

ICT PROJECT MANAGEMENT

CHAPTER

Introduction

Project Organization and Project Life Cycle

Project Management Process Groups

Project Integration Management

Project Scope Management

Project Time Management

Project Cost Management

Project Quality Management

Project Human Resource Management

Project Communication Management

Project Risk Management

Project Procurement Management

Project Stakeholders Management

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Project Organization and Project Life Cycle

Course Contents:

Unit	Content	Hours
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1.1.	Project, Program, Portfolio and System	
1.2.	Project Objectives and Goals <ul style="list-style-type: none">• SMART Goals	
1.3.	Classification of Projects	
1.4.	Project Constraints	
1.5.	Project Management and Its Advantages	
1.6.	Project Management Body of Knowledge	
1.7.	Project Environment <ul style="list-style-type: none">• Internal, Task and External Environment	
1.8.	Skill Requirements of Project Manager	
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- ICT (information Communication Technology)
 - Science which includes the flow of information using hardware, software and internet.
- Project
 - A group of milestones or phases, activities
 - Has start and end points.
 - Temporary endeavor
 - Delivers new product , a service, a result or business value
 - E.g developing a new website, new software, construction of bridge, building e.t.c
 - Project= subprojects or temporary work

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- Programs
 - Group of related projects that provide certain benefits when managed together.
 - E.g managing the development of all ecommerce projects
 - Program=subprograms+projects and sub projects.
- Portfolios
 - Different segment of organization(eg electronic segment, vehicle segment , construction segment .
 - Focuses on strategic objectives of organization.
 - Investment decisions are made.
 - Includes programs, group of programs and projects that do not align with any program.
 - E.g managing all types of website development related projects and programs, managing all mobile apps related projects and programs
 - Portfolio=subportfolios+programs and subprograms+projects and subprojects

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Portfolios, Programs and Projects



- Portfolio – Project, Programs, Sub portfolios and Operations grouped together for strategic business objectives. – Aligns with Org strategies.
- Programs – A group of sub programs, projects managed in a coordinated way to obtain results that are not possible by managing them individually. – Aligns itself to realize specific benefits.
- Projects – An endeavour undertaken to produce a specific deliverable with definite timelines and defined resources. – Aligns itself to achieve a specific scope.

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Relationship between: Portfolios, Programs, Projects and Operations



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- Management
 - is the process of Planning, Organizing, Controlling and Measuring

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- Project Management:
 - A collection of linked activities, carried out in an organised manner, with a clearly defined START POINT and END POINT to achieve some specific results desired to satisfy the needs of the organisation at the current time
 - A dynamic process that utilises the appropriate resources of the organisation in a controlled and structured manner, to achieve some clearly defined objectives identified as needs.
 - It is always conducted within a defined set of constraints.
 - Project management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements.
 - Project management is accomplished through the application and integration of the project management processes of initiating, planning, executing, monitoring and controlling, and closing.

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Project Management....



Work Smart Not Hard !!!

Discipline	Process	Tools
Project management	> Initiating > Planning > Executing > Monitoring and controlling > Closing <i>(From PMBOK® Guide, Third Edition)</i>	> Statement of work, > Project charter, > Business case > Work breakdown structure, > Budget estimations > Resource allocation > Schedules > Tracking > Risk identification and mitigation > Reports on performance and compliance

Variety of projects

- Projects at personal levels :
 - Preparation of examination, Writing book, Weeding in house, Getting dressed ,Birthday function, Family vacation
- Projects in local level:
 - School function, Cleanliness drive, Construction of clubs
- Organizational projects:
 - Construction of building , 4G deployment, Highway construction
- National projects:
 - Illiteracy campaign, Poverty removal campaign., Launching satellite, Preparation of annual budgets:
- Global projects:
 - Organizing peace (UN) mission, Space exploration, Environment protection

Who uses Project Management?

- Nearly Everyone to some degree

People plan their Days, their Weeks, their Vacations and their Budgets and keep a simple project management form known as "To Do" list

- Any Process or Means used to track tasks or efforts towards accomplishing a goal could be considered Project Management

Why is Project Management used?

- It is necessary to Track or Measure the progress we have achieved towards a Goal we wish to accomplish.
- We use Project Management to Aid us in Maximizing and Optimizing our resources to accomplish our goals

How much time does Project Management take?

- Not much. Probably more time is wasted as a consequence of lack of Project Management tool than is spent to Plan adequately, Organize, Control effectively and Measure appropriately
- How long: As long as there are things to do

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1.2 Project objectives and goals

- Projects are planned and implemented in terms of their Goals and Objectives set by the Project Champion and Stakeholders
- Goals and Objectives must be clearly defined and established at the outset.

1.2 Project objectives and goals

- Goal
 - Broad way
 - E.g to be runner
- Objectives
 - Specific
 - Running 1 km in 30 min
 - Defined and measured in both time and by what is accomplished.

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1.2 Project objectives and goals

- Objectives:
 - Represent a **managerial commitment** to achieve specified results in a specified period of time. They clearly **spell out the quantity and quality of performance to be achieved, the time period, the process and the person who is responsible** for the achievement of the objective.
 - “Objectives are end results of planned activity”
 - “Objectives state what is to be accomplished by when and should be quantified if possible.”

1.2 Project objectives and goals

Importance of objectives

Characteristics of objectives	Importance of objectives
1. Objectives form a hierarchy	1. Objectives help to define the organization in its environment
2. Objectives form a network	2. Objectives help in coordinating decisions and decision-maker
3. Multiplicity of objectives	3. Objectives help in formulating strategies
4. Long and short range objectives	4. Objectives provide standards for assessing organizational performance

1.2 Project objectives and goals

- Goal:
 - Defined as an “intermediate result to be achieved by a certain time as part of the grand plan . A plan can, therefore have many goals.”
 - Are **short term (one year or less)** milestones or bench marks that organizations must achieve in order for long term long term objectives to be reached.
 - Should be **measurable, quantitative, challenging, realistic, consistent and prioritized**
 - **Needed for each objective** that is established in an organization.

1.2 Project objectives and goals

Goals	Objectives
Strategy Implementation	strategy formulation
expected or desired outcome of a planning process	detailed statements of quantitatively or qualitatively measurable results the plan hopes to accomplish
general expressions of the guiding principles and aspirations of an organization	precise targets that are necessary to achieve goals
broad	specific

1.2 Project objectives and goals

Objectives need to be SMART:

- Specific: clearly stated with specific outcomes.
- Measureable: so the end of each objective can be identified and measured against success criteria
- Achievable: attainable given the available resources, time, and technology, in accordance with required quality.
- Realistic: sensible, pragmatic, and prioritised activities for achieving set goals.
- Timely: planned and attained tasks according to base line and prioritisation of hierarchy of needs.

1.2 Project objectives and goals

Objectives need to be SMART:

- Specific: what? Why ? Who ? Where? Which ?
- Measureable: Metrics and milestones? How much? What percentage?
- Achievable: Do you have skills and tools to accomplish this objective ?
- Realistic: Does it fit with overall organization objectives.
- Timely: final deadline.

1.2 Project objectives and goals

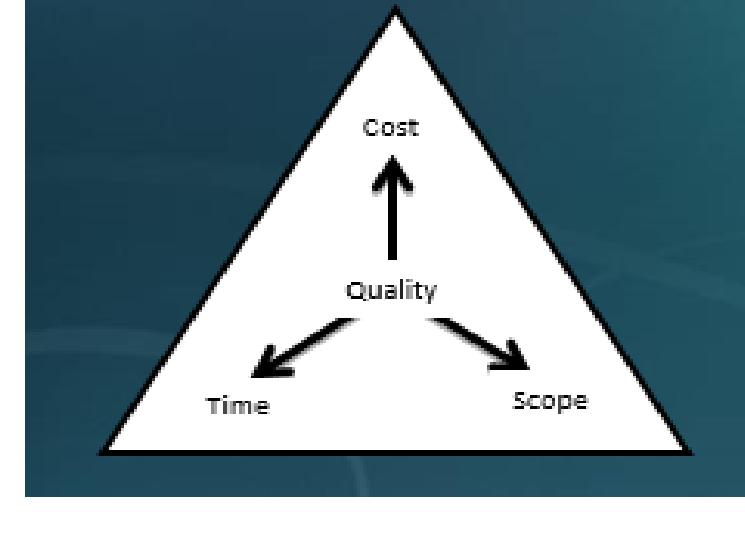
Broad Goal: I want to grow my business.

Objective:

- Specific: I will acquire three new clients for my consulting business.
- Measurable: I will measure my progress by how many new clients I bring on, while maintaining my current client base.
- Achievable: I will ask current clients for referrals, launch a social media marketing campaign and network with local businesses.
- Realistic: Adding additional clients to my business will allow me to grow my business and increase my revenue.
- Time-Based: I will have three new clients within two months.

