

Chapter1-- A Project

A project is a temporary endeavor undertaken to create a unique product, service or result. Projects are **temporary** in nature, have definite start & end dates, result in the creation of a **unique** product or service and are completed when their goals and objectives have been met & signed off by the stakeholders. Sometimes projects ends when it's determined that the goals & objectives cannot be accomplished or when the product or service of the project is no longer needed and the project is canceled.

Progressive Elaboration

It is a characteristic of projects that accompanies the concepts of temporary & unique. It means developing in steps and continuing by increments.

Project vs. Operations

Common

- 1) Performed by people
- 2) Constrained by limited resources
- 3) Planned, executed & controlled

Operations are ongoing & repetitive

Projects are often utilized as a means of achieving an organization's **strategic plan**. Projects are typically authorized as result of following strategic considerations

- 1) Market demand
- 2) Organizational need
- 3) Customer request
- 4) Technological advance
- 5) Legal requirement
- 6) Social need

What is Project Management?

It is the application of knowledge, skills, tools & techniques to project activities to meet project requirements. Managing a project includes

- 1) Identifying requirements
- 2) Establishing clear & achievable objectives
- 3) Balancing the competing demands for quality, scope, time and cost
- 4) Adapting the specifications, plans and approach to the different concerns and expectations of the various stakeholders.

Area of Expertise- five

- 1) PMBOK->
 - a. Project life cycle definition
 - b. Five process groups
 - c. Nine knowledge areas
- 2) Application area knowledge, standards & regulations
 - a. Have common elements significant in some projects but not needed in others
 - b. Functional Deptt- legal, logic, mgmt, mktg
 - c. Technical elements- s/w develop, construction engg
 - d. Management specializations- govt contracting, community development
 - e. Industry groups- automotive, chemical, agricultural & financial services
 - f. A standard is a document established by consensus & approved by recognized body that provides, for common & repeated use, guidelines.
 - g. A regulation is govt imposed requirement with which compliance is mandatory
- 3) Understanding the project environment
 - a. Cultural & social environment
 - b. International & political environment
 - c. Physical environment
- 4) General management knowledge & skills
 - a. Planning, organizing, staffing, executing & controlling the operations of an ongoing enterprise. Fin,logic,IT, procurement,marketing etc.
- 5) Interpersonal skills (Project Manager should have)
 - a. Effective communication
 - b. Influencing the organization & Budgeting skills
 - c. Leadership skills
 - d. Motivation & Team building
 - e. Negotiation & conflict management
 - f. Problem solving
 - g. Organizational & planning skills

Program & Program Management

A program is a group of related projects managed in a coordinated way to obtain benefits & control not available from managing them individually. Programs also involve series of repetitive or cyclical undertakings.

Program Management is the centralized, coordinated management of a group of projects to achieve the program's strategic objectives & benefits.

Portfolios & Portfolio Management

A portfolio is a collection of projects or programs & other work that are grouped together to facilitate effective management of that work to meet strategic business objectives. They may not necessarily be interdependent or directly related

Subprojects

Projects are divided into more manageable components or subprojects although the individual subprojects can be referred to as projects and managed as such

Project Management Office PMO

A PMO is an organizational unit to centralize and coordinate the management of projects under its domain. It oversees the management of projects & programs and provides training, software standardized policies and procedures.

The **project coordinator** reports to a higher-level manager and has authority to make some decisions. The **project expediter** has no authority to make decisions.

Chapter 2 Project Life Cycle & Organization

PM or organization can divide projects into phases to provide better management control known as project life cycle. The end of each phase allows PM, stakeholders & project sponsor the opportunity to determine if the project should continue to the next phase.

Handoffs -> Project phase evolve through life cycle in a series of phase sequences called handoffs or technical transfers. The end of one phase sequence typically marks the beginning of the next.

Feasibility Study -> The purpose is to determine if the project is worth undertaking & whether the project will be profitable to the organization. It is a preliminary assessment of the viability of the project, the viability or perhaps marketability of the product or service of the project & project's value to the org.

Phase Completion -> each phase has a specific or multiple deliverables that marks the end of the phase. A deliverable is an output that must be produced, reviewed and approved to bring the phase or project to completion. Deliverables are tangible and can be measured & easily proved. Phase ending reviews are also known as phase exits, phase gates or kill points.

Fast Tracking -> when phases are overlapped to shorten or compress the project schedule. It means that a later phase is started prior to completing and approving the phase or phases that come before it.

At start of the project, Level of uncertainty is highest & risk is greatest.

At start of the project, final cost is highest and ability of stakeholders to influence the final characteristics of the project's product and gets progressively lower as the project continues.

Project Stakeholders -> PS are individuals & org that are actively involved in the project or whose interests may be affected as a result of project execution or completion. They may have a positive or negative influence on a project.

Project Sponsor -> the person or group that provides the financial resources in cash or in kind for the project.

Influencers -> people or groups that are not directly related to the acquisition or use of the project's product, but due to an individual's position in the customer org or performing org can influence positively or negatively the course of the project.

Organizational Structure

Functional Org

Advantage	Disadvantage
Employees have 1 supervisor with clear chain of command	PM has little to no formal authority & called as Project leader, coordinator or expeditor
Clear career path with separation of functions, allowing specialty skills to flourish	Multiple project compete for limited resources and priority
Enduring org structure	Project team members are loyal to the functional manager

Projectized Org

1. PM have ultimate authority over the project
2. the focus of the org is the project
3. the org's resources are focused on projects and project work
4. team members are collocated
5. loyalties are formed to the project, not to a func mgr
6. Project teams are dissolved at the conclusion of the project and may find themselves out of work.

Org Str.	Functional	Matrix			Projectized
Project Char		Weak	Balanced	Strong	
PM Authority	Little or none	Limited	Low to moderate	Moderate to high	High to almost total
Resource availability	Little or none	Limited	Low to moderate	Moderate to high	High to almost total
Who controls budget	Functional Mgr	Functional Mgr	Mixed	PM	PM
PM role	Part time	Part time	Full time	Full time	Full time
PM admin staff	Part time	Part time	Part time	Full time	Full time

Project management system ->

It is the set of tools, techniques, methodologies, resources and procedures used to manage a project. It could be formal or informal and aids a project manager in effectively guiding a project to completion

Chapter 3 PM Processes for a Project

Project Management is the application of knowledge, skills, tools & techniques to project activities to meet project requirements. In order for a project to be successful, the project team must:

- Select appropriate processes within PM process groups that are required to meet the project objectives
- Use a defined approach to adapt the product specifications & plans to meet project & product requirements
- Comply with requirements to meet stakeholder needs, wants & expectations
- Balance the competing demands of scope, time, cost, quality, resources & risk to produce a quality product

Tailoring

Determining which processes & process groups should be performed for the project. The project manager & team should take into consideration the size & complexity of the project & the various inputs & outputs of each of the processes when determining which ones to perform. It's generally accepted that performing all five process groups is good practice for any project.

Process

A process is a set of interrelated actions and activities that are performed to achieve a pre-specified set of products, results or services. Two major categories

- Project management processes- initiate, plan, execute, monitor & control and close
- Product oriented processes- specify & create the project's product defined by project life cycle.

Plan-do-check-act cycle as defined in American Society for Quality.

The five process groups are not project phases but they are interrelated & dependent on each other.

Five process groups are;

1. **Initiating Process Group**-> occurs at the beginning of the project & of each phase for large projects. It acknowledges that a project or phase should begin & grants the approval to commit the organization's resource. Also authorizes PM to begin working on project.
2. **Planning Process Group**-> formulating & revising project goals & objectives & creating project management plan to achieve the goals the project was undertaken to address. Max no. of processes
3. **Executing Process Group**-> putting project management plan into action. Approved changes are implemented. Will utilize most project time & resources results in high cost. PM will have greatest conflicts over schedule.
4. **Monitoring & Controlling Process Group** -> project performance measurements is taken. To identify problems & apply corrective actions.
5. **Closing Process Group** -> most often skipped. It brings a formal, orderly end to the activities of a project phase or to project itself. Project info is gathered & stored for future

ref. contract closeouts occur here and formal acceptance & approval are obtained from stakeholders.

I & P process group

Low impact or probability	High impact or probability
Costs	Risk occurrence
Staffing levels	Stakeholder influence
Chance for successful completion	

M&C and Closing process group

Low impact or probability	High impact or probability
Risk probability	Risk impact
Staffing levels	Chance for successful completion
Stakeholder influence	

Level of accuracy for project estimate is -25% to +75%

See page 42 fig 3-4 high level summary of process group interaction

See page 70 table 3-45 mapping of PM processes to knowledge areas & process groups

Major project documents

1. project charter, formally authorizes the project
2. Project scope statement. States what work is to be accomplished and what deliverables need to be produced.
3. Project management plan. States how the work will be performed.

Fig III-2 page 75

Chapter4 Project Integration Management

It includes the processes & activities needed to identify, define, combine, unify & coordinate the various processes & project management within the project management process groups. In project management context, it includes characteristics of unification, consolidation, articulation & integrative actions that are crucial to project completion, successfully meeting customer & other stakeholder requirements & managing expectations.

In the context of managing a project, it is making choices about where to concentrate resources & effort on any given day, anticipating potential issues.

Fig 4-1 Project integration management overview page 79

Fig 4-2 processes flow diagram page 80

Develop Project Charter (Initiation)

Formally authorizes the project. Assign PM & approves to apply org resources. Initiated by project sponsor or initiator. Six demands (problems, opportunities or business requirement) bcoz of which project initiates. Market demand, business need, customer request, technological advance, legal requirement & social need.

Project charter should address the following information:

customer requirements, business needs, summary milestone schedule

summary budget, stakeholder influence, functional org, assumptions, constraints, ROI

Feasibility study

- If a project is viable project
- To determine the probability of the project succeeding
- Can also examine the viability of product of the project

Four Inputs to Develop project charter

1. Contract

From client if project is being done for external client. Contains the conditions under which the project will be executed, time frame & description of work

2. Project statement of work

Narrative description of products or services to be supplied. Written by project sponsor or initiator if internal. By customer as part of bid document if external. It consider following items

- Business need-> need of the organization itself based on training, govt standards, tech advance, market demands or legal req

- product scope description-> documents the product requirements and characteristics of the product or service that the project will be undertaken to create
- strategic plan-> all projects should support the organization's strategic goals.

