



# Process Framework



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## Definition of Project

### Definition as per *PMBOK® Guide*

**A project is a temporary endeavor undertaken to create a unique product , service or results.**





# Project Characteristics

- A **temporary** endeavor — means that every project has a definite beginning and end.
- **Unique** means that the product or service or result is different from other product or service or result.
- **Progressively elaborated** - proceeding in steps

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# Examples of Project

- Building a Software
- A Major Enhancement to the software
- Filming a Motion Picture
- Building a new office
- Designing a new product or service
- Creating an advertisement campaign
- Creating a new process with a business unit
- Moving from one building to another
- Designing a space vehicle

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## Project vs Operation

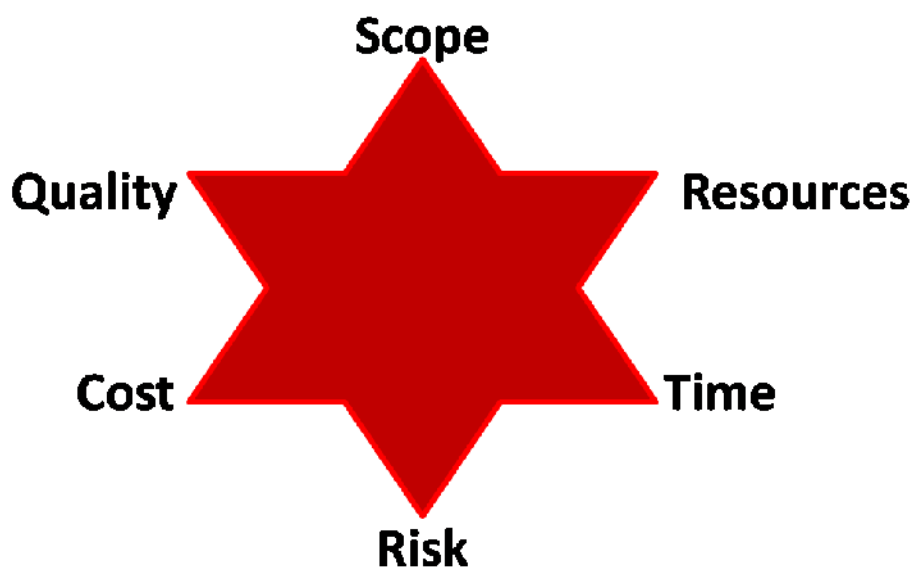
PROJECTS	OPERATIONS
Temporary	Ongoing
Unique	Repetitive
Closes after attaining the objectives	Objective is to sustain business
Prototyping the new car model	Assembly line production

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## Project Constraints



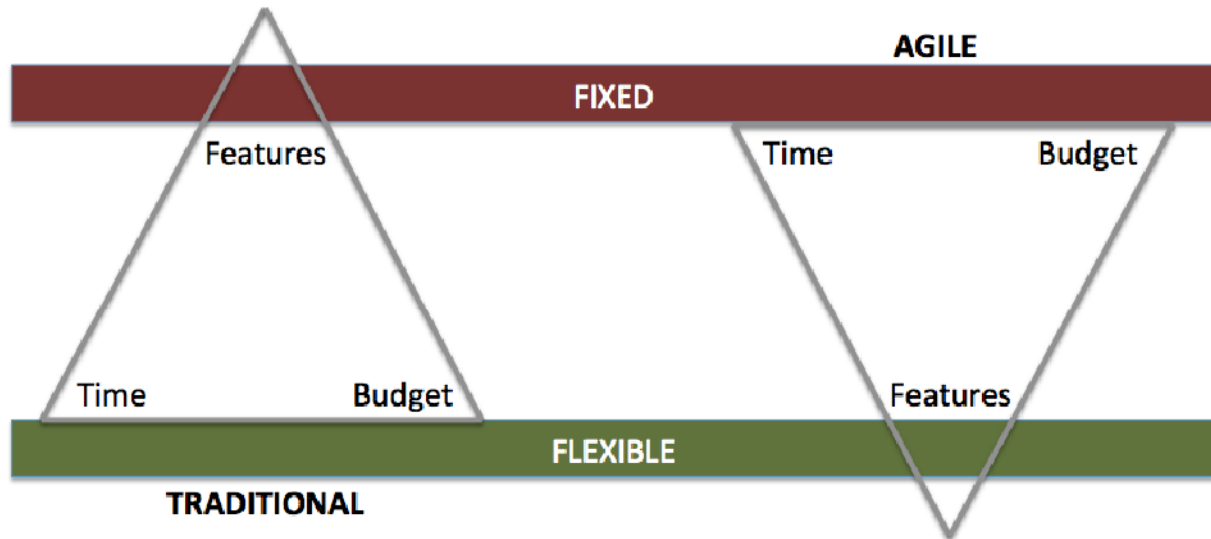
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## Project Triangle



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## Why Projects Fail ?

- Lack of clearly defined purpose
- Inexperienced project Managers
- Poor estimation of duration and cost
- Cultural and ethical misalignment
- Poor requirements and scope management
- Lack of coordination of resources and activities
- Poor communication
- Inadequate planning of scope, schedule, resources, cost, risk and quality
- Lack of progress and quality control
- In effective Stakeholder Management

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## What Is Project Management ?

Project management is the application of knowledge, skills, tools and techniques to project activities to meet the project requirements

### Balancing Constraints



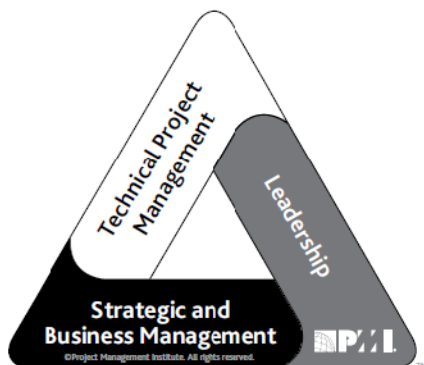
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## PROJECT MANAGER

### The PMI Talent Triangle®



PMI Talent Triangle® focuses on three key skill sets:

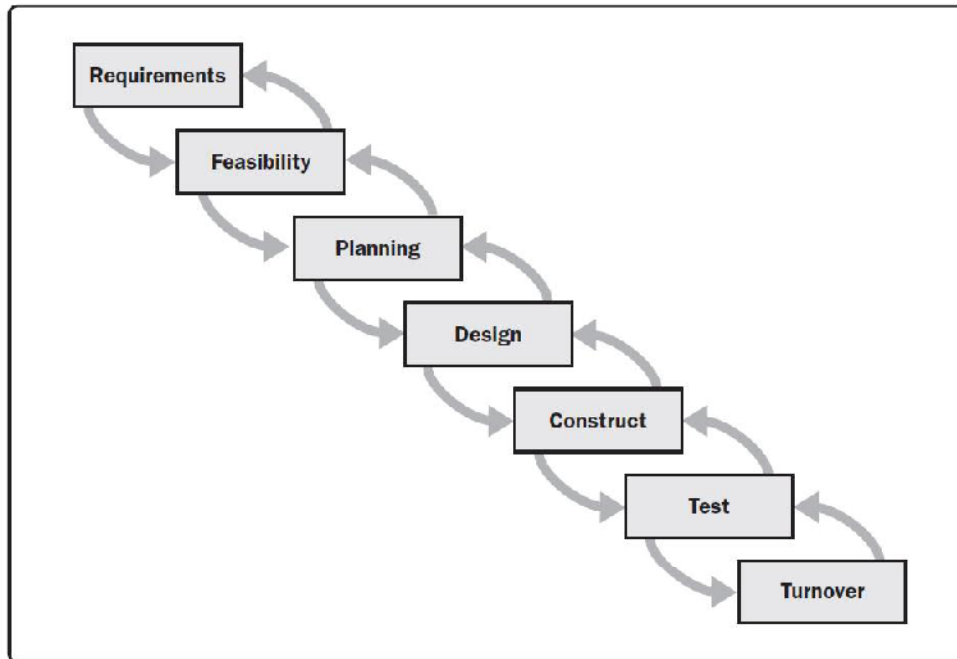
- **Technical project management.** The knowledge, skills, and behaviors related to specific domains of project, program, and portfolio management. The technical aspects of performing one's role.
- **Leadership.** The knowledge, skills, and behaviors needed to guide, motivate, and direct a team, to help an organization achieve its business goals.
- **Strategic and business management.** The knowledge of and expertise in the industry and organization that enhanced performance and better delivers business outcomes.



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## Project Life Cycle - Predictive

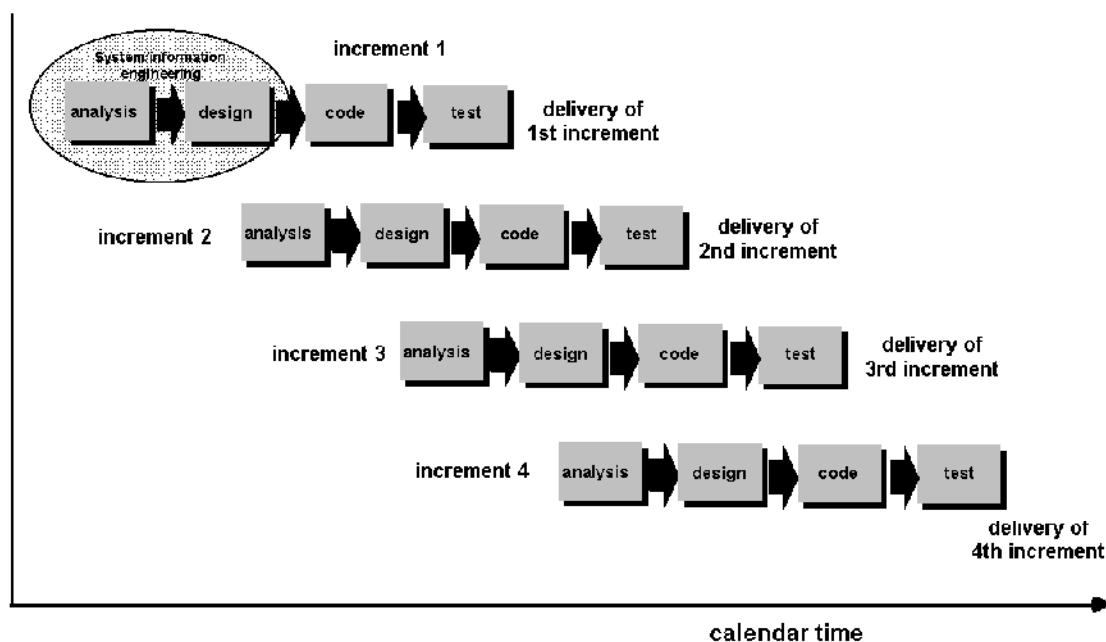


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## Project Life Cycle - Iterative



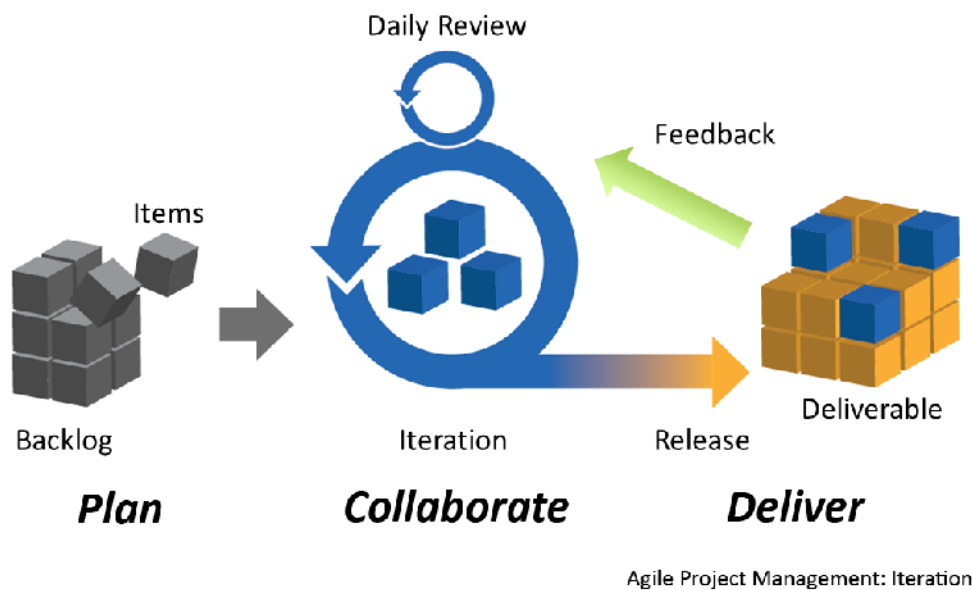
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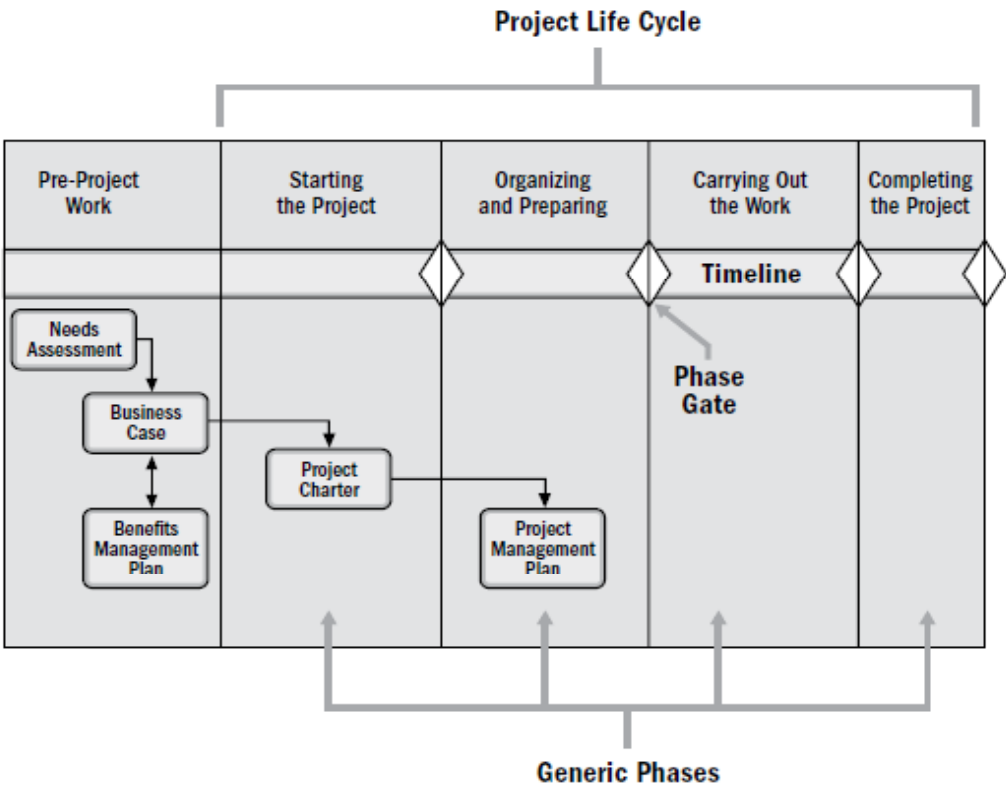
# Project Life Cycle - Adaptive



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# THE OVERALL SPECTRUM





# PROJECT BUSINESS DOCUMENTS

Project Business Documents	Definition
Project business case	A documented economic feasibility study used to establish the validity of the benefits of a selected component lacking sufficient definition and that is used as a basis for the authorization of further project management activities.
Project benefits management plan	The documented explanation defining the processes for creating, maximizing, and sustaining the benefits provided by a project.



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## BUSINESS CASE & BENEFITS MANAGEMENT PLAN

Key elements of a **Business Case** (but not limited to):

- Business needs
- Analysis of the situation
- Recommendation
- Evaluation

Key elements of a **Benefits Management Plan** (but not limited to):

- Target benefits
- Strategic alignment
- Timeframe for realizing benefits
- Benefits owner
- Metrics
- Assumptions
- Risks



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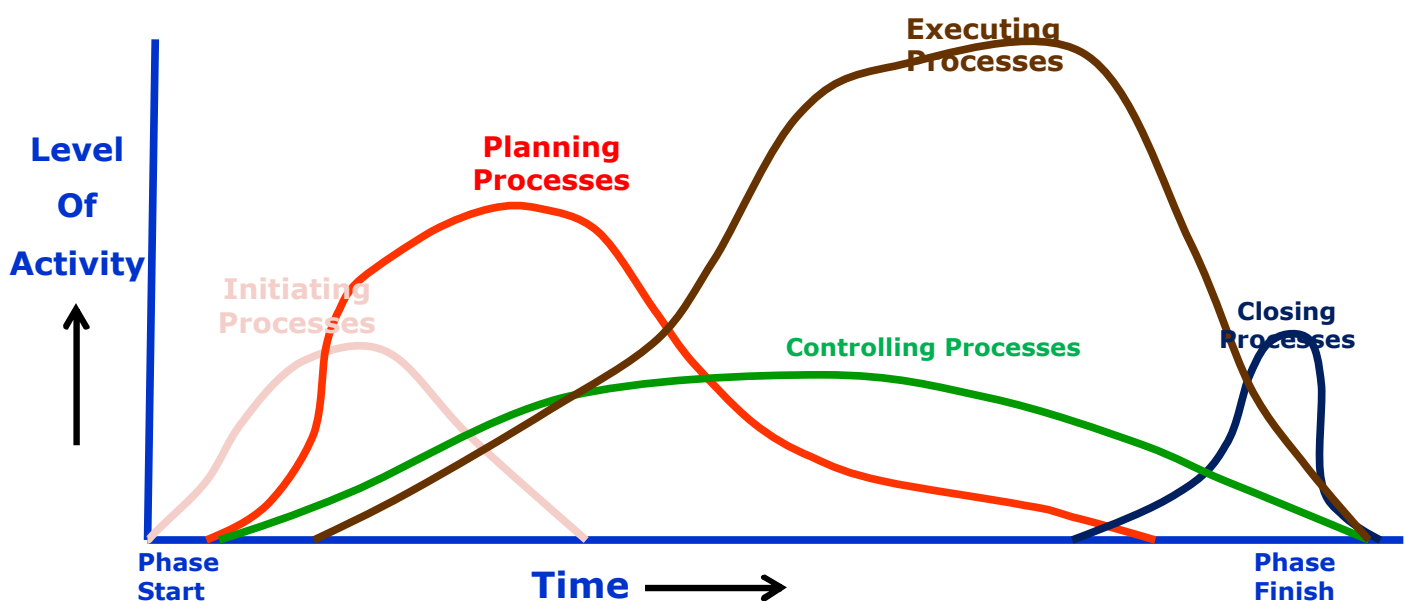
# PROJECT MANAGEMENT PROCESS GROUPS

A process group is a logical grouping of activities, inputs, tools, techniques, and outputs required for any type of project.

Process Groups	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Activities	Define a new project or new phase, identify stakeholders, and obtain authorization	Develop an integrated project management plan to attain project objectives	Complete the work and satisfy project objectives	Track and review project progress and performance; manage variance and change	Finalize all activities and formally close the project or phase
Key Outputs	"Authorize the Work" <ul style="list-style-type: none"><li>• Project Charter</li><li>• Stakeholder Register</li></ul>	"Plan the Work" <ul style="list-style-type: none"><li>• Project Mgt. Plans &amp; Related Documents<ul style="list-style-type: none"><li>- Scope</li><li>- Requirements</li><li>- Schedule</li><li>- Cost</li><li>- Quality</li><li>- Human Resources</li><li>- Communication</li><li>- Risk</li><li>- Procurement</li><li>- Change</li><li>- Stakeholders</li></ul></li></ul>	"Work the Plan" <ul style="list-style-type: none"><li>• Project Deliverables</li><li>• Work Performance Data</li><li>• Team Performance Assessments</li><li>• Project Communications (e.g. status reports)</li><li>• Selected Suppliers &amp; Agreements</li><li>• Change Requests</li><li>• Issue Log</li></ul>	"Control the Plan" <ul style="list-style-type: none"><li>• Change Logs</li><li>• Approved Change Requests</li><li>• Work Performance Information</li><li>• Schedule Forecasts</li><li>• Cost Forecasts</li><li>• Updates to Project Plan</li><li>• Quality Control Measurements</li><li>• Verified Deliverable</li><li>• Accepted Deliverables</li></ul>	"End the Work" <ul style="list-style-type: none"><li>• Final Product, Service, or Result (i.e. purpose of project)</li></ul>



## PROCESS GROUP INTERACTION





## Project Life Cycle – Key Points

- Projects are divided into **phases**
- The project will have at least a beginning, intermediate and ending phase
- Number of phases depends on **complexity** and **size** of the project
- Reviews are conducted at the end of each phase to **measure** performance
- Phase end reviews allows to decide if the project should **continue**
- The collection of phases is called **project life cycle**
- The project life cycle defines the **beginning** and **end** of a project

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## Project Life Cycle – Key Points

- The completion of one or more deliverables marks the project phase
- Deliverables are reviewed and formally **accepted** by customer at phase end
- Phase end reviews are also called **phase exits, stage gates** or **kill points**
- **Rolling wave planning** summarizes the future phases at high level

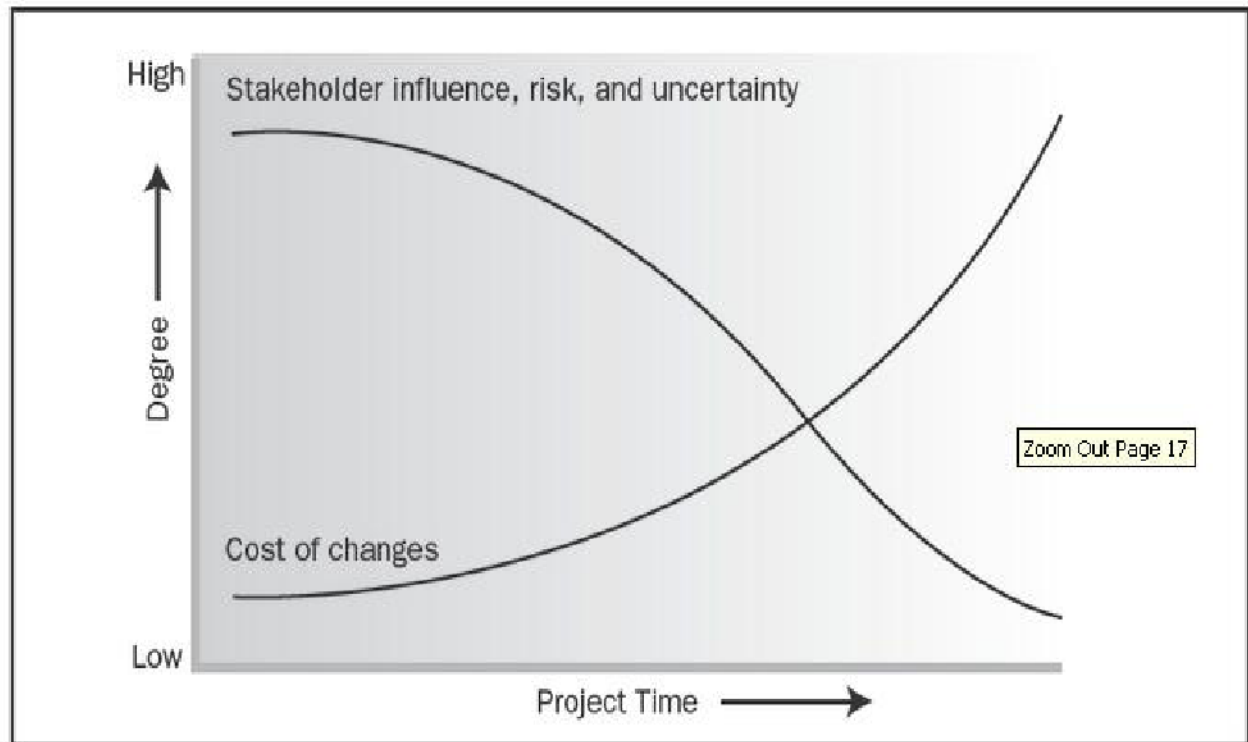
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## CHARACTERISTIC OF PROJECT LIFE CYCLE



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## Project Stakeholders

- Individuals and organizations involved in the project
- Those who will be directly or indirectly impacted
- Stakeholders should be identified throughout the project
- They may have a positive or negative influence on the outcome
- Stakeholder influence goes down as the project progresses

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- **Key stakeholders include:-**
  - Project Manager
  - Customer / User
  - Performing organization
  - Project team members
  - Project management team
  - Sponsor
  - Influencers
  - PMO

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## Project Manager – Skill Set

- **Communication Skills**
- **Organizational and Planning skills**
- **Budgeting Skills**
- **Conflict Management Skills**
- **Negotiation and Influencing Skills**
- **Leadership Skills**
- **Team Building and Motivating skills**

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## Project, Program & Portfolio Management



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## Project, Program & Portfolio Management

### ■ Programs

- Collection of related projects
- Controls are implemented and managed in a coordinated way
- Collective benefits are realized
- Each project has a project manager

### ■ Portfolios

- Collection of programs and projects
- Projects meet a specific business goal or objective
- Includes weighing the value of each project against the portfolios strategic objective

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## Project Management Office (PMO)

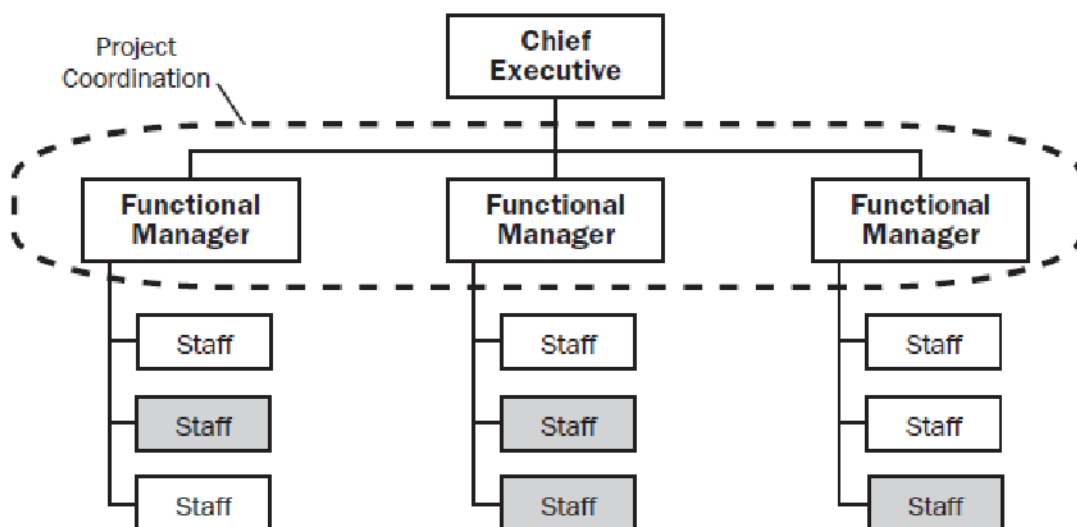
- **Project Management Office [PMO]**
  - Centralized units to oversee project and programs within the organization
  - Establishes and maintains the standards of project management methodologies
  - Support managers in planning, estimating, risk management and provide trainings
  - A PMO can be **Supportive PMO, Controlling PMO or Directive PMO**

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## Organization Type – Functional Organization



(Gray boxes represent staff engaged in project activities)

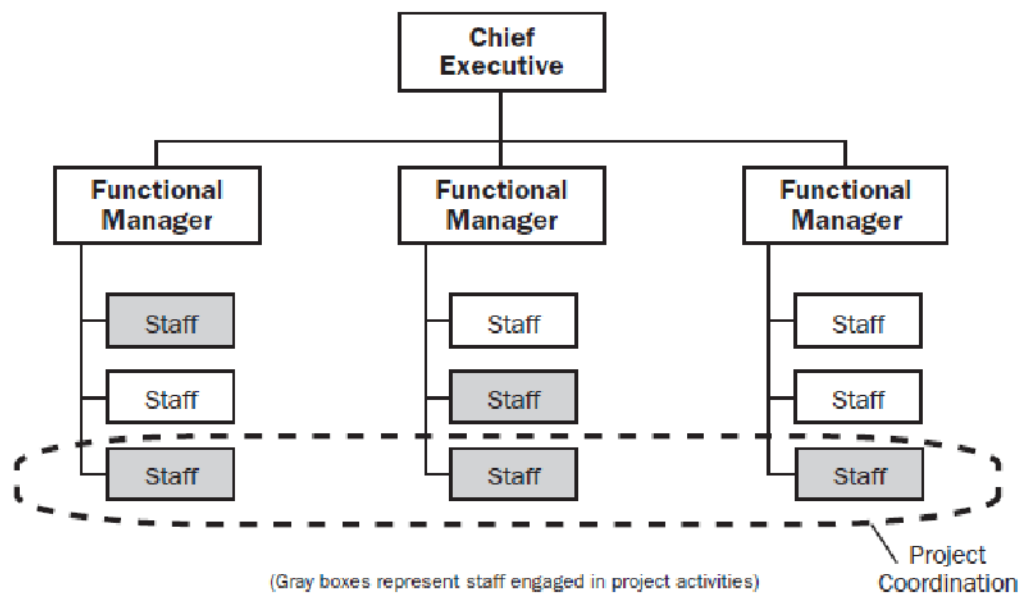
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## Organization Type – Weak Matrix

