# ICT Project Management

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# Unit 7: Project Cost Management

Cost Management is the process of defining how the project costs will be estimated, budgeted, managed, monitored, and controlled.

- ✓ Cost management provides guidance and direction on how the project costs will be managed throughout the project.
- ✓ This process is performed once or at predefined points in the project

Project cost management is a process that involves the estimation and allocation of project budget and subsequent costs, as well as project cost control.

- ✓ Project Cost Management is primarily concerned with the cost of the resources needed to complete project activities.
- ✓ Project Cost Management should consider the effect of project decisions on the subsequent recurring cost of using, maintaining, and supporting the product, service, or result of the project.
- ✓ **For example**, limiting the number of design reviews can reduce the cost of the project but could increase the resulting product's operating costs

Project costs involve:

1. **Direct costs** – equipment, materials, project management tasks, engineering tasks, transportation.

2. **Indirect costs** – operating overhead expenses, target annual salary.
3. **Fixed Cost** - any Cost which is fixed throughout the project and does not fluctuate.
4. **Variable Cost** – any cost which changes in proportion to a product or has a high tendency to variate.
5. **Sunk Cost** - Sunk Costs are costs which are already spent, but have failed to generate any business value for the project.

**Total Cost of Project** = FC+VC+DC+IC+SC

## Why Cost Management?

Beneficial to

- ✓ Set clear expectations with stakeholders
- ✓ Control scope creep by leveraging transparencies established with the customer
- ✓ Track progress and respond with corrective action at a quick pace
- ✓ Maintain expected margin, increase ROI, and avoid losing money on the project
- ✓ Generate data to benchmark for future projects and track long-term cost trends

## 7.1. Project Cost Management Process

The Project Cost Management processes are:

1. **Plan Cost Management**: Process of defining how the project costs will be estimated, budgeted, managed, monitored, and controlled.
2. **Estimate Costs:** Process of developing an approximation of the monetary resources needed to complete project work.
3. **Determine Budget:** Process of aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline.
4. **Control Costs:** Process of monitoring the status of the project to update the project costs and manage changes to the cost baseline.

## 7.2 Project Cost Estimation Process

Project cost estimating is a process that can be broken down into five steps:

- ✓ Compile a list of tasks and the resources required to complete them
- ✓ Identify and allocate resources to tasks based on your team's capacity
- ✓ Estimate the task length to create a project schedule
- ✓ Calculate the project cost based on a chosen estimation method
- ✓ Use project cost estimating tools to track budgets in real time

OR, process can be list out as:

1. Define the purpose of the estimate
2. Describe characteristics of the project
3. Develop the plan for the estimate
4. Determine your approach to the estimate
5. Manage date collection
6. Document the estimate
7. Present the estimate to the management / stakeholder.

There are several criteria that you can use to judge how successful a project cost estimation is, including:

1. Accuracy
2. Credibility
3. Documentation
4. Verification
5. Risk identification

## 7.3. Review of Cost Estimation and Its Types

The purpose of an estimate review process is to present information about the project and estimate in a way that allows the reviewer to evaluate that the estimate is of sufficient quality to meet its intended purpose

- ✓ The first review of the estimate should always be conducted by the project team screening review to ensure that the estimate is documented correctly and includes a comprehensive basis of estimating document and that it adheres to all estimating related company established guidelines.
- ✓ Typically the lead estimator should conduct this review with all team members before submitting the estimate for review by the Estimating department manager.

The following **steps** are necessary for any meaningful review:-

**1. Basis of Estimate (BOE)**

- ✓ The comprehensive basis of estimate (BOE) document or document of understanding (DOU) should be reviewed carefully to ensure that it is both correct and complete.
- ✓ The amount indicated on an estimate is meaningless without knowing the parameters, or what is included and not included in the estimate.