3. Enterprise Environmental Factors

Following must be considered, these factors have significant influence on success of project

- organizational culture & structure
- govt or industry standards (product & quality standards)
- infrastructure(existing facilities & capital equipment)
- existing human resources (skills, knowledge)
- personnel administration (hiring & firing guidelines, emp perf review)
- company work authorization system
- marketplace conditions(supply & demand)
- stakeholder risk tolerance
- commercial database
- PM Information System(an automated tool suite, scheduling s/w tool, config mgmt system)

4. Organizational Process Assets

It refers to org policies, guidelines, procedures, plans, approaches or standards for conducting work.

- Templates (risk, WBS)
- Final project audit, project evaluations, product validation
- Project files (scope, cost, schedule & quality baseline, project calendars)
- Historical information & lesson learned
- Issue & defect mgmt database

Four Tools & Technique for Develop project charter

A steering committee is a group of folks comprising senior mgmt & sometimes midlevel managers who represent each of the functional areas in the org. they are responsible for project review, selection & prioritization.

1. Project Selection Methods

Two categories

- a. **Benefit measurement or decision methods**-> it examine diff criteria used in making decisions regarding project selection
- b. **Mathematical/calculation methods**-> provides a way to calculate the value of the project. They use linear, dynamic, integer, nonlinear, and/or multi objective programming in the form of algorithms. These are complicated mathematical formulas & algorithms.

Benefit Measurement Methods includes

Cost-Benefit analysis

It compares the cost to produce the product or service of the project to the benefit the org will receive as a result of executing the project. It may include develop, marketing & operation cost.

Scoring Models

In Weighted scoring model the project selection committee decides criteria & assigns a weight depending on its importance to the committee. Then each project is rated on a scale. This rating is then multiplied by the weight of criteria factor and added to other weighted criteria scores for a total weighted score.

Cash Flow Analysis Techniques

Payback Period

It is the length of the time it takes the company to recoup the initial costs of producing the product or service of the project. It compares the initial investment to the cash inflows expected over the life of the product or service. Least precise

Initial investment= Rs 200000

Cash Inflows= 25000 * 4 = Rs 100000 per year total inflow

Payback is reached in 2 yrs.

Discounted cash flows or time value of money

Money recd in future is worth less than money recd today. Formula for future value calc is

$FV = PV (1+i)^n$ power

i= interest rate

n= time period

discounted cash flow is reverse

$PV = FV$ divide by $(1+i)^n$

Project A is expected to make Rs 100000 in 2 yrs

Project B is expected to make Rs 120000 in 3 yrs

I=12 %

PV of A= Rs 79,719

PV of B= Rs 85,414 hence will return highest investment to company.

Net Present Value

It calculates an accurate value for project in today's money. If NPV calculation is greater than zero accept the project & it will earn a return at least equal to or greater than the cost of capital.

Also, project with high returns early in the project are better projects. Most conservative

Internal rate of return

Most difficult & complicated formula. IRR is the discount rate when the present value of the cash inflows equals the original investment. Project with higher IRR values are generally considered better than project with lower IRR values.

- IRR is the discount rate when NPV equals zero
- IRR assumes that cash inflows are reinvested at the IRR values
- Choose project with highest IRR value

Opportunity Cost is simply the value of the project you did not select.

2. Project Mgmt Methodology

It refers to a methodology for managing projects & all of the processes contained within each of them. It may be a formal, recognized project mgmt standard or an informal technique but should help the project manager to develop the project charter.

3. PMIS

It is a set of automated tools that allows scheduling project activities & resources & collecting & distributing project info. It facilitates the creation of project charter, captures feedback & changes to charter & publishes the finalized approved charter.

4. Expert Judgment

To rely on individuals or group of people who have training, specialized knowledge or skills in their area. It assess the input of this process, environmental

Develop Preliminary Project Scope Statement (Initiation)

It is a **high level** definition of project objectives & deliverables. It describes the characteristics of the product of the project, what is & what is not included in project scope (project boundaries). It may include assumptions, constraints, milestones and high level risk list & definition.

Four Inputs

1. Project Charter
2. Project SOW
3. Enterprise environmental factor
4. Organizational process assets

Three tools

1. Project Mgmt Methodology

2. PMIS
3. Expert Judgment

Develop Project Management Plan (Planning)

The first process in planning process group. It includes the actions necessary to define, integrate and coordinate all subsidiary plans into a project mgmt plan. It also defines how the project is executed, monitored & controlled and closed & documents the outputs of planning group processes. It may include:

- PM processes selected by PM team & their level of implementation
- Description of tools & techniques to be used
- Execution , monitoring , configuration mgmt(PMIS), dependencies & communication, baselines
- Project life cycle & phases. Mgmt reviews

The subsidiary plans:

- Scope, Schedule, Cost, Quality, Process improvement plan
- Staffing mgmt plan, communication, risk, procurement.

Components:

- Milestone list, Resource calendar & Risk register
- Schedule, Cost & Quality baseline

Four Inputs

1. Preliminary project scope stmt
2. PM processes
3. Enterprise environmental factor
4. organizational process assets

Three Tools

1. PM methodology
2. Expert judgment
3. PMIS
 - a. **Configuration Management System:** It is a subsystem of the overall PMIS. It includes the process for submitting proposed changes, defining approval levels for authorizing changes and providing a method to validate approved changes. It is also a collection of formal documented procedures used to apply technical & administrative direction & surveillance to:
 - i. Identify & document the functional & physical characteristics of product or component
 - ii. Control any changes to such characteristics
 - iii. Record & report each change & its implementation status
 - iv. Support the audit of products to verify conformance to requirements.

- b. **Change Control System:** it is a collection of formal documented procedures that define how project deliverables & documentation are controlled, changed & approved. It is subsystem of Config Mgmt

Direct & Manage Project Execution

The purpose is to perform multiple actions & execute the project mgmt plan to accomplish the work defined in the project scope stmt. Some of these actions are:

- Perform activities to accomplish project objectives
- Expend efforts & Spend funds
- Staff, train & manage team members
- Obtain quotation, bids, offers, or proposals
- Select sellers & manage sellers
- Obtain, manage & use resources like tool, materials & equip
- Manage risk & implement risk response activities

Seven Inputs:

1. Project Mgmt Plan
2. **Approved Corrective Actions:** - they are documented, authorized directions required to bring expected future project performance into conformance with project mgmt plan. It is o/p of integrated change control.
3. **Approved Preventive Actions:** - they are documented, authorized directions that reduce the probability of negative consequences associated with project risks.
4. **Approved Change Requests:** - they either expand or reduce project scope & may also cause to revision to budget, schedule, pmp etc. change request can be internal or external to project or org. o/p of M&C process group
5. **Approved Defect Repairs:** - it is the documented, authorized request for product correction of a defect found during perform quality assurance process or audit process.
6. **Validated Defect Repair:** - you found a problem with product in quality processes, u corrected the problem (defect repair) & now u r re-inspecting that repair to make certain the fix is accurate, correct & fixed the problem.
7. **Administrative Closure Procedure:** - it documents all the activities, interactions & related roles & responsibilities needed in executing the admin closure procedure for the project.

Two Tools

1. Project Mgmt Methodology
2. PMIS-> **Work Authorization Systems:** - clarify & initiate the work of each work package or activity. This is a formal procedure that authorizes work to begin in correct sequence & at the right time.

Seven Outputs

1. **Deliverables:** - A deliverable is any unique & verifiable product, result or capability to perform a service that is identified in the project mgmt planning

documentation and must be produced & provided to complete the project. They are not tangible always

2. **Requested changes:** - changes requested to expand or reduce project scope, to modify policies or procedures, to modify project cost or budget or to revise project schedule are often identified while project work is being performed. Requests for a change can be direct or indirect, externally or internally initiated & can be optional or legally/contractually mandated.
3. Implemented Change request
4. Implemented Corrective actions
5. Implemented preventive actions
6. Implemented defect repair
7. **Work Performance Information:** - concerns gathering, documenting & recording the status of project activities.
 - a. Schedule status & progress
 - b. Status of deliverable completion
 - c. Progress & status of schedule activities
 - d. Adherence to quality standards
 - e. Status of costs (those authorized & costs incurred to date)
 - f. Schedule activities percent complete
 - g. Lessons learned
 - h. Resource consumption & utilization

Monitor & Control Project Work

It is performed to monitor project processes associated with initiating, planning, executing and closing. Corrective or preventive actions are taken to control the project performance. It is concerned with

- a. Comparing actual project performance against project mgmt plan
- b. Recommending corrective or preventive actions
- c. Analyzing, tracking & monitoring project risks & make risk response
- d. Forecasting
- e. Monitoring implementation of approved changes

Three Inputs

1. Project Mgmt Plan
2. Work Performance Information
3. **Rejected Change request:** - includes change request, their supporting documentation & their change review status showing disposition of rejected change requests.

Four Tools

1. Project Mgmt Methodology
2. PMIS
3. Expert Judgment
4. Earned Value technique

Five Outputs

1. Recommended Corrective Actions
2. Recommended Preventive Actions
3. Recommended Defect Repair
4. Requested Changes
5. **Forecasts:** - includes estimates or predictions of conditions & events in the project's future, based on the information & knowledge available at the time of forecast.

Integrated Change Control

This process is performed from project inception thru completion. Factors that may cause change include project constraints, stakeholder requests, team member recommendation, and vendor issues. It is primarily concerned with the following:

- Influencing the factors that cause change & reaching agreement on their resulting change requests
- Determining that change is needed or has happened
- Managing approved changes
- Documenting requested changes & their impacts

Managing changes may involve making changes to the project scope, schedule or cost baseline also known as **performance measurement baseline** which is the approved project mgmt plan.

Configuration Management: - it is generally a subset of PMIS which describes the process for submitting change requests & includes processes for tracking the changes & their disposition, processes for defining the approval levels for approval & denying changes & a process for authorizing the changes.

Configuration Identification: - it describes the characteristics of the product of the project. Product & documents are labeled, changes are managed & accountability is maintained.

Configuration Status Accounting: - it is about accounting for the status of the changes by documenting & storing the config info needed to effectively manage the product information.

Configuration verification & auditing: - verification & audits are performed to determine if the performance & functional requirements have been met.

Change Control System: - they are documented procedures that describe how to submit the change requests, how to manage change request & the management impacts of the change as they pertain to project performance. They are usually subset of config mgmt system. It also tracks the status of change request including their approval status.

Change control system & config mgmt system together identify, document & control the changes to the performance baseline.

Change Control Board: - Configuration control board is established to review all change requests. The board is given the authority to approve or deny change requests as defined by the org. it may include stakeholders, managers, project team members etc. other names are Technical Assessment board(TAB), technical review board(TRB), engineering review board(ERB) and change control board.