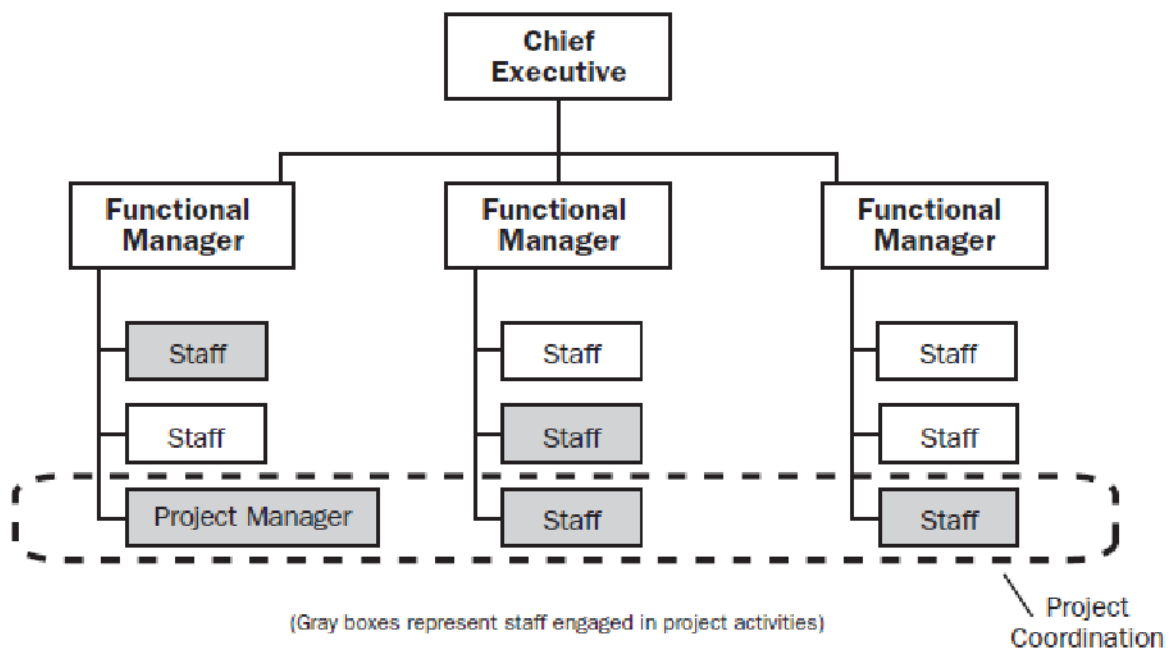


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## Organization Type – Balanced Matrix



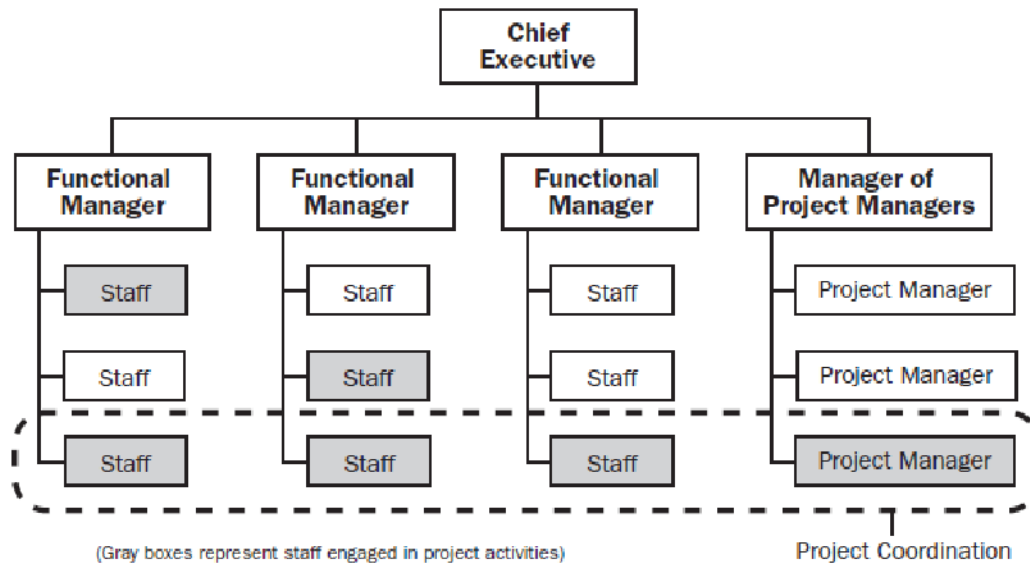
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## Organization Type – Strong Matrix

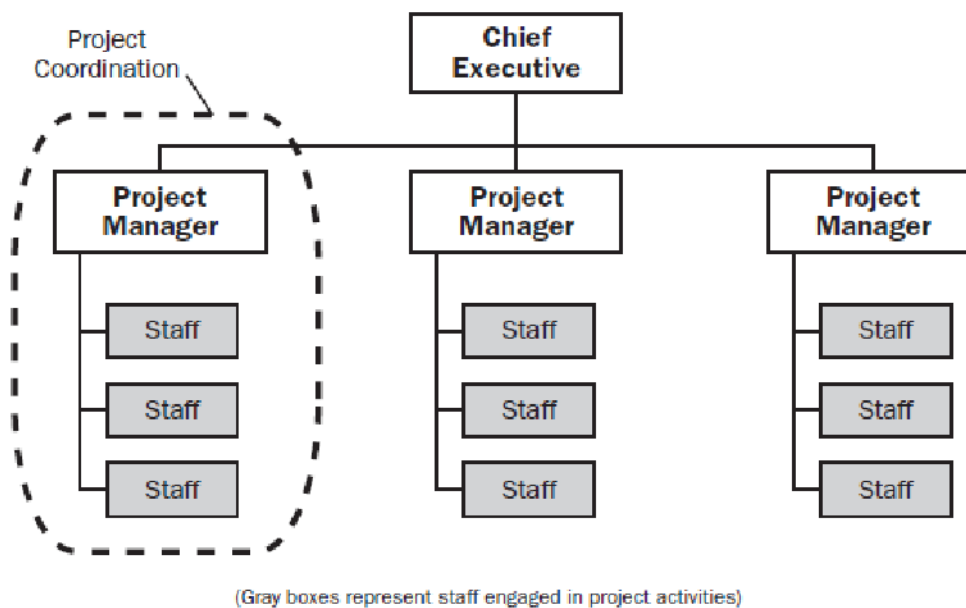


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## Organization Type – Projectized



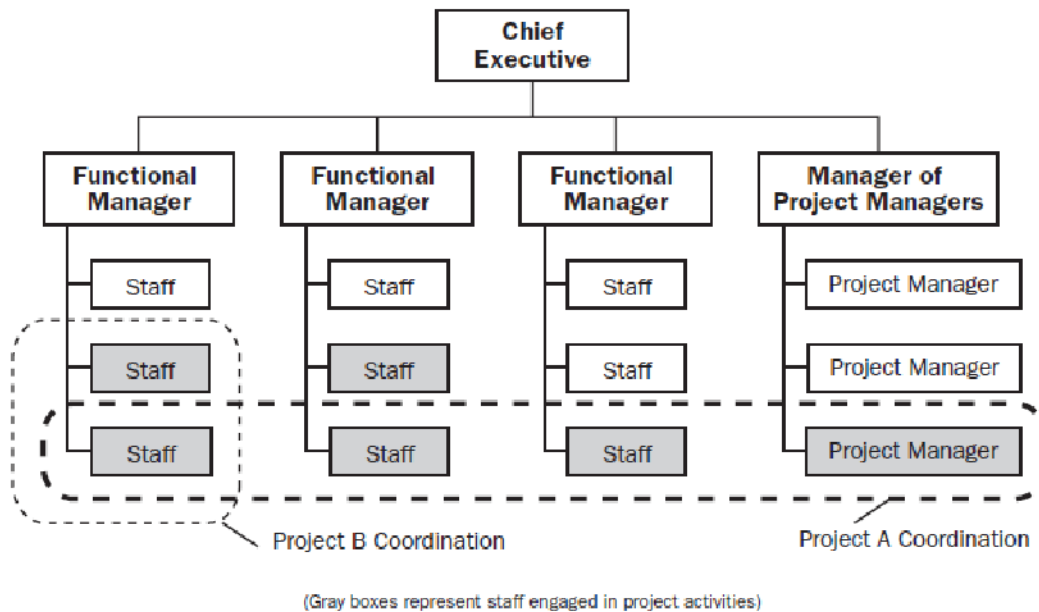
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## Organization Type – Composite



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## ENTERPRISE ENVIRONMENT FACTORS

Enterprise environmental factors refer to both internal and external environmental factors that surround or influence a project's success.

- Organizational culture, structure, and processes;
- Government or Industry Standards (e.g., regulatory agency regulations, codes of conduct)
- Standards, quality standards, and workmanship standards
- Marketplace Conditions;
- Political Climate;
- Organization's established communications channels;



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## **ORGANIZATION PROCESS ASSETS**

- **Processes and procedures**
  - Plans,
  - Processes,
  - Policies,
  - Procedures,
- **Corporate Knowledge Base**
  - Lessons learned
  - Historical information.
    - Completed schedules,
    - Risk data, and
    - Earned value data.



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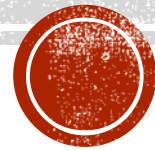
# **PROJECT MANAGEMENT FRAMEWORK**

**PMBOK SIXTH EDITION**





# **Project Integration Management**



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## **PROJECT INTEGRATION MANAGEMENT**

Processes and activities needed to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups



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## PROJECT INTEGRATION MANAGEMENT

- **Develop Project Charter**—the process of developing a document that formally authorizes a project or a phase and documenting initial requirements that satisfy the stakeholder's needs and expectations.
- **Develop Project Management Plan**—the process of documenting the actions necessary to define, prepare, integrate, and coordinate all subsidiary plans.
- **Direct and Manage Project Work**—the process of performing the work defined in the project management plan to achieve the project's objectives.
- **Manage Project Knowledge** - Manage Project Knowledge is the process of using existing knowledge and creating new knowledge to achieve the project's objectives and contribute to organizational learning.
- **Monitor and Control Project Work**—the process of tracking, reviewing, and regulating the progress to meet the performance objectives defined in the project management plan.
- **Perform Integrated Change Control**—the process of reviewing all change requests, approving changes, and managing changes to the deliverables, organizational process assets, project documents, and the project management plan.



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## DEVELOP PROJECT CHARTER

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>▪ Business documents <ul style="list-style-type: none"> <li>▪ Business case</li> </ul> </li> <li>▪ Agreements</li> <li>▪ Enterprise environmental factors</li> <li>▪ Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>▪ Expert judgment</li> <li>▪ Data gathering <ul style="list-style-type: none"> <li>▪ Brainstorming</li> <li>▪ Focus groups</li> <li>▪ Interviews</li> </ul> </li> <li>▪ Interpersonal and team skills <ul style="list-style-type: none"> <li>▪ Conflict management</li> <li>▪ Facilitation</li> <li>▪ Meeting management</li> </ul> </li> <li>▪ Meetings</li> </ul>	<ul style="list-style-type: none"> <li>▪ Project charter</li> <li>▪ Assumption log</li> </ul>



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CHARTER CONTENT ITEM	WHAT IT DOES
PURPOSE & JUSTIFICATION	REASON FOR THE PROJECT – MAY REFER TO BUSINESS CASE, STRATEGIC OBJECTIVES OR EXTERNAL FACTORS
OBJECTIVES	MULTIPLE OBJECTIVES FOR THE SCOPE, SCHEDULE, COST, QUALITY, CUSTOMER SATISFACTION, ETC
SUCCESS CRITERIA	MEASUREABLE CRITERIA TO INDICATE SUCCESSFUL COMPLETION OF EACH OBJECTIVE
HIGH LEVEL REQUIREMENTS	INITIAL HIGH LEVEL BUSINESS & COMPLIANCE REQUIREMENTS THAT MEETS CUSTOMER EXPECTATIONS
ASSUMPTIONS & CONSTRAINTS	INITIAL ASSUMPTION ABOUT SCOPE, RESOURCES, FUNDING, LIMITATION, BUDGET OR FIXED DUE DATE
HIGH LEVEL PROJECT DESCRIPTION	SUMMARY OF THE PROJECT'S DELIVERABLES & APPROACH TO BUDGETS
HIGH LEVEL RISKS	INITIAL RISK THAT WILL LATER BE PROGRESSIVELY ELABORATED
SUMMARY MILESTONE	SIGNIFICANT EVENTS OF DELIVERABLES: PHASE COMPLETION, DELIVERABLES & ACCEPTANCE
SUMMARY BUDGET	INITIAL RANGE OF EXPENDITURES ESTIMATE
STAKEHOLDER LIST	INITIAL LIST OF PEOPLE WHO CAN INFLUENCE OR BE INFLUENCED BY THE PROJECT
APPROVAL REQUIREMENTS	WHO CAN APPROVE & SIGN OFF ON EACH DELIVERABLE & CRITERIA FOR ACCEPTANCE
PM AUTH ON STAFFING, TECHNICAL DECISION, CONFLICT RESOLUTION, BUDGET MGMT	AUTHORITY TO HIRE, FIRE, DISCIPLINE, ACCEPT OR REJECT. AUTH TO MAKE TECHNICAL DECISIONS OR APPROACH, TO RESOLVE CONFLICT WITHIN TEAMS OR EXTERNAL STAKEHOLDERS & TO COMMIT & MANAGE FUNDS VARIANCE
SPONSOR, PM & OTHER RELEVANT SIGNATURES	DEMONSTRATE COMMITMENT & APPROVAL FOR THE PROJECT

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## Project Selection Methods

### Numeric Methods

- **Benefit Measurement Model (also called Comparative approach )**
  - Payback Period
  - Cost Benefit Analysis
  - Scoring Models
  - Net Present Value (NPV)
  - Internal Rate of Return (IRR)
- **Mathematical Models (also called Constrained Optimization)**
  - Use linear, dynamic, non-linear, multi-objective programming to solve problem



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## Project Selection Methods

- **Payback period** – the amount of time to recover your cost. It compares the initial investment to the cash inflows expected over the life of the product.
  - **For example**, Initial investment on a project is Rs. 4,00,000, Expected cash inflows: Rs. 50,000 per quarter for first two years, Rs. 100,000 per quarter thereafter.
  - **What is the payback period?**
  - Cash inflows = Rs. 50,000 x 4 (quarters in a year) = Rs. 2, 00,000 per year for first two years. Hence, year 1 inflow = Rs. 2, 00,000, year 2 inflow = Rs. 2, 00,000. Total Rs. 4, 00,000 in 2 years
  - So payback is reached in **2 years**.



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## Project Selection Methods

- **Benefit Cost Ratio (BCR)** or profitability Index .This is the ratio of project benefit and the project cost.
  - **BCR = Revenue / Cost**
  - Select the project with a higher BCR



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## Project Selection Methods

- **Present Value (PV)** is the expected future cash flows expressed in today's monetary value

$$PV = FV / (1+r)^n$$

- **For example**, Calculate the Present Value of \$ 100,000 received three years from now. The interest rate is 10 percent.
- $PV = 100000 / (1+10/100)^3 = \$ 75,131$



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## Project Selection Methods

- **Net Present value (NPV)** is the sum total of the Present Value of Cash Inflows – Cash Outflows

TIME PERIOD	INCOME/REVENUE	PRESENT VALUE AT 10% INT RATE	COSTS	PRESENT VALUE AT 10% INT RATE
0	0	0	200	200
1	50	45	100	91
2	100	83	0	0
3	300	225	0	0
TOTAL		353		291

**NPV of the Project is  $353-291 = 62$**

**Select the project with higher NPV**



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## Project Selection Methods

- **Internal Rate of Return (IRR):** The rate of interest at which the revenues and costs are equal.
  - Select the project with a higher IRR.
  
- **Return On Investment (ROI)** – A return ratio that compares the net benefits of a project/ product, verses its total cost.
  - $ROI = \text{Operating Income} / \text{Investments}$



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### SCORING MODEL WEIGHTED CRITERIA (EXAMPLE, USING SCALE OF 1-5)

Item Criteria	Weight	Project A	Project B	Project C		
Good ROI	3	4 12	5 15	3 9	0	0
CEO Likes It	5	2 10	3 15	5 25	0	0
Provide Better Service	4	5 20	4 16	2 8	0	0
Match New Initiatives of Competition	3	4 12	4 12	5 15	0	0
		0	0	0	0	0
		Total: 54	Total: 58	Total: 57	Total: 0	Total: 0

**Our Winner!!**  
(hmmmm...)



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## Exercise 1: Which Project Will You Select

Method	Project A	Project B	Which One?
Scoring Model	17	20	B
Payback Period	24 Months	25 months	A
Benefit Cost Ratio	3.5	4.5	B
Net Present Value (NPV)	£95,000	£80,000	A
IRR	9.5%	11.5%	B



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## PROJECT MANAGEMENT PLAN

The project management plan defines how the project is executed, monitored and controlled, and closed. The project management plan content will vary depending upon the application area and complexity of the project.



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## DEVELOP PROJECT MANAGEMENT PLAN

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>▪ Project charter</li><li>▪ Outputs from other processes</li><li>▪ Enterprise environmental factors</li><li>▪ Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>▪ Expert judgment</li><li>▪ Data gathering<ul style="list-style-type: none"><li>▪ Brainstorming</li><li>▪ Checklists</li><li>▪ Focus groups</li><li>▪ Interviews</li></ul></li><li>▪ Interpersonal and team skills<ul style="list-style-type: none"><li>▪ Conflict management</li><li>▪ Facilitation</li><li>▪ Meeting management</li><li>▪ Meetings</li></ul></li></ul>	<ul style="list-style-type: none"><li>▪ Project management plan</li></ul>



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## Components of Project Management Plan

- Subsidiary Plan
  - Requirements Management Plan
  - Scope management plan
  - Schedule management plan
  - Cost management plan
  - Quality management plan
  - Resource management plan
  - Communication management plan
  - Risk management plan
  - Procurement management plan
  - Stakeholder management plan
- Project baselines (include but not limited to scope, schedule and cost baselines)



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## Components of Project Management Plan

**Additional components.** Most components of the project management plan are produced as outputs from other processes, though some are produced during this process. Those components developed as part of this process will be dependent on the project; however, they often include but are not limited to:

- *Change management plan.* Describes how the change requests throughout the project will be formally authorized and incorporated.
- *Configuration management plan.* Describes how the information about the items of the project (and which items) will be recorded and updated so that the product, service, or result of the project remains consistent and/or operative.
- *Performance measurement baseline.* An integrated scope-schedule-cost plan for the project work against which project execution is compared to measure and manage performance.
- *Project life cycle.* Describes the series of phases that a project passes through from its initiation to its closure.
- *Development approach.* Describes the product, service, or result development approach, such as predictive, iterative, agile, or a hybrid model.
- *Management reviews.* Identifies the points in the project when the project manager and relevant stakeholders will review the project progress to determine if performance is as expected, or if preventive or corrective actions are necessary.



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## DIRECT AND MANAGE PROJECT WORK

**Direct and Manage Project Work** is the process of performing the work defined in the project management plan and implementing approved changes to achieve the project's objectives.



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## DIRECT AND MANAGE PROJECT WORK

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>Project management plan               <ul style="list-style-type: none"> <li>Any component</li> </ul> </li> <li>Project documents               <ul style="list-style-type: none"> <li>Change log</li> <li>Lessons learned register</li> <li>Milestone list</li> <li>Project communications</li> <li>Project schedule</li> <li>Requirements traceability matrix</li> <li>Risk register</li> <li>Risk report</li> </ul> </li> <li>Approved change requests</li> <li>Enterprise environmental factors</li> <li>Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>Expert Judgment</li> <li>Project Management Information System</li> <li>Meetings</li> </ul>	<ul style="list-style-type: none"> <li>Deliverables</li> <li>Work performance data</li> <li>Issue log</li> <li>Change requests</li> <li>Project management plan updates               <ul style="list-style-type: none"> <li>Any component</li> </ul> </li> <li>Project documents updates               <ul style="list-style-type: none"> <li>Activity list</li> <li>Assumption log</li> <li>Lessons learned register</li> <li>Requirements documentation</li> <li>Risk register</li> <li>Stakeholder register</li> </ul> </li> <li>Organizational process assets update</li> </ul>



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## MANAGE PROJECT KNOWLEDGE

Manage Project Knowledge is the process of using existing knowledge and creating new knowledge to achieve the project's objectives and contribute to organizational learning. The key benefits of this process are that prior organizational knowledge is leveraged to produce or improve the project outcomes, and knowledge created by the project is available to support organizational operations and future projects or phases



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## MANAGE PROJECT KNOWLEDGE

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>▪ Project management plan All components</li> <li>▪ Project documents <ul style="list-style-type: none"> <li>▪ Lessons learned register</li> <li>▪ Project team assignments</li> <li>▪ Resource breakdown structure</li> <li>▪ Stakeholder register</li> </ul> </li> <li>▪ Deliverables</li> <li>▪ Enterprise environmental factors</li> <li>▪ Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>▪ Expert judgment</li> <li>▪ Knowledge management</li> <li>▪ Information management</li> <li>▪ Interpersonal and team skills <ul style="list-style-type: none"> <li>▪ Active listening</li> <li>▪ Facilitation</li> <li>▪ Leadership</li> <li>▪ Networking</li> </ul> </li> <li>▪ Political awareness</li> </ul>	<ul style="list-style-type: none"> <li>▪ Lessons learned register</li> <li>▪ Project management plan updates <ul style="list-style-type: none"> <li>▪ Any component</li> </ul> </li> <li>▪ Organizational process assets updates</li> </ul>



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## MONITOR AND CONTROL PROJECT WORK

Monitor and Control Project Work is the process of tracking, reviewing, and regulating the progress to meet the performance objectives defined in the project management plan.

Continuous monitoring gives the project management team insight into the health of the project, and identifies any areas that may require special attention. Control includes determining corrective or preventive actions or re-planning and following up on action plans to determine if the actions taken resolved the performance issue.



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## MONITORING AND CONTROL PROJECT WORK

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>Project management plan <ul style="list-style-type: none"> <li>Any component</li> </ul> </li> <li>Project documents <ul style="list-style-type: none"> <li>Assumption log</li> <li>Basis of estimates</li> <li>Cost forecasts</li> <li>Issue log</li> <li>Lessons learned register</li> <li>Milestone list</li> <li>Quality reports</li> <li>Risk register</li> <li>Risk report</li> <li>Schedule forecasts</li> </ul> </li> <li>Work performance information</li> <li>Agreements</li> <li>Enterprise environmental factors</li> <li>Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>Expert judgment</li> <li>Data analysis <ul style="list-style-type: none"> <li>Alternatives analysis</li> <li>Cost-benefit analysis</li> <li>Earned value analysis</li> <li>Root cause analysis</li> <li>Trend analysis</li> <li>Variance analysis</li> </ul> </li> <li>Decision making <ul style="list-style-type: none"> <li>Voting</li> </ul> </li> <li>Meetings</li> </ul>	<ul style="list-style-type: none"> <li>Work performance reports</li> <li>Change requests</li> <li>Project management plan updates <ul style="list-style-type: none"> <li>Any component</li> </ul> </li> <li>Project documents updates <ul style="list-style-type: none"> <li>Cost forecasts</li> <li>Issue log</li> <li>Lessons learned register</li> <li>Risk register</li> <li>Schedule forecasts</li> </ul> </li> </ul>



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## SAMPLE WORK PERFORMANCE REPORT

### Dashboard, 2008-Aug-11 [Back to home page](#)

Black Sea Port Construction Project

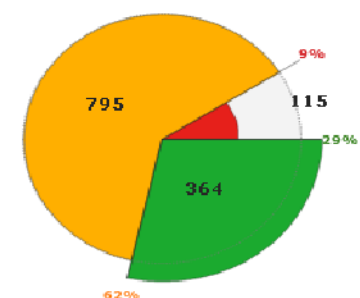
#### Project Summary (Passport)

Project manager:  
 Start:  
 Finish: 2009-03-03  
 Duration: 365 day(s)  
 Complete: 40%  
 Budget: \$8 500 000,00  
 Goal: Open Black Sea Port in 2009

#### Earned Value Schedule Indicators

ACWP	\$4750000	CPI	1,01
BCWP	\$4800000	SPI	0,96
BCWS	\$5000000	EAC	6433000
SV	-200000	VAC	67000
SV%	-4%	TCPI	0,97
CV	50000		
CV%	1,04		

#### Resources and Tasks



[Resources rate](#)

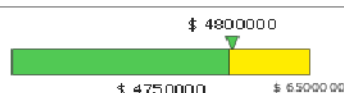
#### Project Complete



[Late tasks in progress](#)

[Not started](#)

#### Cost and Budget

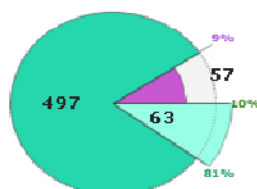


[25 most expensive tasks](#)

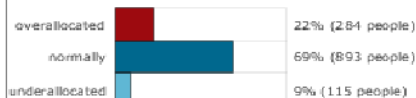
[Overcosted tasks](#)

#### Tasks

[Late tasks](#)  
[On time tasks](#)  
[Early tasks](#)



#### Resource Allocation



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## PERFORM INTEGRATED CHANGE CONTROL

Perform Integrated Change Control is the process of review in all change requests, approving changes and managing changes to the deliverables, organizational process assets, project documents and the project management plan.

The Perform Integrated Change Control process is conducted from project inception through completion. The project management plan, the project scope statement, and other deliverables are maintained by carefully and continuously managing changes, either by rejecting changes or by approving changes thereby assuring that only approved changes are incorporated into a revised baseline.



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## PERFORM INTEGRATED CHANGE CONTROL

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>▪ Project management plan<ul style="list-style-type: none"><li>• Change management plan</li><li>• Configuration management plan</li><li>• Scope baseline</li><li>• Schedule baseline</li><li>• Cost baseline</li></ul></li><li>▪ Project documents<ul style="list-style-type: none"><li>• Basis of estimates</li><li>• Requirements traceability matrix</li><li>• Risk report</li></ul></li><li>• Work performance reports</li><li>• Change requests</li><li>• Enterprise environmental factors</li><li>• Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>• Expert judgment</li><li>• Change control tools</li><li>• Data analysis<ul style="list-style-type: none"><li>• Alternatives analysis</li><li>• Cost-benefit analysis</li></ul></li><li>• Decision making<ul style="list-style-type: none"><li>• Voting</li><li>• Autocratic decision making</li><li>• Multicriteria decision analysis</li></ul></li><li>• Meetings</li></ul>	<ul style="list-style-type: none"><li>▪ Approved change requests</li><li>• Project management plan updates<ul style="list-style-type: none"><li>Any component</li></ul></li><li>▪ Project documents updates</li><li>▪ Change log</li></ul>



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## CLOSE PROJECT OR PHASE

Close Project or Phase is the process of finalizing all activities across all of the Project Management Process Groups to formally complete the project or phase.

When closing the project, the project manager will review

all prior information from the previous phase closures to ensure that all project work is complete and that the

project has met its objectives.



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## CLOSE PROJECT OR PHASE

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>• Project charter</li><li>• Project management plan<ul style="list-style-type: none"><li>All components</li></ul></li><li>• Project documents<ul style="list-style-type: none"><li>▪ Assumption log</li><li>▪ Basis of estimates</li><li>▪ Change log</li><li>▪ Issue log</li><li>▪ Lessons learned register</li><li>▪ Milestone list</li><li>▪ Project communications</li><li>▪ Quality control measurements</li><li>▪ Quality reports</li><li>▪ Requirements documentation</li><li>▪ Risk register</li><li>▪ Risk report</li></ul></li><li>▪ Accepted deliverables</li><li>• Business documents<ul style="list-style-type: none"><li>Business case</li><li>Benefits management plan</li></ul></li><li>• Agreements</li><li>• Procurement documentation</li><li>• Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>▪ Expert judgment</li><li>▪ Data analysis<ul style="list-style-type: none"><li>• Document analysis</li><li>• Regression analysis</li><li>• Trend analysis</li><li>• Variance analysis</li></ul></li><li>• Meetings</li></ul>	<ul style="list-style-type: none"><li>▪ Project documents updates<ul style="list-style-type: none"><li>▪ Lessons learned register</li></ul></li><li>▪ Final product, service, or result transition</li><li>▪ Final report</li><li>▪ Organizational process assets updates</li></ul>



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## Exercise 2: Integration Management

### Revising Key Terms

1. The project management plan is the collection of \_\_\_\_\_ Plans
2. Work Culture and company policies are called Enterprise \_\_\_\_\_ Factors
3. \_\_\_\_\_ is a document that gives the project manager authority over the team



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## Answer to Exercise 2: Integration Management

### Revising Key Terms

1. The project management plan is the collection of Subsidiary Plans
2. Work Culture and company policies are called Enterprise Environmental Factors
3. Project Charter is a document that gives the project manager authority over the team



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# QUIZ !



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## Project Scope Management



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## PROJECT SCOPE MANAGEMENT

Project Scope Management includes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully. Managing the project scope is primarily concerned with defining and controlling what is and is not included in the project.



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## WHY MANAGE PROJECT SCOPE?

- Some of the issues faced in projects
  - Project teams believe the additional work is a change request, but the client insists it is part of the original scope
  - The project suddenly finds itself crunched for time. A number of additional requirements are coming up along with the continuing development work
  - The client talks about a high level vision which the project is expected to achieve, but the stakeholders are either unable to articulate this vision in concrete objectives and deliverables or provide conflicting views
  - Contradicting requirements. Different interpretation of the same statement by different people
  - Commitment made to the customer without understanding the application portfolio



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## PROJECT SCOPE MANAGEMENT

Project Scope Management includes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully. Managing the project scope is primarily concerned with defining and controlling what is and is not included in the project.



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## PROJECT SCOPE MANAGEMENT

- **Plan Scope Management** — The process of creating a scope management plan that documents how the project scope will be defined , validated and controlled
- **Collect Requirements**—The process of defining and documenting stakeholders' needs to meet the project objectives
- **Define Scope**—The process of developing a detailed description of the project and product
- **Create WBS**—The process of subdividing project deliverables and project work into smaller, more manageable components
- **Validate Scope**—The process of formalizing acceptance of the completed project deliverables
- **Control Scope**—The process of monitoring the status of the project and product scope and managing changes to the scope baseline



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## PLAN SCOPE MANAGEMENT

Plan Scope Management is the process of creating a scope management plan that documents how the project scope will be defined , validated and controlled.

The key benefit of this process is that it provides guidance and direction on how scope will be managed throughout the project.



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## PLAN SCOPE MANAGEMENT

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>• Project charter</li><li>• Project management plan<ul style="list-style-type: none"><li>• Quality management plan</li><li>• Project life cycle description</li><li>• Development approach</li></ul></li><li>• Enterprise environmental factors</li><li>• Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>• Expert judgment</li><li>• Data analysis<ul style="list-style-type: none"><li>• Alternatives analysis</li></ul></li><li>• Meetings</li></ul>	<ul style="list-style-type: none"><li>• Scope management plan</li><li>• Requirements management plan</li></ul>



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## SCOPE MANAGEMENT PLAN

The scope management plan is a component of the project or program management plan that describes how the scope will be defined, developed, monitored, controlled, and verified. The scope management plan is a major input into the Develop Project Management Plan process, and the other scope management processes.



