# Project Management Techniques: Overview


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# Learning Objectives

By the end of this lesson, you will be able to:

- Explain Work Breakdown Structure
- Explain Gantt charts and network diagrams
- Describe Critical Path method
- Define Earned Value Management
- Identify different categories of risk
- Explain the different types of contract

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# Project Selection Techniques

An organization can undertake a project as a contract or driven by business needs. There should be a formal process for selecting projects to ensure that the limited corporate resources are optimized.

**The two broad project selection methods are as follows:**

- Benefit measurement methods
- Constrained optimization methods

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# Project Selection Techniques

## Benefit measurement methods

These methods ascertain the costs and benefits of undertaking the project.

Examples of benefits measurement methods :

- Murder board
- Peer review
- Scoring models
- Economic models
- Benefit compared to cost

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# Project Selection Techniques

## Constrained optimization methods

These methods rely on mathematical modeling techniques to determine the selection of the best projects to achieve certain business objectives.

Example of constrained optimization methods:

- Linear programming

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# Project Selection Techniques

Q What type of project selection technique is peer review?

A Peer review is a type of benefit measurement method.

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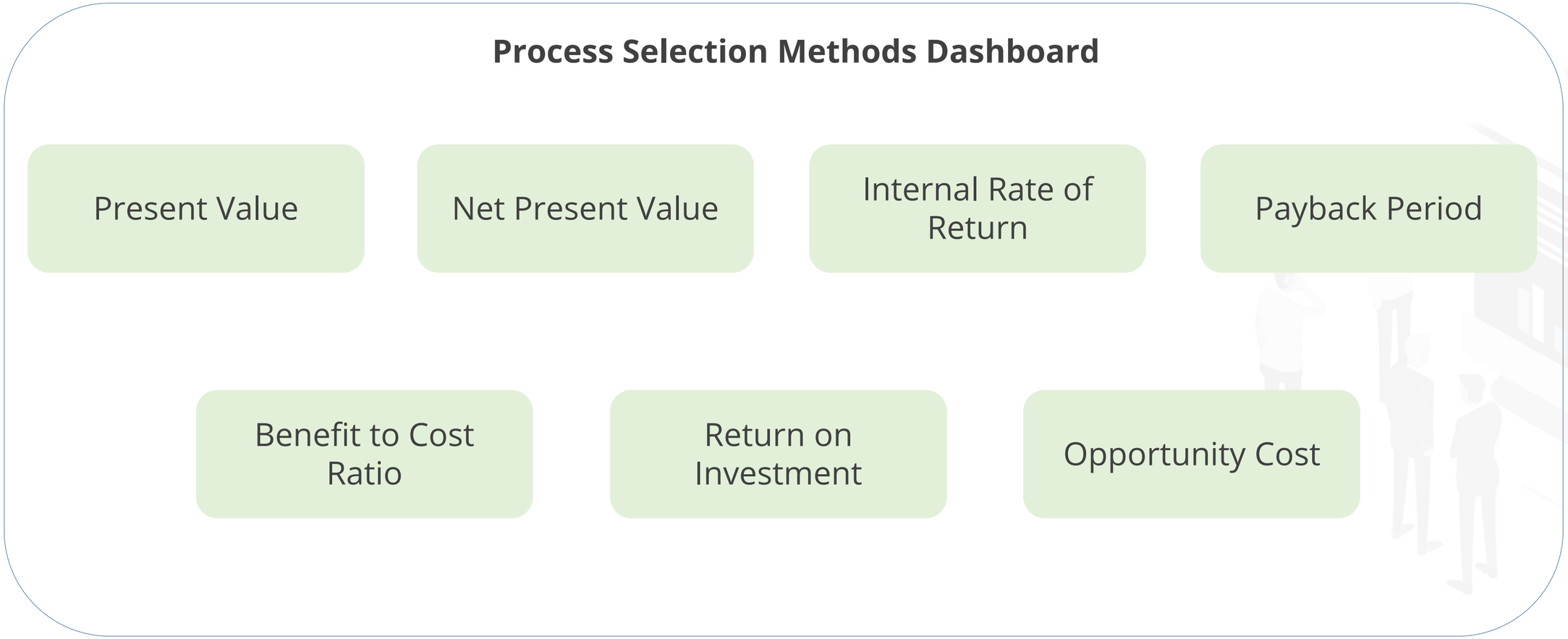
# Project Selection Techniques

Organizations have to consider various parameters while making project selection decisions.

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# Work Breakdown Structure

Work Breakdown Structure reflects the scope baseline of the entire project. Deliverables not incorporated in WBS will not be a part of the project

WBS is prepared with the team's buy-in.

During decomposition, each level should be complete; it should include all the work in the project before decomposing further.

Decomposition should be done until the lowest work unit cannot be logically sub-divided further (and/or it can be estimated with reasonably accurately).

WBS is a deliverable-oriented decomposition and should contain only deliverables and not activities.

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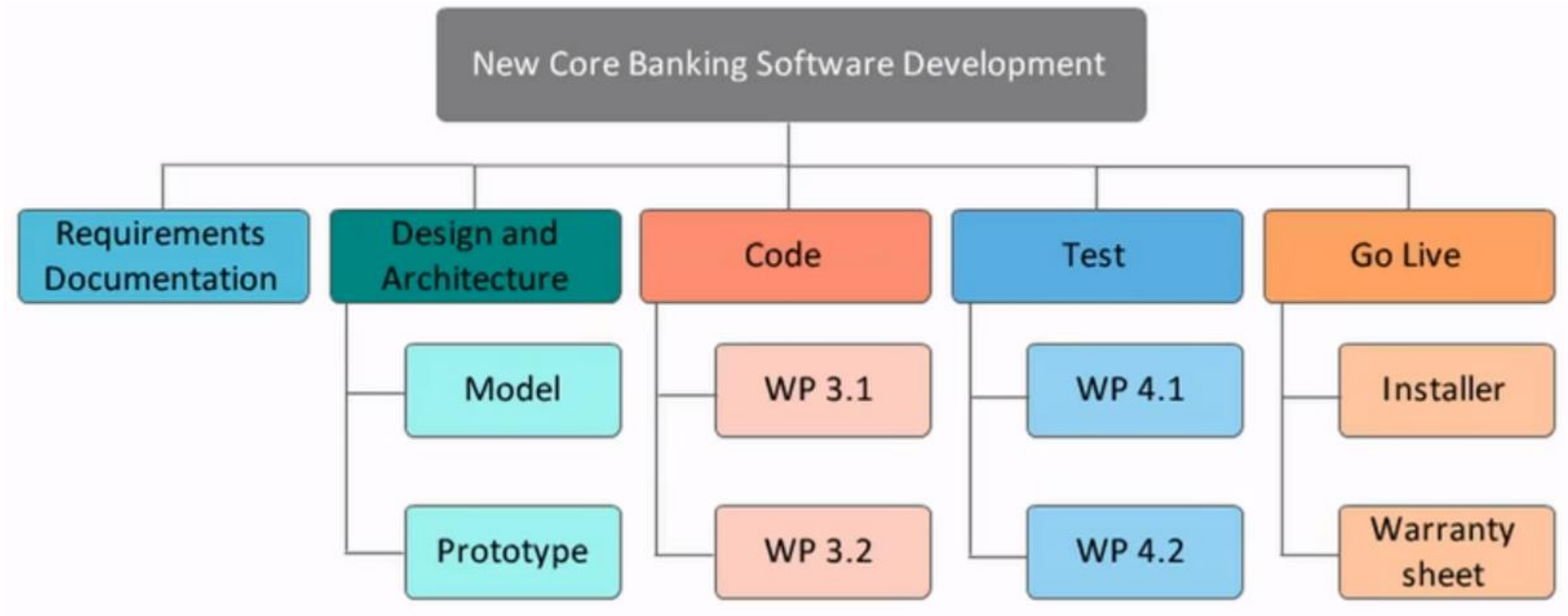
# Work Breakdown Structure: Example