1.2 Project objectives and goals

Objectives are developed within the limits set by the project triple constraints – also known as primary objectives - of time, resources, and scope, in accordance with required quality for project output



Smith (2008) argues that satisfying all three primary objectives in full is almost impossible. Preferences must be applied in deciding the relative importance of each constraint in relation to goals.

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1.3 Classification of Project



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1.3 Classification of Project

Difference between Engineering projects and management projects

- Use of Specialist Staff

- Engineering projects almost always represent the day-to-day work of the organization. For example, a construction company will employ people who specialize in building office blocks, public buildings, houses, or roads.
- Similarly, a manufacturing company will have design engineers to take a product from conception, through the design process and prototyping before the work is handed over to production engineers who will then be responsible for mass production.
- This is quite different from a management project where people who don't usually run projects may find themselves doing much the work.

1.3 Classification of Project

Difference between Engineering projects and management projects

- Environmental Issues

- The challenges of engineering projects are often physical in nature. For example, a construction project may be held up by bad weather, the discovery of archeological remains, or other unforeseen environmental problems.
- Management projects on the other hand usually take place on the organization's own premises and are not subject to these sorts of issues.

- Specification of Final Deliverable

- In the case of engineering projects the final deliverable is usually specified in detail at the beginning of the project because it will need to comply with existing standards or legislation.
- This is not usually the case with management projects where the exact form of the final deliverable may not become clear until some of the work of the project has been done. It may also alter as the project develops, or in response to market research or other developments

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1.4 Project Constraint



1.4 Project Constraint

- The three most significant project constraints – **time (schedule) , cost and quality** - are sometimes known as the triple constraint or the project management triangle.
- project's scope
 - involves the specific goals, deliverables and tasks that define the boundaries of the project.
- Schedule:
 - (sometimes stated more broadly as time)
 - specifies the timeline according to which those components will be delivered, including the final deadline for completion.
- Cost:
 - (sometimes stated more broadly as resources)
 - involves the financial limitation of resources input to the project and also the overall limit for the total amount that can be spent.

1.4 Project Constraint

- Triads are mutually Exclusive each other,
- **Making a change to one constraint will affect one or both of the others.**
- For example, increasing the quality of the project is likely to require more time and money.

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Why is Project Management Important?

- Enables us to map out a course of action or work plan
- Helps us to think systematically and thoroughly
- Unique Task
- Specific Objective
- Variety of Resources
- Time bound

Advantages

- In built Monitoring/ Sequencing
- Easy and Early identification of Bottlenecks
- Activity based costing
- Identification and Addition of missing and new activities
- Preempting unnecessary activity/expenditure
- Timely Completion
- Assigning tasks
- Reporting

Road to Better Project Management

- Find a Project plan that fits your style of project management needs
- It may be as simple as creating templates, forms and spreadsheets to track tasks
- Formation of a Project Management committee
- Listing out all the tasks and sub-tasks to accomplish a goal
- Jot down the time period and person responsible against each task/sub-task
- Identify a Project Manager
- Identify Task Managers
- Sequence the activities in relation to time period
- Present to the PMC
- Finalize by reaching an agreement and start work.....

Implementation

- Regular Monitoring
- Resource Support
- Critical issues discussed and solution
- Meeting with the team on completion of each major milestone
- Track the progress against the plan
- System to add/delete tasks in the PMT

Consequences of not using PMT

- DELAY
- COST
- WASTE OF RESOURCES
- QUALITY
- DISSATISFACTION
- REPUTATION

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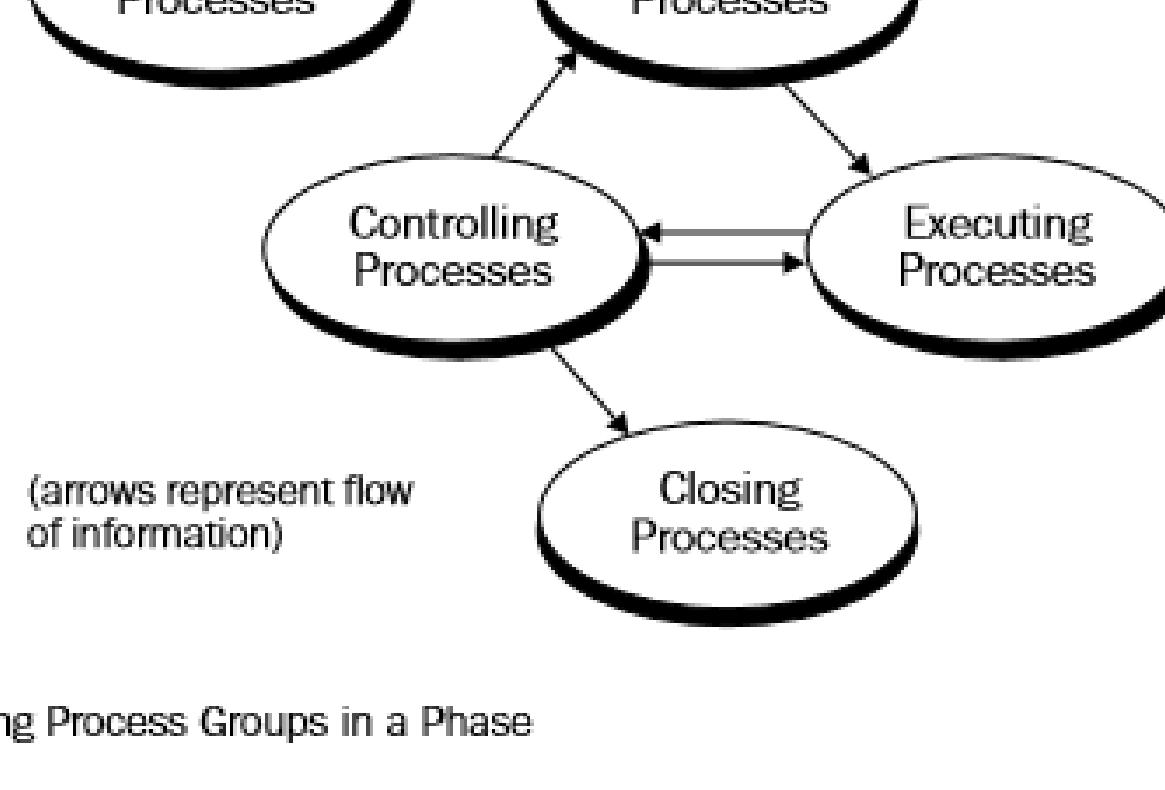
1.6 Project management Body of Knowledge

- Project Management Body of Knowledge (PMBOK) is a collection of processes and knowledge areas accepted as best practice for the project management profession. The PMBOK® is published by the Project Management Institute (PMI), which was formed in the USA in 1969
- As an internationally recognized standard (ANSI/PMI 99-001-2008 and IEEE 1490-2011) it provides the fundamentals of project management, irrespective of the type of project be it construction, software, engineering, automotive.
- PMBOK recognizes five basic process groups and ten knowledge areas typical of almost all projects. The basic concepts are applicable to projects, programmes and operations.

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1.6 Project management Body of Knowledge



Links among Process Groups in a Phase

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1.6 Project management Body of Knowledge

10 Areas of knowledge

- Project Integration Management
- Project Scope Management
- Project Time Management
- Project Cost Management
- Project Quality Management
- Project Human Resources Management
- Project Communications Management
- Project Risk Management
- Project Procurement Management
- Project Stakeholder Management