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## SCOPE MANAGEMENT PLAN

- The components of a scope management plan include:
- Process for preparing a detailed project scope statement
- Process that enables the creation of the WBS from the detailed project scope statement
- Process that establishes how the WBS will be maintained and approved
- Process that specifies how formal acceptance of the completed project deliverables will be obtained and
- Process to control how requests for changes to the detailed project scope statement will be processed.



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## REQUIREMENTS MANAGEMENT PLAN

The requirements management plan is a component of the project management plan that describes how requirements will be analyzed, documented, and managed.



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## REQUIREMENTS MANAGEMENT PLAN

Components of the requirements management plan can include, but are not limited to:

- How requirements activities will be planned, tracked, and reported;
- Configuration management activities such as: how changes to the product will be initiated, how impacts will be analyzed, how they will be traced, tracked, and reported, as well as the authorization levels required to approve these changes;
- Requirements prioritization process;
- Product metrics that will be used and the rationale for using them; and
- Traceability structure to reflect which requirement attributes will be captured on the traceability matrix.



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## COLLECT REQUIREMENTS (PLANNING PROCESS GROUP)

Collect Requirements is the process of defining and documenting stakeholders need to meet the project objectives

Many organizations categorize requirements into project requirements and product requirements. Project requirements can include business requirements, project management requirements, delivery requirements, etc. Product requirements can include information on technical requirements, security requirements, performance requirements etc.



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## Product Scope and Project Scope

<b>Product Scope:</b>	The features and functions in a product, service, or result.
<b>Project Scope:</b>	The work that needs to be done in order to deliver a product, service or result with the specified features and functions.



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## COLLECT REQUIREMENTS

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>Project charter</li> <li>Project management plan               <ul style="list-style-type: none"> <li>Scope management plan</li> <li>Requirements management plan</li> <li>Stakeholder engagement plan</li> </ul> </li> <li>Project documents               <ul style="list-style-type: none"> <li>Assumption log</li> <li>Lessons learned register</li> <li>Stakeholder register</li> </ul> </li> <li>Business documents               <ul style="list-style-type: none"> <li>Business case</li> </ul> </li> <li>Agreements</li> <li>Enterprise environmental factors</li> <li>Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>Expert judgment</li> <li>Data gathering               <ul style="list-style-type: none"> <li>Brainstorming</li> <li>Interviews</li> <li>Focus groups</li> <li>Questionnaires and surveys</li> <li>Benchmarking</li> </ul> </li> <li>Data analysis               <ul style="list-style-type: none"> <li>Document analysis</li> </ul> </li> <li>Decision making               <ul style="list-style-type: none"> <li>Voting</li> <li>Autocratic decision making</li> <li>Multicriteria decision analysis</li> </ul> </li> <li>Data representation               <ul style="list-style-type: none"> <li>Affinity diagrams</li> <li>Mind mapping</li> </ul> </li> <li>Interpersonal and team skills               <ul style="list-style-type: none"> <li>Nominal group technique</li> <li>Observation/conversation</li> <li>Facilitation</li> </ul> </li> <li>Context diagram</li> <li>Prototypes</li> </ul>	<ul style="list-style-type: none"> <li>Requirements documentation</li> <li>Requirements traceability matrix</li> </ul>



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## COLLECT REQUIREMENTS – REQUIREMENT TRACEABILITY MATRIX

Requirements Traceability Matrix								
Project Name:								
Cost Center:								
Project Description:								
ID	Associate ID	Requirements Description	Business Needs, Opportunities, Goals, Objectives	Project Objectives	WBS Deliverables	Product Design	Product Development	Test Cases
001	1.0							
	1.1							
	1.2							
	1.2.1							
002	2.0							
	2.1							
	2.1.1							
003	3.0							
	3.1							
	3.2							
004	4.0							
005	5.0							



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## DEFINE SCOPE

Define Scope is the process of developing a detailed description of the project and product. The preparation of a detailed project scope statement is critical to project success and builds upon the major deliverables, assumptions, and constraints that are documented during project initiation.



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## DEFINE SCOPE -

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>▪ Project charter</li><li>▪ Project management plan<ul style="list-style-type: none"><li>▪ Scope management plan</li></ul></li><li>▪ Project documents<ul style="list-style-type: none"><li>▪ Assumption log</li><li>▪ Requirements documentation</li><li>▪ Risk register</li></ul></li><li>▪ Enterprise environmental factors</li><li>▪ Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>▪ Expert judgment</li><li>▪ Data analysis<ul style="list-style-type: none"><li>▪ Alternatives analysis</li></ul></li><li>▪ Decision making<ul style="list-style-type: none"><li>▪ Multicriteria decision analysis</li></ul></li><li>▪ Interpersonal and team skills</li><li>▪ Facilitation</li><li>▪ Product analysis</li></ul>	<ul style="list-style-type: none"><li>▪ Project scope statement</li><li>▪ Project documents updates<ul style="list-style-type: none"><li>▪ Assumption log</li><li>▪ Requirements documentation</li><li>▪ Requirements traceability matrix</li><li>▪ Stakeholder register</li></ul></li></ul>



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## PROJECT SCOPE STATEMENT

The detailed project scope statement, includes the following:

- Product scope description
- Acceptance criteria
- Deliverable
- Project exclusion
- Constraints & Assumptions.



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## CREATE WBS (PLANNING PROCESS GROUP)

Create WBS is the process of subdividing project deliverables and project work into smaller, more manageable components.

The planned work is contained within the lowest level WBS components, which are called work packages. A work package can be scheduled, cost estimated, monitored, and controlled.



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## CREATE WBS - (PLANNING PROCESS GROUP)

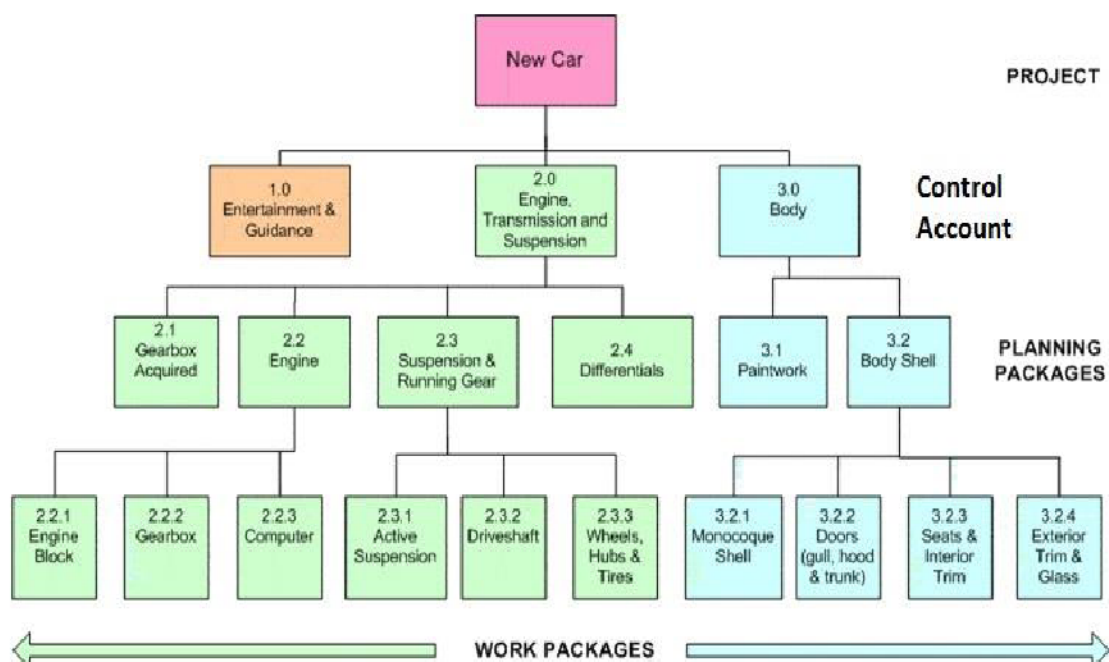
Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>Project management plan<ul style="list-style-type: none"><li>Scope management plan</li></ul></li><li>Project documents<ul style="list-style-type: none"><li>Project scope statement</li><li>Requirements documentation</li></ul></li><li>Enterprise environmental factors</li><li>Organizational process asset</li></ul>	<ul style="list-style-type: none"><li>Expert judgment</li><li>Decomposition</li></ul>	<ul style="list-style-type: none"><li>Scope baseline</li><li>Project documents updates<ul style="list-style-type: none"><li>Assumption log</li><li>Requirements documentation</li></ul></li></ul>



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## CREATE WBS

- The Work Breakdown Structure breaks down deliverables
- Work Packages are deliverables / work packages, NOT activities



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WBS Dictionary			
Project Name:	WBS Name:	WBS Id:	Parent Id:
WBS Owner:		Start Date:	End Date:
WBS Detail:			
WBS Element Description:			
Acceptance Criteria:			
Assumptions:			
Resources Assigned:			
WBS dependencies:			
Cost:			
Approved by:		Date:	



## Scope Baseline

- **Definition:** An approved specific version of the detailed scope statement, work breakdown structure (WBS), and its associated WBS dictionary
- When finalizing scope baseline, the items that are eliminated from the project must be formally documented as exclusions to the project.
- If their exclusion is not properly documented, they may return again and again as new requirements to be considered.





## VALIDATE SCOPE

**Validate Scope** is the process of formalizing acceptance of the completed project deliverables. This process includes reviewing deliverables with the customer or sponsor to ensure that they are completed satisfactorily and obtaining formal acceptance of deliverables by the customer or sponsor.



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## VALIDATE SCOPE

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>▪ Project management plan<ul style="list-style-type: none"><li>▪ Scope management plan</li><li>▪ Requirements management plan</li><li>▪ Scope baseline</li></ul></li><li>▪ Project documents<ul style="list-style-type: none"><li>▪ Lessons learned register</li><li>▪ Quality reports</li><li>▪ Requirements documentation</li><li>▪ Requirements traceability matrix</li></ul></li><li>▪ Verified deliverables</li><li>▪ Work performance data</li></ul>	<ul style="list-style-type: none"><li>▪ Inspection</li><li>▪ Decision making<ul style="list-style-type: none"><li>▪ Voting</li></ul></li></ul>	<ul style="list-style-type: none"><li>▪ Accepted deliverables</li><li>▪ Work performance information</li><li>▪ Change requests</li><li>▪ Project document updates<ul style="list-style-type: none"><li>▪ Lessons learned register</li><li>▪ Requirements documentation</li><li>▪ Requirements traceability matrix</li></ul></li></ul>



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## CONTROL SCOPE (MONITORING AND CONTROLLING PROCESS GROUP)

Monitoring the status of the project and product scope and managing changes to the scope baseline.



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## CONTROL SCOPE (MONITORING AND CONTROLLING PROCESS GROUP )

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>▪ Project management plan<ul style="list-style-type: none"><li>▪ Scope management plan</li><li>▪ Requirements management plan</li><li>▪ Change management plan</li><li>▪ Configuration management plan</li><li>▪ Scope baseline</li><li>▪ Performance measurement baseline</li></ul></li><li>▪ Project documents<ul style="list-style-type: none"><li>▪ Lessons learned register</li><li>▪ Requirements documentation</li><li>▪ Requirements traceability matrix</li></ul></li><li>▪ Work performance data</li><li>▪ Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>▪ Data analysis<ul style="list-style-type: none"><li>▪ Variance analysis</li><li>▪ Trend analysis</li></ul></li></ul>	<ul style="list-style-type: none"><li>▪ Work performance information</li><li>▪ Change requests</li><li>▪ Project management plan updates<ul style="list-style-type: none"><li>▪ Scope management plan</li><li>▪ Scope baseline</li><li>▪ Schedule baseline</li><li>▪ Cost baseline</li><li>▪ Performance measurement baseline</li></ul></li><li>▪ Project documents updates<ul style="list-style-type: none"><li>▪ Lessons learned register</li><li>▪ Requirements documentation</li><li>▪ Requirements traceability matrix</li></ul></li></ul>



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## Exercise 1: Correct Order



Arrange the following activities in correct order

Define  
scope

Create  
WBS

Collect  
Requirements

Validate Scope



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## Exercise 2: Scope Management Crossword

Revising Key Terms : Complete the following

1. \_\_\_\_\_ Scope means the features or functions of the thing or service that you are building
2. The process where you write the project scope statement is called \_\_\_\_\_ Scope



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## Exercise 2: Scope Management Crossword



**Revising Key Terms : Complete the following**

1. **Product Scope** means the features or functions of the thing or service that you are building
2. The process where you write the project scope statement is called **Define Scope**



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# QUIZ !



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# Project Schedule Management



Pankaj Sharma, 9810996356

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## PROJECT SCHEDULE MANAGEMENT

**Project Schedule Management** includes the processes required to manage timely completion of the project.

**Plan schedule management** — The process of establishing the policies, procedures and documentation for planning, developing, managing, executing and controlling the project schedule

**Define Activities**—The process of identifying the specific actions to be performed to produce the project deliverables.

**Sequence Activities**—The process of identifying and documenting relationships among the project activities..

**Estimate Activity Durations**—The process of approximating the number of work periods needed to complete individual activities with estimated resources.

**Develop Schedule**—The process of analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule.

**Control Schedule**—The process of monitoring the status of the project to update project progress and managing changes to the schedule baseline.





## PLAN SCHEDULE MANAGEMENT

Plan schedule Management is the process of establishing the policies, Procedures, and documentation for planning, developing, managing and controlling the project schedule

The key benefit of this process is that it provides direction on how the project schedule will be managed throughout the project.

Pankaj Sharma, 9810996356



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## PLAN SCHEDULE MANAGEMENT

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>▪ Project charter</li><li>▪ Project management plan<ul style="list-style-type: none"><li>▪ Scope management plan</li><li>▪ Development approach</li></ul></li><li>▪ Enterprise environmental factors</li><li>▪ Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>▪ Expert judgment</li><li>▪ Data analysis<ul style="list-style-type: none"><li>▪ Alternatives analysis</li></ul></li><li>▪ Meetings</li></ul>	<ul style="list-style-type: none"><li>▪ Schedule management plan</li></ul>

Pankaj Sharma, 9810996356



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## PLAN SCHEDULE MANAGEMENT

The schedule management plan can establish the following:

- **Project schedule model development.** The scheduling methodology and the scheduling tool to be used
- **Level of accuracy.** The acceptable range used in determining realistic activity duration estimates is
- **Units of measure.** Each unit used in measurements (such as staff hours, staff days, or weeks for time
- **Organizational procedures links.** The WBS provides the framework for the schedule
- **Project schedule model maintenance.** The process used to update the status and record progress
- **Control thresholds.** Variance thresholds for monitoring schedule performance may be specified to indicate

Pankaj Sharma, 9810996356



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## DEFINE ACTIVITIES

Define Activities is the process of identifying and documenting the specific actions to be performed to produce the project deliverables.

The key benefit of this process is to break down work packages into Activities that provide a basis for estimating, scheduling, executing, Monitoring , and controlling the project work.

Pankaj Sharma, 9810996356



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## DEFINE ACTIVITIES

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>Project management plan<ul style="list-style-type: none"><li>Schedule management plan</li><li>Scope baseline</li></ul></li><li>Enterprise environmental factors</li><li>Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>Expert judgment</li><li>Decomposition</li><li>Rolling wave planning</li><li>Meetings</li></ul>	<ul style="list-style-type: none"><li>Activity list</li><li>Activity attributes</li><li>Milestone list</li><li>Change requests</li><li>Project management plan updates<ul style="list-style-type: none"><li>Schedule baseline</li><li>Cost baseline</li></ul></li></ul>



## ACTIVITY ATTRIBUTES AND MILESTONE LIST

**Activity attributes** depicts the multiple components associated with each activity

- Activity ID, WBS ID, Activity Name, activity description, predecessor activities, successor activities, logical relationships, leads and lags, resource requirements, imposed dates, constraints, and assumptions.
- Activity attributes can be used to identify the person responsible for executing the work, geographic area, or place where the work has to be performed, and activity type such as level of effort (LOE), discrete effort, and apportioned effort (AE).

**Milestone List** identifies all milestones and indicates whether the milestone is mandatory, such as those required by contract, or optional, such as those based upon historical information.





## SEQUENCE ACTIVITIES

Sequence Activities is the process of Identifying and documenting relationships among the project activities.

The key benefit of this Process is that it defines the logical sequence of Work to obtain the greatest efficiency given all project constraint.



## SEQUENCE ACTIVITIES

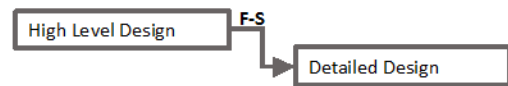
Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>Project management plan<ul style="list-style-type: none"><li>Schedule management plan</li><li>Scope baseline</li></ul></li><li>Project documents<ul style="list-style-type: none"><li>Activity attributes</li><li>Activity list</li><li>Assumption log</li><li>Milestone list</li></ul></li><li>Enterprise environmental factors</li><li>Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>Precedence diagramming method</li><li>Dependency determination and integration</li><li>Leads and lags</li><li>Project management information system</li></ul>	<ul style="list-style-type: none"><li>Project schedule network diagrams</li><li>Project documents updates<ul style="list-style-type: none"><li>Activity attributes</li><li>Activity list</li><li>Assumption log</li></ul></li><li>Milestone list</li></ul>



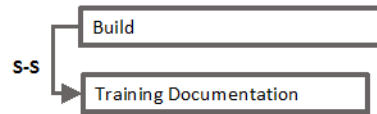


## PRECEDENCE DIAGRAMMING METHOD - INCLUDES 4 TYPES OF RELATIONSHIPS

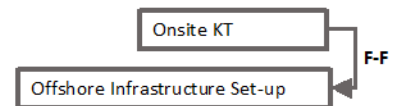
**Finish-to-Start (FS)** - Successor activity cannot start until a predecessor activity has finished.



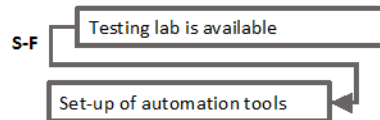
**Start-to-Start (SS)** - Successor activity cannot start until a predecessor activity has started.



**Finish-to-Finish (FF)** - Successor activity cannot finish until a predecessor activity has finished.



**Start-to-Finish (SF)** - Successor activity cannot finish until a predecessor activity has started.

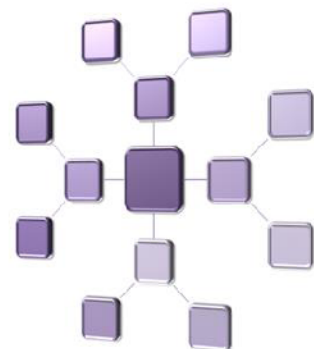


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## DEPENDENCY DETERMINATION

**Dependency Determination:** Dependencies may be characterized by the following attributes:

- **Mandatory dependencies:**
  - Logical relationships inherent in the set of activities.
  - Also called hard logic.
- **Discretionary dependencies:**
  - Dependencies which are defined by the project team or the performing organization.
  - Also called preferred logic or soft logic.
  - These dependencies need documentation as they may impact scheduling options later on in the project.
- **External dependencies:**
  - Represents relationship between project and non-project activities. E.g. projects requiring government approval.



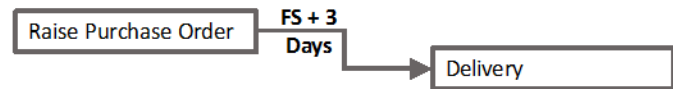
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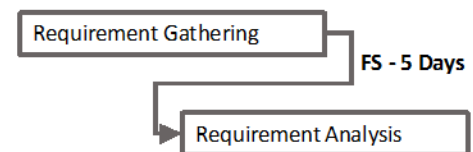
## SEQUENCE ACTIVITIES – TOOLS & TECHNIQUES

**Leads and Lags:** Lead and Lags are represented to connote the delays or leads between two activities

**Lag Time** - The delay between tasks that have a dependency.



**Lead Time** - The overlap between tasks that have a dependency.



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## ESTIMATE ACTIVITY DURATION

Estimate Activity Durations is the process of estimating the Number of work periods needed to complete individual Activities with estimated resources.

The key benefit of this process is that it provides the amount of time each activity will take to complete, which is a major input to Develop schedule process.





## ESTIMATE ACTIVITY DURATION

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>Project management plan               <ul style="list-style-type: none"> <li>Schedule management plan</li> <li>Scope baseline</li> </ul> </li> <li>Project documents               <ul style="list-style-type: none"> <li>Activity attributes</li> <li>Activity list</li> <li>Assumption log</li> <li>Lessons learned register</li> <li>Milestone list</li> <li>Project team assignments</li> <li>Resource breakdown structure</li> <li>Resource calendars</li> <li>Resource requirements</li> <li>Risk register</li> </ul> </li> <li>Enterprise environmental factors</li> <li>Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>Expert judgment</li> <li>Analogous estimating</li> <li>Parametric estimating</li> <li>Three-point estimating</li> <li>Bottom-up estimating</li> <li>Data analysis               <ul style="list-style-type: none"> <li>Alternatives analysis</li> <li>Reserve analysis</li> </ul> </li> <li>Decision making               <ul style="list-style-type: none"> <li>Voting</li> </ul> </li> <li>Meetings</li> </ul>	<ul style="list-style-type: none"> <li>Duration estimates</li> <li>Basis of estimates</li> <li>Project documents updates               <ul style="list-style-type: none"> <li>Activity attributes</li> <li>Assumption log</li> <li>Lessons learned register</li> </ul> </li> </ul>

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## ESTIMATE ACTIVITY DURATION – TOOLS AND TECHNIQUES

**Expert Judgment** guided by historical information, can provide duration estimate information or recommended maximum activity durations from prior similar projects. Expert judgment can also be used to determine whether to combine methods of estimating and how to reconcile differences between them.

**Analogous estimating** uses parameters such as duration, budget, size, weight, and complexity, from a previous, similar project, as the basis for estimating the same parameter or measure for a future project.

**Parametric Estimating** Parametric estimating uses a statistical relationship between historical data and other variables (e.g., square footage in construction) to calculate an estimate for activity parameters, such as cost, budget, and duration.

**Reserve Analysis** include contingency reserves, (sometimes referred to as time reserves or buffers) into the overall project schedule to account for schedule uncertainty. The contingency reserve may be a percentage of the estimated activity duration, a fixed number of work periods, or may be developed by using quantitative analysis methods.

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## THREE POINT ESTIMATES

**Three-Point Estimates** is based on statistical methods in particular normal distribution. The estimation of activity duration is done based on the following three points

**Most likely (M).** The duration of the activity, given the resources likely to be assigned, their productivity, realistic expectations of availability for the activity, dependencies on other participants, and interruptions.

**Optimistic (O).** The activity duration is based on analysis of the best-case scenario for the activity.

**Pessimistic (P).** The activity duration is based on analysis of the worst-case scenario for the activity.

PERT analysis calculates an **Expected (E)** activity duration using a weighted average of these three estimates:

**Double Triangular or Beta Distribution (PERT)** -  $E = (O + 4M + P)/6$ , Standard Deviation -  $SD = P-O/6$

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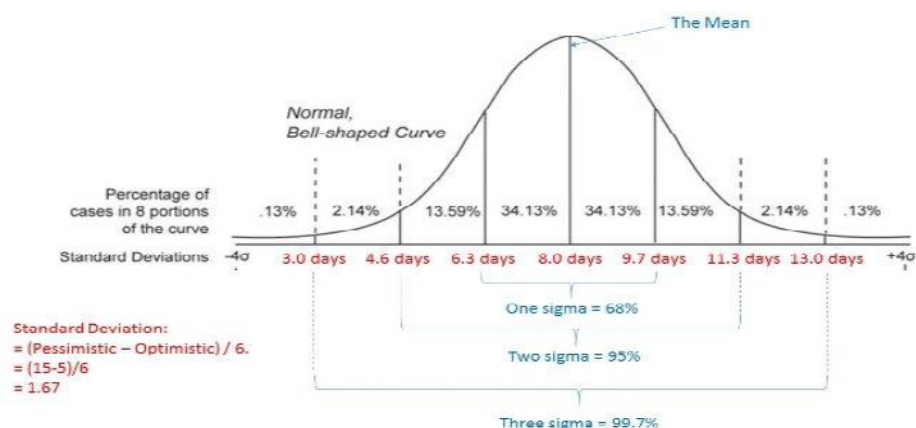
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## THREE POINT ESTIMATES - PERT

PERT analysis calculates an **Expected (E)** activity duration using a weighted average of these three estimates:

**Double Triangular or Beta Distribution** -  $E = (O + 4M + P)/6$ , Standard Deviation -  $SD = (P-O)/6 = (15-5)/6 = 10/6 = 1.67$

$O = 5, M = 7, P = 15$



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## PERT EXAMPLE

PMP® Exam Preparation



### PERT Example

Activity	O	ML	P	Expected or PERT Duration	Standard Deviation ( $\sigma$ )	$\sigma^2$	Range of the Estimate
W	16	26	54	29	6.33	40.11	29 $\pm$ 6.33
X	40	59	84	60	7.33	53.78	60 $\pm$ 7.33
Y	40	45	56	46	2.67	7.11	46 $\pm$ 2.67
Z	30	38	40	37	1.67	2.78	37 $\pm$ 1.67
Path				172	10.19	103.78	

If W,X,Y and Z are the only activities in a project and all are on the critical path, what is the project duration?  
The answer is 172 with a standard deviation of 10.19.

The probability of completing the project between: 161.81 and 182.19 days is 68.27% (one sigma)  
151.63 and 192.37 days is 95.45% (two sigma)  
141.44 and 202.56 days is 99.73% (three sigma)

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## THREE POINT ESTIMATES – TRIANGULAR DISTRIBUTION

**Triangular Distribution –  $E = (O+M+P)/3$  ,**

**Standard Deviation  $= \sqrt{(O^2+M^2+P^2-OM-MP-PO)/18}$**

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## DEVELOP SCHEDULE

Develop schedule is the process of analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule model.

The key benefits of this process is that by entering schedule activities , durations, resources, resource availabilities and Logical relationships into the scheduling tool , it generates a schedule model with planned dates for completing project activities

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## DEVELOP SCHEDULE

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>Project management plan               <ul style="list-style-type: none"> <li>Schedule management plan</li> <li>Scope baseline</li> </ul> </li> <li>Project documents               <ul style="list-style-type: none"> <li>Activity attributes</li> <li>Activity list</li> <li>Assumption log</li> <li>Basis of estimates</li> <li>Duration estimates</li> <li>Lessons learned register</li> <li>Milestone list</li> <li>Project schedule network diagrams</li> <li>Project team assignments</li> <li>Resource calendars</li> <li>Resource requirements</li> <li>Risk register</li> </ul> </li> <li>Agreements</li> <li>Enterprise environmental factors</li> <li>Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>Schedule network analysis</li> <li>Critical path method</li> <li>Resource optimization</li> <li>Data analysis               <ul style="list-style-type: none"> <li>What-if scenario analysis</li> <li>Simulation</li> </ul> </li> <li>Leads and lags</li> <li>Schedule compression</li> <li>Project management information system</li> <li>Agile release planning</li> </ul>	<ul style="list-style-type: none"> <li>Schedule baseline</li> <li>Project schedule</li> <li>Schedule data</li> <li>Project calendars</li> <li>Change requests</li> <li>Project management plan updates               <ul style="list-style-type: none"> <li>Schedule management plan</li> <li>Cost baseline</li> </ul> </li> <li>Project documents updates               <ul style="list-style-type: none"> <li>Activity attributes</li> <li>Assumption log</li> <li>Duration estimates</li> <li>Lessons learned register</li> <li>Resource requirements</li> <li>Risk register</li> </ul> </li> </ul>

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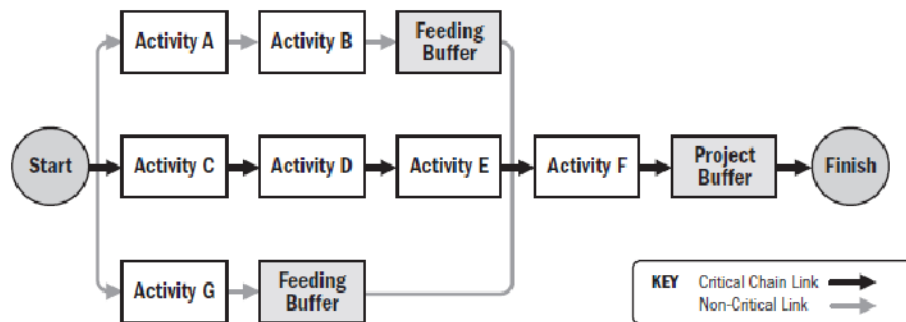
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## CRITICAL CHAIN METHOD

**Critical Chain Method** is a schedule network analysis technique that modifies the project schedule to account for limited resources. The resource-constrained critical path is known as the critical chain. The critical chain method adds duration buffers that are non-work schedule activities to manage uncertainty.



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## RESOURCE OPTIMIZATION TECHNIQUES – RESOURCE LEVELLING

**Resource Levelling** - Is necessary when resources have been over-allocated, such as when a resource has been assigned to two or more activities during the same time period, when shared or critical required resources are only available at certain times or are only available in limited quantities. Resource leveling can often cause the original critical path to change.