Close Project

Two procedures are developed to establish the interactions necessary to perform closure activities across the entire project or for a project phase.

Administrative closure procedure: - this procedure details all the activities, interactions & related roles & responsibilities of the project team members & stakeholders involved in executing the admin closure procedure for the project. It also includes integrated activities needed to collect project records, analyze project success or failure, gather lessons learned & archive project info for future use by the org. the procedures to transfer the project product or service to production and/or operations are developed & established.

Contract Closure procedure: - includes all activities & interactions needed to settle & close any contract agreement established for the project. It involves both product verification (all work completed correctly & satisfactorily) & administrative closure. Early termination of contract may involve the inability to deliver the product, a budget overrun or lack of required resources.

Chapter 5 Project Scope Management

It includes the processes reqd to ensure that the project includes all the work required & only the work reqd to complete the project successfully. It is concerned with defining & controlling what is & is not included in the project.

P 105 project scope mgmt overview

P 106 project scope mgmt process flow diagram

1. Scope Planning

The project scope mgmt plan is a planning tool describing how the team will define the project scope, develop the detailed project scope stmt, define & develop the work breakdown structure, verify the project scope & control the project scope.

Five Inputs

1. Organizational Process Assets
2. Enterprise Environmental Factors
3. Project Charter
4. Preliminary Project Scope Statement
5. Project Management Plan

Two Tools

1. Expert Judgement
2. Templates, Forms and Standards

Output: Project Scope mgmt Plan

It provides guidance on how project scope will be defined, documented, verified, managed, & controlled by the project mgmt team. It may include:

- A process to prepare a detailed project scope stmt based upon the preliminary project scope stmt
- A process that enables the creation of the WBS from the detailed project scope stmt & how they will be maintained & approved
- A process that specifies how formal verification & acceptance of the completed project deliverables will be obtained.
- A process to control change request & is directly linked to integrated change control process

Product Scope: The feature & function that characterize a product, service or result

Project Scope: The work that needs to be accomplished to deliver a product, service or result with the specified features & functions.

2. Scope Definition (Planning)

During planning, scope is defined & described with greater specificity bcoz more info abt project is known. Stakeholder needs, wants & expectations are analyzed & converted into requirements.

Five Inputs

1. Organizational Process Assets
2. Project Charter
3. Project Scope Management Plan
4. Project Management Plan
5. Approved Change Requests

Four Tools

1. **Product Analysis** is a method of converting the product description & project objectives into deliverables & requirements. It might include performing value analysis, functional analysis, system-engineering technique, system analysis or value-engineering techniques to further define the product or service.
2. **Alternatives Identifications** is a technique used for discovering different methods or ways of accomplishing the project. Like brainstorming & lateral thinking is a process of separating the problem.
3. Expert Judgment
4. **Stakeholder Analysis** identifies the influence (pos & neg) & interests of the various stakeholders & documents their needs, wants & expectations.

Three Outputs:

1. **Project Scope Statement:** it describes in detail the project's deliverables & the work reqd to create those deliverables. It is an agreement between the project & project customer that states precisely what the work of the project will produce. It includes
 - a. Project **Objectives** are quantifiable criteria used to measure project success like schedule, cost & quality measures. SMART: Specific, Measurable, Accurate, Realistic & tangible and Time bound.
 - b. Product **Scope description** describes the characteristics of the product or service of the project
 - c. Project **Deliverables** are measurable outcomes or results or specific items that must be produced to consider the project or project phase completed. Deliverables & Objectives are referred to as Critical Success Factors.
 - d. Project **Requirements** describes the characteristics of deliverable. Requirements are conditions that must be met or criteria that the product or service of the project must possess in order to satisfy the project documents, a contract, a standard or a specification.
 - e. Project **Boundaries** defines what is & what is not included in the work of the project
 - f. Product **Acceptance Criteria** includes the process & the criteria that will be used to determine if the deliverables and the final product or service of the project are acceptable & satisfactory

- g. Project **Constraints** that either restricts the action of project team or dictates the action of project team. Time, budget, schedule, quality, technology & directive
 - h. Project **Assumptions** are factors that are considered to be true for project. It lists & describes the specific assumptions associated with scope & potential impact of those if they prove to be false.
 - i. **Initial Project Org**: the project team member & stakeholders are identified & the org of the project is also documented
 - j. **Initial defined risks**: lists all risks pose threats & opportunities to the project.
 - k. **Schedule Milestones** are typically points in the project where something significant is achieved or completed. Schedule constraints
 - l. **Fund Limitation** -> cost constraint
 - m. **Cost estimate**-> project's expected overall cost
 - n. Project config mgmt requirements
 - o. Project specifications
 - p. Approval requirements
2. Requested Changes
 3. Project Scope Mgmt Plan (Updates)

3. Create WBS (Planning)

It is a deliverable-oriented hierarchical decomposition of the work to be executed by project team, to accomplish the project objectives and create the required deliverables. It organizes & defines the total scope of the project. The planned work contained within the lowest-level WBS components which are called **work packages**, can be scheduled, cost estimated, monitored & controlled.

Four Inputs

1. Organizational Process Assets
2. Project Scope Statement
3. Project Scope Management Plan
4. Approved Change Requests

Two Tools

1. **WBS Templates**-> WBS from previous project can be used for new project
2. **Decomposition**-> is the subdivision of project deliverables into smaller, more manageable components until the work & deliverables are defined to the work package level. It is a five step process
 - a. Identifying the deliverables & related work
 - b. Structuring & organizing the WBS
 - c. Decomposing the Upper WBS levels into lower level detailed components
 - d. Developing & assigning identification codes to WBS components
 - e. Verifying that degree of decomposition of work is necessary & sufficient
 - f. **Rolling Wave Planning**-> is a process of elaborating deliverables, project phases or subprojects in the WBS to differing levels of decomposition depending on the expected date of work.

Six Outputs

1. Project Scope Stmt (Updates)

2. Project Scope Mgmt Plan (Updates)
3. Requested Changes
4. Work Breakdown Structure
5. WBS Dictionary-> That supports the WBS & is companion document to WBS. The detailed content of the components contained in a WBS including work packages & control accounts can be described in WBS dictionary.
6. Scope Baseline is defined as detailed project scope stmt, WBS & Dictionary.

Other Breakdown Structures

Organizational BS-> provides a hierarchically organized depiction of the project org arranged so that work packages can be related to performing org units

Bill Of material-> presents a hierarchical tabulation of physical assemblies, subassemblies & components needed to fabricate a manufactured product

Risk BS-> A hierarchically organized depiction of identified project risks arranged by risk category

Resource BS-> A hierarchically organized depiction of resources by type to be used on project.

4. Scope Verification (Monitoring)

It is the process of obtaining the stakeholders formal acceptance of the completed project scope & associated deliverables.

Four Inputs

1. Project Scope Statement
2. WBS Dictionary
3. Project Scope Management Plan
4. Deliverables

One Tool

1. **Inspection** includes activities such as measuring, examining & verifying to determine whether work & deliverables meet requirements & product acceptance criteria. They are also called as reviews, product reviews, audits & walkthroughs.

Three Outputs

1. Accepted Deliverables
2. Requested Changes
3. Recommended Corrective Actions

5. Scope Control (Monitoring)

It is concerned with influencing the factors that create project scope changes & controlling the impact of those changes. It assures that all requested changes & recommended corrective actions are processed through project integrated change control process.

Seven Inputs

1. Project Scope Statement
2. Work Breakdown Structure
3. WBS Dictionary
4. Project Scope Management Plan

5. Performance Reports provide info on project work perf such as interim deliverables.
6. Approved Change Requests
7. Work Performance Information

Four Tools

1. **Change Control System** tracks & records change requests, describes the procedure to follow to implement scope change & details the authorization levels needed to approve the change.
2. **Variance Analysis** includes reviewing project performance measurements to determine if there are variance in project scope & their cause.
3. **Re planning** involves updating WBS, Dictionary, project scope stmt & pmp when a change has occurred.
4. **Configuration Management System** manages change to product & project scope & assures that these changes are reasonable.

Eight Outputs

1. Project Scope Statement (U)
2. WBS (U)
3. WBS Dictionary(U)
4. Scope Baseline(U)
5. Requested Changes
6. Recommended Corrective Actions
7. Organizational Process Assets (U)
8. Project Management Plan (U)

Chapter 6 Project Time Management

It includes the processes required to accomplish timely completion of the project.

Page 125 time mgmt overview

1. Activity Definition

It will identify the deliverables at the lowest level in WBS called as work packages. Project work packages are planned (decomposed) into smaller components called schedule activities to provide a basis of estimating, scheduling, executing & monitoring & controlling the project work.

Six Inputs

1. Enterprise Environmental Factors
2. Organizational Process Assets
3. Project Scope Statement
4. Work Breakdown Structure
5. WBS Dictionary
6. Project Management Plan

Five Tools

1. Decomposition involves subdividing project work packages into smaller more manageable components called schedule activities.
2. Templates
3. Roller Wave Planning is a form of progressive elaboration
4. Expert Judgement
5. Planning Component-> **Control Account** -> mgmt control point can be placed at selected mgmt points of WBS above work package level
Planning package-> is a WBS component below the control account but above work package. This component is used for planning known work content that does not have detailed schedule activities.

Four Outputs

1. **Activity List** is a comprehensive list including all schedule activities that are planned to be performed on the project.
2. **Activity Attributes** describe the characteristics of the activities & describe info such as activity identifier or code, descriptions, constraints & assumptions
3. **Milestone List** is major accomplishments of the project & marks the completion of major deliverables. It records whether milestone is mandatory or optional.
4. Requested Changes

2. Activity Sequencing (Planning)

It involves identifying & documenting the logical relationships among schedule activities. Schedule activities can be logically sequenced with proper precedence relationships as well as leads & lags to support later development of a realistic & achievable project schedule.