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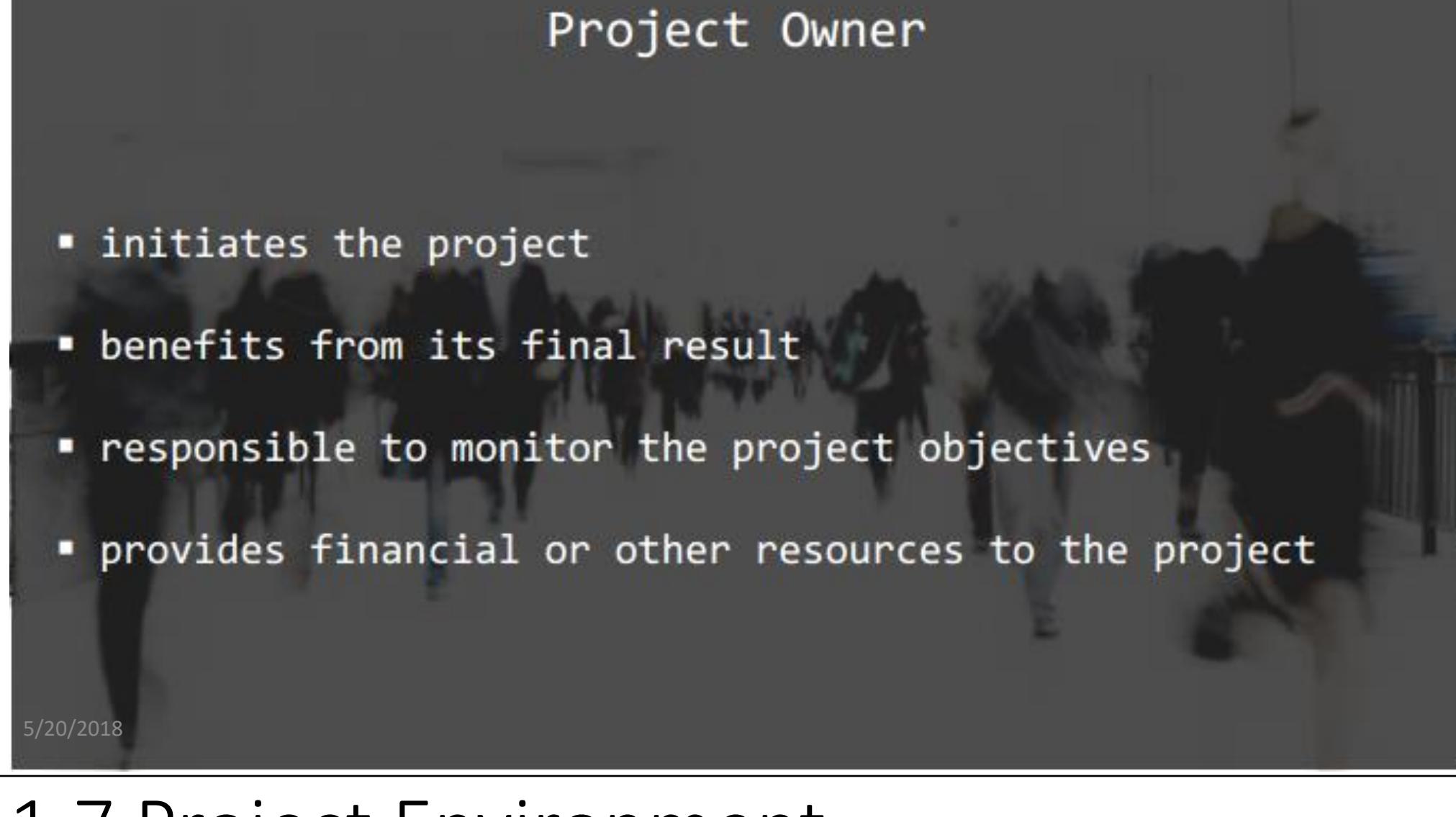
1.7 Project Environment



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1.7 Project Environment **INTERNAL**



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1.7 Project Environment **INTERNAL**

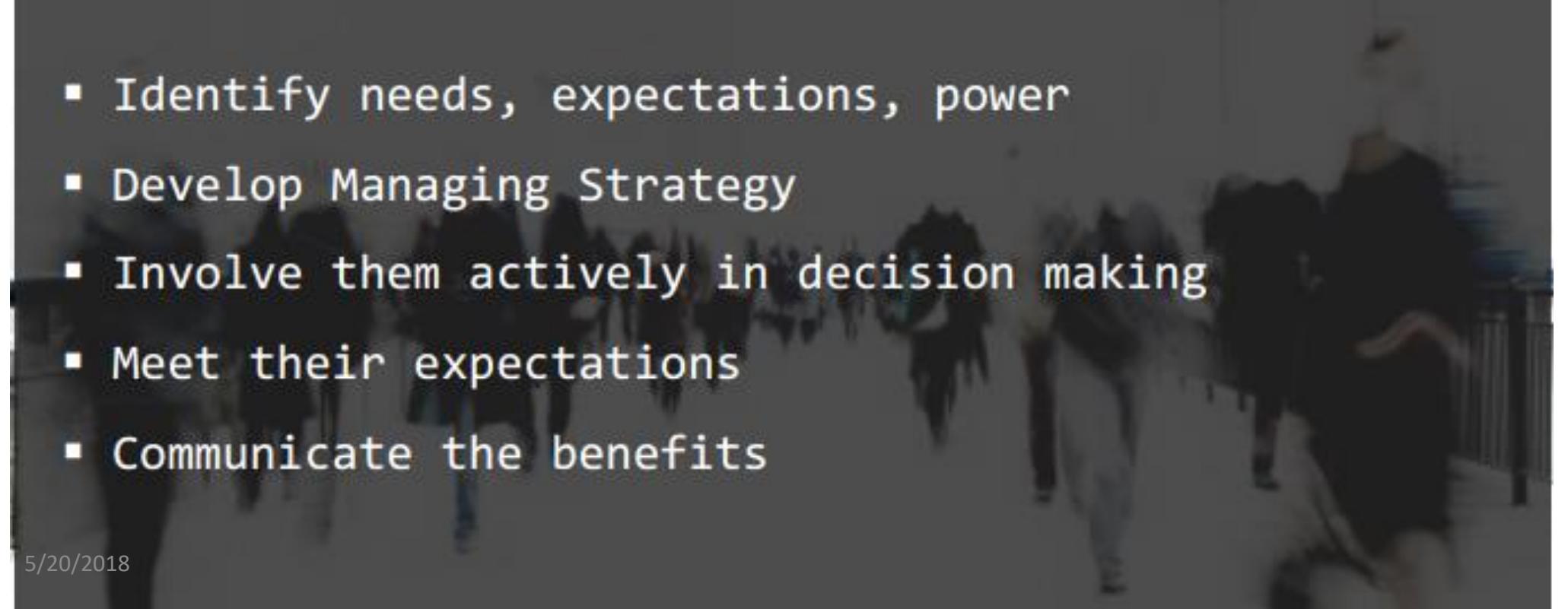


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1.7 Project Environment

EXTERNAL



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1.8 Skills required for Project manager

Project Manager accomplish work through the project team and key stakeholders.

Successful Project Managers balance **knowledge, experience, ethics and a number of interpersonal skills.**

Leadership	Political and cultural awareness
Team Building	Negotiation
Motivation	Trust Building
Communication	Conflict Management
Influencing	Coaching
Decision making	Leading without direct authority

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1.9 Roles and responsibilities of Project manager

- | | |
|--|--|
| 1. Defining scope | 8. Risk analysis |
| 2. Planning scope | 9. Risk management |
| 3. Activity and resource planning | 10. Progress monitoring |
| 4. Developing schedules and timescales | 11. Team Management |
| 5. Cost estimating | 12. Business Partnering |
| 6. Budgeting | 13. Scalability and portability analysis |
| 7. Completing documentation | 14. Quality control |

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1.10 PMI framework and certification

- The Project Management Institute (PMI) is the world's largest not-for-profit membership association for the project management profession. It has more than 700,000 members, credential holders, and volunteers in nearly every country in the world.
- The PMI is the publisher of the 'PMBOK® Guide,' now in its fifth edition. This internationally recognized standard gives project managers the essential tools to practice project management and deliver organizational results. Translations are available in Arabic, Chinese, French, German, Italian, Japanese, Korean, Portuguese, Russian, and Spanish. One of the initiatives of the PMI is the development of global standards. These aim to ensure that the basic project management framework is applied consistently in order to reinforce a common language and approach between project stakeholders.

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PMI framework and certification

- The PMBOK® describes a professional approach to project management that is applicable to most projects. This approach is based on its proven value and benefits in practice through the contribution of thousands of project managers worldwide.
- It is NOT a methodology but more of a framework, a structure that allows different business processes to be grouped together. It also defines common deliverables that act as inputs to and outputs from each process. The framework can help you master a complex topic in a relatively short time by acting as a map, which helps you to navigate around an entire body of knowledge

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- <http://www.projectsmart.com/project-management/introduction.php>

Thankyou!!