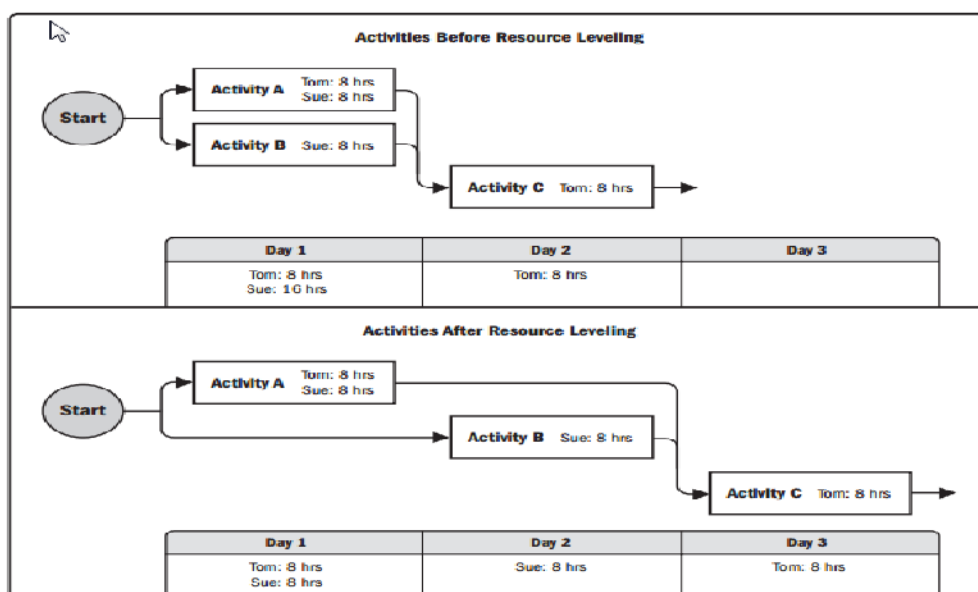


Figure 6-20. Resource Leveling

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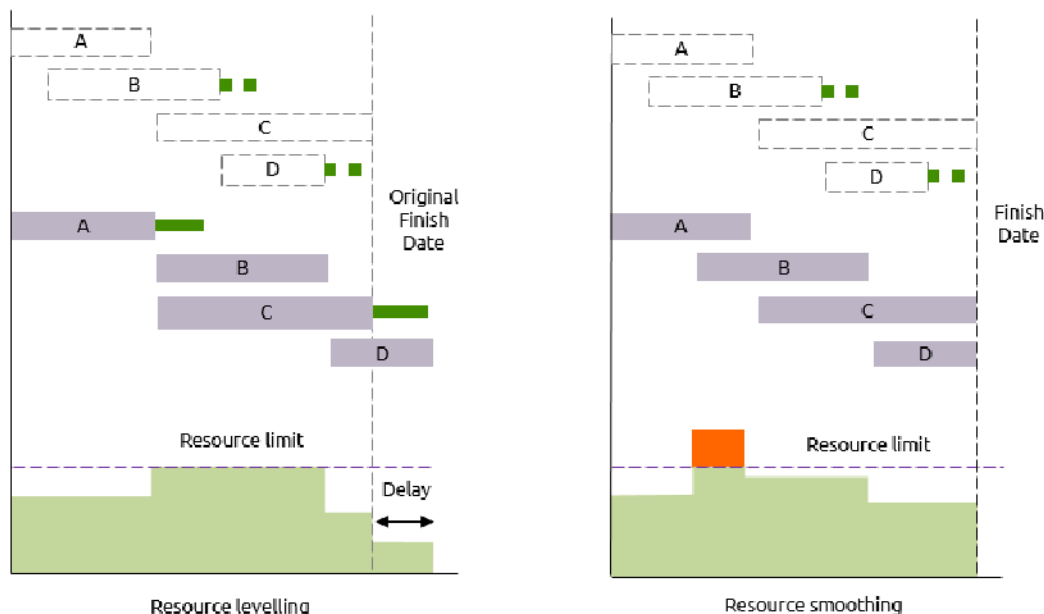


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## RESOURCE OPTIMIZATION TECHNIQUES – RESOURCE LEVELLING AND SMOOTHING

**Resource Smoothing** – A technique that adjusts the activities of a schedule model such that the requirements for resources on the project do not exceed certain predefined resource limits. There is no change in the project completion date the activities may only be delayed within their free and total float.



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## DATA ANALYSIS

**What-If Scenario Analysis-** A schedule network analysis is performed using the schedule to compute the different scenarios, such as delaying a major component delivery, or introducing external factors, such as a strike

The outcome of the what if scenario analysis can be used to assess the Feasibility of the project schedule under adverse conditions

**Simulation** involves calculating multiple project durations with different sets of activity assumptions. The most common technique is Monte Carlo Analysis in which a distribution of possible activity durations is defined for each activity and used to calculate a distribution of possible outcomes for the total project.

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## SCHEDULE COMPRESSION TECHNIQUES



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## DEVELOP SCHEDULE OUTPUTS

**Schedule Baseline** - is a real or theoretical construct that captures the approved schedule. It is used to provide a comparison or contrast with the actual progress of work against the schedule and to determine if performance to date is within acceptable parameters.

**Project schedule** displays the start and end dates of all the activities in the project and the same for overall project. It can be represented in the form of Gantt Chart, Milestone Chart or a project network diagram.

**Schedule data** is the data on the basis of which schedule was developed. It includes resource requirements by time period, alternative schedules such as best-case or worst case, not resource leveled or resource leveled with, or without imposed dates and scheduling of contingency reserves

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## PROJECT CALENDARS

**Project Calendars** – A project calendar identifies working days and shifts that are available for scheduled activities. It distinguishes time period in days or part of days that are available to complete scheduled activities from time period that are not available.

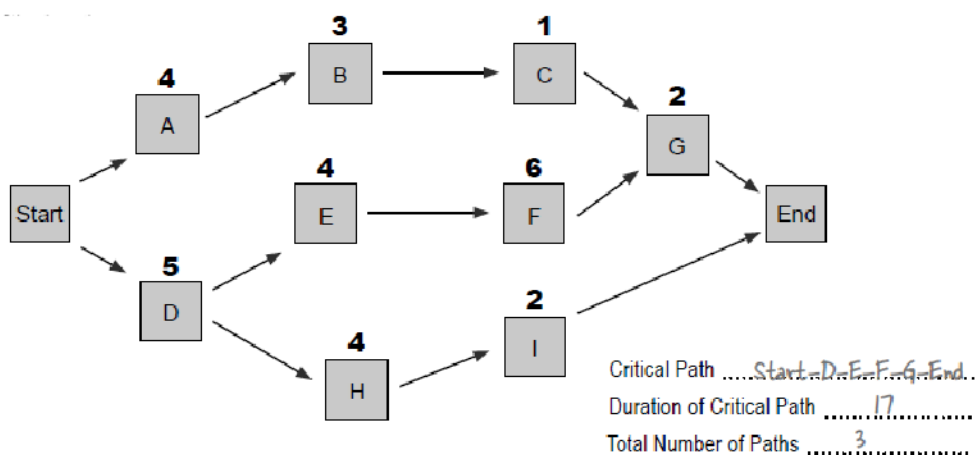
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## EXERCISE : CRITICAL PATH

For the network diagram below find Critical Path, float for activity A and E  
**ABCG=10, DEFG=17, DHI=11**



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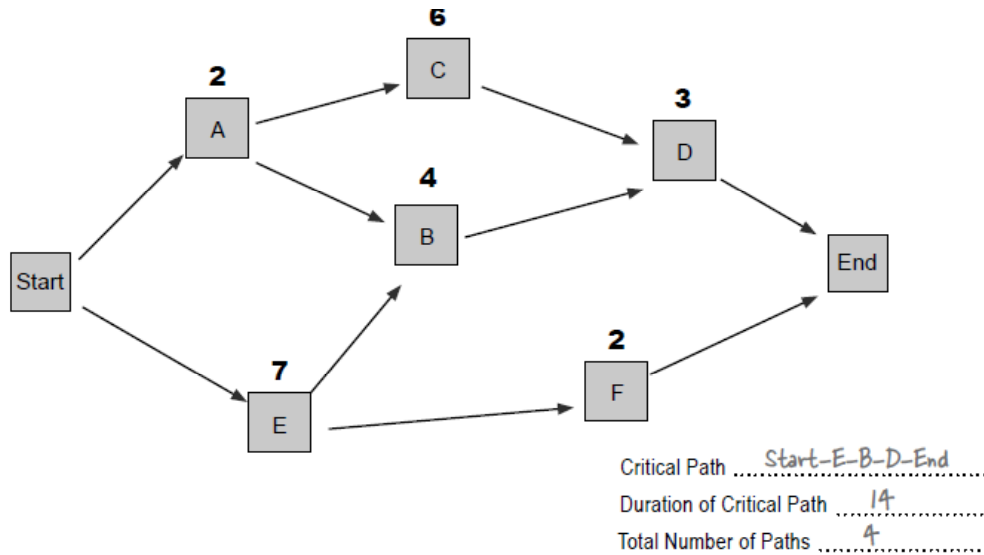
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## EXERCISE : CRITICAL PATH

$$ACD=11, ABD=9, EBD=14, EF=9$$

For the network diagram below find Critical Path, float for activity A and E

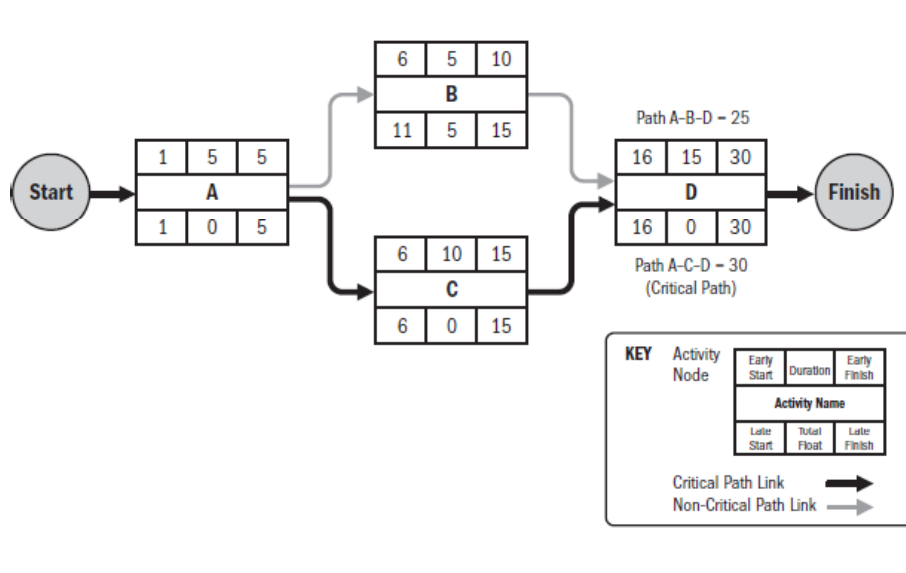


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## EXERCISE : FORWARD AND BACKWARD PASS



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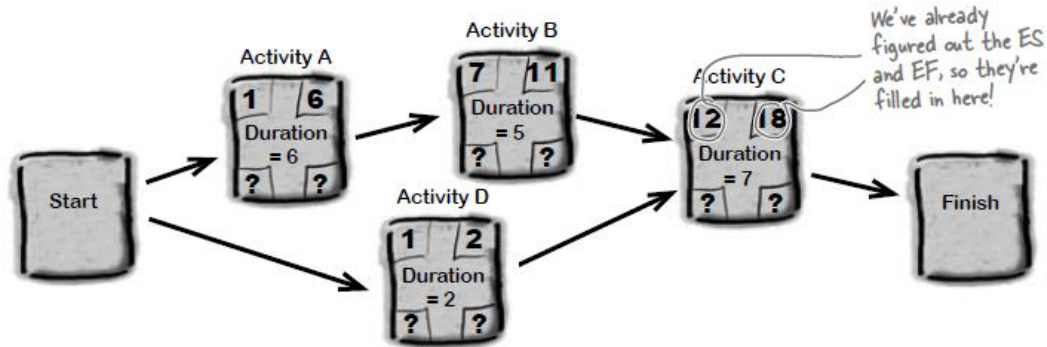


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## EXERCISE : CRITICAL PATH

Complete the following Project Network Diagram



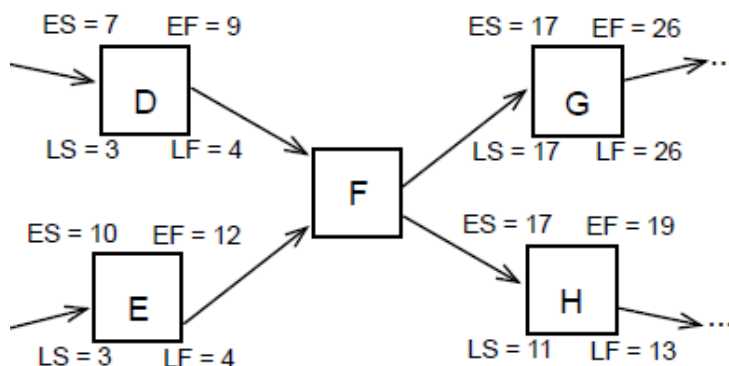
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## Exercise : Critical Path

Based on the portion of network diagram shown below find ES and LF for activity F



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## **CONTROL SCHEDULE**

**(MONITORING AND CONTROLLING PROCESS GROUP)**

**Control Schedule is the process of monitoring the status of the project to update project progress and manage changes to the schedule baseline.**

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## **CONTROL SCHEDULE**

**Control Schedule is the process of monitoring the status of project activities to update project progress and manage changes to the schedule baseline to achieve the plan.**

**The key benefit of this process is that it provides the means to recognize deviation from the plan and take corrective action and preventive actions and thus minimizes risk.**

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## CONTROL SCHEDULE

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>Project management plan               <ul style="list-style-type: none"> <li>Schedule management plan</li> <li>Schedule baseline</li> <li>Scope baseline</li> <li>Performance measurement baseline</li> </ul> </li> <li>Project documents               <ul style="list-style-type: none"> <li>Lessons learned register</li> <li>Project calendars</li> <li>Project schedule</li> <li>Resource calendars</li> <li>Schedule data</li> </ul> </li> <li>Work performance data</li> <li>Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>Data analysis               <ul style="list-style-type: none"> <li>Earned value analysis</li> <li>Iteration burndown chart</li> <li>Performance reviews</li> <li>Trend analysis</li> <li>Variance analysis</li> <li>What-if scenario analysis</li> </ul> </li> <li>Critical path method</li> <li>Project management information system</li> <li>Resource optimization</li> <li>Leads and lags</li> <li>Schedule compression</li> </ul>	<ul style="list-style-type: none"> <li>Work performance information</li> <li>Schedule forecasts</li> <li>Change requests</li> <li>Project management plan updates               <ul style="list-style-type: none"> <li>Schedule management plan</li> <li>Schedule baseline</li> <li>Cost baseline</li> <li>Performance measurement baseline</li> </ul> </li> <li>Project documents updates               <ul style="list-style-type: none"> <li>Assumption log</li> <li>Basis of estimates</li> <li>Lessons learned register</li> <li>Project schedule</li> <li>Resource calendars</li> <li>Risk register</li> <li>Schedule data</li> </ul> </li> </ul>

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## Exercise 3: Time Management

### Complete the following

- Adding more resources to a project so you can get it done faster is called\_\_\_\_\_ .
- \_\_\_\_\_ is the process where you put the activities in order.

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1. Adding more resources to a project so you can get it done faster is called **Crashing** .
2. **Sequence Activities** is the process where you put the activities in order.



# QUIZ !





## Project Cost Management



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## PROJECT COST MANAGEMENT

Project Cost Management includes the processes involved in estimating, budgeting, and controlling costs so that the project can be completed within the approved budget.

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# COST MANAGEMENT PROCESSES

Process	Process Group
Plan Cost Management	Planning
Estimate Costs	Planning
Determine Budget	Planning
Control Costs	Monitoring and Controlling

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## ESTIMATE COSTS

Estimate Costs is the process of developing an approximation of the monetary resources needed to complete project activities. The table below shows different types of estimates that can be used based on the need.

Estimate Type	Range
Order of Magnitude Estimates	-25% to +75%
Definitive Estimate	-5% to +10%

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## Types of Cost

- **Direct Cost-** Any cost that is identified specifically with a particular final cost objective.
- **Indirect Cost-** Any cost not directly identified with a single, final cost objective (more than one project)
- **Fixed Cost -** Periodic charge that does not vary with business volume
- **Variable Cost -** Cost that fluctuates based on the business volume
- **Opportunity Cost:** When there is a decision to be made between two opportunities, the opportunity cost is the value / money forgone for the not doing the project.

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## Types of Cost

- **Lifecycle Costing:** Takes into account cost of development of a project and also the cost of supporting during the lifecycle.
- **Sunk Cost -** Cost already incurred which cannot be recovered regardless of future events

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## PLAN COST MANAGEMENT

The process that establishes the policies, procedures , and documentation for planning , managing , expending , and controlling project costs.

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## PLAN COST MANAGEMENT

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>▪ Project charter</li><li>▪ Project management plan<ul style="list-style-type: none"><li>Schedule management plan</li><li>Risk management plan</li></ul></li><li>▪ Enterprise environmental factors</li><li>▪ Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>▪ Expert judgment</li><li>▪ Data analysis<ul style="list-style-type: none"><li>Alternative analysis</li></ul></li><li>▪ Meetings</li></ul>	<ul style="list-style-type: none"><li>▪ Cost management plan</li></ul>

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## COST MANAGEMENT PLAN

**Cost Management Plan** — is a component of the project management plan and describes how the project costs will be planned, structured, and controlled. The cost management plan can establish the following.

- **Units of measure** - Each unit of measure for each resource.
- **Level of precision** — The degree to which activity cost estimates will be rounded up or down.
- **Level of accuracy** - The acceptable range (e.g.  $\pm 100\%$ ) used in determining realistic activity cost estimates is specified, may include an amount for contingencies.
- **Control threshold** — Variance threshold for monitoring cost performance may be specified to indicate an agreed — upon amount of variation to be allowed before some action need to be taken.
- **Rules of performance measurement** — Earned value management (EVM) rules of performance measurement are set. For example
  - Define the points in the WBS at which measurement of control accounts will be performed
  - Establish the earned value measurement techniques (e.g. weighted milestones, fixed formula, percent complete, etc) to be used and
  - Specify tracking methodologies and the earned value management computation equations for calculating projected estimate at completion (EAC) forecasts to provide a validity check on the bottom-up EAC

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## ESTIMATE COST

**Estimate cost** is the process of developing an approximation of the monetary resources needed to complete project activities. The key benefit of this process is that it determines the amount of cost required to complete project work.

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## ESTIMATE COSTS

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>▪ Project management plan               <ul style="list-style-type: none"> <li>▪ Cost management plan</li> <li>▪ Quality management plan</li> <li>▪ Scope baseline</li> </ul> </li> <li>▪ Project documents               <ul style="list-style-type: none"> <li>▪ Lessons learned register</li> <li>▪ Project schedule</li> <li>▪ Resources requirements</li> <li>▪ Risk register</li> </ul> </li> <li>▪ Enterprise environmental factors</li> <li>▪ Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>▪ Expert judgment</li> <li>▪ Analogous estimating</li> <li>▪ Parametric estimating</li> <li>▪ Bottom-up estimating</li> <li>▪ Three-point estimating</li> <li>▪ Data analysis               <ul style="list-style-type: none"> <li>▪ Alternatives analysis</li> <li>▪ Reserve analysis</li> <li>▪ Cost of quality</li> </ul> </li> <li>▪ Project management information system</li> <li>▪ Decision making               <ul style="list-style-type: none"> <li>▪ Voting</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Cost estimates</li> <li>▪ Basis of estimates</li> <li>▪ Project documents updates               <ul style="list-style-type: none"> <li>▪ Assumption log</li> <li>▪ Lessons learned register</li> <li>▪ Risk register</li> </ul> </li> </ul>



## ESTIMATE COSTS -TOOLS AND TECHNIQUES

- **Expert Judgment** guided by historical information, provides valuable insight about the environment and information from prior similar projects. Expert judgment can also be used to determine whether to combine methods of estimating and how to reconcile differences between them.
- **Analogous Estimating** relies on historical information (Previous projects executed by the organization) to predict the cost of current project. This is a top-down approach is good for fast estimates to get a general idea of what the project may cost. The accuracy depends upon how similar the two projects actually are.
- **Parametric estimating** uses a mathematical model based on known parameters to predict the cost of a Project. A parameter can be cost per unit, cost per cubic yard etc. Two Parametric estimating techniques are Regression Analysis and Learning curve.





## ESTIMATE COSTS -TOOLS AND TECHNIQUES

- **Bottom-up estimating** produces a separate estimate for each scheduled activity. The detailed cost is then summarized or “rolled up” to higher levels for subsequent reporting and tracking purposes. The cost and accuracy of bottom-up cost estimating is typically influenced by the size and complexity of the individual activity or work package.
- **Three-point estimates** concept originated with the program evaluation and review technique (PERT). PERT uses three estimates to define an approximate range for an activity's cost:
- **Triangular Distribution**

Estimated Cost = (Optimistic + Most Likely + Pessimistic) / 3

### Beta Distribution

- **ESTIMATED COST** = (Optimistic + 4\*(Most Likely) + Pessimistic) / 6

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## ESTIMATE COSTS -TOOLS AND TECHNIQUES

- **Reserve Analysis** adds reserve amount (Contingency) to the cost. This is done to take care of uncertainties in the project.
- **Cost of Quality** includes assumptions related to Cost of Quality
- **Project Management Information System** is helpful in performing calculations, Organizing and storing large amount of information needed for preparing cost estimates and for reporting purpose
- **Decision Making Techniques** Team – based approaches , such as brainstorming, the Delphi or nominal group techniques, are used for engaging team members to improve estimate accuracy and commitment to the emerging estimates.

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## ESTIMATE COSTS - OUTPUTS

- **Activity Cost estimates** details how much it would cost to complete each schedule activity on the project
- **Basis of estimates** include supporting documentation of the cost estimates and it may include documentation of the basis of estimates , documentation of all assumptions made , documentation of any known constraint , indication of the range of possible estimates and indication of the confidence level of the final estimates
- Project document updates include project risk register and cost management plan

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## Exercise : Estimate Cost

### Revise Tools to Estimate Cost

1. You figure out a best case scenario and , a likely scenario and a worst case scenario. Then you use a formula to come up with an expected cost for the project. The tool used by you is \_\_\_\_\_
2. John creates a document with all the historical information from similar project he had done in past and also takes input from a contractor who provides his input. The tool used by John is \_\_\_\_\_

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### Revise Tools to Estimate Cost

1. You figure figures out a best case scenario and , a likely scenario and a worst case scenario. Then you use a formula to come up with an expected cost for the project. The tool used by you is Three-point estimate
2. John creates a document with all the historical information from similar project he had done in past and also takes input from a contractor who provides his input. The tool used by John is Expert Judgment

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## DETERMINE BUDGET

Determine Budget is the process of aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline. This baseline includes all authorized budgets, but excludes management reserves.

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## DETERMINE BUDGET

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>Project management plan               <ul style="list-style-type: none"> <li>Cost management plan</li> <li>Resource management plan</li> <li>Scope baseline</li> </ul> </li> <li>Project documents               <ul style="list-style-type: none"> <li>Basis of estimates</li> <li>Cost estimates</li> <li>Project schedule</li> <li>Risk register</li> </ul> </li> <li>Business documents               <ul style="list-style-type: none"> <li>Business case</li> <li>Benefits management plan</li> </ul> </li> <li>Agreements</li> <li>Enterprise environmental factors</li> <li>Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>Expert judgment</li> <li>Cost aggregation</li> <li>Data analysis               <ul style="list-style-type: none"> <li>Reserve analysis</li> </ul> </li> <li>Historical information review</li> <li>Funding limit reconciliation</li> <li>Financing</li> </ul>	<ul style="list-style-type: none"> <li>Cost baseline</li> <li>Project funding requirements</li> <li>Project documents updates               <ul style="list-style-type: none"> <li>Cost estimates</li> <li>Project schedule</li> <li>Risk register</li> </ul> </li> </ul>

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## DETERMINE BUDGET – TOOLS AND TECHNIQUES

**Cost Aggregation** involves aggregating the costs of individual activities to work packages that are further aggregated to higher levels of WBS and finally into the project cost

**Reserve Analysis** include contingency reserve and management reserves for the project. Contingency reserves are allowances for response plan strategized for the identified risks. These are also known as “known unknowns”. Management reserves are allowance for unplanned changes to the project scope and cost. They are also known as “unknown unknowns”. Reserves are not the part of the project cost baseline.

**Expert Judgment** can be taken from experienced consultant in the project application area. This can be from an internal organizational resource or external sources

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## DETERMINE BUDGET – TOOLS AND TECHNIQUES

**Historical Information Review** result in parametric estimates or analogous estimates that involve parameter to develop mathematical models to predict total project costs.

**Funding limit reconciliation** refers to reconciliation of planned spending with the funding limit

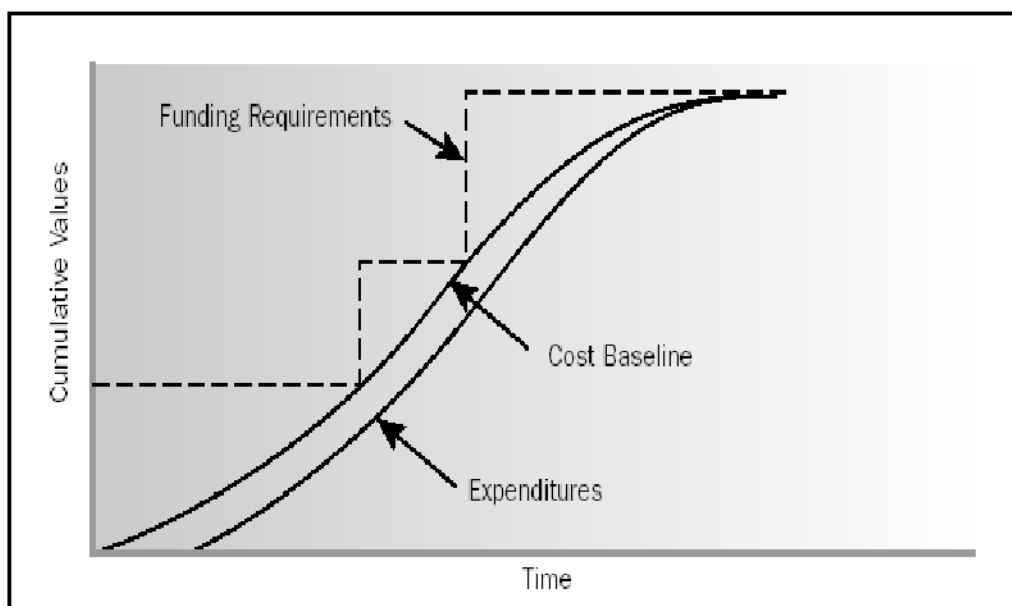
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## DETERMINE BUDGET – OUTPUTS

**Cost performance baseline** is an authorized time-phased budget at completion (BAC) used to measure, monitor, and control overall cost performance on the project. It is developed as a summation of the approved budgets by time period and is typically displayed in the form of an S-curve, as is illustrated in Figure below. In the earned value management technique the cost performance baseline is referred to as the performance measurement baseline (PMB).



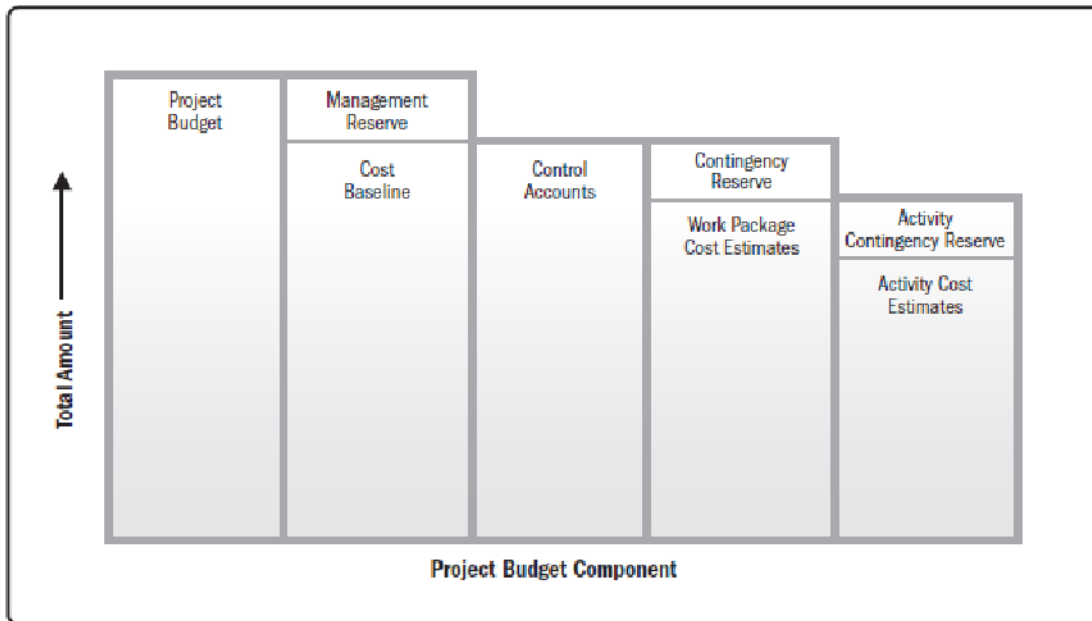
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## PROJECT BUDGET COMPONENTS



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## Exercise 2: Determine Budget

### Revise Tools to Determine Budget

Monika reads a newspaper article that says there has been sharp increase in steel cost recently. She knows this was not in her contractor's original plan and decides to put a few hundred dollars aside to deal with the price hike if it should happen. The tool used by Monika is

- Parametric estimating
- Reserve analysis
- Cost aggregation
- Fund Limit Reconciliation

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## Answers to Exercise 2: Determine Budget

### Revise Tools to Determine Budget

Monika reads a newspaper article that says there has been sharp increase in steel cost recently. She knows this was not in her contractor's original plan and decides to put a few hundred dollars aside to deal with the price hike if it should happen. The tool used by Monika is

- Parametric estimating
- Reserve analysis
- Cost aggregation
- Fund Limit Reconciliation

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## CONTROL COSTS

Control Costs is the process of monitoring the status of the project to update the project budget and managing changes to the cost baseline.