Given below is the Work Breakdown Structure of a Core Banking Software Development project:

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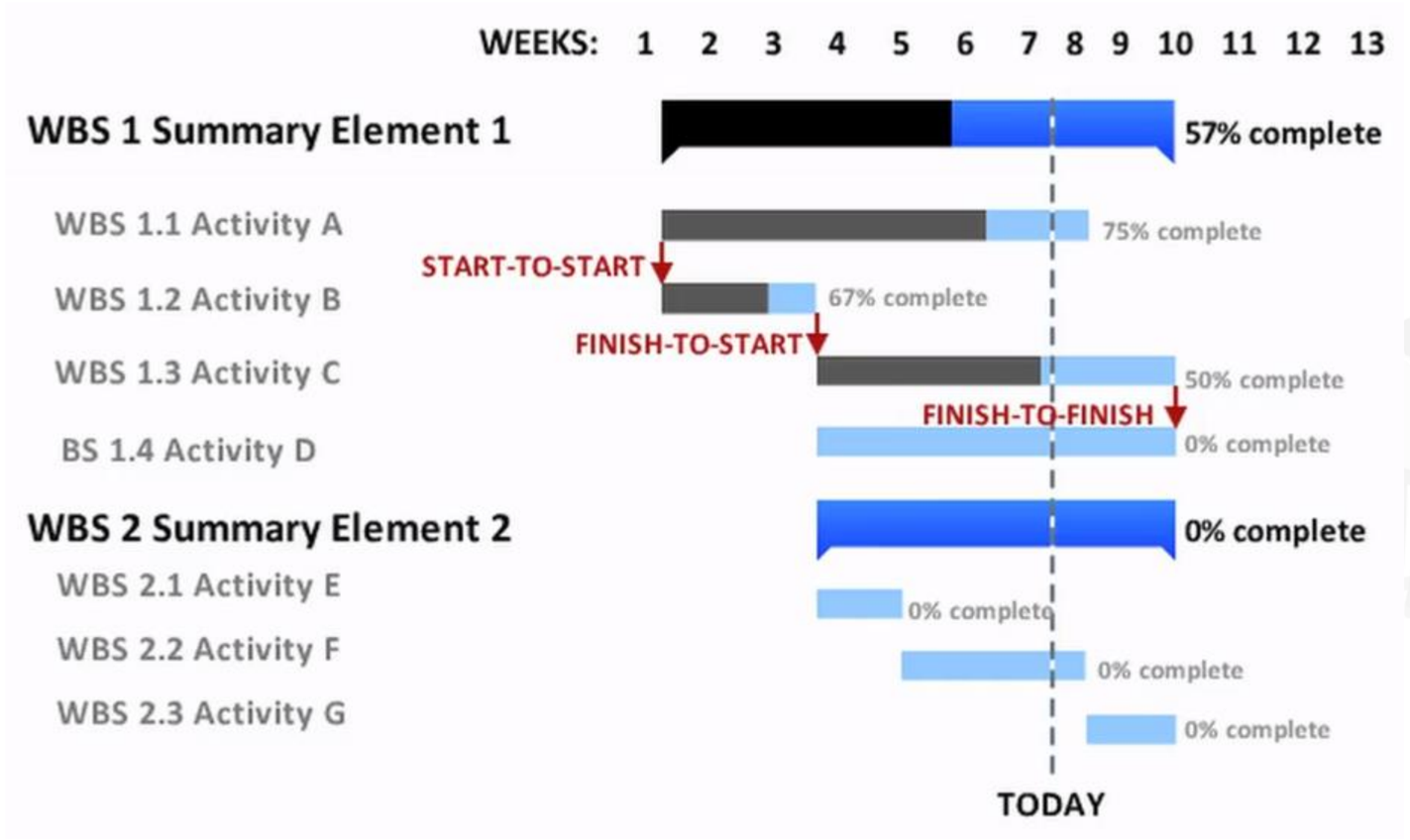
# Gantt Chart

Gantt chart is a type of bar chart that displays the start and end dates for project activities and the overall project schedule. They can also show logical task relationships and indicate the task completion as percent.

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# Gantt Chart: Relationships

Project activities are related to each other.

The relationships among project activities can be classified as follows:

**Finish to start**

An activity must finish before the next activity can start.