The BOE or DOU serves to clearly define the

- Planning basis,
- Design basis,
- Cost basis,
- Execution basis
- Risk basis

**2. Estimating Department Guidelines**

- ✓ A careful review should be done to verify that the cost estimate follows standard estimating guidelines for the department.
- ✓ This would include a review to verify that standard estimating procedures were followed regarding estimate format, cost coding, presentation, and documentation.
- ✓ This would include items such as the following.
  - ♦ Verify that the proper estimating methods, techniques, and procedures have used that match the class of project completeness.
  - ♦ Confirm that the estimate summary and details are organized and presented in the properly established format.
  - ♦ Ensure that all estimate backup information is organized properly.
  - ♦ Verify that all allowances and factors being prepared are consistent with comparable projects and estimates.

This level of estimate review helps to ensure that all estimates prepared by the department are using established guidelines, and are presented in a consistent manner from project to project.

**3.** Engineering / Design Review

**4**. Project Manager / Project Team review

**5**. Cost Review

**6**. Management Review

## 7.4. Planning Cost Management

- ✓ Plan Cost Management is the process of defining how the project costs will be estimated, budgeted, managed, monitored, and controlled.
- ✓ Plan cost management provides guidance and direction on how the project costs will be managed throughout the project.
- ✓ This process is performed once or at predefined points in the project.
- ✓ The cost management planning effort occurs early in project planning and sets the framework for each of the cost management processes so that performance of the processes will be efficient and coordinated.
- ✓ The cost management processes and their associated tools and techniques are documented in the cost management plan.
- ✓ The cost management plan is a component of the project management plan

**Input Tools & Techniques and Output of the process: Plan Cost Management**

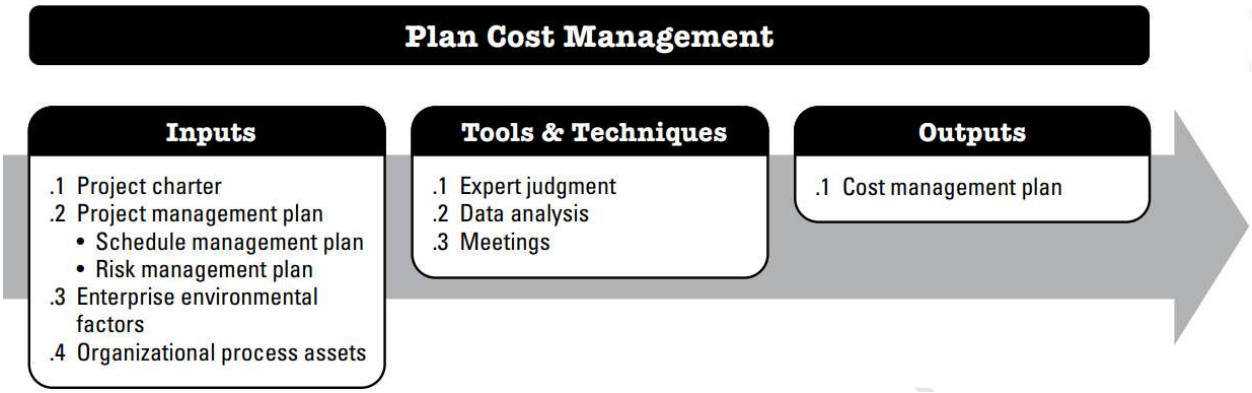


**Figure:** Inputs, Tools & Techniques and Output of the process: Plan Cost Management

# 7.5. Estimating Cost

- ✓ Estimate Costs is the process of developing an approximation of the cost of resources needed to complete project work.
- ✓ This process determines the monetary resources required for the project.
- ✓ This process is performed periodically throughout the project as needed.

A cost estimate is a quantitative assessment of the likely costs for resources required to complete the activity.