Five Inputs

1. Project Scope Statement
2. Activity List
3. Activity Attributes
4. Milestone List
5. Approved Change Requests

Five Tools

1. **Precedence Diagramming Method (PDM) or AON-** PDM is a method of constructing a project schedule network diagram that uses boxes or rectangles, referred to as nodes, to represent activities and connects them with arrows that show the dependencies. It uses only one time estimate to determine duration. This is also called as **Activity on Node**. It includes four types of dependencies or precedence relationships:
 - a. **Finish to Start:** The initiation of successor activity depends upon the completion of the predecessor activity. Commonly used
 - b. **Finish to Finish:** The completion of successor activity depends upon the completion of predecessor activity.
 - c. **Start to Start:** The initiation of successor activity depends upon the initiation of predecessor activity
 - d. **Start to Finish:** The completion of successor activity depends upon the initiation of predecessor activity. Rarely used
2. **Arrow Diagramming Method (ADM) or AOA-** uses arrow to represent activities and connects them at nodes to show their dependencies. It is also called as **Activity on Arrow** but is rarely used. ADM uses only **Finish to Start** dependencies and can require the use of dummy relationships called **dummy activities**.
3. Schedule Network Templates
4. **Dependency Determination-** dependencies are relationships between the activities in which one activity is dependent on another to complete an action or perhaps an activity is dependent on another to start an action before it can proceed. They are identified during the process of establishing the sequence of activities. There are 3 types of dependencies:
 - a. **Mandatory Dependencies:** also known as hard logic or dependencies are inherent in the nature of work being done. They often involve physical limitations
 - b. **Discretionary:** also known as soft logic or preferred logic. They are usually process or procedure driven or best practices techniques based on past experience.
 - c. **External:** they involve relationship between project activities and non-project activities.
5. **Applying Leads and Lags-** A Lead allows an acceleration of the successor activity. A Lag directs a delay in the successor activity.

Four Outputs

1. **Project Schedule Network Diagrams** are schematic display of project's schedule activities and logical relationships among them also referred to as dependencies.
2. Activity List (U)

3. Activity Attributes (U)
4. Requested Changes

3. Activity Resource Estimating (Planning)

It involves determining what resources (persons, equip or material) & what quantities of each resource will be used and when each resource will be available to perform project activities.

Six Inputs

1. Enterprise Environmental Factors
2. Organizational Process Assets
3. Activity List
4. Activity Attributes
5. **Resource Availability**-> Information on which resources are potentially available is used for estimating the resource types.
6. Project Management Plan

Five Tools

1. Expert Judgment
2. Alternatives Analysis
3. Published Estimating Data
4. Project Management Software
5. **Bottom UP Estimating** is a process of estimating individual activities or costs and then adding these up together to come up with a total estimate.

Five Outputs

1. Activity Resource Requirements
2. Activity Attributes (U)
3. **Resource Breakdown Structure** is a hierarchical structure of the identified resources by resource category & resource type
4. **Resource Calendars** (U) look at a particular resource or groups of resources & their skills, abilities, quantity & availability. Working & nonworking days
5. Requested Changes

4. Activity Duration Estimating

It attempts to estimate the work effort, resources & number of work periods needed to complete each schedule activity.

Eight Inputs

1. Enterprise Environmental Factors
2. Organizational Process Assets
3. Project Scope Statement
4. Activity List
5. Activity Attributes
6. Activity Resource Requirements
7. Resource Calendars
8. Project Management plan

Five Tools

1. Expert Judgment
2. **Analogous Estimating or Top Down estimating** means using the actual duration of a previous similar schedule activity as the basis for estimating the duration of a future schedule activity. It is more reliable, involves setting the target cost of the project & then creating the project design to meet the target cost.
3. **Parametric Estimating** is a quantitatively based estimating method that multiplies the quantity of work by the rate. Historical info is used & model is scalable.
4. **Three Point Estimates** are
 - a. **Most Likely** estimate assumes that there are no disasters & the activity can be completed as planned.
 - b. **Optimistic** is based on best-case scenario & is the fastest time frame in which resources can complete the activity.
 - c. **Pessimistic** estimate assumes the worst happens & it takes much longer than planned to get the activity completed.
5. **Reserve Analysis**- also called as buffer or contingency time means incorporating additional time into the overall project schedule as recognition of schedule risk.

Two Outputs

1. **Activity Duration Estimates** are quantitative assessments of the likely number of work periods that will be required to complete a schedule activity. 2 weeks +- 2 days
2. Activity Attributes (U)

5. Schedule Development (Planning)

It is an iterative process, determines planned start & finish dates for project activities. It requires that duration estimates & resource estimates are reviewed & revised to create an approved project schedule that can serve as a baseline against which progress can be tracked.

Nine Inputs

1. Project Scope Statement: two major categories of time constraints considered during schedule development are
 - a. **Imposed Dates** on activity start or finish like start no earlier than & finish no later than.
 - b. Project sponsor or stakeholders often dictate key events or **major milestones** affecting completion of certain deliverables by a specified date.
2. Organizational Process Assets
3. Activity List
4. Activity Attributes
5. Project Schedule Network Diagrams
6. Activity Resource Requirements
7. Resource Calendars
8. Activity Duration Estimates
9. Project Management Plan

Ten Tools

1. **Schedule Network Analysis:** It is a technique that generates the project schedule. It employs a schedule model & various analytical techniques such as critical path method, critical chain method, what-if analysis & resource leveling to calculate the early & late start & finish dates for uncompleted portions of project schedule activities.
2. **Critical Path Method:** It determines the amount of float or schedule flexibility for each of the network paths by calculating the earliest start & finishes date and latest start & finishes date for each activity without regard to resource availability.
 - a. **Critical Path:** It is generally the longest full path on the project. Any project activity with zero float time is considered a critical path task.
 - b. **Float time:** aka slack time. Total float is amount of time you can delay the earliest start of a task without delaying the ending of the project. Free float is amount of time you can delay the start of a task without delaying the early start of successor task.

Program Evaluation and Review Technique (PERT):

It forecasts the project schedule with a high degree of reliability. PERT and CPM are similar techniques. The difference is CPM uses the **most likely** duration to determine project duration, while PERT uses what's called expected value (or the weighted average) to determine project duration. *Expected value* is calculated using three time estimates for activity duration instead of one and then finding the weighted average of the three time estimates. If we take this one step further and determine the standard deviation of each activity, we can assign a **confidence factor** to our project estimates.

- Work will finish within plus or minus **three** standard deviations **99.73** percent of the time.
- Work will finish within plus or minus **two** standard deviations **95.44** percent of the time.
- Work will finish within plus or minus **one** standard deviation **68.26** percent of the time.

Calculating Expected Value

The three time estimates used to calculate expected value are the optimistic estimate, the pessimistic estimate, and the most likely estimate.

We'll say in this case that we're given 38 days for the optimistic time, 57 days for the pessimistic, and 45 days for the most likely.

The formula to calculate **expected value** is as follows:

[optimistic + pessimistic + (4 × most likely)] ÷ 6

The expected value for the Write Programs activity is as follows:

$$[38 + 57 + (4 \times 45)] \div 6 = 45.83$$

The formula for **standard deviation**, which helps us determine **confidence** level, is as follows:

$$(\text{pessimistic} - \text{optimistic}) \div 6$$

The standard deviation for our activity is as follows:

$$(57 - 38) \div 6 = 3.17$$

We could say the following given the information we now have:

_ There is a **68.26** percent chance that the Write Programs activity will be completed between **42.66 days and 49 days**.

_ There is a **95.44** percent chance that the Write Programs activity will be completed between **39.49 days and 52.17 days**.

The **higher the standard deviation** is for an activity, the **higher the risk**.

PERT Calculation

Look at the total project duration using PERT and the standard deviation to determine a range of dates for project duration. You should add only the tasks that are on the **critical path**. Unfortunately, you cannot **add up the standard deviations** because you will come out with a number that is much too high. Totaling the standard deviations assumes that all of the tasks will run over schedule, and that's not likely. **SD Squared** This is the standard deviation squared—or the standard deviation multiplied by it. Then calculate **square root of SD Squared** which is **standard deviation**.

PERT is used for very large, highly complex projects. PERT is also a useful technique to determine project duration when your activity durations are uncertain.

3. **Schedule Compression shortens** the project schedule without changing the project scope, to meet schedule constraints, imposed dates or other schedule objectives. It includes:
 - a. **Crashing:** It is a compression technique that looks at cost and schedule tradeoffs. For e.g. add resources, from either inside or outside the organization, to the critical path tasks. The idea with crashing is to try to gain the greatest amount of schedule compression with the least amount of cost.
 - b. **Fast Tracking:** is starting two tasks at the same time that were previously scheduled to start sequentially. Fast tracking can increase project risk and might cause the project team to have to rework tasks.
4. **What-If Scenario Analysis:** uses different sets of activity assumptions to produce multiple project durations. It weighs the “what” questions and their assumptions & determines the feasibility of project schedule under these conditions. **Monte Carlo Analysis** is a **simulation** technique that produces a range of values for each activity with multiple duration possibilities. Probability durations are then chosen for each activity, and the simulation starts. Monte Carlo will run the possible activity durations and schedule projections many, many times to come up with the schedule projections

and their probability, critical path duration estimates, and float time. For the exam, remember that Monte Carlo is a simulation technique that shows the probability of all the possible project completion dates.

5. **Resource Leveling:** also called as the resource based method is used when resources are limited or time constrained (especially those assigned to critical path activities) and when specific schedule dates need to be met. *Resource leveling* attempts to smooth out the resource assignments to get tasks completed without overloading the individual while trying to keep the project on schedule. It can cause the original critical path to change. Reverse resource allocation scheduling is used when key resources are required at a specific point in the project. This technique requires resources to be scheduled in reverse order (from end date).
6. **Critical Chain Method:** is a schedule n/w analysis technique that accounts for limited or restricted resources when modifying the project schedule. It uses both deterministic (step by step) & probabilistic approaches. The critical path will change after entering the resource availability.
7. **Project Management Software** automates the mathematical calculations like forward & backward pass & performs resource leveling.
8. **Applying Calendars: Project Calendar** that affects all the activities & specify the working periods for resources. **Resource Calendar** looks at a particular resource & their availability.
9. **Adjusting Lead & lags**
10. **Schedule Model** used to create project schedule

Eight Outputs

1. **Project Schedule:** The purpose of the Schedule Development process is to determine the start and finish dates for your project activities. One of the primary outputs of this process is the *project schedule*, which details this information as well as the resource assignments. The project schedule should be approved and signed off by stakeholders and functional managers. Once the schedule is approved, it will become your baseline for the remainder of the project. Project progress and task completion will be monitored and tracked against this original plan to determine if the project is on course as planned. The schedule can be displayed in a variety of ways, Network diagrams, Gantt/Bar Charts & *Milestones* mark the completion of major deliverables or some other key event in the project.
2. **Schedule Model Data** refers to documenting the supporting data for the schedule. The minimum amount of information in the supporting detail output is the project constraints and assumptions & resource histograms.
3. Schedule Baseline
4. Resource Requirements (U)
5. Activity Attributes (U)
6. Project Calendars (U)
7. Requested Changes
8. Project Management Plan (U) -Schedule Management Plan (U)

6. Schedule Control (Monitoring)

Four Inputs

1. Schedule Management Plan
2. Schedule Baseline
3. Performance Reports
4. Approved Change Requests

Six Tools

1. **Progress Reporting** includes info such as actual start & end dates & the remaining durations for unfinished schedule activities.
2. **Schedule Change Control System** defines the procedures by which the project schedule can be changed.
3. **Performance Measurement** includes schedule variance & schedule performance index.
4. **Project Management Software** provides ability to track planned dates versus actual dates.
5. **Variance Analysis** compares the expected project plan results with the actual results as the project progresses to determine if variances exist.
6. **Schedule Compression Bar Charts** shows current actual status & other bar shows status of approved project schedule baseline.

