC)}]

• Example: If a project has a total budget of \$100,000 and is expected to be 50% completed by now, then: [PV = 50% \times 100,000 = 50,000]

2. Earned Value (EV)

- EV is the budgeted amount for the actual work completed at a given point in time.
- Also called Budgeted Cost of Work Performed (BCWP).
- Formula:

[EV = \text{Actual % of work completed} \times \text{Total Budget (BAC)}]

• Example: If only 40% of the work is completed in the same project: [EV = 40% \times 100,000 = 40,000]

3. Actual Cost (AC)

- AC is the actual amount spent on the work performed so far.
- Also known as Actual Cost of Work Performed (ACWP).
- This value is directly obtained from financial records.
- Example: If the company has spent \$45,000 so far, then AC = \$45,000.

Performance Indicators in EVA

Using the key metrics (PV, EV, AC), we can derive important performance indicators:

1. Cost Variance (CV)

- CV shows whether the project is over or under budget.
- Formula:

```
[CV = EV - AC]
```

- Interpretation:
 - CV > 0 (Positive): Project is under budget.
 - CV < 0 (Negative): Project is over budget.
- Example:

```
[ CV = 40,000 - 45,000 = -5,000 ] (The project is over budget by $5,000.)
```

2. Schedule Variance (SV)

- SV shows whether the project is ahead or behind schedule.
- Formula:

```
[SV = EV - PV]
```

- · Interpretation:
 - SV > 0 (Positive): Project is ahead of schedule.
 - **SV < 0 (Negative):** Project is behind schedule.
- Example:

```
[ SV = 40,000 - 50,000 = -10,000 ]
(The project is behind schedule by $10,000.)
```

3. Cost Performance Index (CPI)

CPI indicates cost efficiency.

• Formula:

```
[CPI = \frac{EV}{AC}]
```

- · Interpretation:
 - CPI > 1: Project is cost-efficient (under budget).
 - **CPI < 1:** Project is over budget.
- Example:

```
[ CPI = \frac{40,000}{45,000} = 0.89 ] (Since CPI < 1, the project is over budget.)
```

4. Schedule Performance Index (SPI)

- SPI shows how efficiently the project is progressing according to schedule.
- Formula:

```
[SPI = \frac{EV}{PV}]
```

- Interpretation:
 - **SPI > 1:** Project is ahead of schedule.
 - SPI < 1: Project is behind schedule.
- Example:

```
[ SPI = \frac{40,000}{50,000} = 0.80 ] (Since SPI < 1, the project is behind schedule.)
```

5. Estimate at Completion (EAC)

- EAC predicts the total cost of the project at completion based on current performance.
- Formula:

```
[EAC = \frac{BAC}{CPI}]
```

• Example:

```
[ EAC = \frac{100,000}{0.89} = 112,359.55 ] (The total project cost is now expected to be $112,359.55, exceeding the budget.)
```

6. Estimate to Complete (ETC)

- ETC estimates how much more will be needed to complete the remaining work.
- Formula:

```
[ETC = EAC - AC]
```

• Example:

```
[ ETC = 112,359.55 - 45,000 = 67,359.55 ]
(The project will require $67,359.55 more to complete.)
```

Question: Tools and tecchniques for controlling the cost of a project.

Tools and Techniques for Controlling Project Cost

Controlling project costs is crucial to ensure that a project stays within budget while meeting its objectives. Cost control involves monitoring expenditures, identifying variances, and making necessary adjustments to avoid overruns. Here are some key tools and techniques used for effective cost control in project management:

1. Earned Value Management (EVM)

What It Is:

- EVM is a **quantitative technique** that integrates scope, cost, and schedule to assess project performance.
- It helps compare planned vs. actual costs and forecast cost trends.

Key Metrics in EVM:

Metric	Formula	Meaning	
Cost Variance (CV)	CV = EV - AC	Negative CV → Over budget Positive CV → Under budget	
Schedule Variance (SV)	SV = EV - PV	Negative SV → Behind schedule Positive SV → Ahead of schedule	
Cost Performance Index (CPI)	CPI = EV / AC	CPI < 1 → Over budget CPI > 1 → Under budget	
Estimate at Completion (EAC)	EAC = BAC / CPI	Predicts final project cost	

Why Use It?