Chapter 2

2.	Project Organization and Project Life Cycle	2 hrs
2.1.	Organizational Structure	
2.2.	Matrix Organization and Its Types	
2.3.	Organizational Structure Influences on Project	
2.4.	Project Team	
2.5.	Project Life Cycle and Phases	

Chapter 2

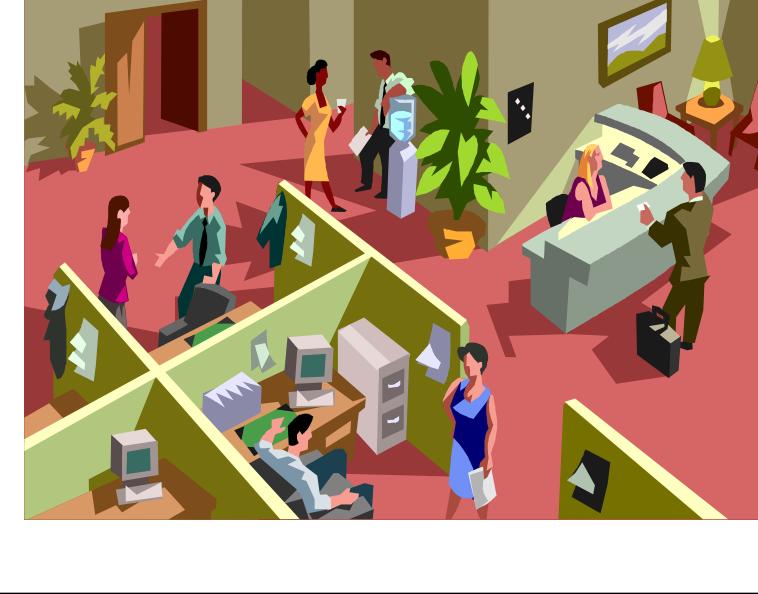
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2.1 Organization Structure

- Hierarchical arrangement of lines of authority, communications, rights and duties of an organization.
- Is framework that determines how efficiently and effectively organizational resources are used to achieve the goal and objectives of organization.
- Is framework within which an organization arranges its lines of authorities and communications and allocates rights and duties.
- Refers to framework within which managerial and operating tasks are performed.
- Level of management and division of responsibilities within an organization.
- how the roles, power and responsibilities are assigned, controlled, and coordinated, and how information flows between the different levels of management.

2.1 Organization Structure

- A structure depends on the organization's objectives and strategy.
- In a centralized structure, the top layer of management has most of the decision making power and has tight control over departments and divisions.
- In a decentralized structure, the decision making power is distributed and the departments and divisions may have different degrees of independence.



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2.1 Organization Structure

• Organizing

- The process by which managers establish working relationships among employees to achieve goals.
- Assures that effort are directed to attain of goals in such manner that resources are used optimally and people are able to work collectively and effectively for common goals.
- Means for translating plan into action.

• Organizational Structure

- Formal system of task and reporting relationships showing how workers use resources.

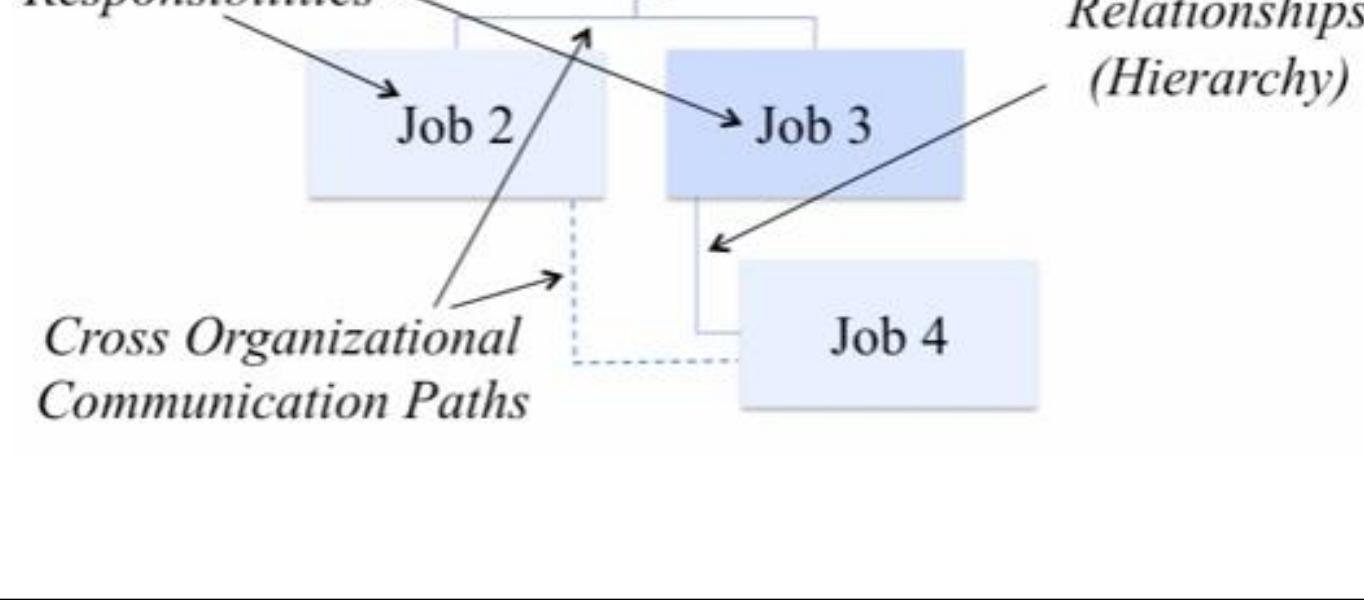
• Organizational design

- The process by which managers create a specific type of organizational structure and culture so that a company can operate in the most efficient and effective way

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2.1 Organisational Structure

- Organization structure is firm's formal configuration of roles, governance, authority and decision making channels.



2.1 Organization Structure

- Factors affecting organizational Structures



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2.1 Organization Structure

Structure is the means for attaining the objectives and goals of organization – peter drucker (1974).

Steps in process of organizing :

1. Identification and division of work
2. Grouping of work
3. Assignment of Duties
4. Establishing reporting relationships

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2.1 Organization Structure

Purpose:

- Who is to do what tasks
- Who is responsible for what result
- Remove obstacles to performance caused by confusion and uncertainty of assignment.
- Furnish decision making and communication networks that reflect and support organization objectives.

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2.1 Organization Structure

need:

- Not needed in case of one man structure.
 - Required coordination in case organization grows.
 - To function smoothly.
 - Required in dynamic environment.
- Benefits:
 - Smooth flow of communication
 - Better control of operations.
 - Provides framework.

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2.1 Organization Structure

Importance :

- Benefits of specialization
- Clarity of working relationships
- Optimum utilization resources
- Adaptation to change
- Effective administration
- Development of Personnel
- Expansion and growth

2.1 Organization Structure

Dimensions of Organization Structure

- a) **Span of control.** This refers to the number of employee directly controlled by a single supervisor.
- b) **Chain of command:** This identifies how power and control is passed down through the organization. A tall structure is a long chain of command and a flat structure is a short chain of command. Chain of command is also described in terms of vertical complexity.
- (c) **Centralisation/ decentralization.** This refers to the level in the organizational hierarchy in which decisions are made. In a centralized hierarchy, the decisions are made at higher level.
- (d) **Formalization-** the amount of written documentation in the organization that describes the procedures, job descriptions, regulations policies of these organizations.
- (e) **Specialization-** the degree to which organizational tasks is subdivided. (This is also referred to as the division of labor.) If specialization is extensive, each employee performs only a narrow range of activities.

2.1 Organization Structure

f) **Standardization-** is the extent to which similar work activities are performed in a unified manner. In a highly standardized organization, work content is described in detail, so similar work is performed the same way across departments or locations.

(g) **Hierarchy of authority-** describes who reports to whom and the span of control for each manager. Span of control refers to the number of employees reporting to a supervisor. Hierarchy of authority is the number of hierachal levels.

(h) **Personnel configuration** is another structural dimension of organisation and this refers to the deployment of people to various functions and departments. Personnel configuration is measured by ratios such as administrative ratios, the ratio of direct/ indirect labour employees. It's measured by dividing the number of employees in a function by the total number of employees in the organisation.