Eight Outputs

1. Schedule Model Data (U)
2. Schedule Baseline (U)
3. Performance Measurements
4. Requested Changes
5. Recommended Corrective Actions
6. Organizational Process Assets (U)
7. Activity List (U)
8. Activity Attributes (U)

A budget estimate has an accuracy of between -10% & 25%

A definitive estimate has an accuracy of between -5% & 10%

An order of magnitude estimate has an accuracy of between -25% & 75%

Chapter 7 Project Cost Management

It includes the processes involved in planning, estimating, budgeting & controlling costs so that the project can be completed within the approved budget. It can establish

- **Precision level:** - schedule activity cost estimates will adhere to a rounding of the data to a prescribed precision (Rs 1000/100000) based on the scope of the activities.
- **Units of Measure:** - each unit used in measurement is defined such as staff hours, days
- **Organizational procedure links:** - the WBS component used for the project cost accounting is called control account & is assigned a code or account no. that is directly linked to accounting system.
- Control Thresholds: - variance thresholds for cost or other indicators
- Earned Value Rules
- Reporting formats
- Process description

1. Cost Estimating (Planning)

Estimating schedule activity costs involves developing an approximation of the costs of the resources needed to complete each schedule activity including risks. Generally expressed in units of currency. The accuracy of project estimate in initiation phase will have **rough order of magnitude (ROM)** estimates in the range -50 to 100%. Definitive estimate -10 to 15%.

Six Inputs

1. Enterprise Environmental Factors-> marketplace conditions & commercial databases.
2. Organizational Process Assets-> cost estimating policies & templates, project files
3. Project Scope Statement
4. Work Breakdown Structure
5. WBS Dictionary
6. Project Management Plan
 - a. Schedule management plan
 - b. Staffing management plan
 - c. Risk register

Eight Tools

1. **Analogous Estimating** means using actual cost of previous similar project as basis, frequently used when limited amount of detailed information about the project is available, it uses expert judgment & less costly & accurate but more reliable
2. **Determine Resource Cost** rates means unit cost rates such as staff cost per hour
3. **Bottom UP Estimating** involves estimating cost of individual work package with lowest level of detail & then this detailed cost is summarized.
4. **Parametric Estimating** uses a statistical relationship between historical data & other variable to calculate cost. Highly accurate.

5. Project Management Software uses cost estimating s/w applications, computerized spreadsheets & simulation & statistical tools
6. **Vendor Bid Analysis**-> gathering info from vendors
7. **Reserve Analysis** are contingency allowances for known-unknown events
8. **Cost of Quality**

Four Outputs

1. **Activity Cost Estimates** is quantitative assessment for all resources required.
2. **Activity Cost Estimates Supporting Details** like documentation of basis of estimate, assumptions & constraints.
3. **Requested Changes**
4. **Cost Management Plan (U)**

2. Cost Budgeting (Planning)

It involves aggregating the estimated costs of individual work packages to establish total baseline to measure project performance. The cost baseline is expected cost of project.

Nine Inputs

1. Project Scope Statement
2. Work Breakdown Structure
3. WBS Dictionary
4. Activity Cost Estimates
5. Activity Cost Estimates Supporting Details
6. Project Schedule
7. Resource Calendars
8. Contracts
9. Cost Management Plan

Four Inputs

1. **Cost Aggregation** is tallying schedule activity cost estimates at work package level & then totaling them to higher level WBS component level (control account)
2. **Reserve Analysis**-> not part of earned value calculations
3. **Parametric Estimating**-> accurate, scalable & quantifiable
4. **Funding Limit Reconciliation** involves reconciling the amount of funds spent with amount of funds budgeted for project by org or customer.

Four Outputs

1. **Cost Baselines** is a time phased budget that is used as a basis against which to measure, monitor & control over all cost perf on project, usually displayed as S-Curve
 2. **Project Funding Requirements or project budget** are total amount of money spent on project. Mgmt contingency reserves usually a margin or percentage of cost baseline
 3. Cost Management Plan (U)
 4. Requested Changes
3. **Cost Control (Monitoring & Controlling)**

It includes influencing the factors that create changes to cost baseline. Managing & recording all changes when & as they occur.

Six Inputs

1. Cost Baseline
2. Project Funding Requirements
3. Performance Reports
4. Work Performance Information
5. Approved Change Requests
6. Project Management Plan

Six Tools

1. **Cost Change Control System** defines the procedures by which cost baseline can be changed & includes forms, documentation, tracking system & approval levels.
2. **Performance Measurement Analysis** is accomplished using Earned Value technique. The primary function is to determine & document cause of variance, impact of variance & to determine if corrective action should be implemented as a result.
 - a. **Planned Value** is cost of work that's been budgeted for schedule activity hence also called as budgeted cost of work scheduled (**BCWS**)
 - b. **Actual Cost** is cost of completing work in given time period, may include direct & indirect cost but must correspond to what was budgeted. (**ACWP**) Actual cost of work performed.
 - c. **Earned Value** is the value of work completed to date as it compares to budgeted amount assigned to work component. (**BCWP**) Budgeted cost of work performed.
 - d. **Cost Variance** tells if cost is higher than budgeted (negative) or lower (pos)
 $CV = EV - AC$
 - e. **Schedule Variance** tells if schedule is behind (neg) or ahead (pos) what was planned for time period. $SV = EV - PV$
 - f. **Performance Index** if greater than 1 then better perf (under budget) then expected. $CPI = EV / AC$
 $SPI = EV / PV$
3. **Forecasting** uses the info gathered to date & estimates the future conditions based on what you know when calculation is performed. 2 types
 - a. **Estimate to Complete** tells how much it will cost to complete all the work remaining for schedule activity. **ETC based on new Estimate** is most accurate & comprehensive ETC calculation. $ETC = (BAC - EV) / CPI$ when future cost variance will be similar. $ETC = (BAC - EV)$ when future cost variances will **not** be similar.
 - b. **Estimate at Completion** estimates the expected total cost of work component. **EAC using new estimates** $EAC = AC + ETC$. **EAC using CPI when variance are typical** $EAC = AC + ((BAC - EV) / CPI)$ or $AC + ETC$. **EAC using remaining budget when variance are atypical.** $EAC = AC + BAC - EV$
4. **Project Performance Reviews** or status reviews examines milestones due & activities that are over & under budget. 3 types- Earned Value, Variance analysis & trend analysis.
 - a. **Variance at Completion** = $BAC - EAC$ (Budget & estimate at completion) & negative means not good

- b. **Trend Analysis** determines if project performance is improving or worsening over time by periodically analyzing project results measured with mathematical formulas based on historical info & results.
5. Project Management Software such as computerized spreadsheets
6. **Variance Management** includes the processes for managing cost variances & appropriate response based on impact & level of variance.

Eight Outputs

1. Cost Estimates (U)
2. Cost Baselines (U)
3. Performance Measurements
4. Forecasted Completion
5. Requested Changes
6. Recommended Corrective Actions
7. Organizational Process Assets (U)
8. Project Management Plan (U)

Variable costs change with the amount produced.

Fixed costs do not vary with the amount produced.

Direct cost could be either fixed or variable.

Sunk cost is money already spent.

Double declining balance is a form of accelerated depreciation.

Straight line depreciation uses the same amount each time period. 100 100 100

Value analysis is performed to get a less costly way of doing the same work.

The cost accounts are included in the project cost estimate and the management reserve is added to that to come up with the cost baseline. Thereafter the management reserve is added to come up with the cost budget. The difference between the cost baseline & cost budget is **Management reserve**.

Chapter 8 Project Quality management

It includes the activities that determine quality policies, objectives & responsibilities so that the project will satisfy the needs for which it was undertaken. Important points are-> customer satisfaction, prevention over inspection, mgmt responsibility & continuous improvement.

Quality is a degree to which a set of inherent characteristics fulfill requirements.

Grade is a category assigned to products or services having same functional use but different technical characteristics. Low quality is problem but not low grade.

1. Quality Planning

It involves identifying which quality standards are relevant to the project & determining how to satisfy them.

Four Inputs

1. Enterprise Environmental Factors
 - a. **Standard** is approved by recognized body & employs rules, guidelines or characteristics that should be followed.
 - b. **Regulation** is mandatory & always imposed by govt
2. Organizational Process Assets
 - a. **Quality Policy** is a guideline published by executive mgmt.
3. Project Scope Statement
4. Project management Plan

Five Tools

1. **Cost Benefit Analysis**-> must consider tradeoffs of cost of quality. Benefit is less rework which means higher productivity, lower costs & increased stakeholder satisfaction.
2. **Benchmarking** is a process of comparing previous similar activities to the current project current activities to provide a standard to measure performance against.
3. **Design of Experiments** is a statistical technique that identifies the elements or variables that will have the greatest effect on overall project outcomes. It allows changing all the variables at once instead of changing one variable at a time.
4. **Cost of Quality (COQ)** is total cost to produce the product or service of the project according to quality standards.
 - a. **Prevention cost**-> prevention means keeping defects out of hands of customer
 - b. **Appraisal cost**-> are expended to examine the product or process and make certain the requirements are being met. May include inspection & testing cost
 - c. **Failure cost**-> aka cost of poor quality, when things do not go as per plan
 - i. Internal->these occur when customer requirements are not satisfied while the product is still in the control of org & may include corrective action, rework, scrapping & downtime
 - ii. External-> these occur when product has reached customer & may include inspection at customer site, returns & customer service cost

5. Additional Quality Planning Tools

Men's theory on cost of quality

Philip B Crosby -> Zero defects & prevention or rework results. Costs are lower. Do it right first time

Joseph M Juran -> fitness for use, conformance. Stakeholders expectation are met or exceeded

W Edwards Deming -> Quality is a management problem. **Total Quality Management.**

Six Sigma -> is a measurement based strategy, no more than 3.4 defects per million are produced

Two methodologies: **DMADV** is used to develop new product or processes. **DMAIC** is used to improve existing processes & products.