- ✓ It is a prediction that is based on the information known at a given point in time.
- ✓ Cost estimates include the identification and consideration of costing alternatives to initiate and complete the project.
- ✓ Cost trade-offs and risks should be considered, such as make versus buy, buy versus lease, and the sharing of resources in order to achieve optimal costs for the project.
- ✓ Cost estimates are generally expressed in units of some currency (i.e., dollars, euros, yen, etc.), although in some instances other units of measure, such as staff hours or staff days, are used to facilitate comparisons by eliminating the effects of currency fluctuations.
- ✓ Cost estimates should be reviewed and refined during the course of the project to reflect additional detail as it becomes available and assumptions are tested.
- ✓ The accuracy of a project estimate will increase as the project progresses through the project life cycle.
- ✓ Costs are estimated for all resources that will be charged to the project. This includes but is not limited to labor, materials, equipment, services, and facilities, as well as special categories such as an inflation allowance, cost of financing, or contingency costs.

There are different techniques of cost estimation:

1. **Expert Judgment**

   - ✓ Expert judgment implies consulting with experienced cost estimators or specialists.
   - ✓ When predicting costs by using this technique, you rely on experts' knowledge of the project's contents and the general business environment. In return, you get meaningful, evidence-based assumptions and explanations of relational patterns between relevant cost variables.

2. **Delphi Method**

   - ✓ The Delphi method is an interactive forecasting technique carried out by a group of experts.
   - ✓ During a series of meetings, each member of the expert panel provides their cost forecasts in the questionnaire format.
   - ✓ The answers are then analyzed and anonymously announced to others by a facilitator.

- ✓ This activity is repeated for two or more rounds to provide experts with an opportunity to adjust their forecasts each time until the ultimate goal of the Delphi method – consensus on a final cost estimate – is attained.

### 3. Analogous Estimation

- ✓ Analogous project cost estimation is the calculation of a new project's costs by contrasting the knowledge of its contents and features with data obtained when administering a similar project in the past.
- ✓ This technique involves 3 key steps:
    - ♦ Determine a new project's attributes,
    - ♦ Locate any previous project with similar characteristics and retrieve all the information about its costs and financial performance,
    - ♦ Develop original cost estimates based on the acquired historical data.

### 4. Parametric Estimation

- ✓ By using parametric estimation, the total project cost is calculated based on the number and price of the project's sub-components.
- ✓ Also known as work units.
- ✓ The project cost estimation process includes just 3 core steps:
    - ♦ Identify relevant project units (i.e., number of peanut butter jars to be produced, square feet of pavement to be laid, lecture hours to be delivered, etc.)
    - ♦ Estimate the cost of every unit by summing up the price of materials, labor, etc.;
    - ♦ Estimation Formulae: *Number of Work Units* × *Cost of a Single Unit*
    - ♦ To define the cost of a single unit before administering the project, you may refer to historical data taken from previous projects or industry examples.

### 5. 3-point Estimation

- ✓ To calculate a probable project cost with the 3-point estimating technique, one needs to create 3 types of estimates:
    - ♦ **optimistic estimate** – ideal case
    - ♦ A **pessimistic estimate** – worse case,
    - ♦ **Most Likely estimate-** best-guess estimate.
- ✓ Use PERT formula: (O+4M+P) / 6 for beta distribution (weighted average)
- ✓ Use formula : (O+M+P)/3 for triangular distribution (normal average)

6. **Bottom-up Estimation**

- ✓ The bottom-up approach starts the cost calculation process with the identification and evaluation of separate project components.
- ✓ The expenditures for every individual project task or a series of tasks are then summed up to arrive at the total project cost.
- ✓ The bottom-up estimation technique can be very accurate in case a thorough and complete work breakdown structure is applied.

**7. Reserve Analysis**

- ✓ Reserve analysis focuses on factors of cost uncertainty and is primarily concerned with avoiding risks that may lead to cost overruns.
- ✓ reserve analysis is used to monitor the status of contingency and management reserves for the project to determine if these reserves are still needed or if additional reserves need to be requested
- ✓ The purpose of this method is to determine the size of two types of backup sums:
    - ♦ **Contingency reserve** – the amount of money allocated for mitigation of various expected project risks (e.g., delays in supply, increased staff turnover, technological holdbacks, etc.)
    - ♦ **Management reserve** – the amount of money that could be utilized to tackle the outcomes of unidentified risks.