2.1 Organization Structure

Types of organizational Structure

- Functional Organization
- Matrix Organization
- Project Organization

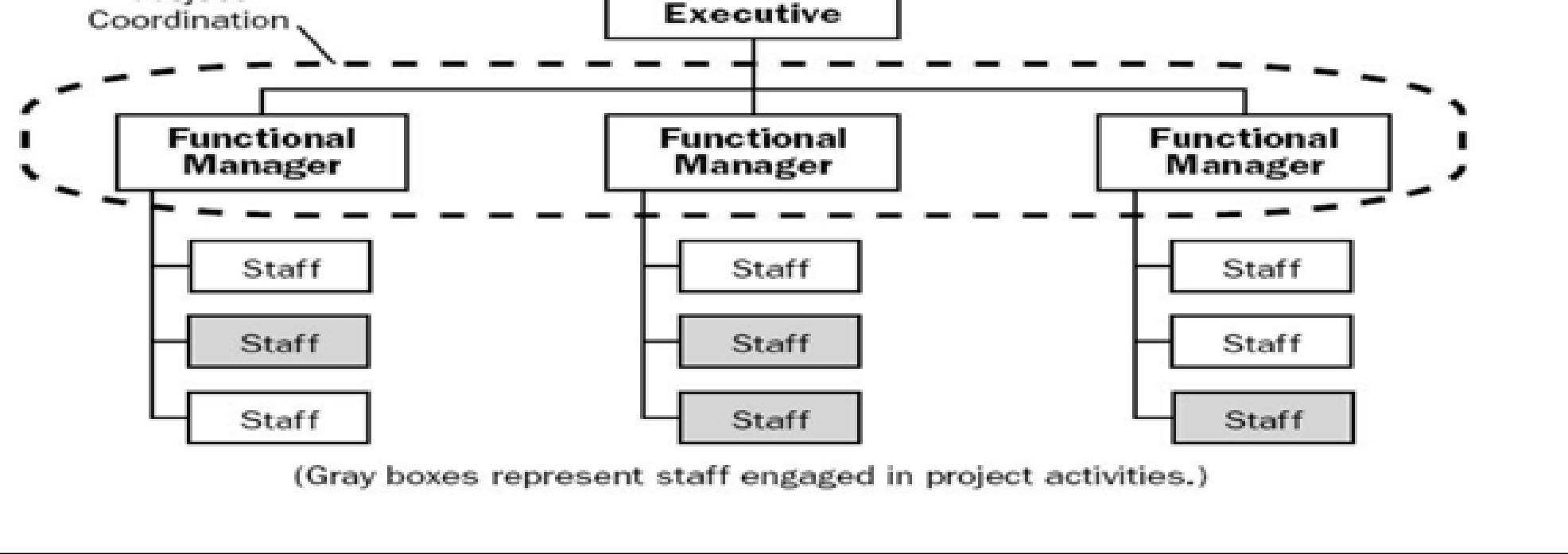
2.1 Organization Structure

Functional Organization Structure

- Organization is divided into fragments according to the functions they perform.
- Efficiency of each fragment is increased due to better control and effective management.
- **people are grouped by areas of specialization.**
- For instance, marketing professionals are grouped under marketing department, human resources professionals are grouped under human resources department, technical people are grouped under IT departmentetc.
- Depending on their size, these groups are managed by managers, directors or vice presidents.
- **the team members do both project work and departmental or operational work at the same time.**

2.1 Organization Structure

- For instance, if a software engineer from the IT department is also assigned to a project, he has to complete his assignments in this project. On the other hand, if there are defects or problems that need to be resolved, this should be under the responsibility of the IT department, therefore he has to deal with these issues as well.
- E.g Accounting firms, Large volume producers, Software companies e.t.c

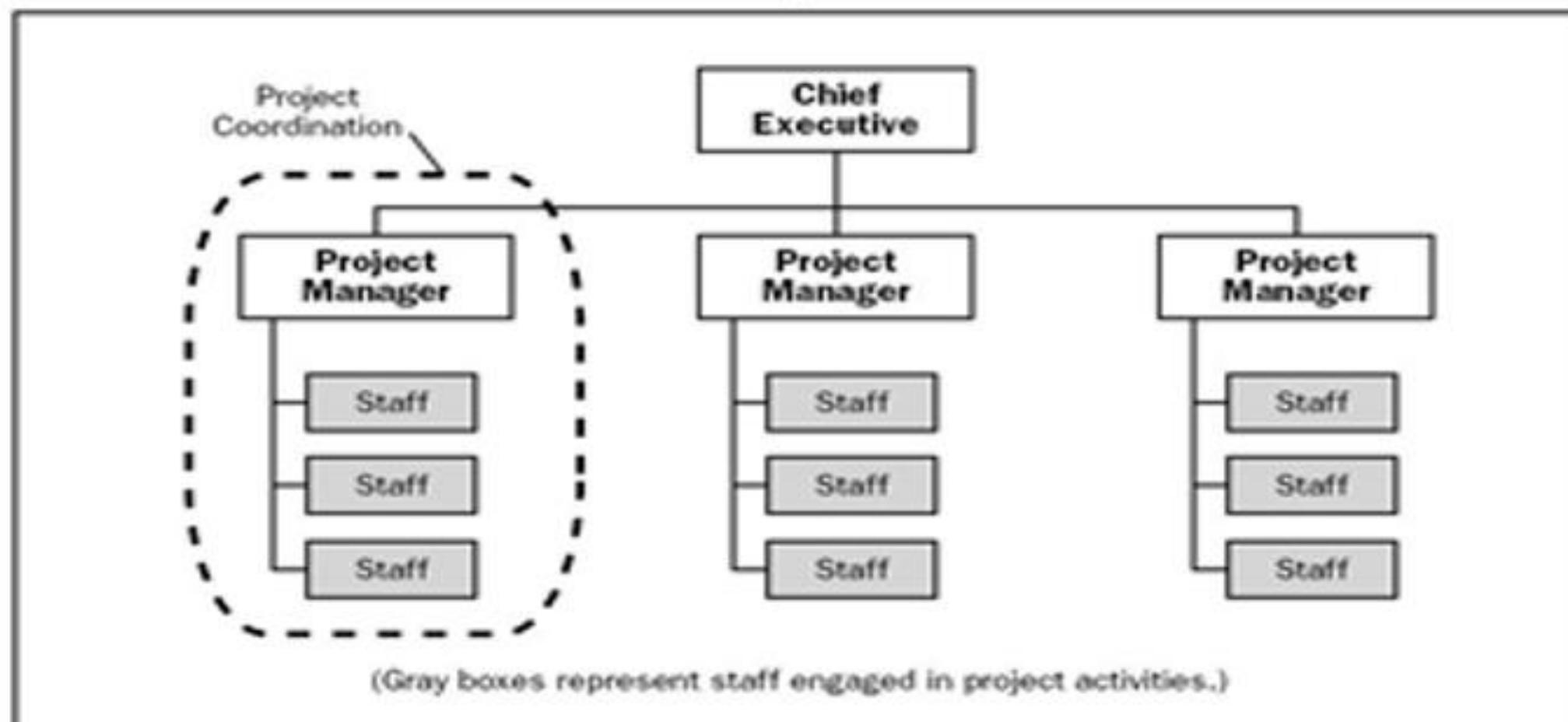


2.1 Organization Structure

Projectized Organizational Structure:

- Entire company is organized by projects.
- So the resources of the project are fully dedicated to the project activities.
- No department for resources.
- Project Managers have control on the projects.
- Resources only report to project manager and the project manager has the ultimate control of resources.
- When project is over, personnel is either assigned to a new project , or need to find a new job.

2.1 Organization Structure



Chapter 2

2.	Project Organization and Project Life Cycle	2 hrs
2.1.	Organizational Structure	
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2.3.	Organizational Structure Influences on Project	
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2.5.	Project Life Cycle and Phases	