- Start to Start
- Finish to Finish
- Start to Finish


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# Gantt Chart: Relationships

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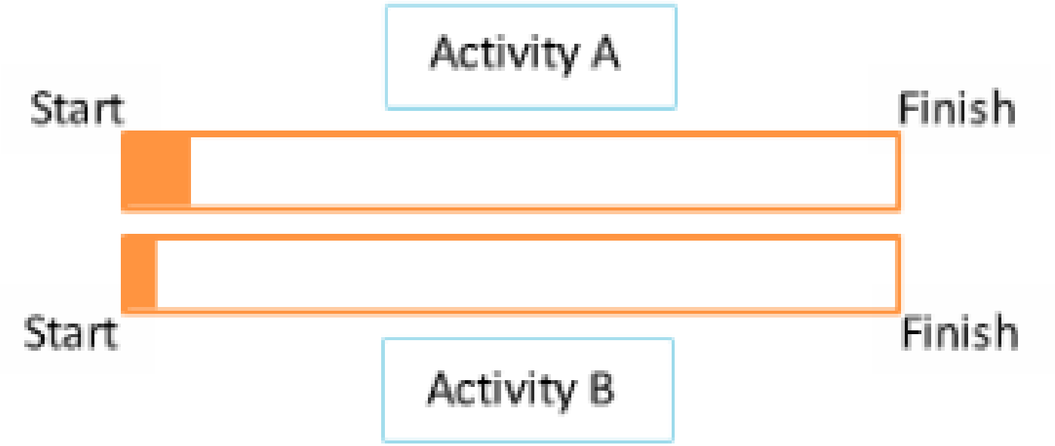


Finish to Finish

Start to Finish

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# Gantt Chart: Relationships

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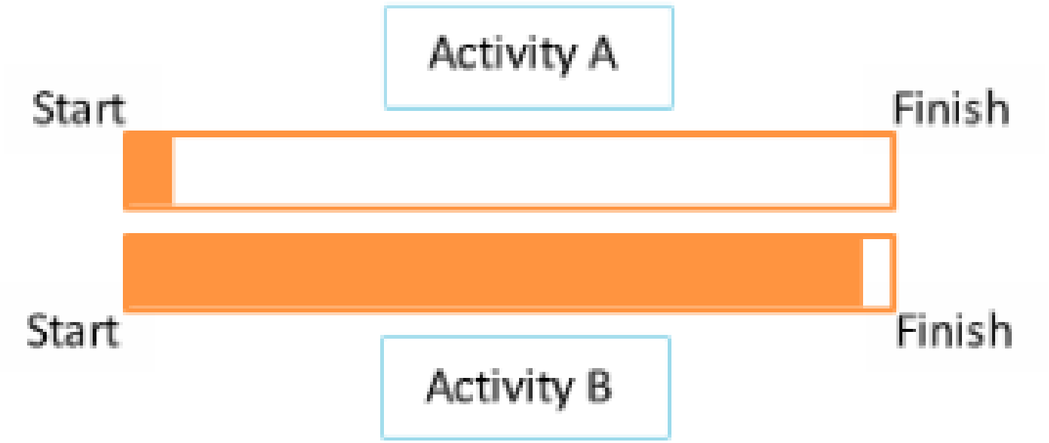


**Finish to Finish**

**Start to Finish**

! Finish to Start is the most commonly used relationship type and Start to Finish is the least used.

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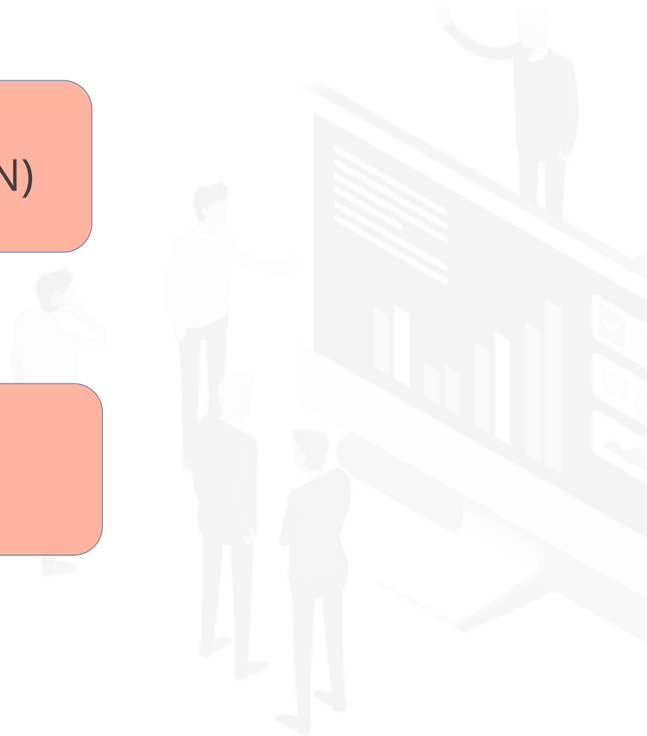
# Network Diagram

Network diagram is used to plot the activity dependencies. Project activities are represented in the form of a network. Network diagrams can be drawn in one of the following two ways:

Precedence Diagramming Model (PDM) or Activity on Node (AON)

Arrow Diagramming Model (ADM) or Activity on Arrow (AOA)



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# Network Diagram

**Precedence Diagramming Model (PDM) or Activity on Node (AON)**

In precedence diagramming model:

- boxes represent activities
- arrows indicate dependencies and
- relationships can be of four types:
  - Finish to Start
  - Start to Start
  - Finish to Finish
  - Start to Finish



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# Network Diagram

## Arrow Diagramming Model (ADM) or Activity on Arrow (AOA)

In arrow diagramming model:

- arrows are used to represent activities
- direction of the arrows indicate the relationships and sequence
- only Finish to Start relationships can be shown and
- dummy activities may be required to show a dependency

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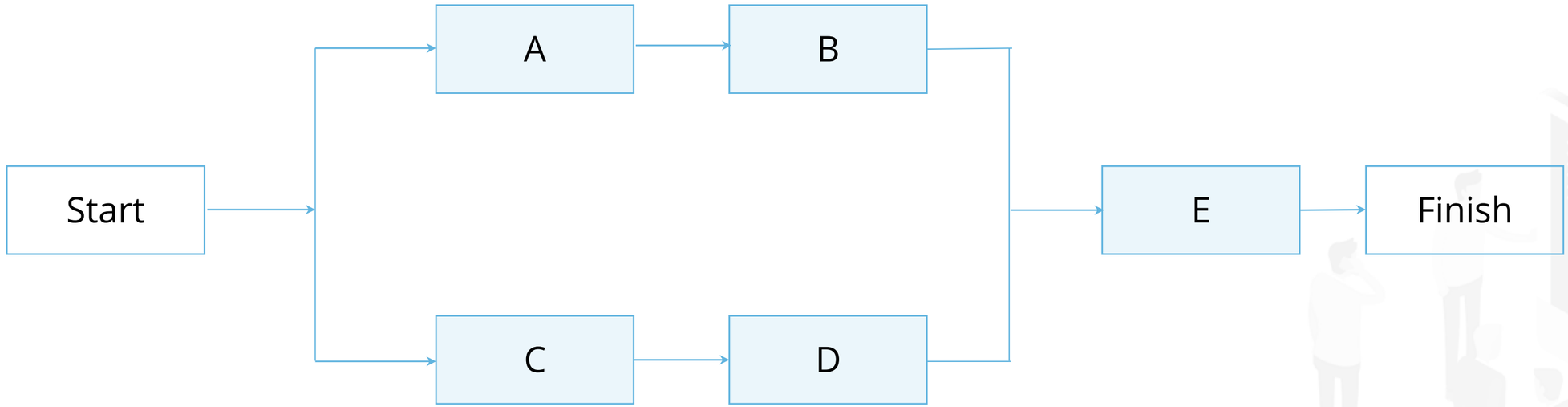
# Network Diagram: Example

Given below is an Activity On Node network diagram:




Hammock activities are used to show a comprehensive summary activity, which can be used for control and reporting purposes.