Kaizen -> continuous improvement (watch continuously for ways to improve quality) improve quality of people first. TQM & Six Sigma are e.g.

Five Outputs

1. **Quality Management Plan** describes how project team will enact quality policy & all the processes and procedures the project team and organization use to satisfy quality requirements. The quality management plan is written by the project manager in cooperation with the project staff. It must address quality control, quality assurance & continuous process improvement for the project.
2. **Quality Metrics** also called as **operational definitions** and their purpose is to specifically describe what is being measured and how it will be measured according to the Quality Control plan and process.
3. **Quality Checklists** provide a means to determine if the required steps in a process have been followed. Checklists can be activity specific or industry specific, and might be very complex or easy to follow.
4. **Process Improvement Plan** focuses on finding inefficiencies in a process or activity and eliminating them.
5. Quality Baseline
6. Project management Plan (U)

2. Perform Quality Assurance (Executing)

It involves performing quality audits to determine how the project is proceeding. Quality Assurance is concerned with making certain the project will meet and satisfy the quality standards of the project defined during the Quality Planning process. The Quality Assurance process should be carried out through the rest of the project. The Quality Assurance process integrates project scope, project costs, and project time. Project team members, the project manager, and the stakeholders are responsible for the Quality Assurance of the project. The project manager will have the greatest impact on the quality of the project during this process.

Ten Inputs

1. Quality Management Plan
2. Quality Metrics
3. Process Improvement Plan

4. Work Performance Information
5. Approved Change Requests
6. Quality Control Measurements
7. Implemented Change Requests
8. Implemented Corrective Actions
9. Implemented Preventive Actions
10. Implemented Defect Repair

Four Tools

1. Quality Planning Tools and Techniques (same as quality planning)
2. **Quality Audits** are independent reviews performed by trained auditor or third-party reviewers. Internal team reports results to the project team & mgmt. external team report results to the customer. Quality audits performed correctly will provide the following benefits:
 - a. The product of the project is fit for use and meets safety standards.
 - b. Applicable laws and standards are adhered to.
 - c. Corrective action is implemented where necessary.
 - d. The quality plan for the project is adhered to.
 - e. **Quality improvements** are identified. During the course of the audit, you may discover ways of improving the efficiency or effectiveness of the project thereby increasing the value of the project and more than likely exceeding stakeholder expectations. Quality improvements are implemented by submitting change requests or taking corrective action.
3. **Process Analysis** looks at process improvement from an org & technical perspective. It examines
 - a. Problems experienced while conducting the project
 - b. Constraints of the project
 - c. Inefficient & ineffective processes identified during process operation.
4. Quality Control Tools and Techniques

Four Outputs

1. Requested Changes
2. Recommended Corrective Actions
3. Organizational Process Assets (U)
4. Project management Plan (U)

3. Perform Quality Control (Mon & Control)

It is specifically concerned with monitoring work results to see if they comply with the standards set out in the quality mgmt plan. Quality Control should be practiced and performed throughout the project to identify and remove the causes of unacceptable results. Remember that Quality Control is concerned with project results both from a management perspective, such as schedule and cost performance, and from a product perspective.

Seven Inputs

1. Quality Management Plan
2. Quality Metrics
3. Quality Checklists

4. Work Performance Information
5. Organizational Process Assets
6. Approved Change Requests
7. Deliverables

Ten Tools

1. **Cause and Effect Diagram or Ishikawa or fishbone diagram** illustrates how various factors might be linked to potential problems or effects.
2. **Control Charts** measure the results of processes over time and display the results in graph form. Control charts are a way to measure variances to determine if process variances are in control or out of control. A control chart is based on sample variance measurements. From the samples chosen and measured, the mean and standard deviation are determined. Quality Control is usually maintained, or said to be in control, within plus or minus three standard deviations. The definition of the **rule of seven** says that there are seven or more sequential data points that fall on the same side of the mean. This indicates that the process is out of control. **Standard deviation** is the measurement of a range around the mean. A process is out of control when a point falls outside the upper or lower control limits on a control chart or when seven consecutive data points fall on the same side of the mean. A data point on control chart falls inside upper or lower control limit is in control.
3. **Flowcharting** are diagrams that show the logical steps that must be performed in order to accomplish an objective.
4. **Histogram** is bar charts that depict the distribution of variables over time.
5. **Pareto Chart**-> According to Pareto, the 80/20 rule as it applies to quality says that a small number of causes create the majority of the problems. Pareto diagrams are displayed as histograms that rank order the most important factors such as delays, costs, defects, or other factors by their frequency over time.
6. **Run Charts** are used to show variations in the process over time or show trends (improvements or lack of improve) in the process. Three types of variables
 - a. **Random Variance** may be normal but occurs randomly
 - b. **Known or predictable** that you know exist in the process
 - c. **Variances that are always present in the process** the process will have inherent variability caused by human mistakes, machine variations or malfunctions.
7. **Scatter Diagram** use two variables, one called an independent variable, which is an input, and one called a dependent variable, which is an output. Scatter diagrams display the relationship between these two elements as points on a graph.
8. **Statistical Sampling** involves taking a sample number of parts from the whole population and examining them to determine if they fall within the variances outlined by the quality control plan. It may also involve determining the standard deviation for a process.
9. **Inspection** involves physically looking at, measuring, or testing results to determine if they conform to the requirements or quality standards. It's a tool used to gather information and improve results. Inspections might occur after the final product is produced or at intervals during the development of the product to examine individual components. Measurements that fall within a specified range are called *tolerable results*.

10. **Defect Repair Review**-> the quality department will review the repairs that were made to make certain the repairs were made correctly & the deliverable or product of project is in compliance.

Ten Outputs

1. Quality Control Measurements
2. Validated Defect Repair
3. Quality Baseline (U)
4. Recommended Corrective Actions
5. Recommended Preventive Actions
6. Requested Changes
7. Recommended Defect Repair
8. Organizational Process Assets (U)
9. Validated Deliverables
10. Project management Plan (U)

Statistical independence deals with two events not being linked. **Just in time** refers to inventory levels i.e. no or little inventory. By definition, two events that are **mutually exclusive** cannot happen on the same trial.

A data point that requires you to determine (investigate) the cause of the problem calls for a **special cause**

Gold plating is providing the customer more than what they asked for.

A specification limit is the customer-defined requirements for quality.

Chapter 9 Project Human Resource Management

It includes the processes that organize & manage the project team which is comprised of the people who have assigned roles & responsibilities to complete the project work.

1. Human Resource planning

Identifying & documenting project roles, responsibilities & reporting relationships as well as creating the staffing mgmt plan.

Three Inputs

1. Enterprise Environmental Factors like org, technical, interpersonal & political factors.
Three constraints are org structures, collective bargaining agreements & economic conditions.
2. Organizational Process Assets-> Templates & Checklists
3. Project Management Plan-> Activity resource Requirements

Three Tools

1. Organization charts and position description
 - a. **Hierarchical Charts**-> designed in top down format like **org breakdown structure (OBS) or resource breakdown structure (RBS)**
 - b. **Matrix Based Charts**-> used to show the type of resource & the responsibility they have on project thru **Responsibility Assignment Matrix (RAM)**
 - c. **Text Oriented Format** are used when you have a significant amount of detail to record also called as position description or role responsibility authority forms
2. **Networking** includes activities like proactive communication, lunch meetings, informal conversations & trade conferences.
3. Organizational Theory provides info regarding the ways that people, teams & org units behave.

Three Outputs

1. **Roles and Responsibilities** can take form of RAM or RACI chart where
 - a. **Roles** describe what parts of project the individuals or teams are accountable for.
 - b. **Authority** describes the amount of authority the resource has to make decisions, dictate directions & approve the work.
 - c. **Responsibility** describes the work required to complete the project activities
 - d. **Competency** describes the skills & ability needed to perform the project activities.
2. Project Organization Charts
3. **Staffing Management Plan** documents how and when people resources are introduced to the project and later released. It also includes staff acquisition, timetable, release criteria, training needs, recognition & rewards, compliance & safety.

2. Acquire Project Team

It involves attaining & assigning human resources to the project. From inside or outside for full time or part time.

Five Inputs

1. **Enterprise Environmental Factors**-> availability, ability, experience, interests & cost.
2. **Organizational Process Assets**-> Hiring policies
3. **Roles and Responsibilities**
4. **Project Organization Charts**
5. **Staffing Management Plan**

Four Tools

1. **Pre-Assignment** can happen when specific team members are promised as part of tender proposal & should be identified in project charter.
2. **Negotiation**-> with func mgr for availability of resource & competency level
3. **Acquisition** involves hiring individuals or teams of people for certain project activities either as full time or on contract from outside.
4. **Virtual teams** do not necessarily work in the same location but all share the goals of project & fulfill their roles with little or no time spent meeting face to face. Communication planning is important.

Three Outputs

1. **Project Staff Assignment**-> project team directory, memos to team members
2. **Resource Availability**-> time periods for each member
3. **Staffing Management Plan (U)**

3. Develop Project Team

This process is about creating an open, encouraging environment for the team & developing it into an effective, functioning, coordinated group.

Three Inputs

1. **Project Staff Assignment**
2. **Resource Availability**
3. **Staffing Management Plan**

Six Tools

1. **General Management Skills**-> **interpersonal skills or soft skills** such as empathy, influence, creativity & group facilitation are valuable assets when managing team.
2. **Training** includes all activities designed to enhance the competencies of project team member, formal or informal & mention in staffing mgmt plan.
3. **Team Building Activity** is simply getting a diverse group of people to work together in the most efficient & effective manner possible. Four stages of development; Forming, Storming, Norming & Performing. Team focus & effective team characteristics.
4. **Ground Rules**-> clear expectation regarding acceptable behavior by project team members
5. **Co-Location**-> can be temporary & involves placing many or all of most active team members in same physical location.
6. **Recognition and Rewards**-> only desirable behavior should be rewarded.