2.2 Matrix Organization and its Types

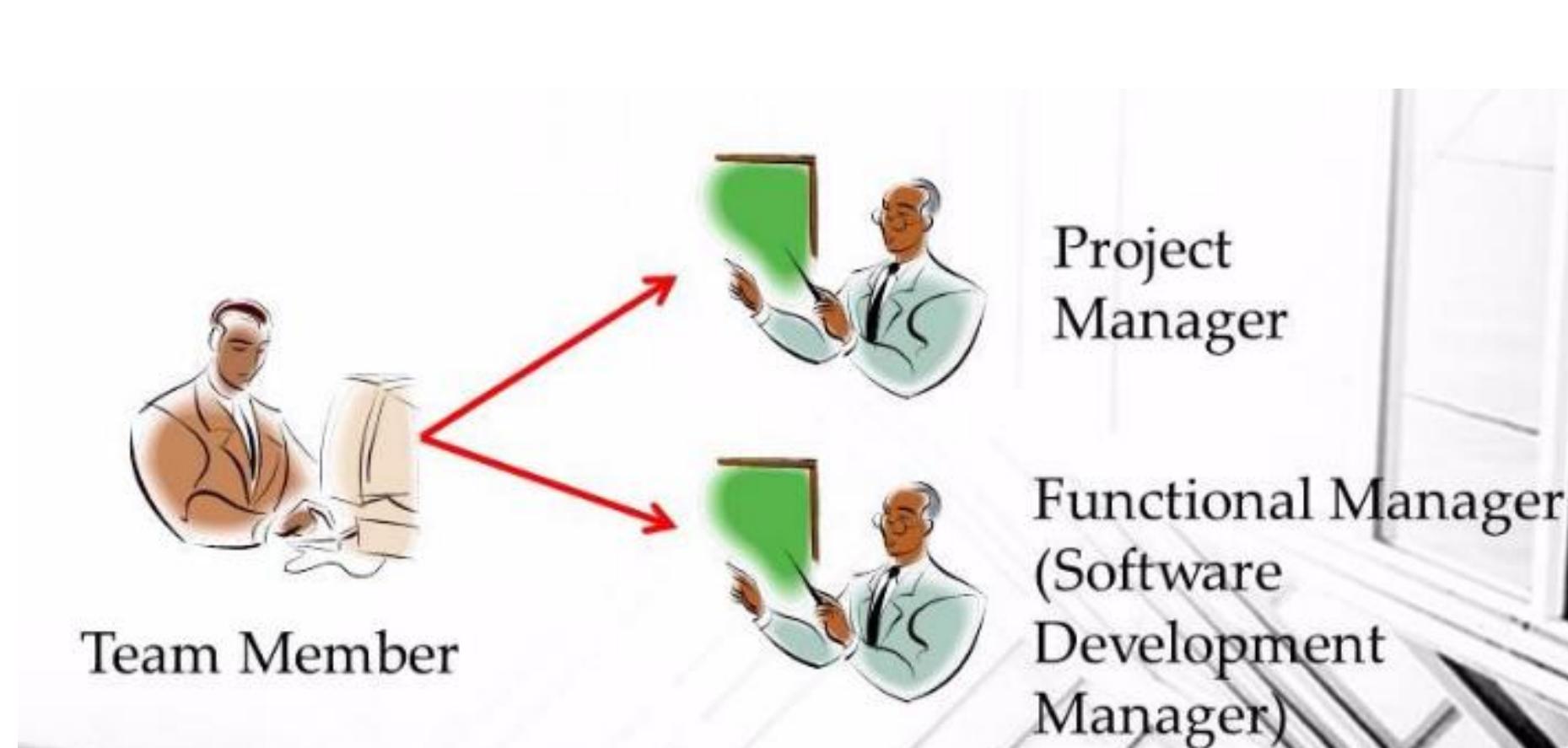
- Is a blend of the projectized and the functional organization structures (According to the PMBOK Guide)
- The authority of a functional manager flows vertically downwards, and the authority of the project manager flows sideways. Since these authorities flow downward and sideways, this structure is called the matrix organization structure.
- In a matrix organization structure, employees may report to many bosses or some people from one section report to one boss and the rest report to another boss.
- Matrix Organization attempts to get strengths of Projectized and Functional Organizations.
- Projectized Organizations ensure the dedication of project resources to the project. Therefore, projects have a higher probability of success. On the other hand, Functional Organizations ensure sustainability of the organization since the resources turn back to their departments once the project is over. Therefore, **Matrix Organization aims to get the benefits from these two previous organizational structures.**

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2.2 Matrix Organization and its Types

- For example let's say that you are a mechanical engineer working in a functional department. Your organization gets a project and they need a mechanical engineer to assist the project manager on certain tasks. In this case, you may be assigned to the project for a short time, or they may transfer you there while your services are required. If you're assigned there for a short time, you will have to report to two bosses.
- Let's consider a software engineer. If he is not working on a project, he will be reporting to his functional manager, for instance, software development line manager. But once software development line manager assigns this software engineer to a project, this engineer will start to report to the project manager as well.

2.2 Matrix Organization and its Types



2.2 Matrix Organization and its

- Types of Matrix Organization Structure
 - Strong Matrix Structure
 - Balanced Matrix Structure
 - Weak Matrix Structure

2.2 Matrix Organization and its Types

- Strong Matrix Organization Structure

- most of the power and authority lie with the project manager.
- The project manager has a full time role, has a full time project management administrative staff under him, and he controls the project budget.
- Strong matrix structure has a lot of the characteristics of a projectized organization.
- Here, the functional manager will have a very limited role.

- Balanced Matrix Organization Structure

- Power and authority are shared between the functional manager and the project managers.
- Although, the project manager has a full time role, he will have a part time project management administrative staff under him.
- In this type of structure, both managers control the project budget.

- Weak Matrix Organization Structure

- The project manager will have a limited power and authority. He will have a part time role and no administrative staff will report to him. His role will be more like a coordinator or an expediter (act as assistant staff and communication coordinator).
- functional manager controls the project budget.
- A weak matrix organization structure resembles the characteristics of a functional organization structure.

2.2 Matrix Organization and its Types

Matrix (Projectized+Functional)

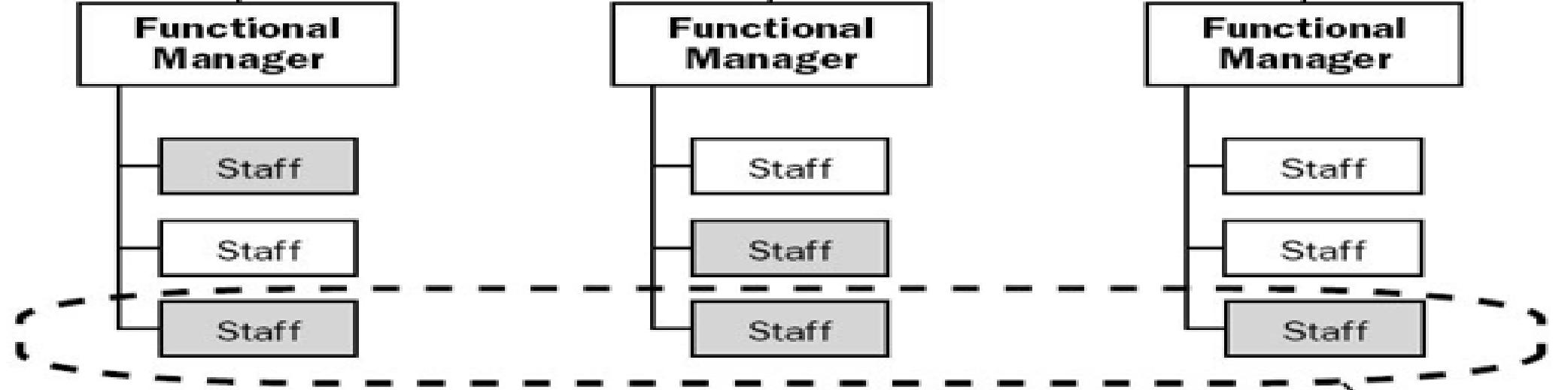
- Team members do

(project work)+(departmental work)



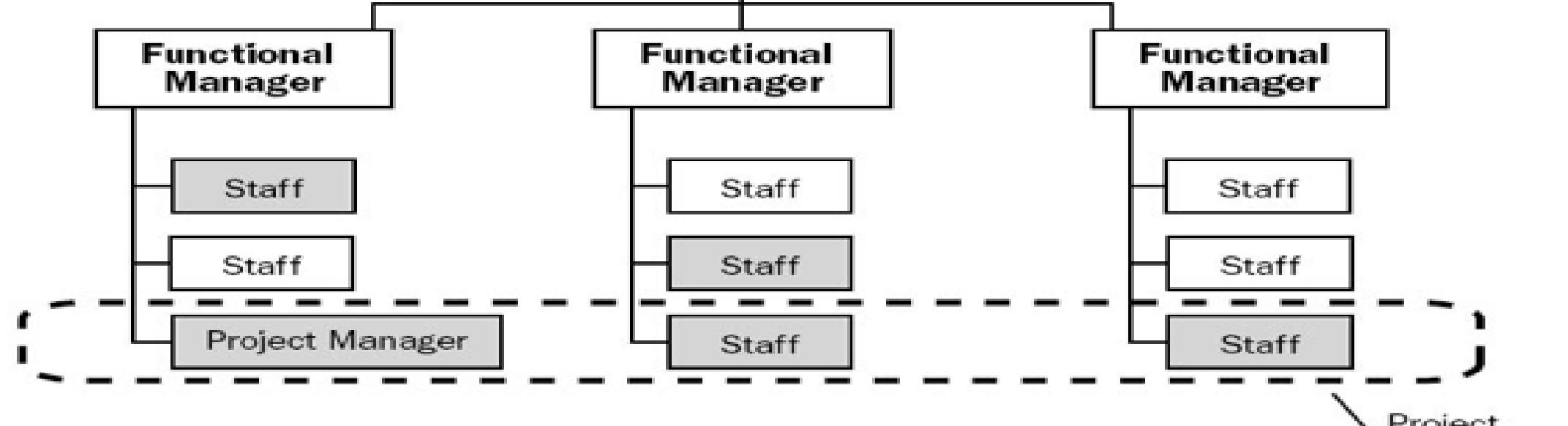
2.2 Matrix Organization and its Types

This is the blueprint example of a **weak Matrix Organization**. Here the staff with the gray background are assigned to projects and reporting mainly to the functional managers. Project coordination is done by the assigned staff, probably with the help of a project expediter or coordinator.