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## CONTROL COSTS

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>Project management plan               <ul style="list-style-type: none"> <li>Cost management plan</li> <li>Cost baseline</li> <li>Performance measurement baseline</li> </ul> </li> <li>Project documents               <ul style="list-style-type: none"> <li>Lessons learned register</li> </ul> </li> <li>Project funding requirements</li> <li>Work performance data</li> <li>Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>Expert judgment</li> <li>Data analysis               <ul style="list-style-type: none"> <li>Earned value analysis</li> <li>Variance analysis</li> <li>Trend analysis</li> <li>Reserve analysis</li> </ul> </li> <li>To-complete performance index</li> <li>Project management information system</li> </ul>	<ul style="list-style-type: none"> <li>Work performance information</li> <li>Cost forecasts</li> <li>Change requests</li> <li>Project management plan updates               <ul style="list-style-type: none"> <li>Cost management plan</li> <li>Cost baseline</li> <li>Performance measurement baseline</li> </ul> </li> <li>Project documents updates               <ul style="list-style-type: none"> <li>Assumption log</li> <li>Basis of estimates</li> <li>Cost estimates</li> <li>Lessons learned register</li> <li>Risk register</li> </ul> </li> </ul>

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## EARNED VALUE MANAGEMENT

**Earned value management** is used to measure the performance of the project, It integrates project scope, cost, and schedule measures to help the project management team assess and measure project performance and progress. The EVM technique involves evaluating the planned value , Earned Value and the Actual cost for each schedule activity , work package or control account.

- Planned Value (PV) is the authorized budget assigned to the scheduled work to be accomplished for a schedule activity or work breakdown structure component. It is also known as Budgeted Cost of Work Scheduled (BCWS)
- Earned Value (EV) is the value of work performed expressed in terms of the approved budget assigned to that work for a schedule activity or a WBS component. It is also known as Budgeted cost of Work Performed (BCWP)
- Actual Cost (AC) is the total cost actually incurred and recorded in accomplishing work performed for an activity or work breakdown structure component.





## EARNED VALUE MANAGEMENT

- **Variance Analysis** helps in analyzing the performance of the project vis-à-vis cost and schedule baselines
- **Schedule Variance (SV)** is a measure of schedule performance on a project. It is equal to the earned value (EV) minus the planned value (PV).  $SV = EV - PV$ .
- **Cost variance (CV)** is a measure of cost performance on a project. It is equal to the earned value (EV) minus the actual costs (AC).  $CV = EV - AC$
- **Schedule performance Index (SPI)** in addition to project status is used to predict the completion date.  $SPI = EV / PV$
- **Cost Performance Index (CPI)** measures the cost efficiency for the work completed, it is the ratio of EV to AC.  $CPI = EV / AC$ .

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## EARNED VALUE MANAGEMENT - FORECASTING

**Forecasting Techniques** are used to calculate Estimate at completion (EAC) and Estimate to complete (ETC).

**EAC forecast for ETC work performed at the present CPI**

$$EAC = BAC / \text{cumulative CPI}$$

**EAC forecast for ETC work performed at the budgeted rate**

$$EAC = AC + BAC - EV$$

**EAC forecast for ETC work performed at an agreed CPI**

$$EAC = AC + (BAC - EV) / CPI$$

**EAC forecast for ETC work considering both SPI and CPI factors.**

$$AC + [(BAC - EV) / (\text{cumulative CPI} \times \text{cumulative SPI})]$$

**If original estimates are flowed**

$$EAC = AC + ETC \text{ (Bottom up)}$$

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**To-complete performance index (TCPI)** is the calculated projection of cost performance that must be achieved on the remaining work to meet a specified management goal, such as the BAC or the EAC.

$$\text{TCPI based on the BAC} = \text{Work Remaining} / \text{Funds Remaining} = (\text{BAC} - \text{EV}) / (\text{BAC} - \text{AC})$$

$$\text{Work Remaining} = (\text{BAC} - \text{EV})$$

$$\text{Fund Remaining} = (\text{BAC} - \text{AC})$$

$$\text{TCPI based on EAC} = \text{Work Remaining} / \text{Funds Remaining} = (\text{BAC} - \text{EV}) / (\text{EAC} - \text{AC})$$

$$\text{Work Remaining} = (\text{BAC} - \text{EV})$$

$$\text{Fund Remaining} = (\text{EAC} - \text{AC})$$



### Exercise 1 : EVM

#### Practice Earned Value Formulae

Your current project is an \$800,000 software development effort, with two teams of programmers that will work for six months, at a total of 10,000 hours. According to the project schedule your team should be done with 38% of the work. You find that the project is currently 40% complete. You have spent 50% of the budget so far. Calculate the following

1. BAC = Cost Baseline = Budget at Completion
  2. EV, PV Earned Value = Actual Percent Complete
  3. SV, CV
  4. SPI, CPI
- $$\text{SV} = \text{EV} - \text{PV}$$
- $$\text{CV} = \text{EV} - \text{AC}$$





## Answer to Exercise - 1 : EVM

### Practice Earned Value Formulae

1.  $BAC = \$ 800,000$ ,  $AC = \$ 400,000$
2.  $PV = \$ 800,000 * 38 / 100 = \$ 304,000$   
 $EV = \$ 800,000 * 40 / 100 = \$ 320,000$
3.  $SV = EV - PV = \$ 16,000$   
 $CV = EV - AC = - \$ 80,000$
4.  $SPI = EV / PV = 1.05$   
 $CPI = EV / AC = 0.8 = 8/10=4/5$

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## Exercise – 2 : EVM

### Practice Earned Value Formulae

You're managing a highway construction project. Your total budget is \$650,000, and there are a total of 7,500 hours of work scheduled on the project. You check with your accounting department, and they tell you that you've spent a total of \$400,000. According to the schedule, your crew should have worked 4,500 hours, but your foreman says that the crew was allowed to work some overtime, and they've actually put in 5,100 hours of work. Based on this Calculate the following Earned Value numbers:

$PV =$   
 $EV =$   
 $CV =$   
 $BAC =$   
 $AC =$   
 $SV =$   
 $SPI = , CPI =$

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## Answer to Exercise - 2 : EVM

### Practice Earned Value Formulae

$$\text{BAC} = \$ 650,000$$

$$\text{AC} = \$ 400,000$$

$$\text{PV} = 650,000 \times 60\% = \$390,000$$

$$\text{EV} = 650,000 \times 68\% = \$ 442,000$$

$$\text{CV} = 442,000 - 400,000 = \$42,000$$

$$\text{SV} = \$ 52,000$$

$$\text{SPI} = 1.13, \text{CPI} = 1.11$$

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## Exercise - 3 : EVM

### Practice Earned Value Formulae

It's nine months into your project. The total budget for your project is \$4,200,000. You've spent \$1,650,000 so far, and you've got a CPI of .875. Use the Earned Value Management formulas from forecasting to figure out where things stand.

Find the following

**EAC =**

**ETC =**

**VAC =**

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## Answer to Exercise - 3 : EVM

### Practice Earned Value Formulae

$$\text{EAC} = \$ 4,200,000 / 0.875 = \$ 4,800,000$$

$$\text{ETC} = \$ 4,800,000 - \$ 1,650,000 = \$ 3,150,000$$

$$\text{VAC} = \$ 4,200,000 - \$ 4,800,000 = -\$ 600,000$$

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# QUIZ !

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# Project Communications Management



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## PROJECT COMMUNICATIONS MANAGEMENT

Processes required to ensure timely and appropriate generation, collection, distribution, storage, retrieval and ultimate disposition of project information. This knowledge area is made up of five processes to determine what to communicate, to whom, how often, and when to reevaluate the plan

An effective project manager spends about 90% of his time communicating and 50% of that time is spent communicating with the project team

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## Communication Model – Various Elements

<b>Sender</b>	The person who needs to initiate the communication
<b>Receiver</b>	The person who gets the message
<b>Medium</b>	The thing used to transmit the message
<b>Feedback</b>	A response to a message
<b>Noise</b>	Something that interferes with the message
<b>Encode</b>	Modify a message so that it can be sent
<b>Decode</b>	Modify a message that has been sent so that it can be understood



## Kinds of Communication

- Formal vs Informal
- Verbal vs Non-verbal
- Official vs Non-official
- Written vs Oral
- Vertical vs Horizontal





## Kinds of Communication

Communication Type	Example
Formal Written	RFP, Project Charter
Informal Written	E-mail
Formal Verbal	Speech
Informal Verbal	Conversations

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## Additional Information

- **Nonverbal Communication**
  - Means gestures, facial expressions, and physical appearance while you are communicating your message
- **Para lingual Communication**
  - Is the tone and pitch of your voice when you are telling people what's going on with your project
- **Feedback**
  - Is when you respond to communication.
- **Active listening**
  - When you give feedback to someone who is speaking

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## Exercise 2: Kinds of Communication

### Revising Key Terms : Kinds of Communication

1. The Project manager writes a requirement specification for your project. This is an example of \_\_\_\_\_ kind of communication.
  - A. Informal verbal
  - B. Informal written
  - C. Formal verbal
  - D. Formal written
  
2. You sent an email to some of your team members to get more information about an issue that has been identified on your project. This is an example of \_\_\_\_\_ kind of communication
  - A. Informal verbal
  - B. Informal written
  - C. Formal verbal
  - D. Formal written



## Answers to Exercise 2: Kinds of Communication

### Revising Key Terms : Kinds of Communication

1. The Project manager writes a requirement specification for your project. This is an example of \_\_\_\_\_ kind of communication.
  - A. Informal verbal
  - B. Informal written
  - C. Formal verbal
  - D. Formal written
  
2. You sent an email to some of your team members to get more information about an issue that has been identified on your project. This is an example of \_\_\_\_\_ kind of communication
  - A. Informal verbal
  - B. Informal written
  - C. Formal verbal
  - D. Formal written







## COMMUNICATION MANAGEMENT PROCESSES

Process	Process Group
Plan Communications management	Planning
Manage Communications	Executing
Monitor Communications	Monitoring and Controlling

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## PLAN COMMUNICATION MANAGEMENT

Determining the project stakeholder information needs and defining a communication approach. It entails:

- ☐ How often communication will be distributed and updated
- ☐ Mode of communication (email, teleconference etc)
- ☐ Information that will be included in the project communications
- ☐ Stakeholders that will receive this information

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## PLAN COMMUNICATIONS MANAGEMENT

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>Project charter</li> <li>Project management plan               <ul style="list-style-type: none"> <li>Resource management plan</li> <li>Stakeholder engagement plan</li> </ul> </li> <li>Project documents               <ul style="list-style-type: none"> <li>Requirements documentation</li> <li>Stakeholder register</li> </ul> </li> <li>Enterprise environmental factors</li> <li>Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>Expert judgment</li> <li>Communication requirements analysis</li> <li>Communication technology</li> <li>Communication models</li> <li>Communication methods</li> <li>Interpersonal and team skills               <ul style="list-style-type: none"> <li>Communication styles assessment</li> <li>Political awareness</li> <li>Cultural awareness</li> </ul> </li> <li>Data representation               <ul style="list-style-type: none"> <li>Stakeholder engagement assessment matrix</li> </ul> </li> <li>Meetings</li> </ul>	<ul style="list-style-type: none"> <li>Communications management plan</li> <li>Project management plan updates               <ul style="list-style-type: none"> <li>Stakeholder engagement plan</li> </ul> </li> <li>Project documents</li> </ul>

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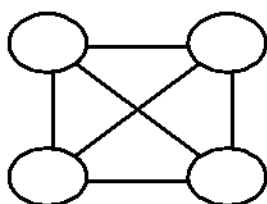


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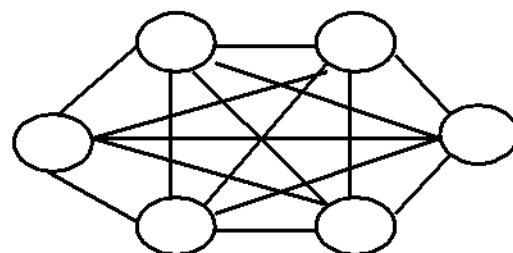
## COMMUNICATION REQUIREMENT ANALYSIS

The analysis of the communication requirements determine the information needs of the project stakeholders. The project manager should also consider the number of potential communication channel or paths as an indicator of the complexity of a project's communications.

For Example if there are  $n$  people involve in a project communication. The total number of channels would be  $n(n-1)/2$



4 people - 6 channels



6 people - 15 channels

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## COMMUNICATION TECHNOLOGY

The method used to transfer information among project stakeholder may vary significantly. For example, a project team may use technique from brief conversation to extended meetings, or from simple written documents to extensive materials which are accessible online as a method of communication .

Factors that can affect the choice of communication technology include :

- Urgency of the need for information
- Availability of technology
- Ease of use
- Project environment
- Sensitivity and confidentiality of the information

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## COMMUNICATION MODEL

Basic model of communication includes the following parameters

- Encode : Thoughts and ideas translated to a language which can be understood by other
- Message & Feedback Message : Output of encoding
- Medium : The method used to convey the message
- Decode : Converting feedback back to understandable form

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## COMMUNICATION METHOD

**Communication Methods** are broadly classified into

- Interactive communication – Such as Video Conferencing, goto Meeting, Face to Face etc.
- Push Communication - Email, Text Messaging etc.
- Pull Communication – Intranet Portals



## COMMUNICATION MANAGEMENT PLAN

Contains the following information

- Stakeholder communication requirements
- Information to be communicated including language , format , content and level of detail;
- Reason for distribution of that information
- Time frame and frequency for the distribution of required information and receipt of acknowledgement or response , if applicable
- Person responsible for communicating the information
- Person responsible for authorizing release of confidential information
- Person or groups who will receive the information
- Person or groups who will receive the information
- Methods or technologies used to convey the information, such as memos, e-mail, and /or press releases;





## COMMUNICATION MANAGEMENT PLAN

- Glossary of common terminology
- Flow charts of the information flow in the project, workflows with possible sequence of authorization , list of report, and meeting plans etc and
- Communication constraints usually derived from a specific legislation or regulation , technology , and organization policies etc

The communications management plan can also include guidelines and templates for project status meetings , project team meetings , e-meetings and e-mail messages.

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## COMMUNICATION MANAGEMENT PLAN

Communication	Format	Frequency	Distribution
Team Briefing	Restricted Intranet	Daily at 9:00	Team and stakeholders with access to secure project info area
Weekly Web Bulletin	Internal Intranet	Weekly	Team, sponsor, senior management
Technical Incident Report	Email	Immediately after Incident	Webmaster, IT Department
Budget and Schedule Detail	Spreadsheets and Detailed Gantt Chart	Bi-Weekly	Sponsor, Senior Management
Accomplishments and Setbacks	Email and Intranet	Weekly	All internal stakeholders
Schedule Milestones	Email and Intranet	Weekly	All internal stakeholders
Cost-to-Date Milestones	Email and Intranet	Weekly	All internal stakeholders
Current Top 5 Risks	Email and Intranet	Weekly	All internal stakeholders

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# MANAGE COMMUNICATIONS

This process updates stakeholders on the progress of the project as per the communications management plan. The information that gets distributed includes status reports, review meetings etc

# MANAGE COMMUNICATIONS

Inputs	Tools and Techniques	Outputs
Project management plan Resource management plan Communications management plan Stakeholder engagement plan Project documents Change log Issue log Lessons learned register Quality report Risk report Stakeholder register Work performance reports Enterprise environmental factors Organizational process assets	Communication technology Communication methods Communication skills Communication competence Feedback Nonverbal Presentations Project management information system Project reporting Interpersonal and team skills Active listening Conflict management Cultural awareness Meeting management Networking Political awareness Meetings	Project communications Project management plan updates Communications management plan Stakeholder engagement plan Project documents updates Issue log Lessons learned register Project schedule Risk register Stakeholder register Organizational process assets updates



# MONITOR COMMUNICATIONS

This process of monitoring and controlling communications throughout the entire project lifecycle to ensure the information needs of the project stakeholders are met.

The key benefit of this process is the optimal information flow as defined in the communications management plan and the stakeholder engagement plan. This process is performed throughout the project

# MONITOR COMMUNICATIONS

Inputs	Tools and Techniques	Outputs
<div>Project management plan<ul style="list-style-type: none"><li>Resource management plan</li><li>Communications management plan</li><li>Stakeholder engagement plan</li></ul>Project documents<ul style="list-style-type: none"><li>Issue log</li><li>Lessons learned register</li><li>Project communications</li></ul>Work performance dataEnterprise environmental factorsOrganizational process assets</div>	<div><ul style="list-style-type: none"><li>Expert judgment</li><li>Project management information system</li><li>Data representation<ul style="list-style-type: none"><li>Stakeholder engagement assessment matrix</li></ul></li><li>Interpersonal and team skills<ul style="list-style-type: none"><li>Observation/conversation</li></ul></li><li>Meeting</li></ul></div>	<div>Work performance informationChange requestsProject management plan updates<ul style="list-style-type: none"><li>Communications management plan</li><li>Stakeholder engagement plan</li></ul>Project documents updates<ul style="list-style-type: none"><li>Issue log</li><li>Lessons learned register</li><li>Stakeholder register</li></ul></div>



# Project Communication Management

## Communication Channels

- Channels =  $n(n-1)/2$   
Where n is the number of people on the project
- If there are five people on the project, then we have 10 communication channels.
- This is calculated as follows:  $5*(5-1) / 2 = 10$

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## COMMUNICATION FILTERING

When a portion of the message is lost in communication.

Common reasons of filtering:

- Ambiguous language
- Predefined mindset
- Hidden agenda in message content
- Senders reputation
- Senders status in the organization
- Dysfunctional emotional behavior
- Environmental Background

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## **Exercise : Communication Management**

### **Revising Key Terms : Complete the following**

1. A contract is always \_\_\_\_\_ communication
2. A stakeholder with high interest and low power must be kept \_\_\_\_\_ of your project's progress
3. Information should be distributed to all \_\_\_\_\_



## **Answers to Exercise : Communication Management**

### **Revising Key Terms : Complete the following**

1. A contract is always formal communication
2. A stakeholder with high interest and low power must be kept Informed of your project's progress
3. Information should be distributed to all stakeholders



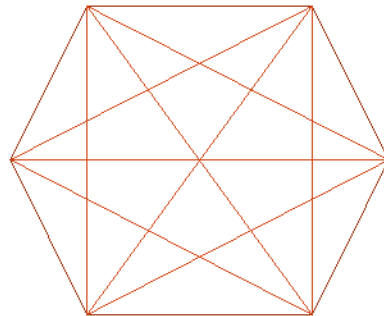


## Exercise 4: Number of Lines of Communication

### Practicing the concept

**You are managing a project with five team members and one sponsor. Draw all the channels of communication on this picture.**

**Solution: Lines of Communication =  $7 * (7 - 1) / 2 = 21$**



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# QUIZ !

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## Project Resource Management



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## PROJECT RESOURCE MANAGEMENT

Project Resource Management includes the processes to identify, acquire, and manage the resources needed for the successful completion of the project. These processes help ensure that the right resources will be available to the project manager and project team at the right time and place.

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## HUMAN RESOURCE MANAGEMENT PROCESSES

Process	Process Group
Plan Resource Management	Planning
Estimate Activity Resources	Planning
Acquire Resources	Executing
Develop Team	Executing
Manage Team	Executing
Control Resources	Monitoring and Controlling

## PLAN RESOURCE MANAGEMENT

Plan Resource Management is the process of defining how to estimate, acquire, manage, and use team and physical resources. The key benefit of this process is that it establishes the approach and level of management effort needed for managing project resources based on the type and complexity of the project. This process is performed once or at predefined points in the project.



# PLAN RESOURCE MANAGEMENT

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>▪ Project charter</li><li>▪ Project management plan<ul style="list-style-type: none"><li>▪ Quality management plan</li><li>▪ Scope baseline</li></ul></li><li>▪ Project documents<ul style="list-style-type: none"><li>▪ Project schedule</li><li>▪ Requirements documentation</li><li>▪ Risk register</li><li>▪ Stakeholder register</li></ul></li><li>▪ Enterprise environmental factors</li><li>▪ Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>▪ Expert judgment</li><li>▪ Data representation<ul style="list-style-type: none"><li>▪ Hierarchical charts</li><li>▪ Responsibility assignment matrix</li><li>▪ Text-oriented formats</li></ul></li><li>▪ Organizational theory</li><li>▪ Meetings</li></ul>	<ul style="list-style-type: none"><li>▪ Resource management plan</li><li>▪ Team charter</li><li>▪ Project documents updates<ul style="list-style-type: none"><li>▪ Assumption log</li><li>▪ Risk register</li></ul></li></ul>

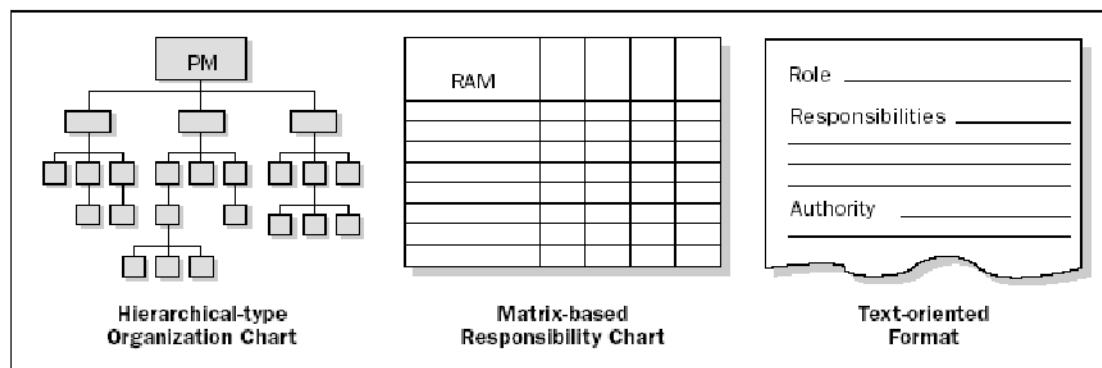
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## ORGANIZATION CHARTS AND ROLES AND RESPONSIBILITIES

The objective of **Organization charts and position descriptions** is to ensure that each work package has an unambiguous owner and all the team members have clear understanding of their roles and responsibilities. Three formats that are most common for creating this document are hierarchical, matrix, and text-oriented



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## SAMPLE RACI CHART

RACI Chart	Person				
Activity	An n	Ben	Carlo s	Dina	Ed
Create charter	A	R	I	I	I
Collect requirements	I	A	R	C	C
Submit change request	I	A	R	R	C
Develop test plan	A	C	I	I	R
	R = Responsible A = Accountable C = Consult I = Inform				



## NETWORKING AND ORGANIZATION THEORY

**Networking** is the process of communicating with others (within Organization, industry or professional environment). It includes luncheon meetings, informal conversations including meetings and events, trade conferences, and symposia. Networking within the organization helps project manager in understanding the political and organizational force that will influence the project.

**Organizational theory** -Different organizational structures have different individual response, individual performance, and personal relationship characteristics. Organizational theory provides information regarding the way in which people, teams, and organizational units behave. This information helps in effective planning and in reducing the amount of time, cost and effort needed to create the plan





## RESOURCE MANAGEMENT PLAN

The resource management plan is the component of the project management plan that provides guidance on how project resources should be categorized, allocated, managed, and released.

It may be divided between the team management plan and physical resource management plan according to the specifics of the project.

The resource management plan may include but is not limited to:

- **Identification of resources.** Methods for identifying and quantifying team and physical resources needed.
- **Acquiring resources.** Guidance on how to acquire team and physical resources for the project.

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## RESOURCE MANAGEMENT PLAN

- **Roles and responsibilities:**
  - *Role.* The function assumed by, or assigned to, a person in the project. Examples of project roles are civil engineer, business analyst, and testing coordinator.
  - *Authority.* The rights to apply project resources, make decisions, sign approvals, accept deliverables, and influence others to carry out the work of the project. Examples of decisions that need clear authority include the selection of a method for completing an activity, quality acceptance criteria, and how to respond to project variances. Team members operate best when their individual levels of authority match their individual responsibilities.
  - *Responsibility.* The assigned duties and work that a project team member is expected to perform in order to complete the project's activities.
  - *Competence.* The skill and capacity required to complete assigned activities within the project constraints. If project team members do not possess required competencies, performance can be jeopardized. When such mismatches are identified, proactive responses such as training, hiring, schedule changes, or scope changes are initiated.

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## RESOURCE MANAGEMENT PLAN

- **Project organization charts.** A project organization chart is a graphic display of project team members and their reporting relationships. It can be formal or informal, highly detailed or broadly framed, based on the needs of the project. For example, the project organization chart for a 3,000-person disaster response team will have greater detail than a project organization chart for an internal, 20-person project.
- **Project team resource management.** Guidance on how project team resources should be defined, staffed, managed, and eventually released.
- **Training.** Training strategies for team members.
- **Team development.** Methods for developing the project team.
- **Resource control.** Methods for ensuring adequate physical resources are available as needed and that the acquisition of physical resources is optimized for project needs. Includes information on managing inventory, equipment, and supplies during throughout the project life cycle.
- **Recognition plan.** Which recognition and rewards will be given to team members, and when they will be given.

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## TEAM CHARTER

The team charter is a document that establishes the team values, agreements, and operating guidelines for the team.

The team charter may include but is not limited to:

- Team values,
- Communication guidelines,
- Decision-making criteria and process,
- Conflict resolution process,
- Meeting guidelines, and
- Team agreements.

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## ESTIMATE ACTIVITY RESOURCES

Estimate Activity Resources is the process of estimating team resources and the type and quantities of materials, equipment, and supplies necessary to perform project work. The key benefit of this process is that it identifies the type, quantity, and characteristics of resources required to complete the project. This process is performed periodically throughout the project as needed

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## ESTIMATE ACTIVITY RESOURCES

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>▪ Project management plan<ul style="list-style-type: none"><li>▪ Resource management plan</li><li>▪ Scope baseline</li></ul></li><li>▪ Project documents<ul style="list-style-type: none"><li>▪ Activity attributes</li><li>▪ Activity list</li><li>▪ Assumption log</li><li>▪ Cost estimates</li><li>▪ Resource calendars</li><li>▪ Risk register</li></ul></li><li>▪ Enterprise environmental factors</li><li>▪ Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>▪ Expert judgment</li><li>▪ Bottom-up estimating</li><li>▪ Analogous estimating</li><li>▪ Parametric estimating</li><li>▪ Data analysis<ul style="list-style-type: none"><li>▪ Alternatives analysis</li></ul></li><li>▪ Project management information system</li><li>▪ Meetings</li></ul>	<ul style="list-style-type: none"><li>▪ Resource requirements</li><li>▪ Basis of estimates</li><li>▪ Resource breakdown structure</li><li>▪ Project documents updates<ul style="list-style-type: none"><li>▪ Activity attributes</li><li>▪ Assumption log</li><li>▪ Lessons learned register</li></ul></li></ul>

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ACQUIRE RESOURCES

Acquire Resources is the process of obtaining team members, facilities, equipment, materials, supplies, and other resources necessary to complete project work. The key benefit of this process is that it outlines and guides the selection of resources and assigns them to their respective activities. This process is performed periodically throughout the project as needed.

ACQUIRE RESOURCES

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>Project management plan<ul style="list-style-type: none"><li>Resource management plan</li><li>Procurement management plan</li><li>Cost baseline</li></ul></li><li>Project documents<ul style="list-style-type: none"><li>Project schedule</li><li>Resource calendars</li><li>Resource requirements</li><li>Stakeholder register</li></ul></li><li>Enterprise environmental factors</li><li>Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>Decision making<ul style="list-style-type: none"><li>Multicriteria decision analysis</li></ul></li><li>Interpersonal and team skills<ul style="list-style-type: none"><li>Negotiation</li></ul></li><li>Pre-assignment</li><li>Virtual teams</li></ul>	<ul style="list-style-type: none"><li>Physical resource assignments</li><li>Project team assignments</li><li>Resource calendars</li><li>Change requests</li><li>Project management plan updates<ul style="list-style-type: none"><li>Resource management plan</li><li>Cost baseline</li></ul></li><li>Project documents updates<ul style="list-style-type: none"><li>Lessons learned register</li><li>Project schedule</li><li>Resource breakdown structure</li><li>Resource requirements</li><li>Risk register</li><li>Stakeholder register</li></ul></li><li>Enterprise environmental factors updates</li><li>Organizational process assets updates</li></ul>



## ACQUIRE PROJECT TEAM– KEY TOOLS AND TECHNIQUES

**Pre-assignment** refers to assigning the project team members in advance, this is needed when specific skilled resources are required or the resources are defined in the project charter

**Negotiation** with functional managers and other project managers is required if project manager needs specific skills for the project

**Acquisition** is needed when specific skills are not available in the organization. This can involve hiring individual consultants or subcontracting work to another organization

**Virtual teams** can be defined as groups of people with a common goal who fulfill their roles with little or no time spent meeting face to face. Communication is important in such teams, the availability of electronic communication such as e-mail, audio conferencing, web-based meetings and video conferencing has made such teams feasible.

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## MULTI – CRITERIA DECISION ANALYSIS

**Multi – Criteria Decision Analysis**, Selection criteria are often used as a part of acquiring the project team . By use of a multi- criteria decision analysis tool, criteria are developed and used to rate or score potential team members. The criteria are weighted according to the relative importance of the needs within the team. Some examples of selection criteria that can be used to score team members are:

- **Availability** . Identify whether the team member is available to work on the project within time period needed. If there are any concerns for availability during project timeline.
- **Cost**. Verify if the cost of adding the team member is within the prescribed budget.
- **Experience**, Verify that the team member has the relevant experience that will contribute to the project success.
- **Ability**, Verify that the team member has the competencies needed by the project.
- **Knowledge and Skills**. The team member has relevant knowledge of the customer, similar implemented projects, nuances of the project environment and relevant skills to use a project tool.
- **Attitude** that includes his ability to gel with other members of the team.
- **International factors** such as location of the team member, time zone and communication capabilities

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DEVELOP TEAM

Develop Team is the process of improving competencies, team member interaction, and the overall team environment to enhance project performance. The key benefit of this process is that it results in improved teamwork, enhanced interpersonal skills and competencies, motivated employees, reduced attrition, and improved overall project performance. This process is performed throughout the project.