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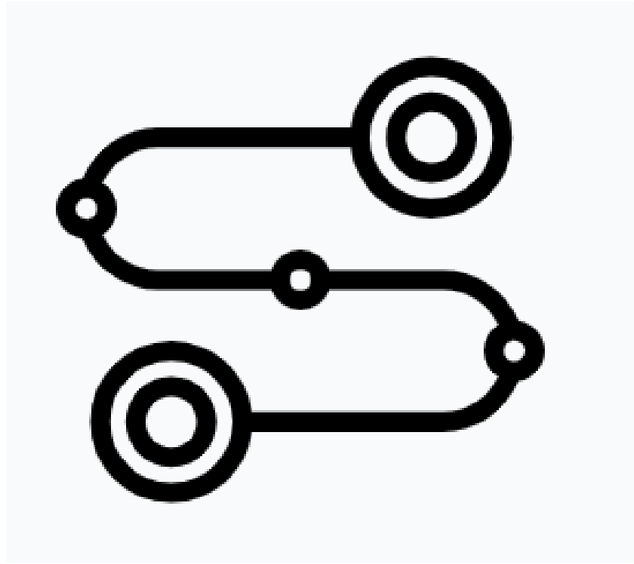
# Critical Path Method

Critical Path is the longest duration path through a network diagram, which determines the shortest time to complete the project.



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# Float

Float, also called slack is calculated in a network diagram. The three types of float are as follows:

| Total Float (Slack) | Free Float (Slack) | Independent Float (Slack) |
| --- | --- | --- |
| The amount of time that a schedule activity can be delayed or extended from its early start date without delaying the project finish date or violating a schedule constraint. | The amount of time that a schedule activity can be delayed without delaying the early start date of any immediate successor or violating a schedule constraint. | The amount of time that a schedule activity can be delayed if all the immediate predecessors finish at their latest finish dates and all the immediate successors are to be started on the earlier start dates. |

! The slack of activities on the Critical Path is zero (0) as the activities on Critical Path cannot be delayed.

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# Program Evaluation and Review Technique

Program Evaluation and Review Technique (PERT) uses three-point estimates for an activity.

| | | |
|---|---|---|
| **Pessimistic** (P) estimate refers to the duration an activity would take in the worst case scenario. | **Most likely (**M) estimate refers to the duration an activity would take in a realistic scenario. | **Optimistic** (O) estimate represents the duration an activity would take in the best case scenario. |

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# Program Evaluation and Review Technique

Given below are the key formulae used in PERT:

| | |
|---|---|
| To calculate the expected duration of the estimate, based on the three estimates | (μ) = (P+4M+O)/6 |
| To calculate the standard deviation of an activity | (σ) = (P-O)/6 |
| To calculate the variance of the activity | σ ^ 2 |

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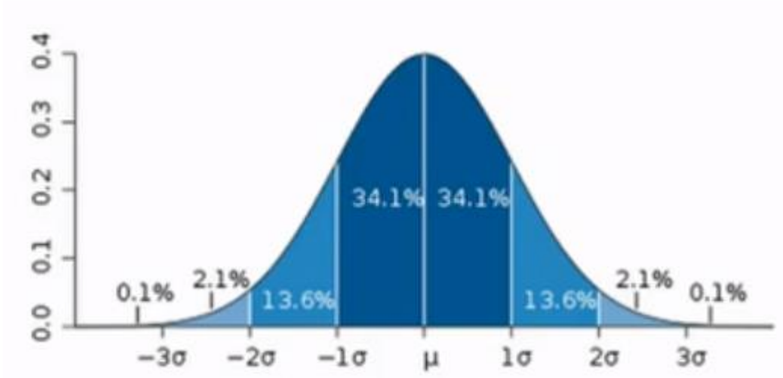
# PERT: Example

The values of expected deviation and standard deviation can be applied to derive useful information about the likely range for values.

**Given:**
O = 20; P = 70; M = 30

Now, μ = (70 + 30 * 4 + 20)/6 = 35
And σ = (70 – 20)/6 = 8 (approx.)

**Using the normal curve**:
Likelihood of actual time lying between:
1 σ; 27 and 43 is 68.2%
2 σ; 19 and 51 is 95.4%
3 σ; 11 and 59 is 99.7%




**Six Sigma:**
Six Sigma is reaching a level of confidence where 3.4 times out of a million would fall outside the stated range.

!

PERT allows to plan based on the intended level of confidence in the outcome and determine buffers accordingly.

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# Earned Value Management

Earned Value Management (EVM) is a method to measure project performance against the project baselines. It results from an earned value analysis indicating potential deviation of the project from the cost and/or schedule baselines.

| Acronym | Term | Explanation |
|---|---|---|
| PV | Planned Value | Authorized budget assigned to scheduled work |
| EV | Earned Value | Work performed in terms of budget authorized for that work |
| AC | Actual Cost | Actual cost incurred in work performed |
| BAC | Budget at Completion | Budgeted amount for the total work |
| EAC | Estimate at Completion | Expected total cost for the project |
| ETC | Estimate to Complete | Expected cost to finish all the remaining project work |
| VAC | Variance at Completion | Projected budget surplus or deficit at the end of the project |

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# Quality Planning vs. Quality Assurance vs. Quality Control

The differences between quality planning, quality assurance and quality control are as follows:

| Basis of Comparison | Scope | Activities | Focus Area |
|---|---|---|---|
| **Quality Planning** | Determines a plan for quality defining the standards, templates, policies, and procedures. | Involves preparation of the quality management plan. | Focuses on Information on the level of quality and the methods of achieving it. |
| **Quality Assurance** | Determines if the project is complying with the organizational (as well as project) policies and procedures. | Involves conducting regular process audits to identify deviations from the quality plan and undertake corrective and preventive actions. | Focuses on process and not products. |
| **Quality Control** | Measures specific project results (product) against standards. | Involves inspecting and verifying the project's product, defect repair, and measuring whether the quality indicators are improving. | Focuses on product and data. |