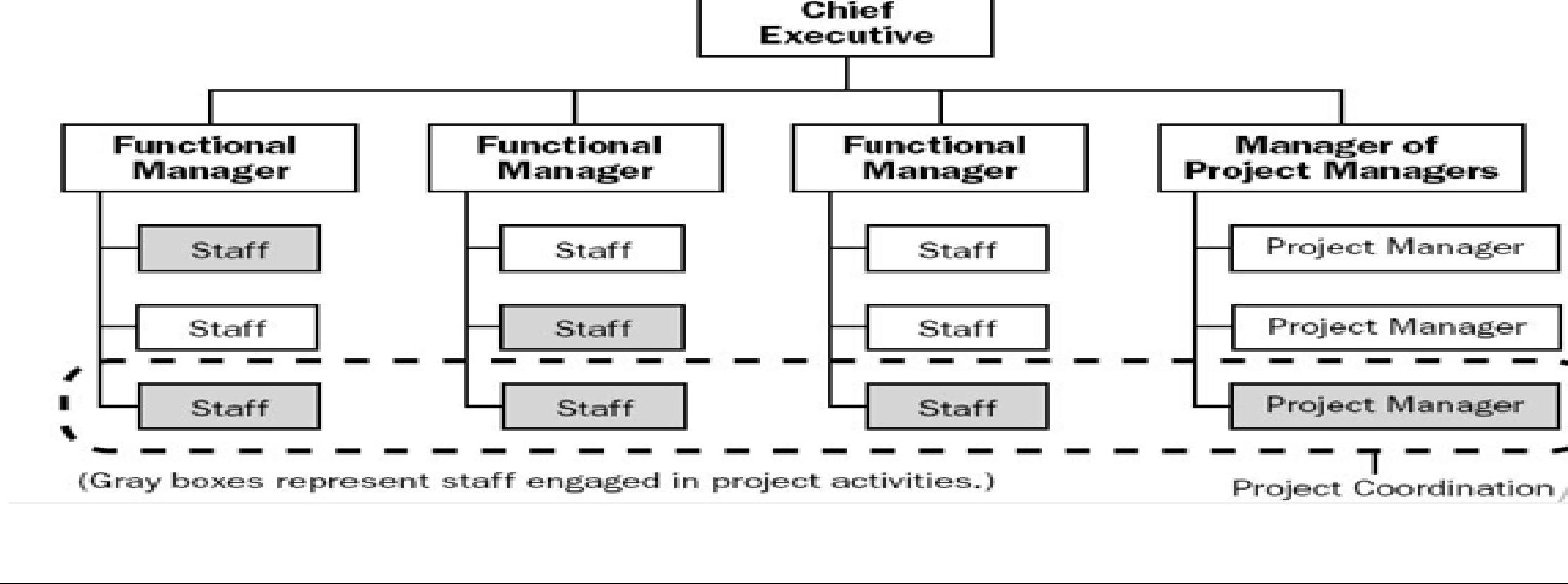
2.2 Matrix Organization and its Types

This is the blueprint example of a **balanced Matrix Organization**. Here, staff with the gray background are assigned to projects. Project resources, including the project manager, report to their functional manager. But project coordination is done with the control of project manager. Functional managers also have power and influence on their resources.



2.2 Matrix Organization and its Types

this is the blueprint example for a strong Matrix Organization. here the resources with the gray background belong to a [project team](#). Project Manager coordinates and manages these resources and project activities. The difference from the Balanced matrix is that the project managers report to the managers or project managers. For instance to the head of [project management office](#). On the other hand, in the balanced Matrix Organization, the project manager was reporting to a functional manager instead.



2.2 Matrix Organization and its Types

Advantages of a Matrix Organization Structure

- Highly skilled and capable resources can be shared between the functional units and projects, allowing more open communication lines which help in sharing the valuable knowledge within the organization.
- The matrix structure is more dynamic than the functional structure because it allows employees to communicate more readily across the boundaries, creating a good working and cooperative environment which helps in integrating the organization.
- Employees can learn and widen their skills and knowledge areas by participating in different kind of projects. The matrix structure provides a good environment for professionals to learn and grow their career.
- In functional departments employees are very skilled, and project teams can get these highly skilled employees whenever their services are needed.
- Since there is a sense of job security, employees tend to be loyal to the organization and perform well, and hence the efficiency of a matrix organization is higher.

2.2 Matrix Organization and its Types

Disadvantages of a Matrix Organization Structure

- Employees may have to **report to two bosses**, which adds confusion and may cause conflict. This usually happens in a balanced matrix organization where both bosses have equal authority and power.
- A **conflict** may arise between the **project manager** and the **functional manager** regarding the **authority and power**.
- If the priorities are not defined clearly, employees may be confused about their role and responsibility, especially when they are assigned a task which is different from what they were doing.
- If any resource is scarce there might be competition to use it, which may cause hostility within the workplace and could affect the operation.
- It is generally seen that matrix organizations have more managers than required, which make overhead cost high.
- In a matrix organization, workload tends to be high. Employees have to do their regular work along with the additional project related work, which exhausts them. It is also possible that the employee may ignore either his functional responsibilities or project management responsibilities.
- A matrix structure is expensive to maintain. Organizations have to pay extra to keep resources because not all resources will be occupied at all times. Some resources are needed only for a short duration.

2.2 Matrix Organization and its Types

How to Overcome the Disadvantages of a Matrix Organization Structure

- There must be close **cooperation between the project manager and the functional manager**. This will help avoid confusion and conflict.
- There should be **well defined and strong communication in all directions**. This is important to gain support from executives, managers, supervisors and employees. Organizations must communicate their vision, objective, and goal with their employees.
- There should be a **proper and balanced distribution of authority and power between the project manager and the functional manager**. Both managers should get the required power and authority. Any imbalance may impact the effectiveness of operations.
- Any conflict between the project manager and the functional manager must be **resolved** as early as possible, and in private.
- Roles and responsibilities must be clearly documented and communicated to employees to avoid confusion.

2.2 Matrix Organization and its Types

Project Characteristics	Organization Structure	Functional	Matrix			Projectized
			Weak Matrix	Balanced Matrix	Strong Matrix	
Project Manager's 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 the project budget	Functional Manager	Functional Manager	Mixed	Project Manager	Project Manager	
Project Manager's Role	Part-time	Part-time	Full-time	Full-time	Full-time	
Project Management Administrative Staff	Part-time	Part-time	Part-time	Full-time	Full-time	

	Functional	Projectized	Matrix
Career Path	Career path well defined in specialty	Career path in project management	
Client	Slow response to client		Quick response to client
Chain of Command	Team members report to one supervisor	Team members report to one PM	More than 1 boss for project teams
Communication	Cross-functional communication difficulties	More effective communications	Better horizontal & vertical info
Human Resources	Flexibility in staff use		More effort needed to acquire team
Loyalty	More loyal to specialty than project	Loyalty to the project	PMs have different priorities than PMs

Organization	Inefficient project organization	Efficient project organization	Better coordination
Project	Fragmented approach to project	Project is point of emphasis	Careful monitoring of projects required
SMEs	Easier management of specialists	Lack of specialization in disciplines	
PM authority	PM has little or no authority	PM has great deal of authority	Project objectives visible to organization
Resources	Similar resources are centralized	Less efficient use of resources	Better firm-wide balanced of resources
Stability	Team members maintain a "home"	No "home" when project done	
Technology	Technological continuity (resources)		Access to reservoir of technical talent

Chapter 2

2.	Project Organization and Project Life Cycle	2 hrs
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2.3 Organizational Structures Influence on Projects

- Projects are typically part of an organization larger than the project.
- The organizational culture, style, and structure influence how projects are performed.
- A project manager should understand these as they affect a project.
- Projects are influenced by the organization(s) that initiated it.
- Maturity of the organization with respect to its project management system, culture, style, organizational structure and PMO can influence the project.

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2.3 Organizational Structures Influence on Projects

- **Organizational Cultures and Styles**
 - Cultures and styles may have a strong influence on a project's ability to meet its objectives.
 - Cultures and styles are typically known as "cultural norms"
 - The "norms" include [Or What do the cultural norms include?]
 - a common knowledge regarding how to approach getting the work done,
 - what means are considered acceptable for getting the work done, and
 - who is influential in facilitating the work getting done.
 - The project manager must know which individuals in the organization are the decision makers and work with them to influence project success.

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2.3 Organizational Structures Influence on Projects

- Most organizations have developed unique cultures that manifest in numerous ways including, but not limited to:
- Shared visions, values, norms, beliefs, and expectations,
- Policies, methods, and procedures,
- View of authority relationships, and
- Work ethic and work hours.