**8. Cost of Quality Analysis (CoQ)**

- ✓ The purpose of the cost of quality (CoQ) analysis is to figure out how much money is needed to meet the preset project quality standards.
- ✓ The CoQ calculation process comprises the following phases:
    - ♦ Define project quality requirements and standards
    - ♦ Identify the **cost of good quality (CoGQ)**: cost of activities needed to prevent quality failures + costs of quality appraisal activities
    - ♦ Identify the **cost of poor quality (CoPQ)**: expenses the project may incur as a result of internal quality failures (e.g., product re-design, waste of time and material resources, etc.) + expenses the project may incur as a result of external quality failures (e.g., customer complaints, shipping errors and damages, etc.)
- ✓ Calculate the **total CoQ** with this simple formula: *CoGQ + CoPQ*

**Inputs, Tools and Techniques and Outputs of the process: Cost Estimation**

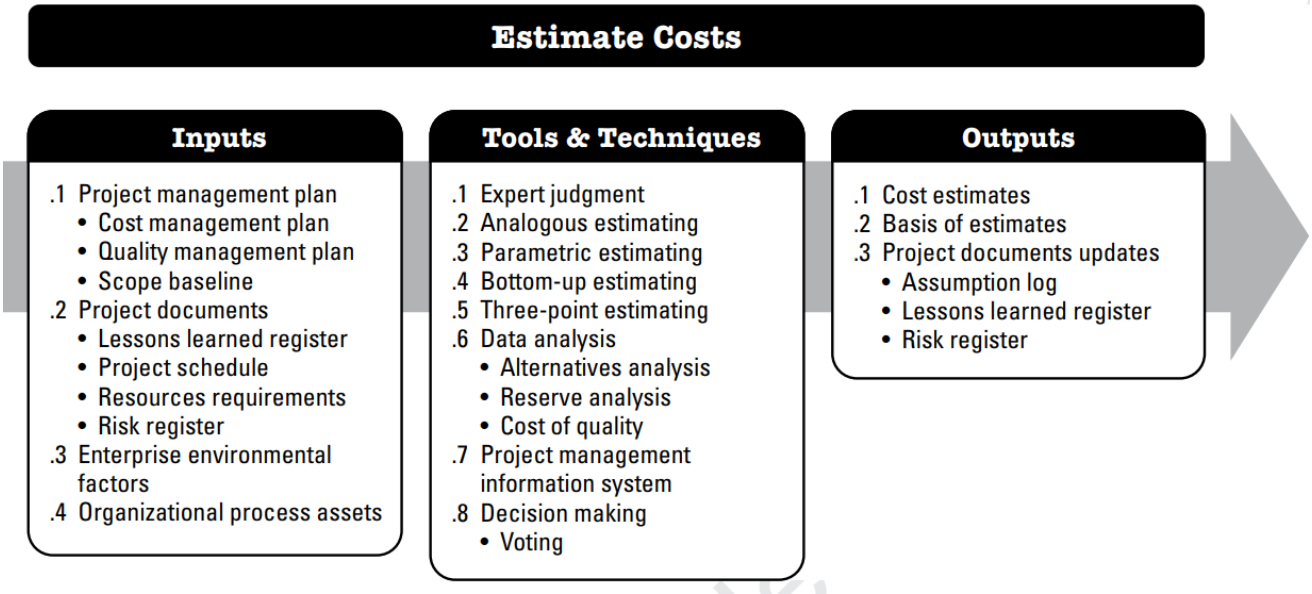


**Figure:** Inputs, Tools and Techniques and Outputs of the process: Cost Estimation

## 7.6. Determining Budget

Determine Budget is the process of aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline.