- · Helps detect cost overruns early
- Provides accurate cost forecasting
- Supports data-driven decision-making

2. Cost Forecasting

৵ What It Is:

- Forecasting **predicts future costs** based on project trends.
- Helps in **proactive adjustments** to avoid budget overruns.

Methods:

Estimate to Complete (ETC):

[ETC = EAC - AC] (How much more money is needed to complete the project?)

• Variance at Completion (VAC):

[VAC = BAC - EAC] (Will the project finish over or under budget?)

Why Use It?

· Helps in decision-making for corrective actions

· Improves accuracy of final cost predictions

3. Cost Change Control System (CCCS)

What It Is:

- A structured process to approve or reject cost changes.
- Prevents unnecessary scope creep and budget overruns.

Components:

- · Change request forms
- · Approval workflows
- · Cost impact analysis

Why Use It?

- Ensures cost control discipline
- Avoids unnecessary expenditures

4. Project Budgeting and Cost Baseline

৵ What It Is:

- The **cost baseline** is the approved budget for the project.
- Acts as a benchmark to track spending.

Steps:

- 1. Estimate costs for all activities
- 2. Develop the budget by aggregating costs
- 3. Monitor actual costs against the baseline

Why Use It?

- · Helps track budget deviations
- · Supports financial decision-making

5. Performance Reviews and Audits

What It Is:

- · Periodic audits and performance reviews assess cost efficiency.
- · Ensures adherence to financial policies.

Types of Reviews:

Internal audits (by project team)

- · External audits (by independent reviewers)
- Variance analysis (comparing planned vs. actual costs)

Why Use It?

- Improves cost accountability
- Identifies cost inefficiencies

6. Resource Leveling & Optimization

What It Is:

- Adjusts resource allocation to **optimize costs**.
- Prevents overuse or underuse of resources.

Techniques:

- Crashing: Adding more resources to reduce time but increasing cost
- Fast-tracking: Performing activities in parallel to save time

Why Use It?

- · Avoids unnecessary labor costs
- · Reduces idle time of resources

7. Risk Management and Contingency Planning

৵ What It Is:

- Identifies and mitigates risks that **could increase project costs**.
- Includes contingency reserves in the budget.

Key Elements:

- · Risk identification
- · Cost impact analysis
- · Contingency reserve planning

Why Use It?

- · Prevents financial shocks
- · Ensures budget flexibility

8. Automated Cost Tracking Tools

★ What It Is:

• Uses software tools to track project expenses.

• Provides real-time cost reporting.

Popular Tools:

- Microsoft Project
- Primavera P6
- SAP ERP
- Smartsheet

Why Use It?

- Reduces human errors in cost tracking
- Improves financial reporting

Conclusion

- Effective cost control ensures that projects are completed within budget while meeting quality and time objectives.
- Key Techniques:
 - **EVM** (Earned Value Management) for tracking budget vs. actual costs.
 - Forecasting to predict future costs.
 - Change Control System to manage cost-related changes.
 - Resource Optimization to control labor and material costs.
 - Risk Management to plan for financial uncertainties.
 - Automated Tools for accurate cost tracking.

Question: Mention the fundamentals of project cost. How the budget of project is detrmined

Fundamentals of Project Cost

Project cost includes all expenses required to complete a project successfully. The key components include:

- Direct Costs Costs that can be directly attributed to the project, such as labor, materials, equipment, and subcontractors.
- 2. **Indirect Costs** Overhead costs that support the project but are not directly tied to it, like utilities, office space, and administrative expenses.
- 3. **Fixed Costs** Costs that remain constant regardless of project progress, such as rent and salaries of permanent staff.
- Variable Costs Costs that fluctuate based on project needs, such as raw materials and hourly labor wages.
- 5. Contingency Costs Extra funds allocated to handle unforeseen risks or uncertainties.
- 6. Sunk Costs Costs already incurred that cannot be recovered, like research and initial studies.
- 7. **Opportunity Costs** The potential benefits lost when choosing one project over another.