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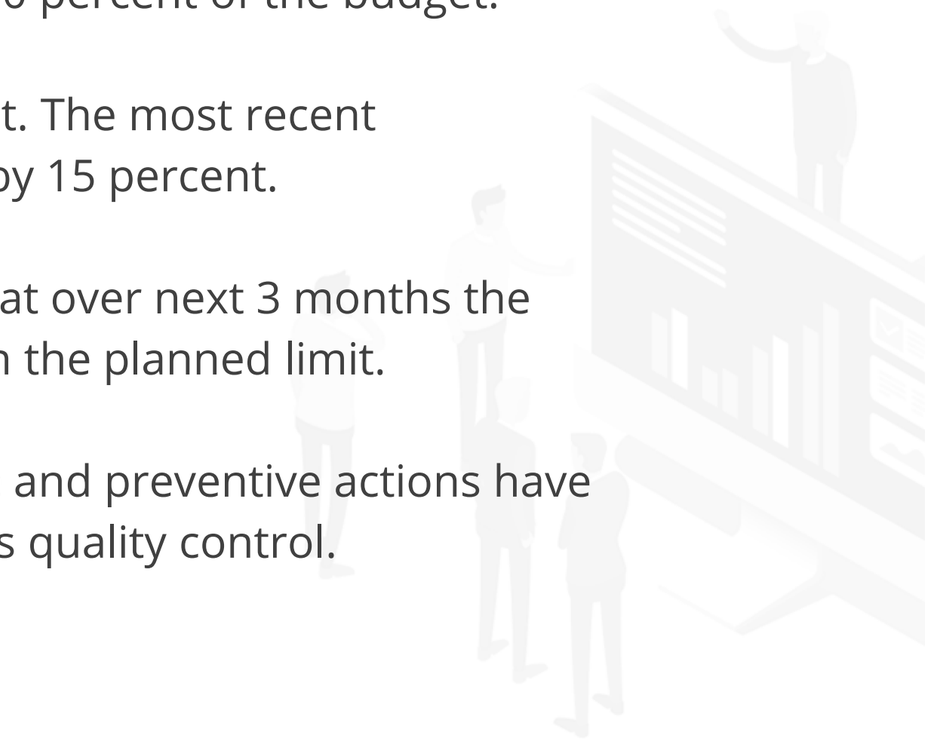
# Quality Planning vs. Quality Assurance vs. Quality Control

**Example:**

- A project was planned to be completed within plus or minus 10 percent of the budget.
- Three months back, the project was over budget by 20 percent. The most recent measurement done one day back shows the budget overrun by 15 percent.
- Since there is an improvement of 5 percent, it is quite likely that over next 3 months the cost would reduce, and the project could get completed within the planned limit.
- If the cost does not decrease, but increases further, corrective and preventive actions have to be taken to bring the project within the agreed limits. This is quality control.



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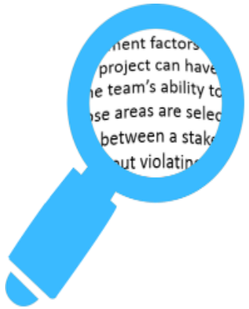
# Quality Management Concepts

**Following concepts are often used in quality management:**

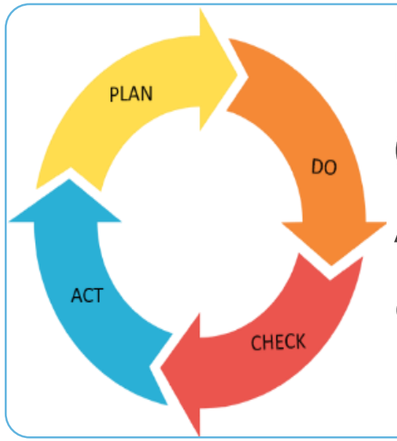


**Total Quality Management (TQM)**

An integrated management philosophy around quality and continuous improvement.

**Kaizen (change for better)**

A philosophy that looks for small and continuous improvements in the process.




**Deming Cycle**

**( Plan – Do – Check – Act)**

A framework for process control and improvement.

**Kanban**

A pull-based inventory management system based on the principle of just-in-time (JIT).

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# Responsibility Assignment Matrix and RACI

Responsibility Assignment Matrix (RAM) is used to define project responsibilities among the project team. RACI charts are a form of RAM. RACI stands for:

- Responsible
- Accountable
- Consulted
- Informed

For every project deliverable, RACI charts identify who is responsible, accountable, consulted, and needs to be informed.

| Activity | John | Kris | Sally | Ting |
|---|---|---|---|---|
| Project Plan | A | R | R | R |
| Configuration Management | C | A | R | R |
| Test Plan | C | R | A | R |
| Design | C | I | R | A |
| Team Budget | C | A | R | R |
| Customer Liaison | A | C | R | I |
| Team Building | R | R | A | C |

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# Risk Categorization

Risks can be classified in various ways. One classification of risk is as follows:

| | |
|---|---|
| External Risks | Arise out of external factors. For example, regulatory, governmental policies, Subcontractors, suppliers, and environmental |
| Internal Risks | Arise within the project. For example, funding, resources, and prioritization |
| Technical Risks | Arise out of the technology being used. For example, requirements, technology, quality |
| Project Management Risks | Arise out of project management activities. E.g., estimating, planning, schedule, and communication |