- ✓ This process determines the cost baseline against which project performance can be monitored and controlled.
- ✓ This process is performed once or at predefined points in the project.

A project **budget** includes all the **funds authorized to execute the project**. The **cost baseline** is the **approved version of the time-phased project budget** that includes contingency reserves, but excludes management reserves.

- ✓ Once the individual tasks have been estimated, the Determine Budget process is used to roll them up into an overall project estimate, which is communicated to stakeholders.
- ✓ In addition, the cost baseline, which is the periodic funding requirements of the project over time, are determined and approved by the funding authorities.
- ✓ The individual task estimates are rolled into control accounts which track the actual expenses during the project.

**Components of Project Budget:**

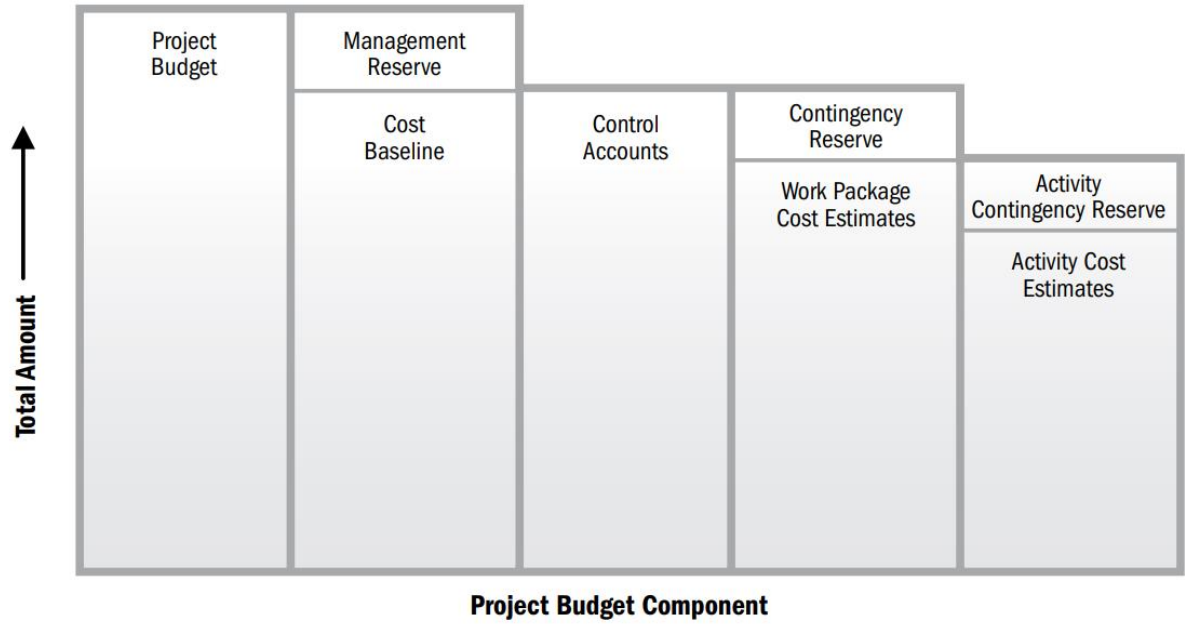


**Figure:** Components of Budget

**Inputs, Tools and Techniques and Output of the process: Determining Budget**

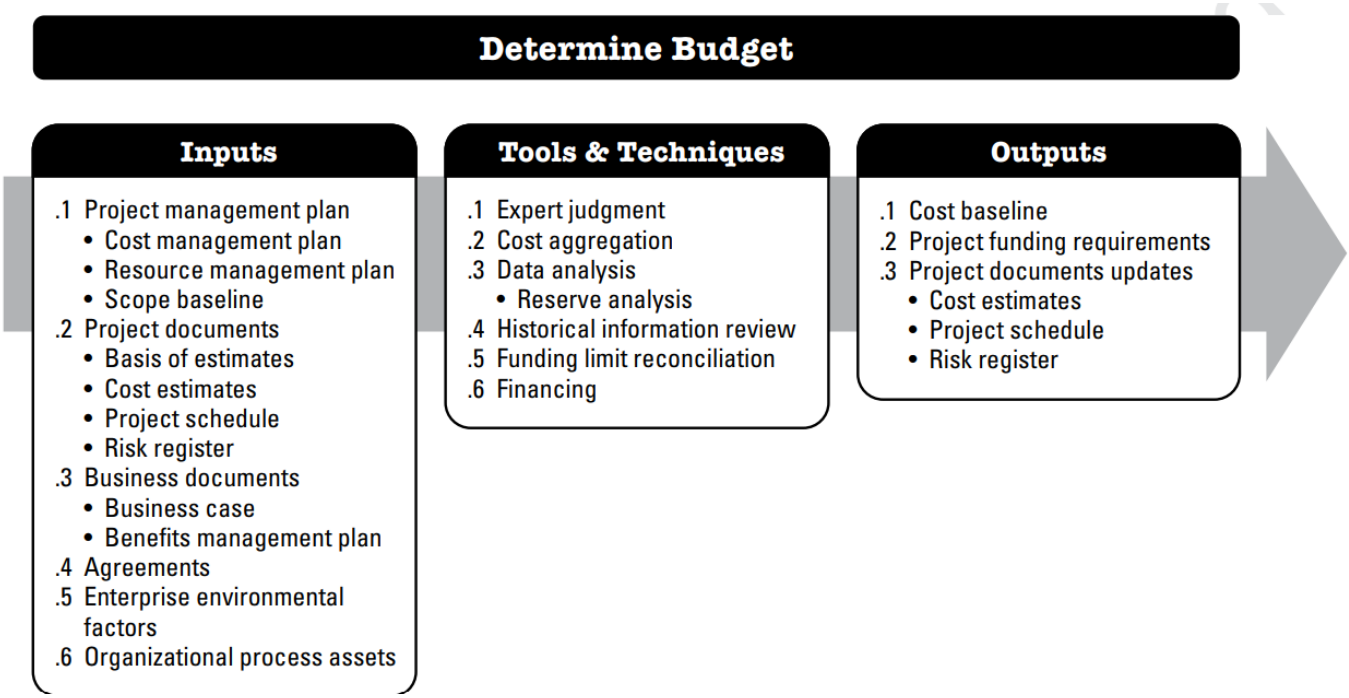


**Figure:** Inputs, Tools and Techniques and Output of the process: Determining Budget

## 7.7. Cost Control and Its Measure

- ✓ Control Costs is the process of monitoring the status of the project to update the project costs and managing changes to the cost baseline.
- ✓ This process is performed throughout the project.
- ✓ The key to effective cost control is the management of the approved cost baseline

Project cost control includes:

- ✓ Influencing the factors that create changes to the authorized cost baseline
- ✓ Ensuring that all change requests are acted on in a timely manner
- ✓ Managing the actual changes when and as they occur
- ✓ Ensuring that cost expenditures do not exceed the authorized funding by period, by WBS component, by activity, and in total for the project
- ✓ Monitoring cost performance to isolate and understand variances from the approved cost baseline
- ✓ Monitoring work performance against funds expended
- ✓ Preventing unapproved changes from being included in the reported cost or resource usage
- ✓ Informing appropriate stakeholders of all approved changes and associated cost
- ✓ Bringing expected cost overruns within the acceptable limits.

**Cost control factors:**

**Employment costs**: Sum of the wages paid to its work team, including staff development, training, and creating an appropriate working environment.

**Material costs:** Total cost of all tools and equipment required for the project. This includes requested material before, during and once the project is completed.

**Actual cost**: Total expenditure incurred by a project from the start to the end. This includes the cost of labor and expenses related to the project.