One Output

1. Team Performance Assessment

The evaluation can include indicators such as

- Improvements in skills that allow a person to perform assigned activities more effectively
- Improvements in sentiments & competencies that help the team perform better as a group
- Reduced staff turnover rate

Motivational Theory

1. Maslow's Hierarchy of needs-> five basic needs

- Self-actualization
- Self-esteem needs
- Social needs
- Safety & Security
- Basic Physical needs

2. Hygiene Theory

- Hygiene Factors deals with work env issues & prevent dissatisfaction
- Motivators lead to satisfaction

3. Expectancy Theory

The Expectancy theory says that the expectation of a positive outcome drives motivation and strength of the expectancy drives the behavior.

4. Achievement Theory

says that people are motivated by the need for three things: **achievement, power, and affiliation**. The achievement motivation is obviously the need to achieve or succeed. The power motivation involves a desire for influencing the behavior of others. And the need for affiliation is relationship oriented.

Leadership versus Management

1. Leaders have a knack for getting others to do what needs done and rallying them around a vision.
2. Good leaders have committed team members who believe in the vision of the leader.
3. Leaders set direction and time frames, and have the ability to attract good talent to work for them.
4. Good leaders are directive in their approach, but allow for plenty of feedback and input. Good leaders commonly have strong interpersonal skills

Managers are generally task oriented, concerned with things like plans, controls, budgets, policies, and procedures. They're generalists with a broad base of planning and organizational skills, and their primary goal is satisfying stakeholder needs. They also possess motivational skills and the ability to recognize and reward behavior.

Power is the ability to get people to do what they wouldn't do ordinarily. It is also the ability to influence behavior. **Politics** imparts pressure to conform regardless of whether people agree with the decision.

McGregor's Theory of X and Y on leadership

Theory X and Theory Y attempt to explain how different managers deal with their team members. **Theory X managers** believe most people do not like work and will try to steer

clear of it; they have little to no ambition, need constant supervision, and won't actually perform the duties of their job unless threatened. As a result, Theory X managers are like dictators and impose very rigid controls over their people. They believe people are motivated only by punishment, money, or position.

Theory Y managers believe people are interested in performing their best given the right motivation and proper expectations. These managers provide support to their teams, are concerned about their team members, and are good listeners. Theory Y managers believe people are creative and committed to the project goals, that they like responsibility and seek it out, and that they are able to perform the functions of their positions with limited supervision.

Contingency Theory

This theory builds on a combination of Theory Y and the Hygiene theory. It says that people are motivated to achieve levels of competency and will continue to be motivated by this need even after competency is reached.

Power of Leaders

Punishment Power

Punishment, also known as coercive or penalty power, is just the opposite of reward power. The employee is threatened with consequences if expectations are not met.

Expert Power

Expert power occurs when the person being influenced believes the manager, or the person doing the influencing, is knowledgeable on the subject or has special abilities that make them an expert. The person goes along just because they think the influencer knows what they're doing and it's the best thing for the situation.

Legitimate Power

Legitimate, or formal, power comes about as a result of the influencer's position. Because that person is the project manager, or executive vice president, or CEO, they have the power to call the shots and make decisions.

Referent Power

Referent power is inferred to the influencer by their subordinates. Project team members who have a great deal of respect and high regard for their project managers willingly go along with decisions made by the project manager because of referent power.

4. Manage Project Team

It is concerned with reporting & tracking on the performance of individual team members. Performance appraisals are prepared & conducted, issues are identified & resolved & feedback is given to the team member.

Eight Inputs

1. Organizational Process Assets
2. Project Staff Assignment
3. Roles and Responsibilities
4. Project Organization Charts
5. Staffing Management Plan

6. Team Performance Assessment
7. Work Performance Information
8. Performance Reports

Four Tools

1. Observation and Conversation
2. Project Performance Appraisals-> 360 degree reviews
3. Conflict Management
4. Issue Log is a place to document the issues that keep the project team from meeting project goals.

Five Outputs

1. Requested Changes
2. Recommended Corrective Actions
3. Recommended Preventive Actions
4. Organizational Process Assets (U)
5. Project Management Plan (U)

Managing Stakeholders

it is about satisfying the need of the stakeholders by managing communications with them, resolving issues and improving project performance by implementing requested changes.

The top four sources of conflict are schedules, project priorities, resources, and technical opinions

Coaching in execution

Directing in planning

Forcing where one person forces a solution on the other parties. This is where the boss puts on the “because I’m the boss and I said so” While this is a permanent solution, it isn’t necessarily the best solution. This is an example of a win-lose

Smoothing does not lead to a permanent solution. It’s a temporary way to resolve conflict where someone attempts to make the conflict appear less important than it is. This is an example of a lose-lose conflict resolution technique

Compromise is achieved when each of the parties involved in the conflict gives up something to reach a solution.

Confrontation is also called **problem solving** and is the best way to resolve conflict. A fact-finding mission results in this scenario and is an example of a win-win conflict resolution technique.

Withdrawal never results in resolution. This occurs when one of the parties gets up and leaves and refuses to discuss the conflict. It is probably the worst of all the techniques as nothing gets resolved. This is an example of lose-lose conflict resolution technique.

Most common source of conflict are schedules, project priorities, resources and technical opinions.

Chapter 10 Project Communication Management

It involves determining the communication needs of stakeholders by defining the types of information needed, the format for communicating the information, how often it's distributed and who prepares it.

1. Communication Planning

Determining the information & communication needs of stakeholders

Four Inputs

1. Organizational Process Assets
2. Enterprise Environmental Factors
3. Project Scope Statement
4. Project Management Plan-> Constraints & Assumptions

Two Tools

1. **Communications Requirements** analysis involves analyzing & determining the comm needs of stakeholders. Valuable info to be communicated to stakeholders either good or bad news. **Line of communication** is n/w model consist of nodes with lines connecting the nodes that indicate the number of communication channels $n(n-1)/2$ where n is participant/stakeholder
2. **Communication technology** examines the method or technology used to communicate info to, from and among the stakeholders. **Forms of communicating** include written, spoken, e-mail, formal status reports, meetings, online databases & schedules. Factors are timing of info exchange, availability of technology, staff experience & duration of project.

One Output

1. Communication management Plan

It documents how communication needs of stakeholder will be met, including types of info that will be communicated, who will communicate it, who receives the communication, the methods used to communicate, the timing & frequency, escalation process & glossary of common terms.

2. Information Distribution (Executing)

It is concerned with getting stakeholders information regarding the project in a timely manner. This can come about in several ways: status reports, project meetings, review meetings. Communication plan is put into action.

One Input

1. Communication Management Plan

Four Tools

1. **Communication Skills**-> It's been estimated that project managers spend as much as 90 percent of their time communicating in one form or another.
 - a. **Information exchange**-> Communication is the process of exchanging information. There are three elements to all communication: the sender, the message, and the receiver. The **sender** is the person responsible for putting the information together in a clear and concise manner. The **message** is the information being sent and received. It might be written, verbal, non-verbal, formal, informal, internal, external, horizontal, or vertical. Horizontal communications are messages sent and received to peers. Vertical communications are messages sent and received down to subordinates and up to executive management. The **receiver** is the person the message is intended for. They are responsible for understanding the information correctly and making sure they've received all of the information.
 - i. **Methods of IE**-> encoding, transmitting & decoding
 - ii. **Forms of comm**-> verbal or written & formal or informal
 - b. **Effective listening skills**-> appear interested, eye contact, nod the head or smile , recap & interrupt only when appropriate.
 - c. **Resolving conflicts**-> Conflict comes into the picture when the desires, needs, or goals of one party are incompatible with the desires, needs, or goals of another party (or parties).
 - i. **Forcing** where one person forces a solution on the other parties. This is where the boss puts on the "because I'm the boss and I said so" While this is a permanent solution, it isn't necessarily the best solution. This is an example of a win-lose
 - ii. **Smoothing** does not lead to a permanent solution. It's a temporary way to resolve conflict where someone attempts to make the conflict appear less important than it is. This is an example of a lose-lose conflict resolution technique
 - iii. **Compromise** is achieved when each of the parties involved in the conflict gives up something to reach a solution.
 - iv. **Confrontation** is also called **problem solving** and is the best way to resolve conflict. A fact-finding mission results in this scenario and is an example of a win-win conflict resolution technique.
 - v. **Withdrawal** never results in resolution. This occurs when one of the parties gets up and leaves and refuses to discuss the conflict. It is probably the worst of all the techniques as nothing gets resolved. This is an example of lose-lose conflict resolution technique.
2. **Information Gathering and Retrieval Systems**-> Retrieval systems are ways that information is stored and shared among project team members. They include things like project management software, manual filing systems, and electronic databases.
3. **Information Distribution Methods**-> Distribution methods are ways of getting the project information to the project team or stakeholders. As the name implies, these are ways to distribute the information and might include e-mail, hard copy, voice mail, videoconferencing, etc.

4. **Lessons Learned Process** -> it is information that you gather & document throughout the project that can be used to benefit the current, future projects. It may be positive or negative & conducted at the end of project phases & project itself.

Two Outputs

1. Organizational Process Assets (U)-> six elements
 - a. Lesson learned documentation
 - b. Project records-> memos & correspondence
 - c. Project reports-> status report & meeting minutes
 - d. Project presentation
 - e. Feedback from stakeholder
 - f. Stakeholder notification
2. Requested Changes

3. Performance Reporting (Monitoring)

It involves collecting and reporting information regarding project progress and project accomplishments to the stakeholders, project team members, management team, and other interested parties. It also involves forecasting future project progress. Reporting might include information concerning project quality, costs, scope, project schedules, procurement, and risk.

Seven Inputs

- a. Work Performance Information
- b. Performance Measurements
- c. Forecasted Completion
- d. Quality Control Measurements
- e. Project Management Plan Performance measurement baseline
- f. Approved Change Requests
- g. Deliverables

Five Tools

- a. **Information Presentation Tools** include automated tools like spreadsheet & presentation software.
- b. **Performance Information Gathering and compilation** via manual or PM s/w systems & databases.
- c. **Status review meetings** provide updated info regarding the project progress.
- d. **Time Reporting Systems** used to record time info about project
- e. **Cost Reporting Systems** used to record cost info about project & expended

Five Outputs

- i. **Performance Reports** is primary output where perf info is gathered, documented & reported to stakeholder
- ii. Forecasts
- iii. Requested Changes
- iv. Recommended Corrective Actions
- v. Organizational Process Assets (U)

4. Manage Stakeholders (Monitoring)

It is about satisfying the needs of the stakeholders by managing communications with them, resolving issues & improving project performance by implementing requested changes.