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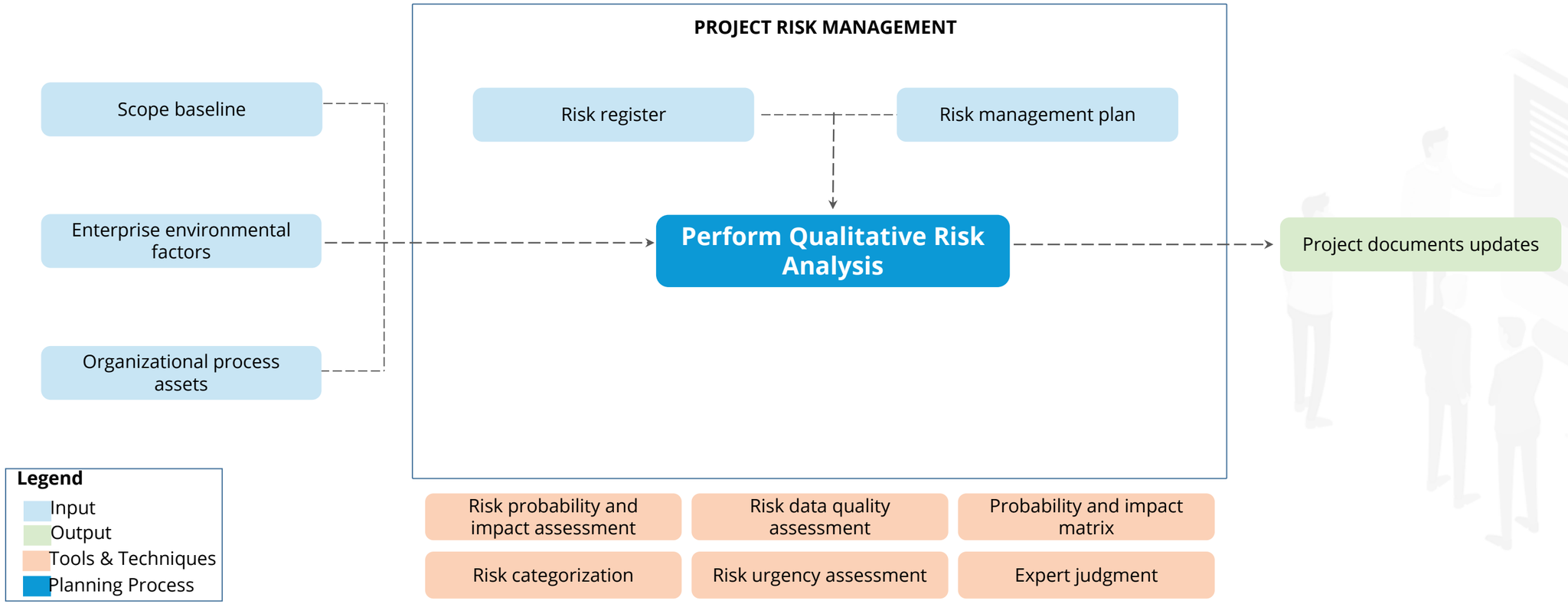
# Perform Qualitative Risk Analysis

Perform Qualitative Risk Analysis is the process of prioritizing risks for further analysis or action by assessing their probability of occurrence and impact. This process belongs to the Planning Process Group.

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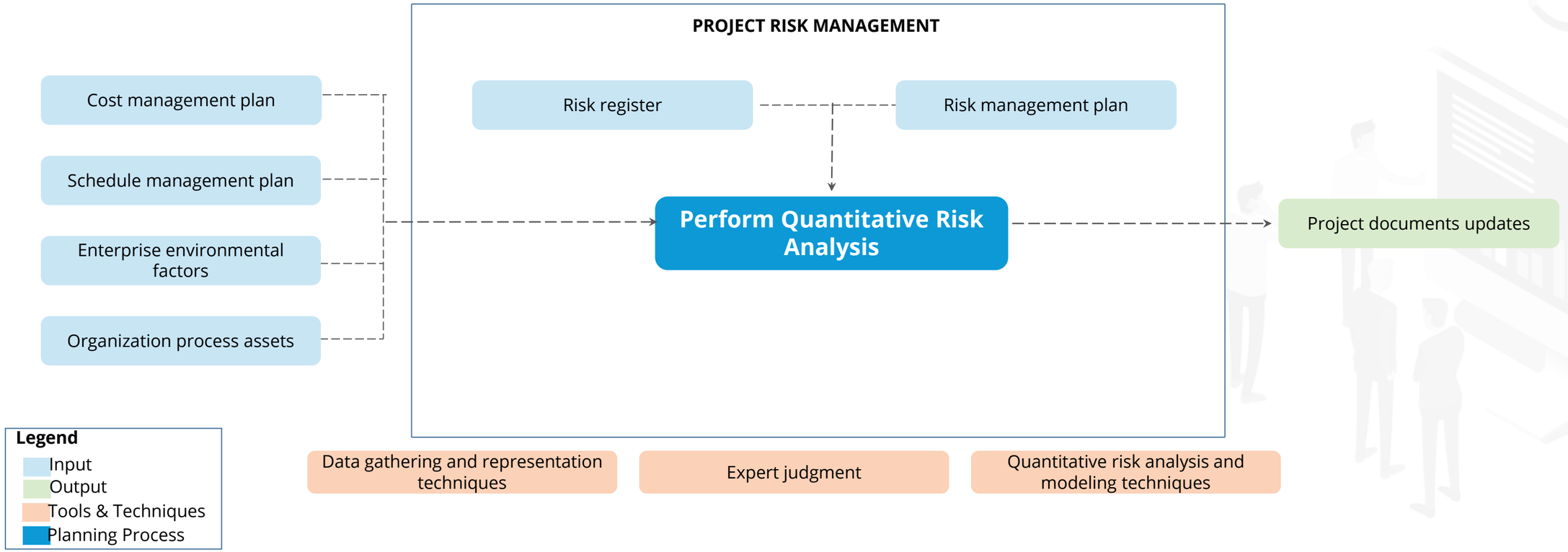
# Perform Quantitative Risk Analysis

Perform Quantitative Risk Analysis is the process of numerically analyzing the effect of identified risks on overall project objectives. This is part of the Planning Process Group.