DEVELOP TEAM

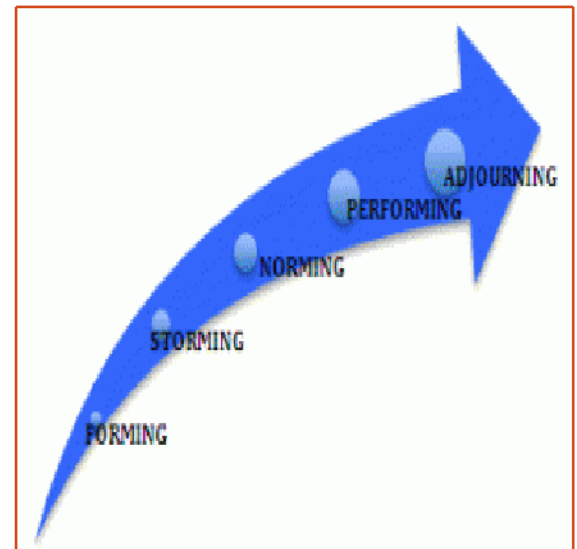
Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>▪ Project management plan<ul style="list-style-type: none"><li>▪ Resource management plan</li></ul></li><li>▪ Project documents<ul style="list-style-type: none"><li>▪ Lessons learned register</li><li>▪ Project schedule</li><li>▪ Project team assignments</li><li>▪ Resource calendars</li><li>▪ Team charter</li></ul></li><li>▪ Enterprise environmental factors</li><li>▪ Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>▪ Colocation</li><li>▪ Virtual teams</li><li>▪ Communication technology</li><li>▪ Interpersonal and team skills<ul style="list-style-type: none"><li>▪ Conflict management</li><li>▪ Influencing</li><li>▪ Motivation</li><li>▪ Negotiation</li><li>▪ Team building</li></ul></li><li>▪ Recognition and rewards</li><li>▪ Training</li><li>▪ Individual and team assessments</li><li>▪ Meetings</li></ul>	<ul style="list-style-type: none"><li>▪ Team performance assessments</li><li>▪ Change requests</li><li>▪ Project management plan updates<ul style="list-style-type: none"><li>▪ Resource management plan</li></ul></li><li>▪ Project documents updates<ul style="list-style-type: none"><li>▪ Lessons learned register</li><li>▪ Project schedule</li><li>▪ Project team assignments</li><li>▪ Resource calendars</li><li>▪ Team charter</li></ul></li><li>▪ Enterprise environmental factors updates</li><li>▪ Organizational process assets updates</li></ul>



## TEAM BUILDING – FIVE STAGES

Traditionally, a team goes through five stages of development.

- **Forming:** a group of people come together to accomplish a shared purpose
- **Storming:** Disagreement about mission, vision, and approaches combined with the fact that team members are getting to know each other can cause strained relationships and conflict.
- **Norming:** The team has consciously or unconsciously formed working relationships that are enabling progress on the team's objectives.
- **Performing:** Relationships, team processes, and the team's effectiveness in working on its objectives are synching to bring about a successfully functioning team.
- **Adjourning :** In the adjourning phase, the team completes the work and moves on from the project.

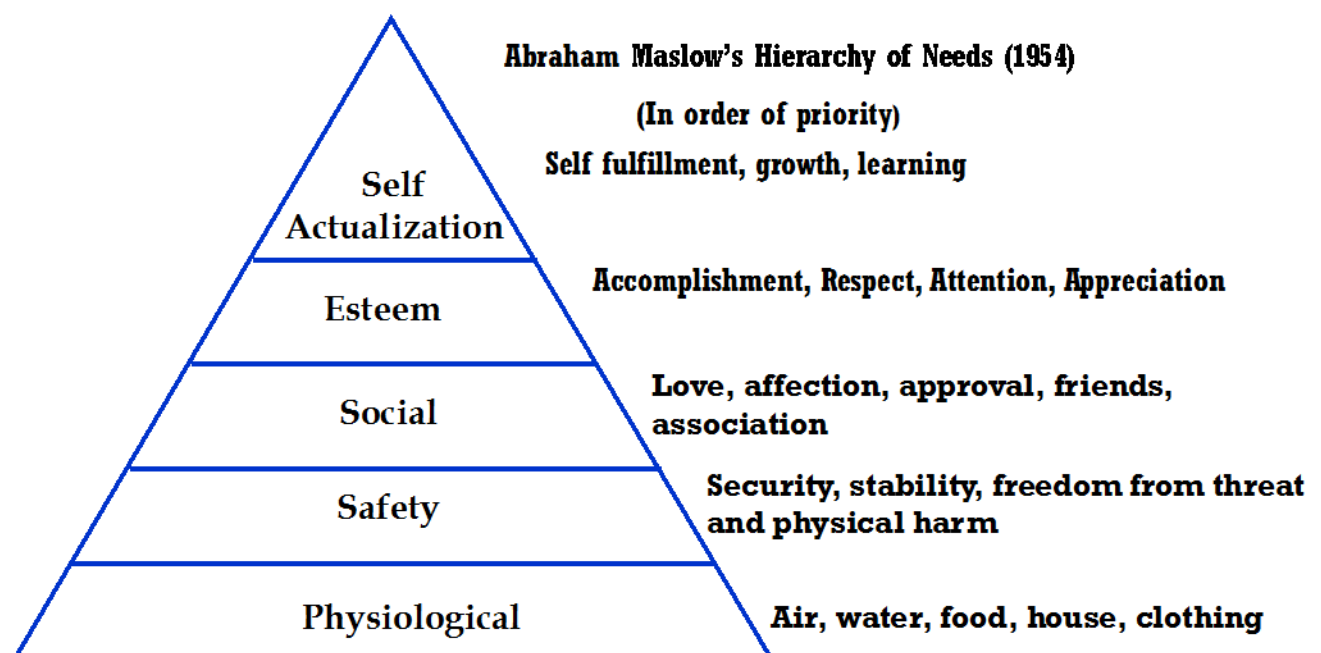


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## Recognition and Rewards – Theories of Motivation



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## RECOGNITION AND REWARDS – THEORIES OF MOTIVATION

### McGregor's Theory X

- The average worker is inherently lazy and needs supervisions
- The average worker dislikes work and avoids work whenever possible
- To induce adequate effort, the supervisor must threaten punishment and exercise careful supervision
- The average worker avoids increased responsibility and seeks to be directed

**Theory X relies on Strict Rules, Performance incentives, Rewards, Threats to job security**

## RECOGNITION AND REWARDS – THEORIES OF MOTIVATION

### McGregor's Theory Y

- Workers are willing to do the job without continuous supervision
- The average worker wants to be active and finds the physical and mental effort on the job satisfying
- Greatest results come from willing participation which will tend to produce self-direction towards goals without coercion and control
- The average worker seeks opportunity for personal improvement and self respect

**Theory Y relies on worker participation in decisions, cordial manager-worker relationships, worker designed job methodology, worker individualism**



## RECOGNITION AND REWARDS – THEORIES OF MOTIVATION

### William Ouchi's Theory Z

According to Theory Z, people who don't fit either Theory X or Theory Y are really a combination of the two.

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## RECOGNITION AND REWARDS – THEORIES OF MOTIVATION

### Herzberg's Motivation – Hygiene Theory

As per this theory presence of hygiene factors doesn't motivate someone, however their absence de-motivates. Motivation factors will motivate but they will not work without the hygiene factors in place.

- Motivating factors
  - Achievements
  - Recognitions
  - Work Itself
  - Responsibility
  - Advancement
  - Possibility for growth

Hygiene Factors are Company Policy, Paycheck, status, Relationship with co-workers

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## RECOGNITION AND REWARDS – THEORIES OF MOTIVATION

### Expectancy Theorem of Motivation by Victor Vroom

1. You need to give people an expectation of a reward in order to motivate them
2. The rewards or awards should be achievable, if they are impossible to achieve, they will de-motivate them
3. People are motivated by achievements
4. People “expect” to be rewarded for achievements

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## RECOGNITION AND REWARDS – THEORIES OF MOTIVATION

### **McLelland's Achievement Theory**

1. People need **achievement, power** and **affiliation** to be motivated.
2. Achievement is when someone performs well and is recognized for it
3. Power means he or she has a lot of control or influence in the company
4. Affiliation , a strong sense from being a part of a working team and having good relationships with coworkers

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## FORMS OF POWER

Below are the five Kinds of Power that can help the project managers maximize his ability to influence and manage the team

- **Formal** – positional, granted by organizational/upper mgmt
- **Expert** – power earned through a recognized level of knowledge or skill in a specific area
- **Reward** – the power to give a positive consequences, like promotions, salary rise etc.
- **Penalty** – the power to provide negative consequences, like suspension, termination, reprimands
- **Referent** – power gained when team members admire, and willingly follow an individual as a role model

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## Exercise : Forms of Power at Work

### Revising Key Terms : Forms of Power at Work

1. **A functional manager assigns a tester to work on the project manager's team. This is an example of \_\_\_\_\_ power**
2. **The programmers always listen to the team lead because he's really a good software architect. This is an example of \_\_\_\_\_ power**

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## Answers to Exercise : Forms of Power at Work

### Revising Key Terms : Forms of Power at Work

1. A functional manager assigns a tester to work on the project manager's team. This is an example of Legitimate power
2. The programmers always listen to the team lead because he's really a good software architect. This is an example of Expert power

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## LEADERSHIP STYLE

Following are the leadership style that managers can use to interact with organizational members

- ❖ Autocratic – traditional figure of a boss who makes binding decisions regardless of what subordinates think or desire
- ❖ Laissez-Fare – Other extreme of autocratic, the staff can pursue anything they wish, enhances free thinking
- ❖ Democratic – participative, decisions made jointly by management and staff

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## TEAM PERFORMANCE ASSESSMENT

As project team development efforts such as training, team building, and colocation are implemented, the project management team makes formal or informal assessments of the project team's effectiveness. The evaluation of a team's effectiveness may include indicators such as:

- Improvements in skills that allow individuals to perform assignments more effectively,
  - Improvements in competencies that help team members perform better as a team,
  - Reduced staff turnover rate, and
  - Increased team cohesiveness where team members share information and experiences openly and help each other to improve the overall project performance.
- As a result of conducting an evaluation of the team's overall performance, the project management team can identify the specific training, coaching, mentoring, assistance, or changes required to improve the team's performance. This should also include identifying the appropriate or required resources necessary to achieve and implement the improvements identified in the assessment.

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## MANAGE TEAM

Tracking team member performance, providing feedback, resolving issues and managing changes to optimize project performance.

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## MANAGE TEAM

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>Project management plan               <ul style="list-style-type: none"> <li>Resource management plan</li> </ul> </li> <li>Project documents               <ul style="list-style-type: none"> <li>Issue log</li> <li>Lessons learned register</li> <li>Project team assignments</li> <li>Team charter</li> </ul> </li> <li>Work performance reports</li> <li>Team performance assessments</li> <li>Enterprise environmental factors</li> <li>Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>Interpersonal and team skills               <ul style="list-style-type: none"> <li>Conflict management</li> <li>Decision making</li> <li>Emotional intelligence</li> <li>Influencing</li> <li>Leadership</li> </ul> </li> <li>Project management information system</li> </ul>	<ul style="list-style-type: none"> <li>Change requests</li> <li>Project management plan updates               <ul style="list-style-type: none"> <li>Resource management plan</li> <li>Schedule baseline</li> <li>Cost baseline</li> </ul> </li> <li>Project documents updates               <ul style="list-style-type: none"> <li>Issue log</li> <li>Lessons learned register</li> <li>Project team assignments</li> </ul> </li> <li>Enterprise environmental factors updates</li> </ul>

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## REASONS FOR CONFLICT

**More than 50% conflicts on the projects are due to disagreement over schedules, priorities and resources)**

1. Schedules
2. Project Priorities
3. Human Resources
4. Technical Opinions
5. Procedures
6. Cost
7. Personality

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## CONFLICT RESOLUTION METHODS

- **Confronting/Problem Solving.** Treating conflict as a problem to be solved by examining alternatives; requires a give-and-take attitude and open dialogue.  
**Collaborating.** Incorporating multiple viewpoints and insights from differing perspectives; leads to consensus and commitment
- **Smoothing/Accommodating.** Emphasizing areas of agreement rather than areas of difference.
- **Compromising.** Searching for solutions that bring some degree of satisfaction to all parties.
- **Forcing.** Pushing one's viewpoint at the expense of others; offers only win-lose solutions.
- **Withdrawing/Avoiding.** Retreating from an actual or potential conflict situation.

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## Exercise 2: Resolving Conflict

### Revising Key Terms : Conflict Management

**Figure out the conflict resolution technique that is being used in the cases below:**

1. **I don't really have time to deal with this right now. Just figure it out and get back to me.**
2. **Hold on a second. Let's sit down and figure out what the real problem is.**

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## Exercise 2: Resolving Conflict

### Revising Key Terms : Conflict Management

Figure out the conflict resolution technique that is being used in the cases below:

1. I don't really have time to deal with this right now. Just figure it out and get back to me - Withdrawal
2. Hold on a second. Let's sit down and figure out what the real problem is – Problem Solving / Confronting

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## HALO EFFECT

Extending the impression of a particular outstanding trait to influence the total judgment of a person E.g. : Assuming that a person who is good in technology will be a good project manager

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# QUIZ !

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## Project Risk Management



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## WHAT IS RISK?

- Project risk is an **uncertain event** that can have a **positive** or a **negative impact** on the **result**
- If a project risk materializes and has a **negative impact** on the project, it is called “**Threat**” to the project e.g.
  - Unproven technology impacting project schedule
  - Loosing critical resource from project
- If an uncertain event has a **positive impact** on the project, it is called “**opportunities**”. E.g.
  - Emergence of new tool to increase productivity
  - New resource replacing the lost resource is a better one!
- Not all risks are bad, however most of them are perceived as “**Threat**” to **success**



## RISK VS ISSUE

### Risk

- Risk is an uncertain event or event that might happen in future
- Once risk is identified, its impact should be analyzed and the response plan should be prepared
- Examples:
  - Lack of Business/Application knowledge which may impact the quality of work products

### Issue

- Issue is an event that has already occurred
- Once the impact of Issue is analyzed, the same should be resolved or escalated
- Examples:
  - Client contact is not providing review comments on deliverables in spite of repeated reminders







## PROJECT RISKS – KEY CHARACTERISTICS

- Some of the risks are known risks e.g.
  - Working in a project with competitor (multi-vendor scenario)
  - Doing a project in a new geography (cultural differences)
  - Project attracting environmentalists attention
  - Accident during Travel
- To manage “known risks”, risk response plan is prepared
- Known risks are predicted / identified based on the past experience of similar projects

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## PROJECT RISKS – KEY CHARACTERISTICS

- All the risks can not be predicted and such risks are known as “unknown risks”. e.g.
  - Natural disaster
- Unknown risks cannot be managed proactively
- Most of the organizations address such risks through “Business continuity” and “Disaster Recovery” plan
- What is the difference between “Risk” and “Issue”?

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## PROJECT RISK MANAGEMENT

Project Risk Management includes the processes of conducting risk management planning, identification, analysis, response planning and monitoring and control on a project. The objectives of Project Risk Management are to increase the probability and impact of positive events, and decrease the probability and impact of negative events in the project.

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## PROJECT RISK MANAGEMENT PROCESSES

Process	Process Group
<ul style="list-style-type: none"><li>Plan Risks Management</li><li>Identify Risks,</li><li>Perform Qualitative Risk Analysis</li><li>Perform Quantitative Risk Analysis Plan Risk Responses</li></ul>	Planning
<ul style="list-style-type: none"><li>Implement Risk Responses</li></ul>	
<ul style="list-style-type: none"><li>Monitor Risks</li></ul>	Monitoring and Controlling

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**PLAN RISK MANAGEMENT**

Plan Risk Management is the process of defining how to conduct risk management activities for a project. The Plan Risk Management process should begin as a project is conceived and should be completed early during project planning.

**PLAN RISK MANAGEMENT**

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>▪ Project charter</li><li>▪ Project management plan<ul style="list-style-type: none"><li>▪ All components</li></ul></li><li>▪ Project documents<ul style="list-style-type: none"><li>▪ Stakeholder register</li></ul></li><li>▪ Enterprise environmental factors</li><li>▪ Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>▪ Expert judgment</li><li>▪ Data analysis<ul style="list-style-type: none"><li>▪ Stakeholder analysis</li></ul></li><li>▪ Meetings</li></ul>	<ul style="list-style-type: none"><li>▪ Risk management plan</li></ul>



## RISK MANAGEMENT PLAN

**Risk management plan** describes the various risk management processes that will be implemented, monitored and controlled throughout the project lifecycle. It can include the following

1. **Methodology** – Defines the approaches, tools and the data sources that may be used to perform risk management on the project
2. **Roles and Responsibilities** – Defines the lead, support and risk management team membership for each type of activity in the risk management plan, assigns people to these roles and clarifies their responsibilities
3. **Budgeting** - Assigns resources and estimates costs needed for risk management for inclusion in the project cost baseline
4. **Timing** – Defines when and how often the risk management process will be performed throughout the project life cycle and establishes risk management activities to be included in the project schedule.

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## RISK MANAGEMENT PLAN

**5. Risk Categories** provides a structure that ensures a comprehensive process of systematically identifying risks to a consistent level of detail and contributes to the effectiveness and quality of Identify risks process.

An organization can use a previously prepared categorization of typical risk. **A risk breakdown structure (RBS)** is one approach to providing such a structure, but it can also be addressed by simply listing the various aspects of the project.

The risk categories may be revisited during the Identify risks process. A good practice is to review the risk categories during the Risk Management Planning process prior to their use in Identify risks process. Risk categories based on prior projects may need to be tailored, adjusted or extended to new situations before those categories can be used on the current project.

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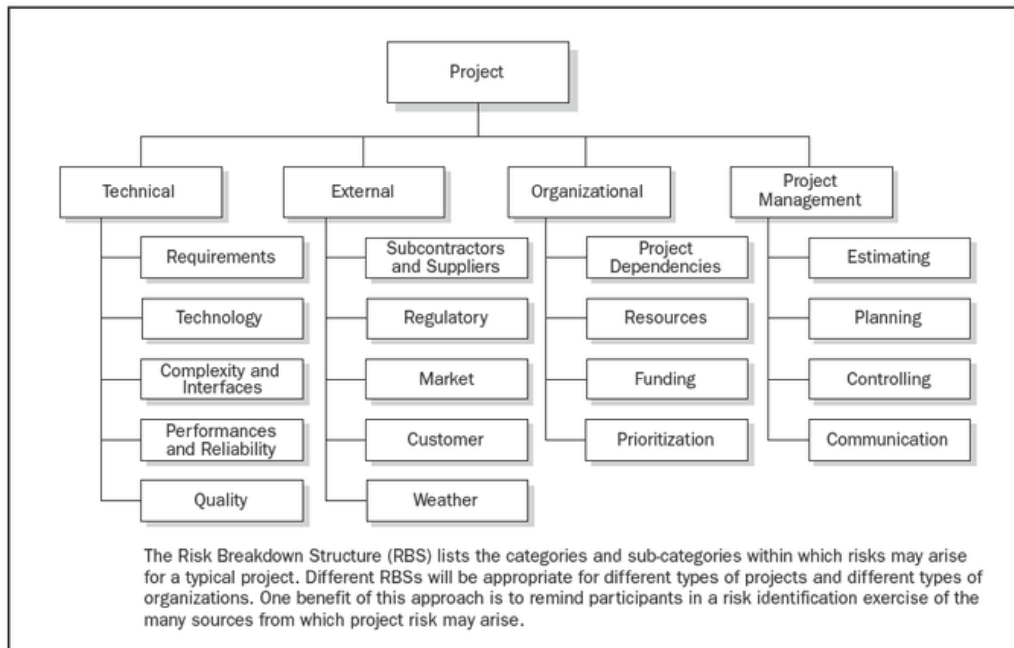


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# RISK MANAGEMENT PLAN

## 6. Risk Breakdown Structure (RBS)



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# RISK MANAGEMENT PLAN

## 7. Definition of Impact Scales

Defined Conditions for Impact Scales of a Risk on Major Project Objectives (Examples are shown for negative impacts only)					
Project Objective	Relative or numerical scales are shown				
	Very low /.05	Low /.10	Moderate /.20	High /.40	Very high /.80
Cost	Insignificant cost increase	<10% cost increase	10-20% cost increase	20-40% cost increase	>40% cost increase
Time	Insignificant time increase	<5% time increase	5-10% time increase	10-20% time increase	>20% time increase
Scope	Scope decrease barely noticeable	Minor areas of scope affected	Major areas of scope affected	Scope reduction unacceptable to sponsor	Project end item is effectively useless
Quality	Quality degradation barely noticeable	Only very demanding applications are affected	Quality reduction requires sponsor approval	Quality reduction unacceptable to sponsor	Project end item is effectively useless
This table presents examples of risk impact definitions for four different project objectives. They should be tailored in the Risk Management Planning process to the individual project and to the organization's risk thresholds. Impact definitions can be developed for opportunities in a similar way.					

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## 8. Definition of Risk Probability and Impact

Probability and Impact Matrix										
Probability	Threats					Opportunities				
0.90	0.05	0.09	0.18	0.36	0.72	0.72	0.36	0.18	0.09	0.05
0.70	0.04	0.07	0.14	0.28	0.56	0.56	0.28	0.14	0.07	0.04
0.50	0.03	0.05	0.10	0.20	0.40	0.40	0.20	0.10	0.05	0.03
0.30	0.02	0.03	0.06	0.12	0.24	0.24	0.12	0.06	0.03	0.02
0.10	0.01	0.01	0.02	0.04	0.08	0.08	0.04	0.02	0.01	0.01
	0.05	0.10	0.20	0.40	0.80	0.80	0.40	0.20	0.10	0.05

Impact (numerical scale) on an objective (e.g., cost, time, scope or quality)

Each risk is rated on its probability of occurring and impact on an objective if it does occur. The organization's thresholds for low, moderate or high risks are shown in the matrix and determine whether the risk is scored as high, moderate or low for that objective.

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# RISK MANAGEMENT PLAN

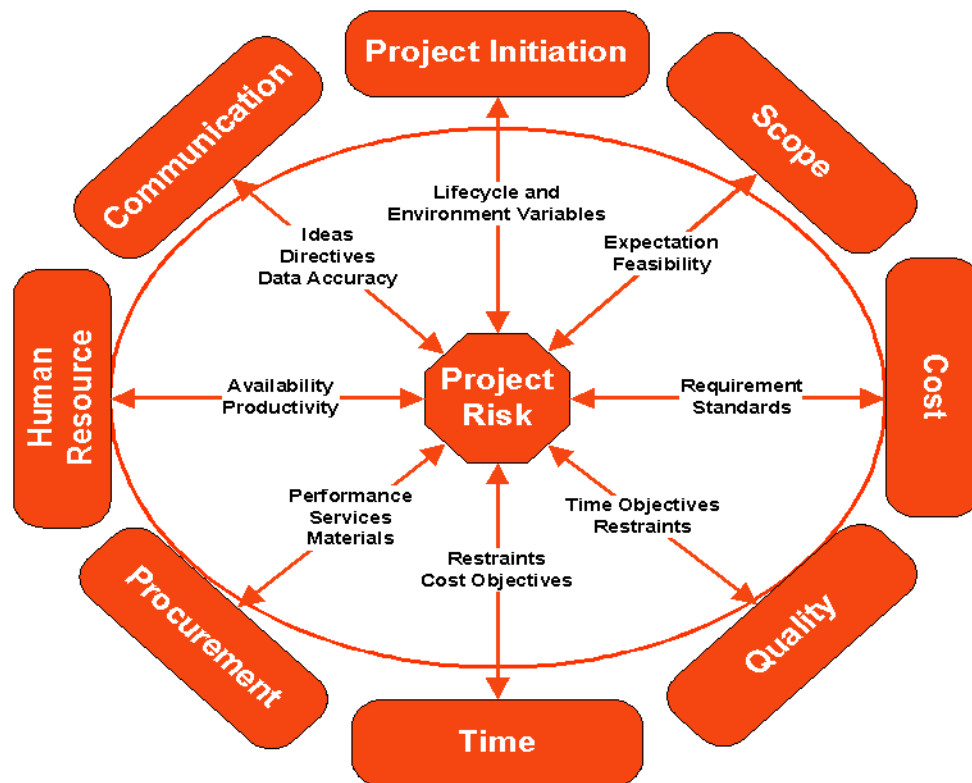
**9. Revised stakeholder's tolerance,** based on the project may be revised in the risk management process.

**10. Reporting formats,** define how the outcomes of the risk management process will be documented , analyzed and communicated. It describes the content and format of the risk register as well as any other risk report required.

**11. Tracking.** Tracking documents how risk activities will be recorded for the benefit of the current project and how risk management processes will be audited.



## SOURCES OF PROJECT RISKS



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## IDENTIFY RISKS PROCESS

Risk Identification process determines which risks may affect the project and documenting their characteristics. It is an iterative process as risk can be identified at any levels in the project. Irrespective of risks having positive or negative consequences, all risks events and their consequences should be identified.

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## IDENTIFY RISKS

Inputs	Tools and Techniques	Outputs
Project management plan Requirements management plan Schedule management plan Cost management plan Quality management plan Resource management plan Risk management plan Scope baseline Schedule baseline Cost baseline Project documents Assumption log Cost estimates Duration estimates Issue log Lessons learned register Requirements documentation Resource requirements Stakeholder register Agreements Procurement documentation Enterprise environmental factors Organizational process assets	Expert judgment Data gathering Brainstorming Checklists Interviews Data analysis Root cause analysis Assumption and constraint analysis SWOT analysis Document analysis Interpersonal and team skills Facilitation Prompt lists Meetings	Risk register Risk report Project documents updates Assumption log Issue log Lessons learned register

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## PERFORM QUALITATIVE RISK ANALYSIS

Prioritizing risks for further analysis or action by assessing and combining their probability of occurrence and impact.

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## PERFORM QUALITATIVE RISK ANALYSIS

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>▪ Project management plan<ul style="list-style-type: none"><li>▪ Risk management plan</li></ul></li><li>▪ Project documents<ul style="list-style-type: none"><li>▪ Assumption log</li><li>▪ Risk register</li><li>▪ Stakeholder register</li></ul></li><li>▪ Enterprise environmental factors</li><li>▪ Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>▪ Expert judgment</li><li>▪ Data gathering<ul style="list-style-type: none"><li>▪ Interviews</li></ul></li><li>▪ Data analysis<ul style="list-style-type: none"><li>▪ Risk data quality assessment</li><li>▪ Risk probability and impact assessment</li><li>▪ Assessment of other risk parameters</li></ul></li><li>▪ Interpersonal and team skills<ul style="list-style-type: none"><li>▪ Facilitation</li></ul></li><li>▪ Risk categorization</li><li>▪ Data representation<ul style="list-style-type: none"><li>▪ Probability and impact matrix</li><li>▪ Hierarchical charts</li></ul></li><li>▪ Meetings</li></ul>	<ul style="list-style-type: none"><li>▪ Project documents updates<ul style="list-style-type: none"><li>▪ Assumption log</li><li>▪ Issue log</li><li>▪ Risk register</li><li>▪ Risk report</li></ul></li></ul>

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## PERFORM QUANTITATIVE RISK ANALYSIS PROCESS

Numerically analyzing the effect of identified risks on overall project objectives.

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## PERFORM QUANTITATIVE RISK ANALYSIS PROCESS

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>Project management plan               <ul style="list-style-type: none"> <li>Risk management plan</li> <li>Scope baseline</li> <li>Schedule baseline</li> <li>Cost baseline</li> </ul> </li> <li>Project documents               <ul style="list-style-type: none"> <li>Assumption log</li> <li>Basis of estimates</li> <li>Cost estimates</li> <li>Cost forecasts</li> <li>Duration estimates</li> <li>Milestone list</li> <li>Resource requirements</li> <li>Risk register</li> <li>Risk report</li> <li>Schedule forecasts</li> </ul> </li> <li>Enterprise environmental factors</li> <li>Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>Expert judgment</li> <li>Data gathering               <ul style="list-style-type: none"> <li>Interviews</li> </ul> </li> <li>Interpersonal and team skills               <ul style="list-style-type: none"> <li>Facilitation</li> </ul> </li> <li>Representations of uncertainty</li> <li>Data analysis               <ul style="list-style-type: none"> <li>Simulation</li> <li>Sensitivity analysis</li> <li>Decision tree analysis</li> </ul> </li> <li>Influence diagrams</li> </ul>	<ul style="list-style-type: none"> <li>Project documents updates               <ul style="list-style-type: none"> <li>Risk report</li> </ul> </li> </ul>

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## DATA GATHERING AND REPRESENTATION TECHNIQUES

- Interviewing** : Experienced project managers , stakeholders and subject matter experts are interviewed to quantify the probability and impact of risks on project objective. During interviewing different kind of probability distribution are used. In case a triangular one is used then the three values for 3 point estimates are taken as input from the SMEs which is used to quantify risk for each element.
- Probability distributions** : are basically of two types – Asymmetrical distribution or Uniform distributions
  - Asymmetrical distribution** depicts shape which are compatible with the data typically developed during project risk analysis. Asymmetrical distributions are of two types- Continuous probability distributions represent the uncertainty in values, such as durations of schedule activities and costs of project components, whereas Discrete probability distributions can be used to represent uncertain events, such as the outcome of a test or a possible scenario in the decision tree.