Two Inputs

1. Communication Management Plan
2. Organizational Process Assets

Two tools

1. Communication Methods
2. Issue Logs

Five Outputs

1. Resolved Issues
2. Approved Change Requests
3. Approved Corrective Actions
4. Organizational Process Assets (U)
5. Project Management Plan (U)

Chapter 12 Project Procurement Management

It includes the processes to purchase or acquire the products, services or results needed from outside the project team to perform the work. It includes the contract management & change control processes required to administer contracts or purchase orders issued by authorized project team members.

1. Plan Purchases and Acquisitions (Planning)

It determines what to purchase or acquire & when & how

Six Inputs

1. Enterprise Environmental Factors- market conditions
2. Organizational Process Assets- procurement related policies
3. Project Scope Statement- boundaries, constraint & assumptions
4. Work Breakdown Structure
5. WBS Dictionary
6. Project Management Plan
 - a. Risk Register
 - b. Risk related contractual agreements
 - c. Resource requirements
 - d. Project Schedule
 - e. Activity cost estimates
 - f. Cost baseline

Three Tools

1. **Make or buy analysis**-> whether it's more cost effective to buy the products and services or more cost effective for the organization to produce the goods and services needed for the project. Costs should include both direct costs—in other words, the actual cost to purchase the product or service—and indirect costs such as the salary of the manager. Other considerations might include things like capacity issues, skills, availability, and trade secrets.
2. Expert Judgment
3. **Contract Types**-> A *contract* is a compulsory agreement between two or more parties and is constructed such that one party gives something up (money) and the other party receives something (goods or services) in return.
 - a. **Fixed Price or Lump sum** -> These contracts set a specific, firm price for the goods or services rendered. The buyer and seller agree on a well-defined deliverable for a set price. In this kind of contract, the biggest risk is borne by the seller. They are usually used for projects that will take a long time to complete and have a high value to the company. **Fixed price plus incentive** contracts are another type but the difference here is that the buyer includes an incentive, or bonus, for early completion or for some other agreed-upon

performance criteria that's exceeded according to contract specifications. **Unit Price Contract** is used quite often. The seller specifies a set amount for the goods or services rendered by some measurement.

- b. **Cost Reimbursable Contracts**-> The costs associated with producing the goods or services are charged to the buyer. All the costs the seller takes on during the project are charged back to the buyer, thus the seller is reimbursed. It carries the highest risk to the buyer as the total costs are uncertain. It is used when there is a lot of uncertainty regarding the project scope & the risk is of buyer. **Cost plus Fee or Cost plus percentage of cost**, the seller is reimbursed for allowable cost plus a fee that's calculated as percentage of the costs. Seller does not have motivation to keep the cost low. **Cost plus Fixed Fee** contracts charge back all allowable costs to the seller & include a fixed fee upon completion of the contract. This fixed fee is seller's profit but costs are variable. **Cost plus Incentive fee**, the buyer reimburses the seller for allowable cost & includes an incentive for exceeding the performance criteria laid out in contract.
- c. **Time & Material Contracts**-> The full amount of the material costs is not known at the time the contract is awarded. This resembles a cost reimbursable contract as the costs will continue to grow during the contract's life. It can resemble fixed price contract when unit rates are used.

Four Outputs

1. **Procurement Management Plan** details how procurement process will be managed. It includes type of contract to use, authority of project team, how multiple vendors will be managed etc...
2. Contract Statement of Work contains the details of procurement item in clear concise terms. It includes project objectives, description of work of project & any post project operational support needed concise specification of product and project schedule, time period of services & work location.
3. Make or buy decision
4. Requested Changes

2. Plan Contracting (Planning)

The purpose is to prepare the documents which will be used in Request Seller responses and select seller processes.

Four Inputs

1. Procurement Management Plan
2. Contract statement of work
3. Make or buy decisions
4. Project Management Plan
 - a. Risk Register
 - b. Risk related contractual agreements
 - c. Resource requirements
 - d. Project Schedule
 - e. Activity cost estimates
 - f. Cost baseline

Two Tools

1. Standard Forms
2. Expert Judgment

Three Outputs

1. **Procurement Documents** are used to solicit vendors & suppliers to bid on your procurement needs. Namely, RFP(proposal), RFI(Information), IFB(invitation for Bid), & RFQ(Quotation)
2. **Evaluation Criteria** refers to the method of choosing a vendor from among the proposals received. It may be subjective or objective, in some cases price is the factor with lowest bidder.
3. Contract Statement of Work (U)

3. Request Seller Responses (Executing)

It is concerned with obtaining responses to bids & proposals from potential vendors.

Three Inputs

1. Organizational Process Assets
2. Procurement Management Plan
3. Procurement Documents

Three Tools

1. **Bidder Conferences** are meetings with prospective vendors that occur prior to completion of their response proposal. The meeting is held once & all vendors attend at the same time & clarifications are asked to buyer.
2. **Advertising** is letting potential vendors know that an RFP is available. Company's internet site, journals & newspaper are example
3. **Develop qualified sellers list** is list of prospective seller who have been pre approved or pre qualified to provide contract services.

Three Outputs

1. **Qualified sellers list** are those sellers who are asked to submit a proposal or quotation.
2. **Procurement Document package** is prepared by buyer as formal request to be send to each seller to prepare a bid.
3. **Proposals** are seller prepared documents that describe how vendor intends to meet project needs. It may be divided into mgmt section, technical approach & pricing section.

4. Select Seller (Executing)

In this the proposals are evaluated against predefined evaluation criteria

Seven Inputs

1. Organizational Process Assets
2. Procurement Management Plan
3. Evaluation Criteria is one method of rating & scoring proposals. Some selections are price driven, quality by checking sample & financial records.

4. Procurement Document package
5. Proposals
6. Qualified Sellers List
7. Project Management Plan ->Risk Register & Risk related contractual agreements

Seven Tools

1. **Weighing system** assigns numerical weights to evaluation criteria & then multiply them weight of each criteria factor to come up with total score for each vendor. It is commonly used & allows to rank-order the multiple proposals to determine sequence of negotiation.
2. **Independent estimates or should cost estimates** includes comparison of vendor prices with cost of proposal. If the difference is large then either SOW is not detailed enough or vendor simply failed to respond to all requirements.
3. **Screening system** use predefined performance criteria to screen out vendors like qualification of team member.
4. **Contract negotiation**-> in this both parties come to an agreement regarding the contract terms which may include price, responsibilities, regulations & law. **Fait accompli** is a distraction technique.
5. **Seller rating systems** use info about the sellers such as past performance, delivery, contract compliance & quality ratings.
6. Expert Judgment
7. Proposal evaluation techniques

Six Outputs

1. Selected Sellers
2. **Contract** is a mutually binding legal agreement that obligates the seller to produce product & buyer to pay. Contract Life Cycles are as follows
 - a. **Requirement = Plan purchase & acquisitions**
 - b. **Requisition = Plan contracting**
 - c. **Solicitation = request seller response**
 - d. **Award = select seller**
3. **Contract Management Plan** describes the contract administrative activities of the project based on SOW elements.
4. Resource Availability
5. Procurement Management Plan (U)
6. Requested Changes

5. Contract Administration (Monitoring)

It concerns monitoring the vendor's performance & ensuring that all requirements of the contract are met.

Six Inputs

1. Contract
2. Contract Management Plan
3. Selected Sellers
4. Performance Reports
5. Approved Change Requests

6. Work Performance Information concerns monitoring work results & examining the vendor's deliverables.

Eight Tools

1. **Contract change control system** describes the processes needed to make contract changes. The change control system is a formal process that requires authorization to make changes. This system tracks disputes and their resolution and all the paperwork for submitting changes, and contains a tracking system to number the change requests and record their status. It becomes part of the Integrated Change Control process
2. **Buyer conducted performance review** examines sellers performance on the contract to date either at end on at interval during contract period.
3. **Inspections and audits**-> the buyer will physically inspect work of seller & perform audit to determine deficiencies in product.
4. **Performance reporting** provides stakeholder info about vendors progress with contract objectives
5. **Payment system** to issue payment
6. **Claims administration** involves documenting monitoring & managing changes to contract. Changes that can not be agreed upon are called contested changes or disputes, claims or appeals. Arbitration involves bringing all parties to table with a third disinterested party who is not a participant in contract to reach an agreement.
7. **Records management system** typically index documents for easy filing & retrieval.
8. Information Technology

Five Outputs

1. **Contract Documentation** includes contract along with supporting schedules, warranties, inspection & so on.
2. Requested Changes
3. Recommended Corrective Actions
4. Organizational Process Assets (U)
 - a. **Correspondence** is information that needs to be communicated in writing to either the seller or the buyer.
 - b. **Payment schedule & request**-> actual payment to vendor
 - c. **Seller performance evaluation** is written record on vendors performance
5. Project Management Plan (U) -Procurement management plan & Contract management plan

6. Contract Closure (Monitoring)

It supports the close project process & concerned with completing & settling the terms of the contract. It updates records & archives the information for future reference.

Four Inputs

1. Procurement Management Plan
2. Contract Management Plan
3. Contract Documentation

4. Contract closure procedure

Two tools

1. **Procurement audit** is structured review of procurement process from plan purchases thru contract admin.
2. Records management system

Two Outputs

1. **Closed Contracts** is formal acceptance & closure of the contract.
2. Organizational Process Assets (U) -> updates contract file, records & supporting documents.

General

Five declarations that every PMI member must abide by are

1. Maintain high standards of integrity & professional conduct
2. Accept responsibility of action
3. Continuously seek to enhance professional capabilities
4. Practice with fairness & honesty
5. Encourage others to act in an ethical & professional manner

Halo Effect is the assumption that because the person is good at technology they would be good at managing a project dealing with the said technology

Weighted milestone approach is ideal when an activity is over two reporting periods in length.

Fixed formula uses a partial credit approach such as 50/50 and is ideal when an activity is short (less than 2 reporting periods)

Earned value is used to show the status of scope, time (PV) & cost (AC).

Forecast reporting focuses on what is getting ready to be done in the project.

Democratic PM counts each project team member's opinion

Autocratic PM does entire decision making instead of team member capability

Laissez Faire allows project team to make all the decisions.

Ouchi's Theory Z states that worker needs to be involved with the mgmt process

Memos are **informal** communication

Presentations, briefing and speeches are **formal** communication

EVM calculation can include status, trend & performance report

The Examination questions for 2005 PMP exam has the following distribution:

Project Initiation 11%

Project Planning 23%

Project Execution 27%

Project Monitoring and Control 21%

Project Closure 9%

Professional and Social Responsibility 9%