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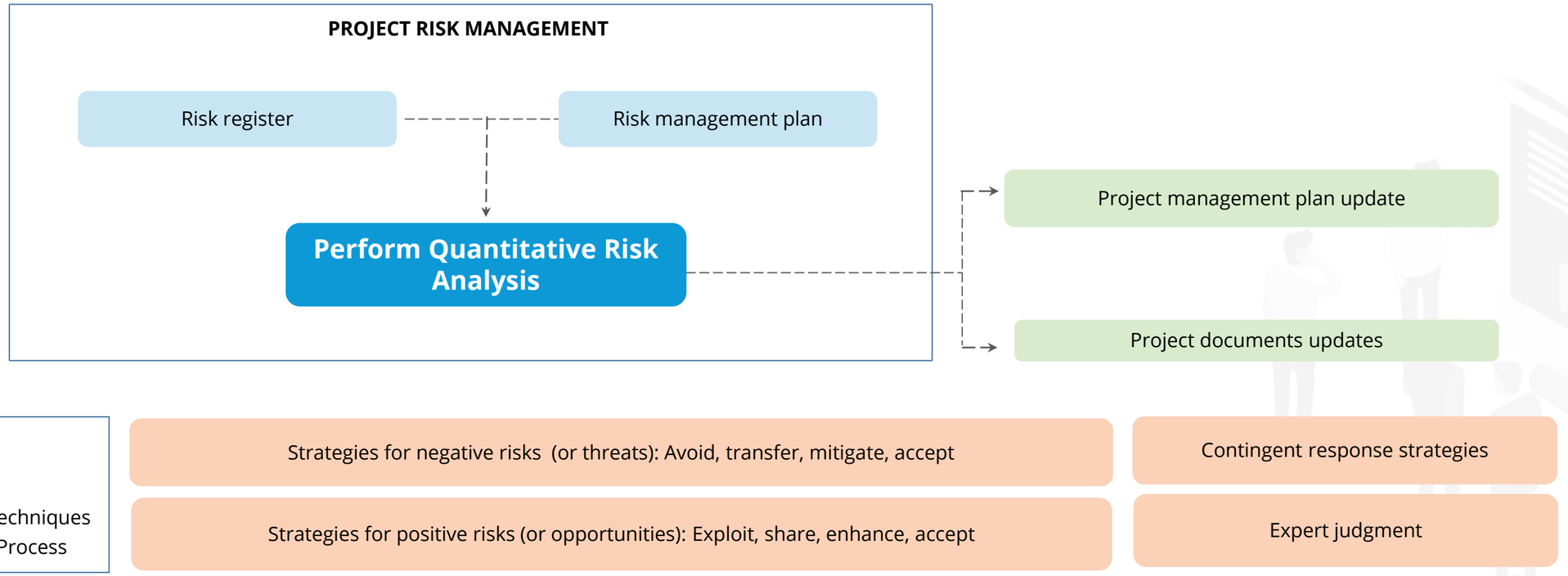
# Plan Risk Responses

Plan Risk Responses is the process of developing options and actions to enhance opportunities and to reduce threats to project objectives. It is part of the Planning Process Group.

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Residual risks are those that remain after the risk responses were implemented. Secondary risks arise out of implementing risk responses.

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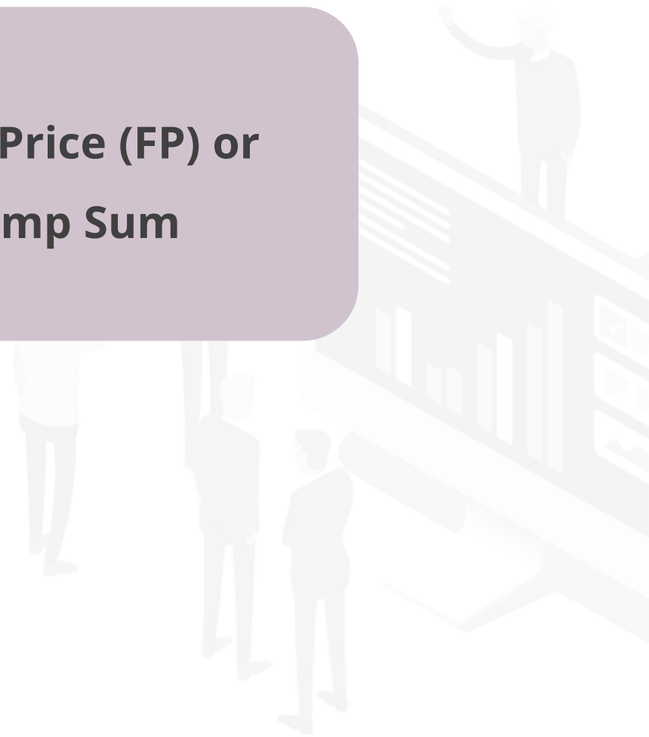
# Three Types of Contract

Contracts can be of three types. They are as follows:

**Cost Reimbursable (CR) or Cost Plus**

**Time and Material (T and M) or Unit Price**

**Fixed Price (FP) or Lump Sum**



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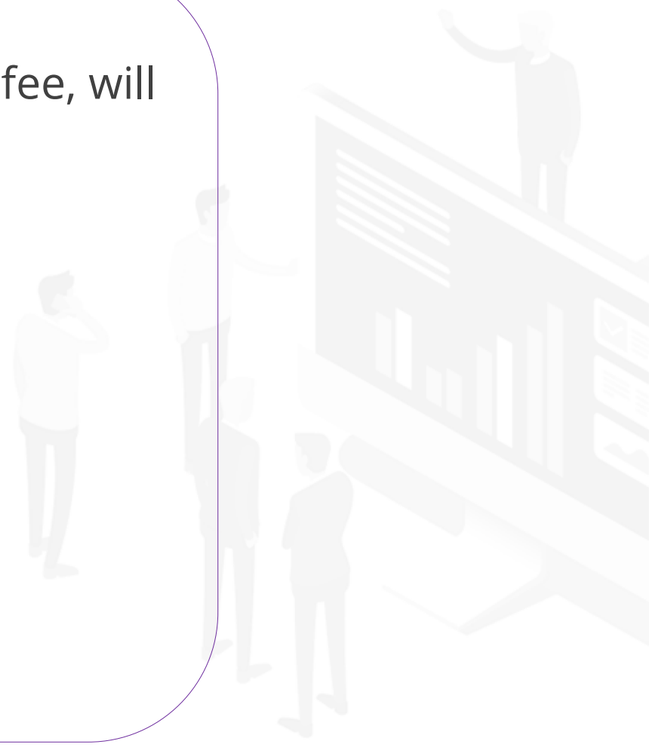
# Three Types of Contract

## Cost Reimbursable (CR) or Cost Plus

The seller is paid based on the actual. Cost plus, say incentive or fixed fee, will be paid in addition to the actuals.

Cost based contracts can be classified as:

- Cost Plus Fee (CPF)
- Cost Plus Percentage of Costs (CPPC)
- Cost Plus Fixed Fee (CPFF)
- Cost Plus Incentive Fee (CPIF)
- Cost Plus Award Fee (CPAF)



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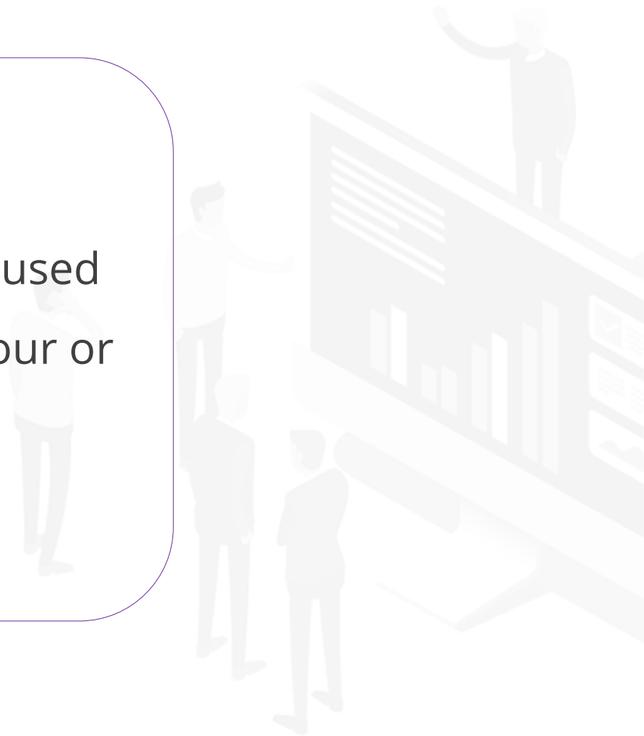
# Three Types of Contract

## Time and Material (T and M) or Unit Price

Time and material (T and M) or unit price contracts are generally used for smaller projects, wherein customer pays on per item or per hour or per day basis.