How the Budget of a Project is Determined

Project budgeting is a systematic process that involves the following steps:

- 1. **Defining Project Scope** Clearly outlining objectives, deliverables, and tasks.
- 2. **Estimating Costs** Identifying costs for each component using techniques like:
 - Bottom-Up Estimation Summing up costs from detailed individual tasks.
 - **Top-Down Estimation** Allocating a budget based on overall constraints.
 - Analogous Estimation Using historical data from similar projects.
 - **Parametric Estimation** Applying mathematical models for cost estimation.
- 3. Allocating Resources Distributing costs for labor, materials, and technology.
- 4. **Adding Contingency Reserves** Including buffers for uncertainties and risks.
- 5. **Approving the Budget** Getting approvals from stakeholders and sponsors.
- 6. **Monitoring & Controlling** Regularly tracking expenses against the budget and making adjustments as needed.

Question: Consider a project scheduled to complete within four months with total estimated project cost of 8,00,000 .At the end of 3 months,4,00,000 was spent while work done was of cost 2,00,000 with these information calculate CV,SV,CPI,SPI,EAC,ETC

We can calculate the required project performance metrics using the Earned Value Management (EVM) formulas.

Given Data:

- Planned Duration = 4 months
- Total Estimated Cost (BAC Budget at Completion) = ₹8,00,000
- Time Elapsed = 3 months
- Actual Cost (AC) = ₹4,00,000
- Earned Value (EV) (Work Done) = ₹2,00,000
- Planned Value (PV) (Expected Value by Month 3)
 - Since the project is planned for 4 months, the planned monthly cost is:
 [PV \text{ (per month)} = \frac{BAC}{4} = \frac{8,00,000}{4} = 2,00,000]
 - So, for 3 months:

```
[ PV = 3 \times 2,00,000 = 6,00,000 ]
```

1. Cost Variance (CV)

[CV = EV - AC] [CV = 2,00,000 - 4,00,000 = -2,00,000] **Interpretation**: The project is over budget by ₹2,00,000.

2. Schedule Variance (SV)

[SV = EV - PV] [SV = 2,00,000 - 6,00,000 = -4,00,000] **Interpretation**: The project is behind schedule by ₹4,00,000 worth of work.

3. Cost Performance Index (CPI)

[CPI = $\frac{EV}{AC}$] [CPI = $\frac{2,00,000}{4,00,000}$ = 0.5] **Interpretation**: For every ₹1 spent, only ₹0.50 worth of work is completed. The project is inefficient in terms of cost.

4. Schedule Performance Index (SPI)

[SPI = $\frac{EV}{PV}$] [SPI = $\frac{2,00,000}{6,00,000}$ = 0.33] **Interpretation**: The project is progressing at **33% of the planned rate** and is significantly behind schedule.

5. Estimate at Completion (EAC)

[EAC = $\frac{8,00,000}{0.5} = 16,00,000$] Interpretation: The total estimated project cost will increase to **16,00,000** due to inefficiencies.

6. Estimate to Complete (ETC)

[ETC = EAC - AC] [ETC = 16,00,000 - 4,00,000 = 12,00,000] **Interpretation**: ₹12,00,000 more is required to complete the project.

Summary of Results:

Metric	Formula	Value	Interpretation
Cost Variance (CV)	EV - AC	-2,00,000	Over budget
Schedule Variance (SV)	EV - PV	-4,00,000	Behind schedule
Cost Performance Index (CPI)	EV / AC	0.5	Inefficient cost usage
Schedule Performance Index (SPI)	EV / PV	0.33	Slow progress
Estimate at Completion (EAC)	BAC / CPI	16,00,000	Expected total cost
Estimate to Complete (ETC)	EAC - AC	12,00,000	Additional funds required

This project is in serious trouble, as it is both **over budget and behind schedule**. Immediate corrective actions are needed. Would you like recommendations on how to recover the project?