Uniform distributions can be used if there is no obvious value that is more likely than any other between specified high and low bounds

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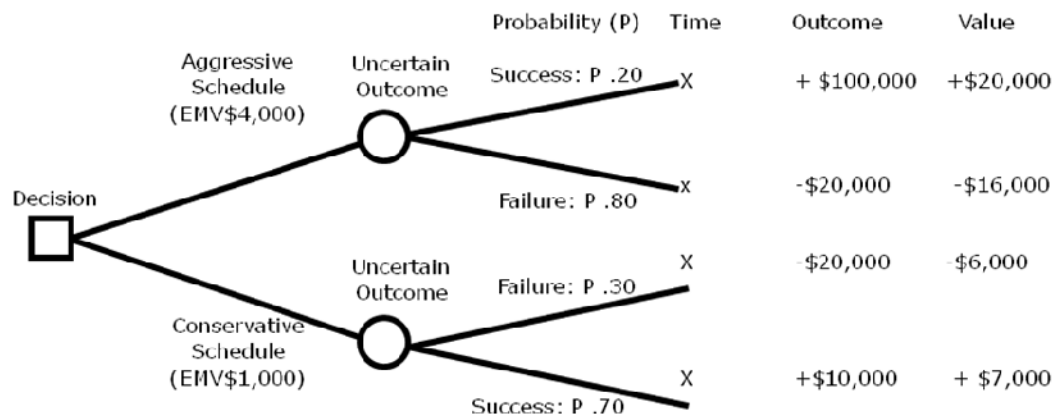


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## EXPECTED MONETARY VALUE ANALYSIS – DECISION TREE

**A decision tree is a diagram that describes a decision under consideration and the implications of choosing one or other available alternatives**



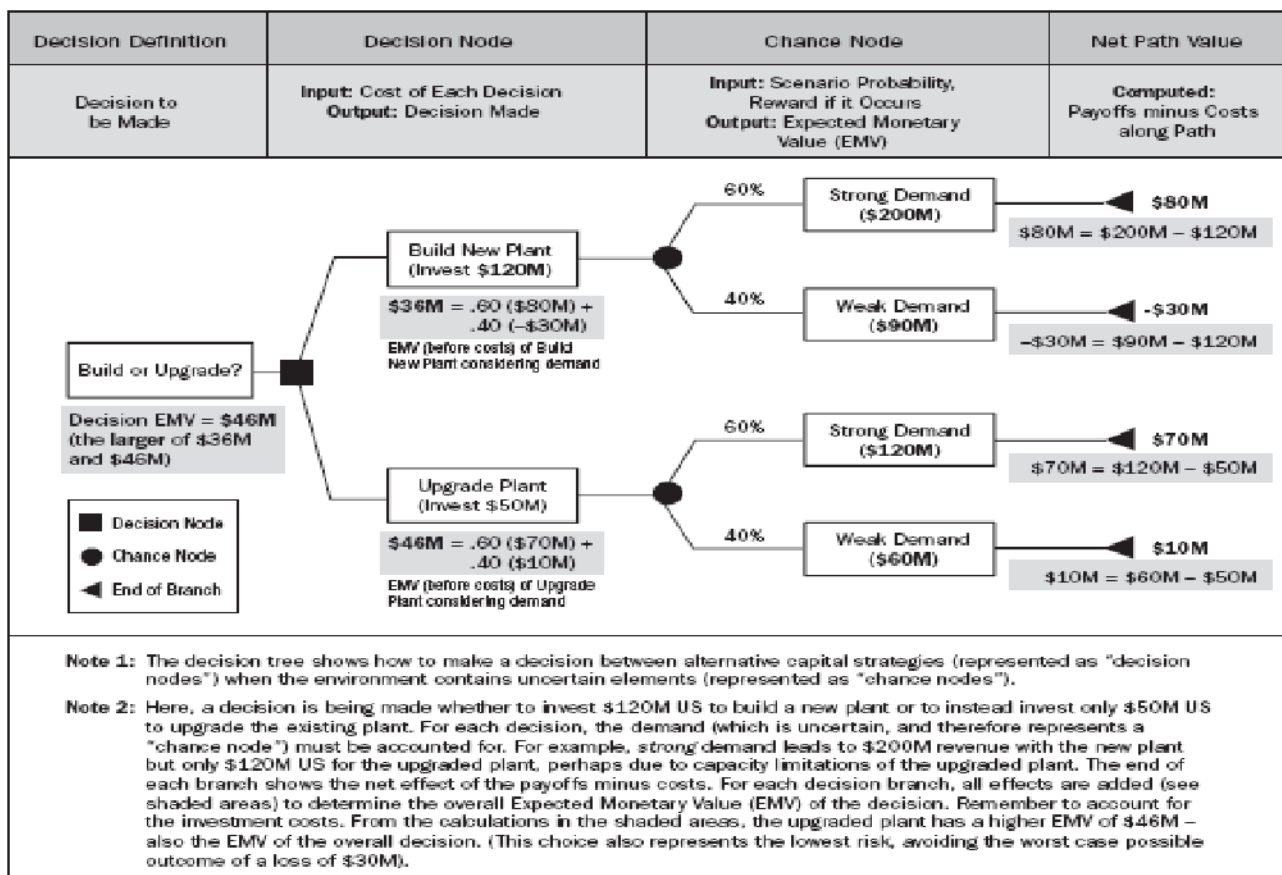
- Expected monetary value (EMV) of result Outcome x Probability of that outcome
- Expected monetary value of a decision sum of EMVs of all Outcomes stemming from that decision
- Aggressive schedule has expected monetary value of \$4,000 and is "preferred" over conservative schedule with expected monetary value of \$1,000

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## Perform Quantitative Risk Analysis



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## SENSITIVITY ANALYSIS - TORNADO DIAGRAM



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## MODELING OR SIMULATION

**Modeling and simulation.** A project simulation uses a model that translates the uncertainties or potential risks specified at a detailed level of the project into their potential impact on project objectives.

Simulation techniques compute the project model using the inputs such as cost or schedule to determine the probability distribution. Simulation techniques should be the preferred one for predicting schedule or cost risks as compared to other techniques

Simulations are typically performed using the Monte Carlo technique. In a simulation, the project model is computed many times (iterated) with the input values randomized from a probability distribution function (e.g. cost of project elements or duration of schedule activities) chosen for each iteration from the probability distribution of each variable. A probability distribution is then calculated.

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# PLAN RISK RESPONSES

Developing options and actions to enhance opportunities and reduce threats to project objectives



# PLAN RISK RESPONSES

Inputs	Tools and Techniques	Outputs
<div>Project management plan</div> <div>Resource management plan</div> <div>Risk management plan</div> <div>Cost baseline</div> <div>Project documents</div> <div>Lessons learned register</div> <div>Project schedule</div> <div>Project team assignments</div> <div>Resource calendars</div> <div>Risk register</div> <div>Risk report</div> <div>Stakeholder register</div> <div>Enterprise environmental factors</div> <div>Organizational process assets</div>	<div>Expert judgment</div> <div>Data gathering</div> <div>Interviews</div> <div>Interpersonal and team skills</div> <div>Facilitation</div> <div>Strategies for threats</div> <div>Strategies for opportunities</div> <div>Contingent response strategies</div> <div>Strategies for overall project risk</div> <div>Data analysis</div> <div>Alternatives analysis</div> <div>Cost-benefit analysis</div> <div>Decision making</div> <div>Multicriteria decision analysis</div>	<div>Change requests</div> <div>Project management plan updates</div> <div>Schedule management plan</div> <div>Cost management plan</div> <div>Quality management plan</div> <div>Resource management plan</div> <div>Procurement management plan</div> <div>Scope baseline</div> <div>Schedule baseline</div> <div>Cost baseline</div> <div>Project documents updates</div> <div>Assumption log</div> <div>Cost forecasts</div> <div>Lessons learned register</div> <div>Project schedule</div> <div>Project team assignments</div> <div>Risk register</div> <div>Risk report</div>





## STRATEGIES FOR NEGATIVE RISKS OR THREATS

**Mitigate.** Risk Mitigation implies a reduction in the probability and impact of an adverse risk event to an acceptable threshold. E.g. Conducting more tests, a more stable supplier etc

- **Avoid.** Risk avoidance involves changing the project management plan to eliminate the threat posed by an adverse risk, to isolate the project objectives from the risk's impact or to relax the objective that is in jeopardy, such as extending the schedule or reducing scope. Some risks that arise early in the project can be avoided by clarifying requirements, obtaining information, improving communication or acquiring expertise.

- **Transfer.** Risk transference requires shifting the negative impact of a threat, along with ownership of the response to a third party. Transferring the risk simply gives another party responsibility for its management, it doesn't eliminate it. Risk transference nearly always involves payment of a risk premium to the party taking on the risk. Transference tools can be quite diverse and can include but are not limited to the use of insurance, performance, bonds, warranties, guarantees etc.

- **Accept.** This includes passive or active acceptance. Passive acceptance requires no action, the most common active acceptance strategy is to establish a contingency reserves, including amounts of money or resources to handle known or unknown threats/ opportunities



## STRATEGIES FOR POSITIVE RISK RESPONSE OR OPPORTUNITIES

**Enhance .** This strategy modifies the size of an opportunity by increasing probability and /or positive impacts and by identifying and maximizing key drivers of these positive-impact risks. Seeking to facilitate or strengthen the cause of the opportunity and proactively targeting and reinforcing its trigger conditions, might increase the probability

- **Exploit .** This strategy may be selected for risks with positive impacts where the organization wishes to ensure that the opportunity is realized. This strategy seeks to eliminate the uncertainty associated with a particular upside risk by making the opportunity definitely happen. Directly exploiting responses include assigning more talented resources to the project to reduce time to completion or to provide better quality than originally planned.

- **Share.** Sharing a positive risk involves allocating ownership to a third party who is best able to capture the opportunity for the benefit of the project. E.g. forming risk-sharing partnerships, teams, special-purpose companies or joint ventures, which can be established with the express purpose of managing opportunities.

- **Accept.** Accepting an opportunity is being willing to take advantage of it if it comes along, but not actively pursuing it.





## CONTINGENT RESPONSE STRATEGIES

**Contingent response strategy.** Some responses are designed for use only if certain events occur. For some risks, it is appropriate for the project team to make a response plan that will only be executed under certain predefined conditions, if it is believed that there will be sufficient warning to implement the plan. Events that trigger the contingency response such as missing intermediate milestones or gaining higher priority with a supplier, should be defined and tracked

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## RISK REGISTER

[illegible]

Risk Register													
Risk ID	Author	Date Register	Risk Category	Description	Risk Owner	Probability (%)	Impact (£)	Expected Value	Proximity	Risk Response	Action	Risk Actionee	Risk Status
1				Hardware performance is not sufficient		40%	£ 4,500	£ 1,800	Medium term	Contingency	Sufficient budget placed in		Open
2				"Press the ALT + Enter keys to create Line breaks		80%	£ 6,000	£ 4,800	Imminent	Avoid			Open
3				qwerty		12%	£ 200	£ 24	Medium term	Reduce			Open
4				qwerty2		66%	£ 6,000	£ 3,960	Imminent	Avoid			Open
								£ -					
								£ -					
								£ -					
								£ -					
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								£ -					
								£ -					
								£ -					
								£ -					
Insert new risks above													

**Insert new risks above**

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## IMPLEMENTING RISK RESPONSES

Implement Risk Responses is the process of implementing agreed-upon risk response plans. The key benefit of this process is that it ensures that agreed-upon risk responses are executed as planned in order to address overall project risk exposure, minimize individual project threats, and maximize individual project opportunities

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## IMPLEMENT RISK RESPONSES

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>Project management plan<ul style="list-style-type: none"><li>Risk management plan</li></ul></li><li>Project documents<ul style="list-style-type: none"><li>Lessons learned register</li><li>Risk register</li><li>Risk report</li></ul></li><li>Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>Expert judgment</li><li>Interpersonal and team skills<ul style="list-style-type: none"><li>Influencing</li></ul></li><li>Project management information system</li></ul>	<ul style="list-style-type: none"><li>Change requests</li><li>Project documents updates<ul style="list-style-type: none"><li>Issue log</li><li>Lessons learned register</li></ul></li><li>Project team assignments</li><li>Risk register</li><li>Risk report</li></ul>

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MONITOR RISKS

Monitor Risks is the process of monitoring the implementation of agreed-upon risk response plans, tracking identified risks, identifying and analyzing new risks, and evaluating risk process effectiveness throughout the project. The key benefit of this process is that it enables project decisions to be based on current information about overall project risk exposure and individual project risks. This process is performed throughout the project

MONITOR RISKS

Inputs	Tools and Techniques	Outputs
Project management plan Risk management plan Project documents Issue log Lessons learned register Risk register Risk report Work performance data Work performance reports	Data analysis Technical performance analysis Reserve analysis Audits Meetings	Work performance information Change requests Project management plan updates Any component Project documents updates Assumption log Issue log Lessons learned register Risk register Risk report Organizational process assets updates



# QUIZ !

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## Project Quality Management



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## WHAT IS QUALITY?

- Standard Definition:
  - Quality is “the degree to which a set of inherent characteristics fulfil requirements” – *PMBOK® Guide* (Glossary)
  - “Conformance of requirements of the customer” – Philip Crosby
  - “Fitness for use” – Joseph Juran



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## What is Grade?

**Grade** is a category or rank given to entities having the same functional use but different technical characteristics. (as per *PMBOK® Guide* ).



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## IMPORTANCE OF QUALITY?

### Why is quality important?

- Quality = Customer Satisfaction = Business growth
- Quality = Pride in delivery = Higher Team Morale
- Lack of quality = Cost
- Lack of quality = Loss of customer confidence
- Lack of quality = Loss of Reputation = Difficulty in gaining new business
- Lack of quality could lead to loss of life



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## Quality Principles

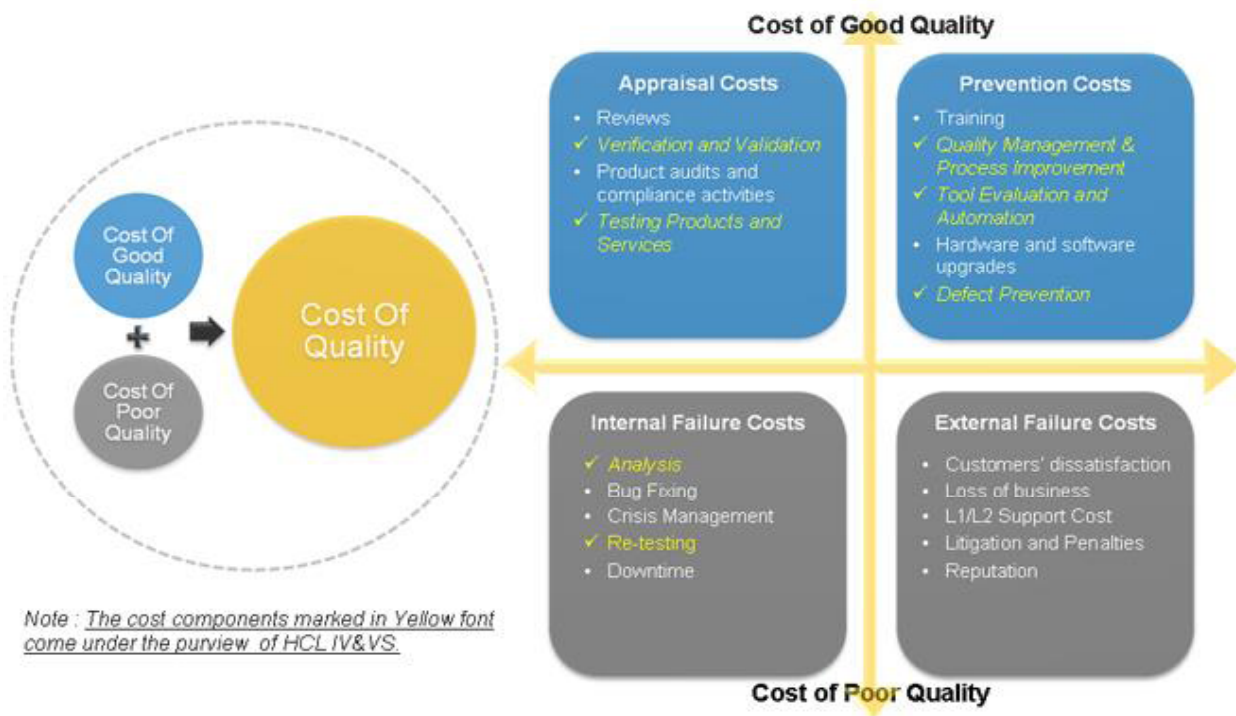
- Quality is concerned with **Prevention over Inspection.**
- Inspection is typically used to prove that the system works (because you've put good quality practices in place), rather than a way to reject the failures.
- A good quote to remember is, "**Quality should be planned in not inspected in**" because the cost of rework can be very high.



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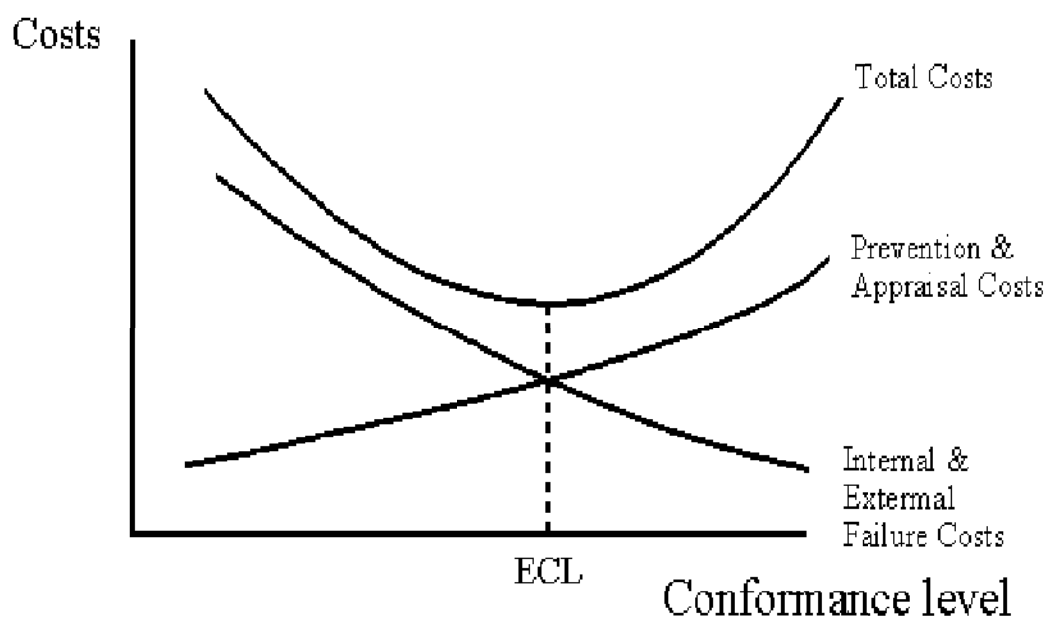
## What is Cost Of Quality?

...and the key parameters of **Cost of Quality** are:



Note : The cost components marked in Yellow font come under the purview of HCL IV&VS.

## ECONOMIC CONFORMANCE MODEL





Processes and activities of the performing organization that determine quality policies, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken



## QUALITY MANAGEMENT PROCESSES

Process	Process Group
Plan Quality Management	Planning
Manage Quality	Executing
Control Quality	Monitoring and Controlling





## PLAN QUALITY MANAGEMENT

Identifying quality requirements and/or standards for the project and product, and documenting how the project will demonstrate compliance.

This process is important to ensure that the resulting product is of acceptable quality. This is performed in parallel with the development of the project management plan and other planning process



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## PLAN QUALITY MANAGEMENT

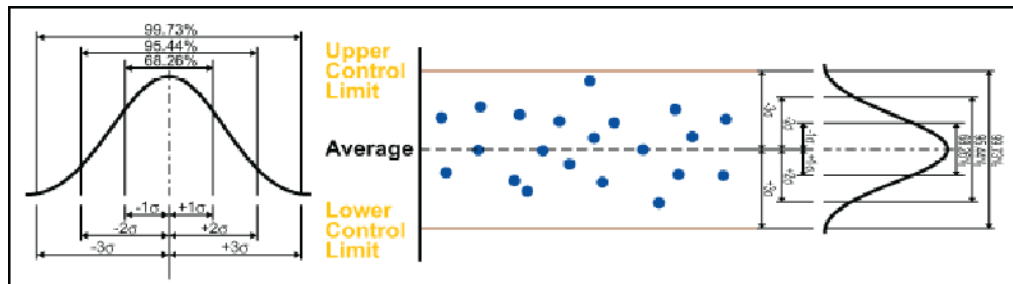
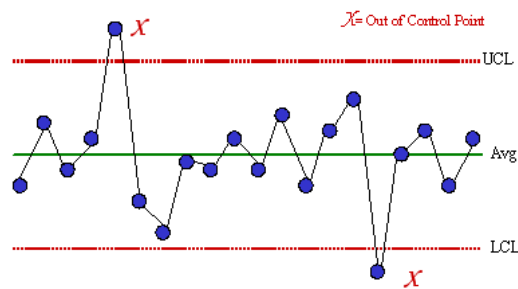
Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>▪ Project charter</li> <li>▪ Project management plan               <ul style="list-style-type: none"> <li>▪ Requirements management plan</li> <li>▪ Risk management plan</li> <li>▪ Stakeholder engagement plan</li> <li>▪ Scope baseline</li> </ul> </li> <li>▪ Project documents               <ul style="list-style-type: none"> <li>▪ Assumption log</li> <li>▪ Requirements documentation</li> <li>▪ Requirements traceability matrix</li> <li>▪ Risk register</li> <li>▪ Stakeholder register</li> </ul> </li> <li>▪ Enterprise environmental factors</li> <li>▪ Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>• Expert judgment</li> <li>▪ Data gathering               <ul style="list-style-type: none"> <li>▪ Benchmarking</li> <li>▪ Brainstorming</li> <li>▪ Interviews</li> </ul> </li> <li>▪ Data analysis               <ul style="list-style-type: none"> <li>▪ Cost-benefit analysis</li> <li>▪ Cost of quality</li> </ul> </li> <li>▪ Decision making               <ul style="list-style-type: none"> <li>▪ Multicriteria decision analysis</li> </ul> </li> <li>▪ Data representation               <ul style="list-style-type: none"> <li>▪ Flowcharts</li> <li>▪ Logical data model</li> <li>▪ Matrix diagrams</li> <li>▪ Mind mapping</li> </ul> </li> <li>▪ Test and inspection planning</li> <li>▪ Meetings</li> </ul>	<ul style="list-style-type: none"> <li>▪ Quality management plan</li> <li>▪ Quality metrics</li> <li>▪ Project management plan updates               <ul style="list-style-type: none"> <li>▪ Risk management plan</li> <li>▪ Scope baseline</li> </ul> </li> <li>▪ Project documents updates               <ul style="list-style-type: none"> <li>▪ Lessons learned register</li> <li>▪ Requirements traceability matrix</li> <li>▪ Risk register</li> </ul> </li> <li>▪ Stakeholder register</li> </ul>



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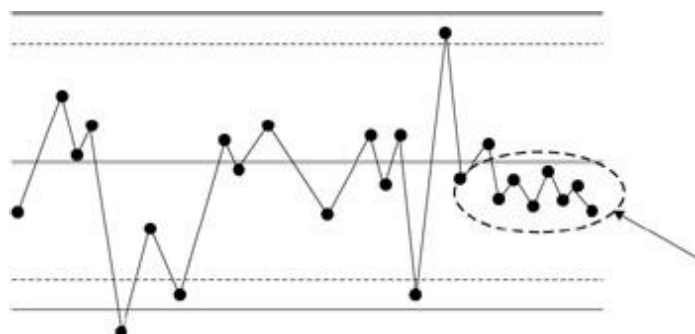
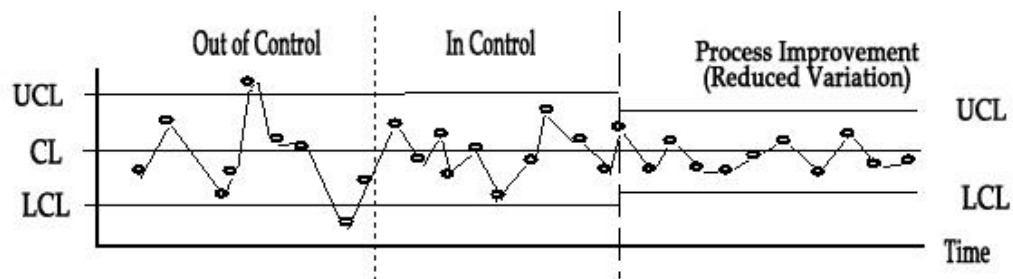


## SEVEN BASIC QUALITY TOOLS - CONTROL CHARTS (7QC - 1 OF 7)



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## SEVEN BASIC QUALITY TOOLS - CONTROL CHARTS (7QC - 1 OF 7)



**Rule of seven**

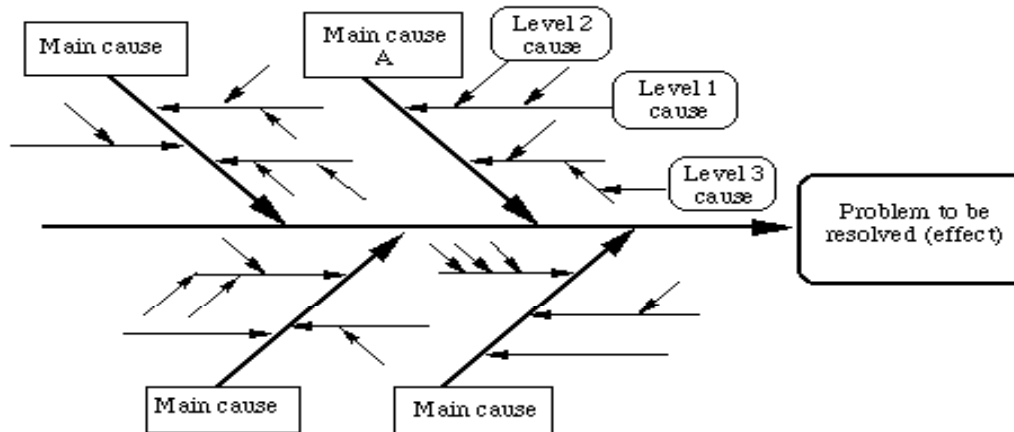


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## **CAUSE AND EFFECT DIAGRAM (ISHIKAWA DIAGRAM OR FISHBONE DIAGRAM) (7QC - 2 OF 7)**

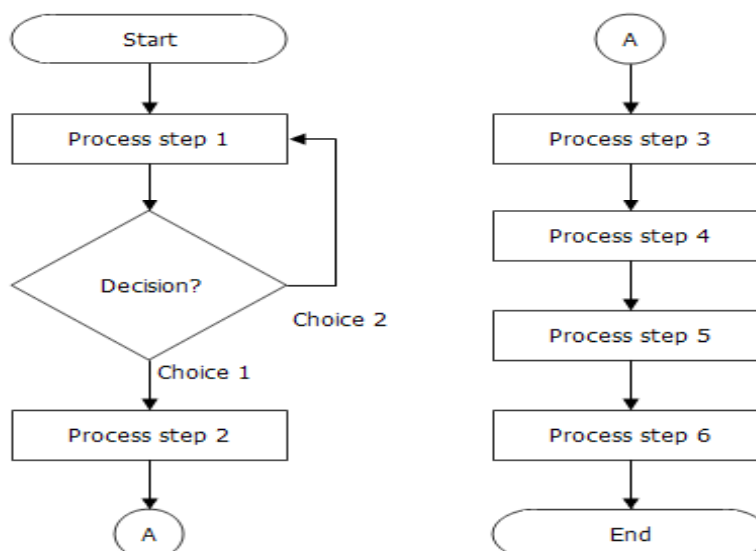
A graphical representation that depicts how different factors relate together and how these relations may contribute to inadequate quality.



## **FLOWCHARTING (7QC - 3 OF 7)**

**Flowcharting (7QC - 3 of 7)** depicts the sequence of operation, inspection, decisions etc in a system. This help in analyzing where quality problem may happen

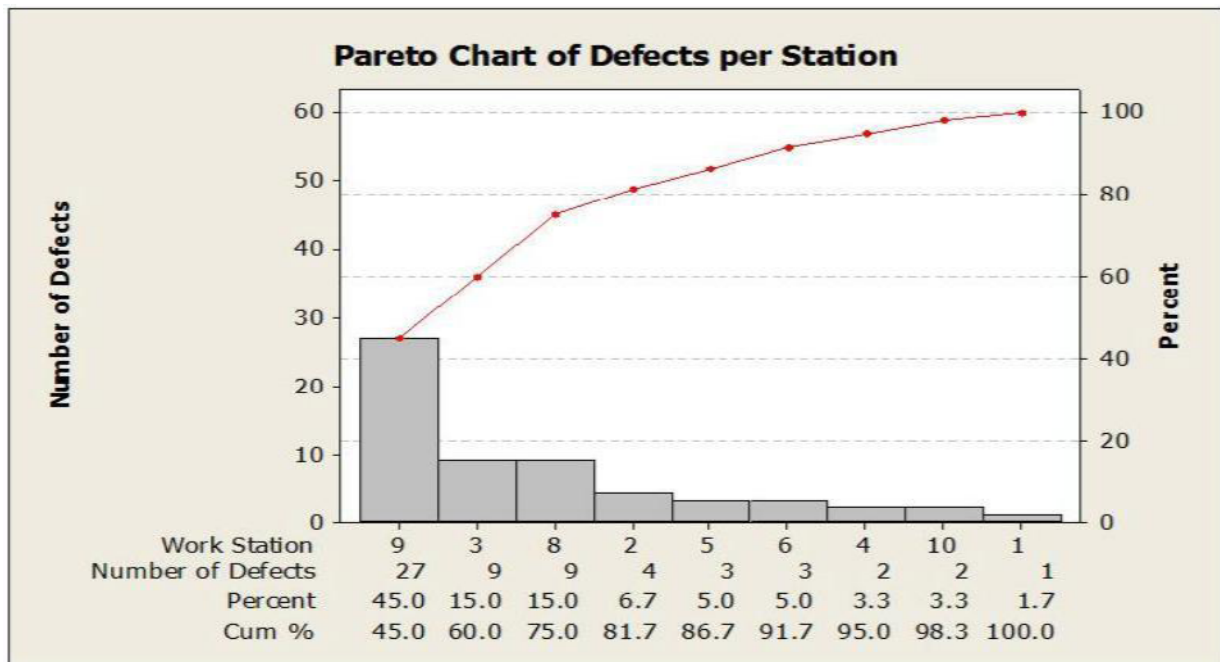
### **Basic Flowchart**





## PARETO CHART (7QC - 4 OF 7)

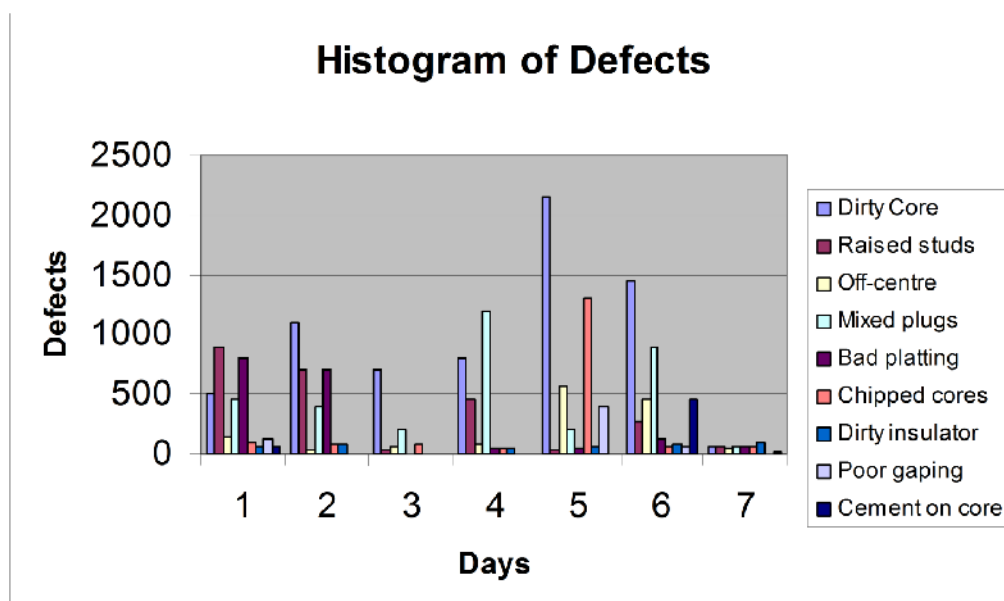
A Pareto chart is a specific type of histogram, ordered by frequency of occurrence. It shows how many defects were generated by type or category of identified cause. Rank ordering is used to focus corrective action. The project team should address the causes creating the greatest number of defects first.