**Cost difference**: Any price difference between the actual cost of the project and the budget identified.

**Return on investment (ROI):** Project's profitability, compared to the amount invested.

**There are a variety of cost control strategies**

- ✓ Conduct a review and cost analysis to identify potential areas for cost savings.
- ✓ Determine the most efficient methods of performing tasks or producing products.
- ✓ Use of new technology or processes to increase efficiency and accuracy.
- ✓ Coordination with suppliers and partners to reduce costs and improve quality-quantity relationships.

**Inputs, Tools and Techniques and Outputs of the process: Cost Control**

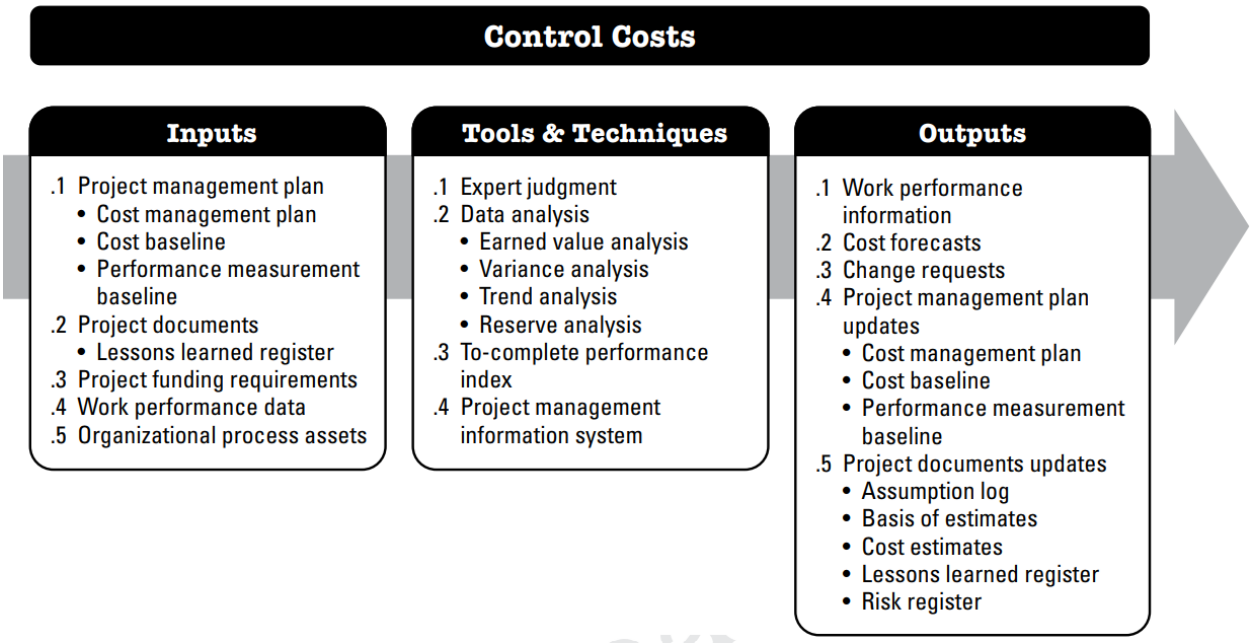


**Figure:** Inputs, Tools and Techniques and Outputs of the process: Cost Control

**Cost Forecasting** involves making projections of conditions and events in the project's future based on current performance information and other knowledge available at the time of the forecast.

## 7.8. Earned Value Analysis (EVA)

- ✓ Earn Value Analysis is data analysis techniques that can be used to control costs.
- ✓ Earned value analysis compares the performance measurement baseline to the actual schedule and cost performance.
- ✓ EVM integrates the scope baseline with the cost baseline and schedule baseline to form the performance measurement baseline.