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# Three Types of Contract

## Fixed Price (FP) or Lump Sum

Fixed price contracts (or lump sum contracts) are generally signed when the scope of the work is very clear.

- Fixed price contracts can be classified as:
- Fixed Price Incentive Fee (FPIF)
- Fixed Price – Economic Price Adjusted (FP – EPA)
- Firm Fixed Price (FFP)

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# Stakeholder Engagement Assessment Matrix

Stakeholder engagement assessment matrix helps in visualizing the current and desired states of a stakeholder's involvement in a project.

| | |
|---|---|
| Unaware | Stakeholder is not aware of the project and its impact. |
| Resistant | Shareholder is aware of the impact and is resistant to change. |
| Neutral | Shareholder is aware of the project, but is neither supportive or has resistance. |
| Supportive | Stakeholder is aware of the project and is supportive of change. |
| Leading | Stakeholder is aware of the project and is actively engaged to ensure project's success. |

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# Stakeholder Engagement Assessment Matrix: Example

| Stakeholder | Unaware | Resistant | Neutral | Supportive | Leading |
|---|---|---|---|---|---|
| Stakeholder 1 | C | | | D | |
| Stakeholder 2 | | C | D | | |
| Stakeholder 3 | | | C | D | |
| Stakeholder 4 | | | C | | D |
| Stakeholder 5 | | | | D, C | |

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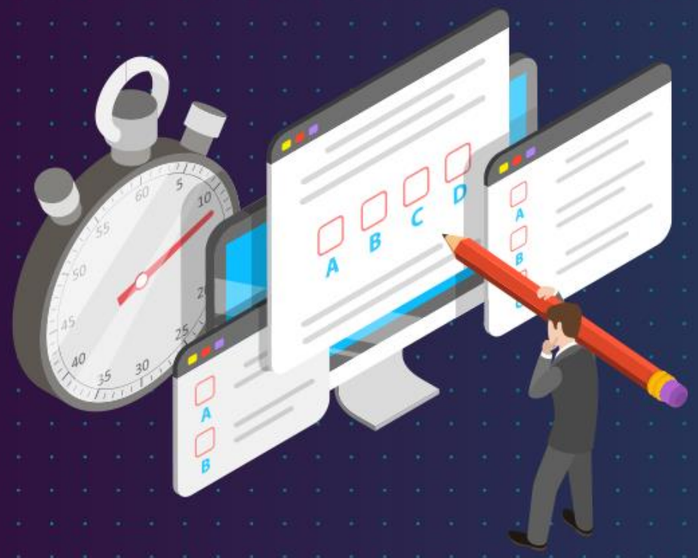


# Knowledge Check

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**Knowledge Check**

**1**

**Which of the following is not true regarding subdividing the work in the WBS?**

A. Subdivide until it has a meaningful conclusion

B. Subdivide until it can be done by a single person

C. Subdivide until it can not be logically subdivided further

D. Subdivide until it can be realistically estimated

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B. Subdivide until it can be done by a single person

C. Subdivide until it can not be logically subdivided further

D. Subdivide until it can be realistically estimated

The correct answer is **B**

**WBS need not be decomposed until it can be done by a single person.**

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**Knowledge Check 2**

**A project team is working on the network diagram of a project and wants to determine the float of a project activity. Which of the following is the correct formula?**

A. Late Finish-Early finish (LF-EF)

B. Late Finish-Early finish (LF-EF) or Late Start-Early Start (LS-ES)

C. Late Start-Early Start (LS-ES)

D. Late Finish-Late Start (LF-LS)

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A. Late Finish-Early finish (LF-EF)

B. Late Finish-Early finish (LF-EF) or Late Start-Early Start (LS-ES)

C. Late Start-Early Start (LS-ES)

D. Late Finish-Late Start (LF-LS)

The correct answers are **B**

**Float is calculated by subtracting either the Early Finish (EF) from the Late Finish (LF), or the Early Start (ES) from the Late Start (LS), i.e., Float for an activity = LS-ES or LF-EF.**

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| Knowledge Check 3 | You have been asked to assist the contract manager in drafting the contract for a large project with limited scope clarity. What type of contract would you suggest, such that your organization does not incur any financial losses? |
|---|---|

A. Time and material

B. Fixed price

C. Cost plus fixed fee

D. Cost plus incentive fee

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**Knowledge Check 3**

**You have been asked to assist the contract manager in drafting the contract for a large project with limited scope clarity. What type of contract would you suggest, such that your organization does not incur any financial losses?**

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B. Fixed price

C. Cost plus fixed fee

D. Cost plus incentive fee

The correct answer is **B**

**Float is calculated by subtracting either the Early Finish (EF) from the Late Finish (LF), or the Early Start (ES) from the Late Start (LS), i.e., Float for an activity = LS-ES or LF-EF.**

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# Key Takeaways

- Work Breakdown Structure breaks the project scope into smaller and more manageable pieces called work packages which are easy to manage.
- Gantt chart displays the start and end dates of project activities, the overall project schedule, and the logical task relationships while network diagram is used to plot the activity dependencies.
- Critical Path is the longest duration path through a network diagram, which determines the shortest time to complete the project.

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# Key Takeaways

- Earned Value Management technique indicates potential deviation of the project from the cost and/or schedule baselines.
- Risk can be classified in various ways. Under one category, risks are classified as external, internal, technical and project management; and on the basis of origin, risks can be classified as scope, resource, schedule, cost and quality risks.
- The three types of contacts are Cost Reimbursable (CR) or Cost Plus, Time and Material (T and M) or Unit Price, and Fixed Price (FP) or Lump.

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