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## HISTOGRAM (7QC - 5 OF 7)

**Histogram (7QC - 5 of 7)** is a statistical tool used in the analysis and determination of possible solutions to quality control problem. It depicts how often the problem happens or its frequency



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## CHECK SHEETS (7QC – 6 OF 7)

	PART NUMBER X-1011	PART NUMBER X-2011	PART NUMBER X-3011	PART NUMBER X-4011	PART NUMBER X-5011
SAMPLES OF 1,000 SOLDER JOINTS					
COLD SOLDER	////			///	
NO SOLDER IN HOLE	///		//	//	
GRAINY SOLDER	///	/		///	
HOLE NOT PLATED THROUGH	///			///	
MASK NOT PROPERLY INSTALLED	///		////	///	
PAD LIFTED	/				



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## SCATTER DIAGRAMS (7QC – 7 OF 7)

Depicts the relation ship between two variables as as shown in figure below. They are also called as correlation charts



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## QUALITY MANAGEMENT PLAN

Plan Quality Management is the process of identifying quality requirements and/or standards for the project and its deliverables, and documenting how the project will demonstrate compliance with quality requirements and/or standards.

The quality management plan may include :

- Quality standards that will be used by the project;
- Quality objectives of the project;
- Quality roles and responsibilities;
- Project deliverables and processes subject to quality review;
- Quality control and quality management activities planned for the project;
- Quality tools that will be used for the project; and
- Major procedures relevant for the project, such as dealing with nonconformance, corrective actions procedures, and continuous improvement procedures.



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## MANAGE QUALITY

Manage Quality is the process of translating the quality management plan into executable quality activities that incorporate the organization's quality policies into the project. The key benefits of this process are that it increases the probability of meeting the quality objectives as well as identifying ineffective processes and causes of poor quality. Manage Quality uses the data and results from the control quality process to reflect the overall quality status of the project to the stakeholders. This process is performed throughout the project.



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## MANAGE QUALITY

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>Project management plan               <ul style="list-style-type: none"> <li>Quality management plan</li> </ul> </li> <li>Project documents               <ul style="list-style-type: none"> <li>Lessons learned register</li> <li>Quality control measurements</li> <li>Quality metrics</li> <li>Risk report</li> </ul> </li> <li>Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>Data gathering               <ul style="list-style-type: none"> <li>Checklists</li> </ul> </li> <li>Data analysis               <ul style="list-style-type: none"> <li>Alternatives analysis</li> <li>Document analysis</li> <li>Process analysis</li> <li>Root cause analysis</li> </ul> </li> <li>Decision making               <ul style="list-style-type: none"> <li>Multicriteria decision analysis</li> </ul> </li> <li>Data representation               <ul style="list-style-type: none"> <li>Affinity diagrams</li> <li>Cause-and-effect diagrams</li> <li>Flowcharts</li> <li>Histograms</li> <li>Matrix diagrams</li> <li>Scatter diagrams</li> </ul> </li> <li>Audits</li> <li>Design for X</li> <li>Problem solving</li> <li>Quality improvement methods</li> </ul>	<ul style="list-style-type: none"> <li>Quality reports</li> <li>Test and evaluation documents</li> <li>Change requests</li> <li>Project management plan updates               <ul style="list-style-type: none"> <li>Quality management plan</li> <li>Scope baseline</li> <li>Schedule baseline</li> <li>Cost baseline</li> </ul> </li> <li>Project documents updates               <ul style="list-style-type: none"> <li>Issue log</li> <li>Lessons learned register</li> <li>Risk register</li> </ul> </li> </ul>



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## QUALITY REPORT

The quality reports can be graphical, numerical, or qualitative. The information presented in the quality reports may include :

- All quality management issues escalated by the team;
- Recommendations for process, project, and product improvements;
- Corrective actions recommendations (including rework, defect/bugs repair, 100% inspection, and more);
- Summary of findings from the Control Quality process



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## CONTROL QUALITY

Monitoring and recording results of executing the quality activities to assess performance and recommend necessary changes. This process takes place throughout the project lifecycle , involves inspection , measurement and testing of deliverables and their comparison with the baseline



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## CONTROL QUALITY

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>▪ Project management plan<ul style="list-style-type: none"><li>▪ Quality management plan</li></ul></li><li>▪ Project documents<ul style="list-style-type: none"><li>▪ Lessons learned register</li><li>▪ Quality metrics</li><li>▪ Test and evaluation documents</li></ul></li><li>▪ Approved change requests</li><li>▪ Deliverables</li><li>▪ Work performance data</li><li>▪ Enterprise environmental factors</li><li>▪ Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>▪ Data gathering<ul style="list-style-type: none"><li>▪ Checklists</li><li>▪ Check sheets</li><li>▪ Statistical sampling</li><li>▪ Questionnaires and surveys</li></ul></li><li>▪ Data analysis<ul style="list-style-type: none"><li>▪ Performance reviews</li><li>▪ Root cause analysis</li></ul></li><li>▪ Inspection</li><li>▪ Testing/product evaluations</li><li>▪ Data representation<ul style="list-style-type: none"><li>▪ Cause-and-effect diagrams</li><li>▪ Control charts</li><li>▪ Histogram</li><li>▪ Scatter diagrams</li></ul></li><li>▪ Meetings</li></ul>	<ul style="list-style-type: none"><li>▪ Quality control measurements</li><li>▪ Verified deliverables</li><li>▪ Work performance information</li><li>▪ Change requests</li><li>▪ Project management plan updates<ul style="list-style-type: none"><li>▪ Quality management plan</li></ul></li><li>▪ Project documents updates<ul style="list-style-type: none"><li>▪ Issue log</li><li>▪ Lessons learned register</li><li>▪ Risk register</li></ul></li><li>▪ Test and evaluation documents</li></ul>



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## VERIFIED DELIVERABLES

**Verified deliverables** - A goal of quality control is to determine the correctness of deliverables. The results of the execution quality control processes are Verified deliverables.



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# QUIZ !



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# **Project Procurement Management**



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## **PROJECT PROCUREMENT MANAGEMENT**

Processes necessary to purchase or acquire products, services or results needed from outside the project team.



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# PROCUREMENT MANAGEMENT PROCESSES

Process	Process Group
Plan Procurements	Planning
Conduct Procurements	Executing
Control Procurements	Monitoring and Controlling



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## PLAN PROCUREMENTS

**Plan Procurements** is the process of documenting project purchasing decisions, specifying the approach, and identifying potential sellers



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## PLAN PROCUREMENTS

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>Project charter</li> <li>Business documents <ul style="list-style-type: none"> <li>Business case</li> <li>Benefits management plan</li> </ul> </li> <li>Project management plan <ul style="list-style-type: none"> <li>Scope management plan</li> <li>Quality management plan</li> <li>Resource management plan</li> <li>Scope baseline</li> </ul> </li> <li>Project documents <ul style="list-style-type: none"> <li>Milestone list</li> <li>Project team assignments</li> <li>Requirements documentation</li> <li>Requirements traceability matrix</li> <li>Resource requirements</li> <li>Risk register</li> <li>Stakeholder register</li> </ul> </li> <li>Enterprise environmental factors</li> <li>Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>Expert judgment</li> <li>Data gathering <ul style="list-style-type: none"> <li>Market research</li> </ul> </li> <li>Data analysis <ul style="list-style-type: none"> <li>Make-or-buy analysis</li> </ul> </li> <li>Source selection analysis</li> </ul>	<ul style="list-style-type: none"> <li>Procurement management plan</li> <li>Procurement strategy</li> <li>Bid documents</li> <li>Procurement statement of work</li> <li>Source selection criteria</li> <li>Make-or-buy decisions</li> <li>Independent cost estimates</li> <li>Change requests</li> <li>Project documents updates <ul style="list-style-type: none"> <li>Lessons learned register</li> <li>Milestone list</li> <li>Requirements documentation</li> <li>Requirements traceability matrix</li> <li>Risk register</li> <li>Stakeholder register</li> </ul> </li> <li>Organizational process assets updates</li> </ul>



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## TYPES OF CONTRACTS

### Time & Material – T & M

The seller is paid for the amount of time it takes to accomplish the work and he is also reimbursed for the materials used for the project

<b>Firm Fixed Price - FFP</b>	The seller is paid a fixed price for an agreed upon unit of work done by him
<b>Fixed Price Incentive Fee – FPIF</b>	The seller is paid a fixed price plus an incentive amount for achieving pre-agreed project metrics
<b>Fixed Price with Economic Price Adjustment Contracts – FP-EPA</b>	The seller is paid a fixed price. The contract is reviewed at pre-defined intervals in the project for adjustments to the contract price based on certain parameters



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## TYPES OF CONTRACTS

### Cost Plus Fixed Fee – CPFF

The contractor is reimbursed its cost plus an additional fixed fee. Not desirable from the buyer's point of view

### Cost Plus Incentive Fee - CPIF

Seller is reimbursed for an agreed upon performance cost along with a pre-established fee plus an incentive bonus. In this case, the buyer and seller share the uncertainty to a certain degree

### Cost Plus Award Fee

Seller is reimbursed for an agreed upon performance cost plus all legitimate cost



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## PROCUREMENT MANAGEMENT PLAN

**Procurement management plan** describes how the procurement process will be managed from planning procurement to close procurement. It contains detail on

1. Types of Contracts to be used
2. Risk management issues
3. Whether independent estimates will be used and whether they are needed as evaluation criteria
4. Standardized procurement documents, if needed
5. Process of managing multiple providers (sellers)
6. Coordination with other project aspects
7. Any constraints and assumptions that could affect planned procurements
8. Handling the long lead times to purchase certain items from sellers and coordinating the extra time needed to procure these items with the development of the project schedule
9. Handling make – or – buy decision and linking them to the Estimate Activity Resources and Develop schedule process.



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## **Exercise 1: Make or Buy Analysis**

### **Practicing Key Concepts**

You've been contracted by a construction company to manage their contracting. They have a choice of either buying an excavator or renting it. To buy it, the company would have to pay \$105,000, but owning it will require approximately \$10,000 in maintenance costs per year. The price to rent the excavator is \$5000 per month, with a one-time service charge of \$2000. What's the minimum number of months the company needs to use the excavator in order for it to make sense to buy it rather than rent?

1. 8 months
2. 16 months
3. 21 months
4. 25 months



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## **Exercise 2: Plan Procurements**

**Which document are we referring below?**

1. A type of procurement document used to request proposals from prospective sellers of products or services.
2. A type of procurement document used to request price quotations from prospective sellers of common or standard products or services.



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## **Exercise 2: Plan Procurements**

**Which document are we referring below?**

1. A type of procurement document used to request proposals from prospective sellers of products or services.

**RFP**

2. A type of procurement document used to request price quotations from prospective sellers of common or standard products or services.

**RFQ**



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## **CONDUCT PROCUREMENT**

**Conduct Procurements is the process of obtaining seller responses, selecting a seller, and awarding a contract**



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## CONDUCT PROCUREMENT

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>Project management plan               <ul style="list-style-type: none"> <li>Scope management plan</li> <li>Requirements management plan</li> <li>Communications management plan</li> <li>Risk management plan</li> <li>Procurement management plan</li> <li>Configuration management plan</li> <li>Cost baseline</li> </ul> </li> <li>Project documents               <ul style="list-style-type: none"> <li>Lessons learned register</li> <li>Project schedule</li> <li>Requirements documentation</li> <li>Risk register</li> <li>Stakeholder register</li> </ul> </li> <li>Procurement documentation</li> <li>Seller proposals</li> <li>Enterprise environmental factors</li> <li>Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>Expert judgment</li> <li>Advertising</li> <li>Bidder conferences</li> <li>Data analysis               <ul style="list-style-type: none"> <li>Proposal evaluation</li> </ul> </li> <li>Interpersonal and team skills</li> <li>Negotiation</li> </ul>	<ul style="list-style-type: none"> <li>Selected sellers</li> <li>Agreements</li> <li>Change requests</li> <li>Project management plan updates               <ul style="list-style-type: none"> <li>Requirements management plan</li> <li>Quality management plan</li> <li>Communications management plan</li> <li>Risk management plan</li> <li>Procurement management plan</li> <li>Scope baseline</li> <li>Schedule baseline</li> <li>Cost baseline</li> </ul> </li> <li>Project documents updates               <ul style="list-style-type: none"> <li>Lessons learned register</li> <li>Requirements documentation</li> <li>Requirements traceability matrix</li> <li>Resource calendars</li> <li>Risk register</li> <li>Stakeholder register</li> </ul> </li> <li>Organizational process assets updates</li> </ul>



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## AGREEMENT

**A** formal document governing the relationship between the buyer and the seller. The contract describes :

- The work to be performed and perhaps the way in which the work will be performed.
- How disputes will be resolved.
- Depending upon the application area, an agreement can also be called an understanding , a contract, a subcontract, or a purchase order. Regardless of the document complexity , a contract is a mutually binding legal agreement that obligates the seller to provide the specific products, services, or results and obligates the buyer to compensate the seller. The major component of agreement are:



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## MAJOR COMPONENT OF AN AGREEMENT

- Statement of work or deliverables
- Schedule baselines
- Performance reporting
- Period of performance
- Roles and responsibilities
- Seller's place of performance
- Pricing
- Payment Terms
- Place of delivery
- Inspection and acceptance criteria
- Warranty
- Product Support
- Limitation of liability
- Fees and retainer
- Penalties
- Incentives
- Insurance and performance bonds
- Subordinate subcontractor approvals
- Change request handling and
- Termination clause and alternative dispute resolution (ADR) mechanism. The ADR method can be decided in advance as a part of the procurement award.



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## CONTROL PROCUREMENTS

Managing procurement relationships, monitoring contract performance and making changes and corrections as needed.



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## CONTROL PROCUREMENT

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>Project management plan               <ul style="list-style-type: none"> <li>Requirements management plan</li> <li>Risk management plan</li> <li>Procurement management plan</li> <li>Change management plan</li> <li>Schedule baseline</li> </ul> </li> <li>Project documents               <ul style="list-style-type: none"> <li>Assumption log</li> <li>Lessons learned register</li> <li>Milestone list</li> <li>Quality reports</li> <li>Requirements documentation</li> <li>Requirements traceability matrix</li> <li>Risk register</li> <li>Stakeholder register</li> </ul> </li> <li>Agreements</li> <li>Procurement documentation</li> <li>Approved change requests</li> <li>Work performance data</li> <li>Enterprise environmental factors</li> <li>Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>Expert judgment</li> <li>Claims administration</li> <li>Data analysis               <ul style="list-style-type: none"> <li>Performance reviews</li> <li>Earned value analysis</li> <li>Trend analysis</li> </ul> </li> <li>Inspection</li> <li>Audits</li> </ul>	<ul style="list-style-type: none"> <li>Closed procurements</li> <li>Work performance information</li> <li>Procurement documentation updates</li> <li>Change requests</li> <li>Project management plan updates               <ul style="list-style-type: none"> <li>Risk management plan</li> <li>Procurement management plan</li> <li>Schedule baseline</li> <li>Cost baseline</li> </ul> </li> <li>Project documents updates               <ul style="list-style-type: none"> <li>Lessons learned register</li> <li>Resource requirements</li> <li>Requirements traceability matrix</li> <li>Risk register</li> <li>Stakeholder register</li> </ul> </li> <li>Organizational process assets updates</li> </ul>



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## CLAIMS ADMINISTRATION

**Claims administration** are basically disagreements (about scope or change request). It is preferred that the claims should be resolved by the parties involved as per the dispute resolution procedure . If not resolved by the parties involved, then the disputes are resolved by the process of Arbitration whereby a third neutral party is given the task of getting the dispute resolved.



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## Exercise : Control Procurements

### Revising Tools and Techniques

1. \_\_\_\_\_ involves process to change the procurement contract. It can involve the approvals, paperwork and the dispute resolution mechanism required for the change control.
2. \_\_\_\_\_ system refers to how the payments are made to the seller.



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## Answer to Exercise : Control Procurements

### Revising Tools and Techniques

1. Contract Change Control System involves process to change the procurement contract. It can involve the approvals, paperwork and the dispute resolution mechanism required for the change control.
2. Payment system refers to how the payments are made to the seller.



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# Project Procurement Management

## ▪ Negotiations Techniques

- **Deadline:** imposing a deadline to reach an agreement
- **Stalling:** one party may claim that an agreement cannot be finalized because of his limited authority
- **Fair and Responsible:** a negotiator may claim that the price for a product is equitable because that's what another company is paying.
- **Delay:** are useful when tempers are beginning to flare, to divert from a subject, etc (Ex: arrival of refreshments, request for recess etc)
- **Withdrawal:** one party may attack an issue, then retreat
- **Arbitration:** a third party may be brought in when agreement cannot be reached. (out of court settlement)
- **Fait Accompli:** a party may claim that what is being asked for has already been accomplished and cannot be changed



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# QUIZ !



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# Project Stakeholder Management



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- Key Learning Objectives
  - Who are Stakeholder and effective way to manage them
  - Project Stakeholder Management processes
    - Identify Stakeholder
    - Plan Stakeholder Engagement
    - Manage Stakeholder Engagement
    - Control Stakeholder Engagement



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## WHAT IS STAKEHOLDER MANAGEMENT?

Stakeholder Management includes the processes required to identify people, groups or organizations that could impact or be impacted by the project, to analyze stakeholder expectations and their impact on the project and to develop appropriate management strategies for effectively engaging stakeholder in project decisions and execution.



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## IDENTIFY STAKEHOLDERS

Identify Stakeholders is the process of identifying the people, groups or organizations that could impact or be impacted by decision, activity or outcome of the project analyzing and documenting relevant information regarding their interest , involvement, interdependencies, influence and potential impact on project success.

The key benefit of Identify stakeholder process is that it allows the project manager to identify the appropriate focus for each stakeholder or group of stakeholders



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## IDENTIFY STAKEHOLDERS

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"> <li>Project charter</li> <li>Business documents               <ul style="list-style-type: none"> <li>Business case</li> <li>Benefits management plan</li> </ul> </li> <li>Project management plan               <ul style="list-style-type: none"> <li>Communications management plan</li> <li>Stakeholder engagement plan</li> </ul> </li> <li>Project documents               <ul style="list-style-type: none"> <li>Change log</li> <li>Issue log</li> <li>Requirements documentation</li> </ul> </li> <li>Agreements</li> <li>Enterprise environmental factors</li> <li>Organizational process assets</li> </ul>	<ul style="list-style-type: none"> <li>Expert judgment</li> <li>Data gathering               <ul style="list-style-type: none"> <li>Questionnaires and surveys</li> <li>Brainstorming</li> </ul> </li> <li>Data analysis               <ul style="list-style-type: none"> <li>Stakeholder analysis</li> <li>Document analysis</li> </ul> </li> <li>Data representation               <ul style="list-style-type: none"> <li>Stakeholder mapping/representation</li> </ul> </li> <li>Meetings</li> </ul>	<ul style="list-style-type: none"> <li>Stakeholder register</li> <li>Change requests</li> <li>Project management plan updates               <ul style="list-style-type: none"> <li>Requirements management plan</li> <li>Communications management plan</li> <li>Risk management plan</li> <li>Stakeholder engagement plan</li> </ul> </li> <li>Project documents updates               <ul style="list-style-type: none"> <li>Assumption log</li> <li>Issue log</li> <li>Risk register</li> </ul> </li> </ul>



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## STAKEHOLDER ANALYSIS

Identifies the interests, expectations and influence of the stakeholders and relates them to the purpose of the project.

There are multiple classification models used for stakeholders analysis , such as :

- *Power /Interest grid*, grouping the stakeholders based on their level of authority (“power”) and their level or concern (“interest”) regarding the project outcomes
- *Power /Influence grid*, grouping the stakeholders based on their level of authority (“power”) and their active involvement (“influence”) in the project.
- *Influence/ Impact grid* , grouping the stakeholders based on their active involvement (“Influence”) in the project and their ability to effect changes to the project’s planning or execution (“ impact”).
- *Salience model*, describing classes of stakeholders based on their power (ability to impose their will), urgency (need for immediate attention), and legitimacy (their involvement is appropriate).



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## POWER GRID MATRIX

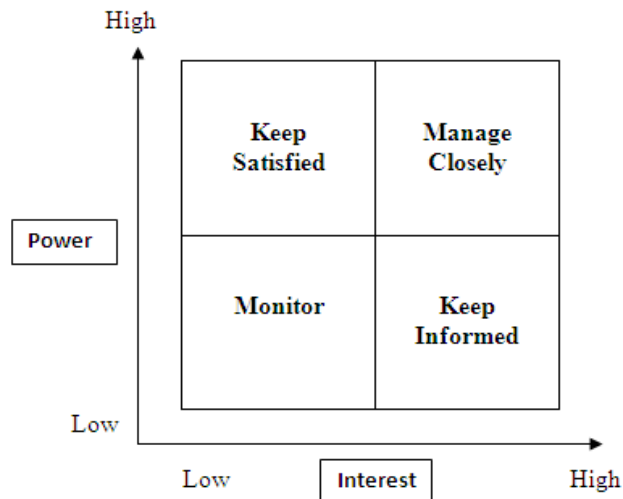


Figure: Power / Interest Grid with Stakeholders



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## STAKEHOLDERS REGISTER

The main output of Identify Stakeholder process is stakeholder register. It contains following details.

### **Identification Information :**

Name, Organizational Position, Location, Role in the project, Contact info

### **Assessment Information:**

Major Requirement, Main expectation, Potential Influence

### **Stakeholders Category:**

External/Internal, Supporter, Neutral, Resister



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## PLAN STAKEHOLDER ENGAGEMENT

**Plan Stakeholder Engagement is the process of developing appropriate management strategies to effectively engage stakeholders throughout the project life cycle, based on the analysis of their needs, interests and potential impact on the project success.**



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## PLAN STAKEHOLDER ENGAGEMENT

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>▪ Project charter</li><li>▪ Project management plan<ul style="list-style-type: none"><li>▪ Resource management plan</li><li>▪ Communications management plan</li><li>▪ Risk management plan</li></ul></li><li>▪ Project documents<ul style="list-style-type: none"><li>▪ Assumption log</li><li>▪ Change log</li><li>▪ Issue log</li><li>▪ Project schedule</li><li>▪ Risk register</li><li>▪ Stakeholder register</li></ul></li><li>▪ Agreements</li><li>▪ Enterprise environmental factors</li><li>▪ Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>▪ Expert judgment</li><li>▪ Data gathering<ul style="list-style-type: none"><li>▪ Benchmarking</li></ul></li><li>▪ Data analysis<ul style="list-style-type: none"><li>▪ Assumption and constraint analysis</li><li>▪ Root cause analysis</li></ul></li><li>▪ Decision making<ul style="list-style-type: none"><li>▪ Prioritization/ranking</li></ul></li><li>▪ Data representation<ul style="list-style-type: none"><li>▪ Mind mapping</li><li>▪ Stakeholder engagement assessment matrix</li></ul></li><li>▪ Meetings</li></ul>	<ul style="list-style-type: none"><li>▪ Stakeholder engagement plan</li></ul>



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## STAKEHOLDERS ENGAGEMENT ASSESSMENT MATRIX

Stakeholders Engagement Assessment Matrix includes comparison of the current engagement level of stakeholder to the planned engagement levels required for successful project completion. Stakeholder engagement throughout the lifecycle of the project is critical to project success.

The engagement level of the stakeholders can be classified as follows:

- **Unaware** – Unaware of project and potential impacts
- **Resistant** – Aware of project and potential impacts and resistant to change
- **Neutral** – Aware of project yet neither supportive nor resistant
- **Supportive** – Aware of project and potential impacts and supportive to change
- **Leading** – Aware of project and potential impacts and actively engaged in ensuring the project is a success.



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## STAKEHOLDERS ENGAGEMENT ASSESSMENT MATRIX

Stakeholder	Unaware	Resistant	Neutral	Supportive	Leading
Stakeholder 1	C			D	
Stakeholder 2			C	D	
Stakeholder 3				D C	



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# STAKEHOLDER ENGAGEMENT PLAN

**Stakeholder Engagement Plan** is a component of the project management plan that explains the management strategies required to effectively engage stakeholders. In addition to the data gathered in the stakeholder register it provides.

- Desired and current engagement levels of key stakeholders
- Scope and impact of change to stakeholders
- Identified interrelationships and potential overlap between stakeholders
- Stakeholder communication requirements for the current project phase;
- Information to be distributed to stakeholders, including language, format, content , and level of detail;
- Reason for the distribution of that information and the expected impact to stakeholder engagement;
- Time frame and frequency for the distribution of required information to stakeholders.
- Method for updating and refining the stakeholder management plan as the project progresses and develops.



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# MANAGE STAKEHOLDER ENGAGEMENT

Manage Stakeholder Engagement is the process of communicating and working with stakeholders to meet their need/expectations, address issues as they occur, and foster appropriate stakeholder engagement in project activities throughout the project life cycle.



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## MANAGE STAKEHOLDER ENGAGEMENT

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>▪ Project management plan<ul style="list-style-type: none"><li>▪ Communications management plan</li><li>▪ Risk management plan</li><li>▪ Stakeholder engagement plan</li><li>▪ Change management plan</li></ul></li><li>▪ Project documents<ul style="list-style-type: none"><li>▪ Change log</li><li>▪ Issue log</li><li>▪ Lessons learned register</li><li>▪ Stakeholder register</li></ul></li><li>▪ Enterprise environmental factors</li><li>▪ Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>▪ Expert judgment</li><li>▪ Communication skills<ul style="list-style-type: none"><li>▪ Feedback</li></ul></li><li>▪ Interpersonal and team skills<ul style="list-style-type: none"><li>▪ Conflict management</li><li>▪ Cultural awareness</li><li>▪ Negotiation</li><li>▪ Observation/conversation</li><li>▪ Political awareness</li></ul></li><li>▪ Ground rules</li><li>▪ Meetings</li></ul>	<ul style="list-style-type: none"><li>▪ Change requests</li><li>▪ Project management plan updates<ul style="list-style-type: none"><li>▪ Communications management plan</li><li>▪ Stakeholder engagement plan</li></ul></li><li>▪ Project documents updates<ul style="list-style-type: none"><li>▪ Change log</li><li>▪ Issue log</li><li>▪ Lessons learned register</li></ul></li><li>▪ Stakeholder register</li></ul>



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## MONITOR STAKEHOLDER ENGAGEMENT

**Monitor Stakeholder Engagement** is the process of monitoring overall project stakeholder relationship and adjusting strategies and plans for engaging stakeholders.



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## MONITOR STAKEHOLDER ENGAGEMENT

Inputs	Tools and Techniques	Outputs
<ul style="list-style-type: none"><li>▪ Project management plan<ul style="list-style-type: none"><li>▪ Resource management plan</li><li>▪ Communications management plan</li><li>▪ Stakeholder engagement plan</li></ul></li><li>▪ Project documents<ul style="list-style-type: none"><li>▪ Issue log</li><li>▪ Lessons learned register</li><li>▪ Project communications</li><li>▪ Risk register</li><li>▪ Stakeholder register</li></ul></li><li>▪ Work performance data</li><li>▪ Enterprise environmental factors</li><li>▪ Organizational process assets</li></ul>	<ul style="list-style-type: none"><li>▪ Data analysis<ul style="list-style-type: none"><li>▪ Alternatives analysis</li><li>▪ Root cause analysis</li><li>▪ Stakeholder analysis</li></ul></li><li>▪ Decision making<ul style="list-style-type: none"><li>▪ Multicriteria decision analysis</li><li>▪ Voting</li></ul></li><li>▪ Data representation<ul style="list-style-type: none"><li>▪ Stakeholder engagement assessment matrix</li></ul></li><li>▪ Communication skills<ul style="list-style-type: none"><li>▪ Feedback</li><li>▪ Presentations</li></ul></li><li>▪ Interpersonal and team skills<ul style="list-style-type: none"><li>▪ Active listening</li><li>▪ Cultural awareness</li><li>▪ Leadership</li><li>▪ Networking</li><li>▪ Political awareness</li></ul></li><li>▪ Meetings</li></ul>	<ul style="list-style-type: none"><li>▪ Work performance information</li><li>▪ Change requests</li><li>▪ Project management plan updates<ul style="list-style-type: none"><li>▪ Resource management plan</li><li>▪ Communications management plan</li><li>▪ Stakeholder engagement plan</li></ul></li><li>▪ Project documents updates<ul style="list-style-type: none"><li>▪ Issue log</li><li>▪ Lessons learned register</li><li>▪ Risk register</li><li>▪ Stakeholder register</li></ul></li></ul>



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## QUIZ



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