EVM develops and monitors **three key dimensions** for each work package and control account:

1. **Planned Value (PV)**
   - ✓ Planned value (PV) is the authorized budget assigned to scheduled work.
   - ✓ It is the authorized budget planned for the work to be accomplished for an activity or work breakdown structure (WBS) component, not including management reserve.
   - ✓ Total of the PV is sometimes referred to as the performance measurement baseline (PMB).
   - ✓ The total planned value for the project is also known as budget at completion (BAC)

2. **Earned Value(EV)**
   - ✓ Earned value (EV) is a measure of work performed expressed in terms of the budget authorized for that work.
   - ✓ It is the budget associated with the authorized work that has been completed
   - ✓ EV measured cannot be greater than the authorized PV budget for a component.
   - ✓ The EV is often used to calculate the percent complete of a project
   - ✓ EV = sum of the planned value of completed work
3. **Actual Cost (AC)**
   - ✓ Actual cost (AC) is the realized cost incurred for the work performed on an activity during a specific time period.
   - ✓ The actual cost of all the work completed to a point in time, usually the data date.

**Budget on Completion (BAC):** The sum of all budgets established for the work to be performed

**Estimate at Completion (EAC):** BAC/CPI

**Estimate to Complete (ETC):** EAC – AC

## Cost Variance (CV)

- ✓ The amount of budget deficit or surplus at a given point in time, expressed as the difference between the earned value and the actual cost.
- ✓ The difference between the values of work completed to a point in time, usually the data date, and the actual costs to the same point in time.
- ✓ CV = EV – AC
- ✓ When CV is :
  - Positive = Under planned cost
  - Neutral = On planned cost
  - Negative = Over planned cost

## Schedule Variance (SV)

- ✓ The amount by which the project is ahead or behind the planned delivery date, at a given point in time, expressed as the difference between the earned value and the planned value.
- ✓ The difference between the work completed to a point in time, usually the data date, and the work planned to be completed to the same point in time
- ✓ SV = EV – PV
- ✓ When SV is:
  - Positive = Ahead of Schedule
  - Neutral = On schedule
  - Negative = Behind Schedule

## Cost Performance Index (CPI)

- ✓ A measure of the cost efficiency of budgeted resources expressed as the ratio of earned value to actual cost.
- ✓ A CPI of 1.0 means the project is exactly on budget that the work actually done so far is exactly the same as the cost so far. Other values show the percentage of how much costs are over or under the budgeted amount for work accomplished.
- ✓ CPI = EV/AC
- ✓ When CPI is:
  - Greater than 1.0 = Under planned cost
  - Exactly 1.0 = On planned cost
  - Less than 1.0 = Over planned cost

## Schedule Performance Index (SPI)

- ✓ A measure of schedule efficiency expressed as the ratio of earned value to planned value.
- ✓ An SPI of 1.0 means that the project is exactly on schedule, that the work actually done so far is exactly the same as the work planned to be done so far. Other values show the percentage of how much costs are over or under the budgeted amount for work planned.
- ✓ SPI = EV/PV
- ✓ When SPI is:
  - Greater than 1.0 = Ahead of schedule
  - Exactly 1.0 = On schedule
  - Less than 1.0 = Behind schedule

## To Complete Performance Index (TCPI)

- ✓ A measure of the cost performance that must be achieved with the remaining resources in order to meet a specified management goal, expressed as the ratio of the cost to finish the outstanding work to the budget available.
- ✓ The efficiency that must be maintained in order to complete on plan.
- ✓ TCPI = (BAC– EV)/(BAC – AC)
  - Greater than 1.0 = Harder to complete
  - Exactly 1.0 = Same to complete
  - Less than 1.0 = Easier to complete
- ✓ The efficiency that must be maintained in order to complete the current EAC (Estimate at Completion)
- ✓ TCPI = (BAC – EV)/(EAC –AC)
  - Greater than 1.0 = Harder to complete
  - Exactly 1.0 = Same to complete
  - Less than 1.0 = Easier to complete

**End of Unit-7**