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Chapter 2

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2.4 Project Team

- Group of the people working together to achieve the organization goal.
- Human resource-related processes is in the executing process group, and it is used to develop the group of individuals assembled as the team members for project and to get them to work together as a team.

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2.4 Project Team

General Role	Specific Role	Role Description
Expertise	1. Project Management Staff	Perform project management activities such as scheduling, budgeting, reporting and control, risk management. PMO supports this role.
	2. Project Staff	Perform the executing of the project to create project deliverables.
	3. Supporting experts (SMEs)	Perform activities to either plan or execute the project that are of a technical nature (legal, quality control, safety, logistics, etc.).
Liaison	4. User/Customer	Liaison with user/customer to ensure proper delivery and validation of deliverables.
	5. Seller/Supplier	Liaison with seller/supplier to ensure timely receipt and acceptance of deliverables.
	6. Business partner	Liaison with business partners who provide specialized expertise or role in project (installation, training, customer support).

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2.4 Project Team

• Inputs:

- The tools & techniques are a varied lot, from skills on how to handle team members (*interpersonal skills* and *personnel assessment tools*), the guidelines for team member behavior (*ground rules*) and their physical environment (*colocation*), to training them individually (*training*) and as a group (*team-building activities*). Also included are ways to encourage team members to work towards the project goals (*recognition and rewards*).

• Outputs:

- The team performance assessments are not the same as individual performance evaluations, but evaluations of how well the team works together. Any training that members receive either as individuals or as a group should be recorded in their training records.

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2.4 Project Team

INPUTS		
1.	Human Resource Management Plan	The portion of the human resource management plan that is used in this process is the one that identifies training strategies and plans for developing the project team
2.	Project staff assignments	This is an output of the last process 9.2 Acquire Project Team: it tells who is going to be on the project, and what their roles and responsibilities will be.
3.	Resource calendars	This is an output of the last process 9.2 Acquire Project Team: it tells when the team members are going to be available to do team development activities.

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2.4 Project Team

TOOLS & TECHNIQUES

1.	Interpersonal skills	These are the so-called “soft skills” such as communication skills, emotional intelligence, conflict resolution, negotiation, influence, team building, and group facilitation.
2.	Training	Activities designed to enhance the competencies of team members.
3.	Team-building activities	This is crucial to the success of the project. Typical models for team building include the Tuckman ladder (see separate post).
4.	Ground rules	Clear guidelines for acceptable behavior by team members stated at the beginning of the project can reduce misunderstandings from happening on the project itself.

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2.4 Project Team

5.	Colocation	Placing the most active project team members in the same physical location, either temporarily at the beginning of the project or for the entire project.
6.	Recognition and rewards	Recognizing and rewarding desirable behavior tells team members that they are valued by their organization and in particular by their project team.
7.	Personnel assessment tools	Gives insight into strengths and weaknesses of team members.

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2.4 Project Team

OUTPUTS		
1.	Team performance assessments	This is an assessment not of the individuals on the project team, but how they work together as a team.
2.	EEFs updates	The training that goes on to develop the team should be noted in the employees' training records.

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Chapter 2

- | | | |
|------|--|-------|
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| 2.5. | Project Life Cycle and Phases | |

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2.5 Project Life cycle and Phases

- Organization performing projects will usually divide **each Project** into **several project phases** to improve the management control and provide for links to the ongoing operations of the performing organizations.
- **Collectively Project Phases** are known as **project cycle**.
- Each project phase is marked by completion of one or more deliverables.
- Deliverables are tangible , verifiable work product such as feasibility study, a detail design, or working prototype which defines the product of project.
- The end or conclusion of the project phase are generally marked by a review of both key deliverables and project performance to date , to a) determine if the project should continue its next phase b) detect and correct errors cost effectively. These phase end reviews are often called as phase exits, state gates, or kill points.

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2.5 Project Life cycle and Phases

- A **project life cycle** is a collection of project phases that defines:
 - What work will be performed in each phase.
 - What deliverables will be produced and when.
 - Who is involved in each phase.
 - How management will control and approve work produced in each phase.
- A **deliverable** is a product or service produced or provided as part of a project.

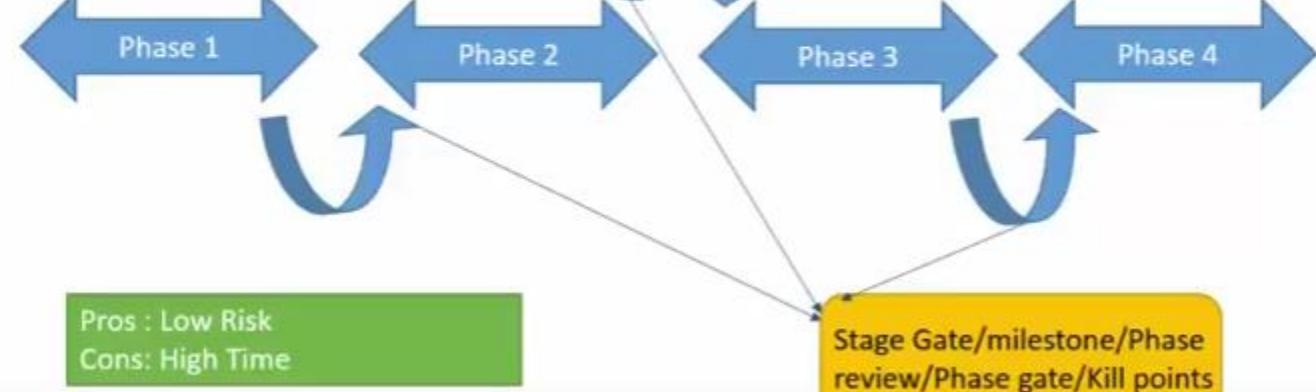
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2.5 project life cycles and phases

- Phases:
 - Sequential
 - Overlapping
 - parallel

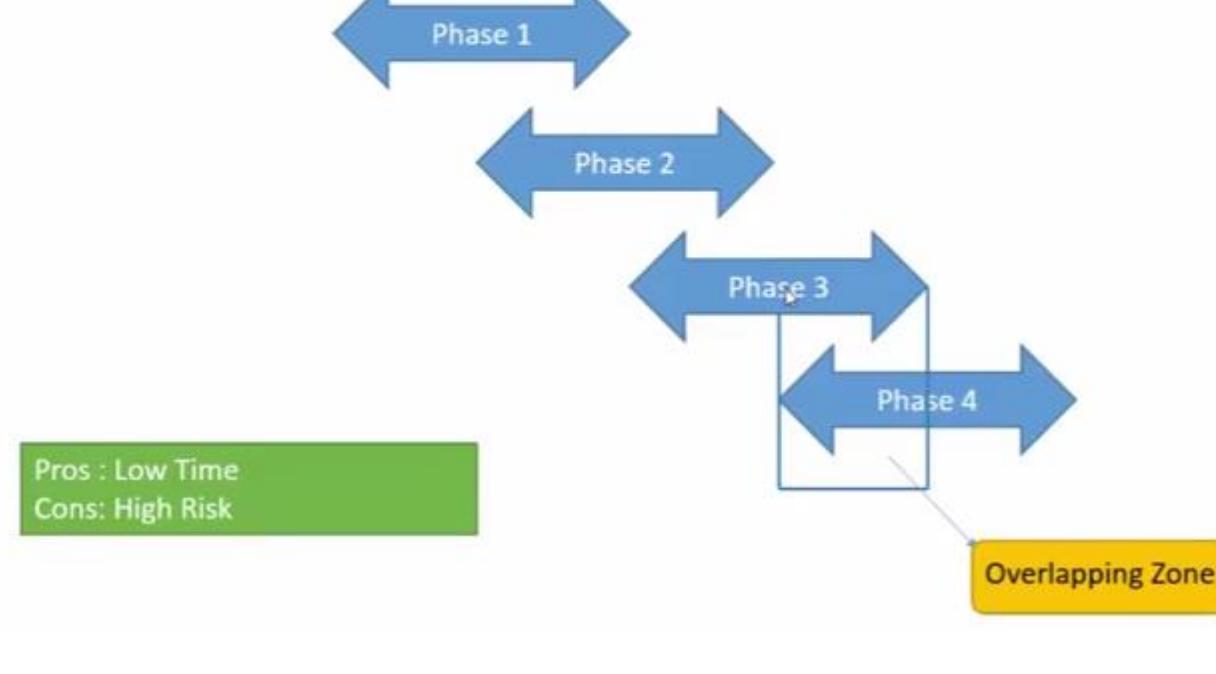
2.5 project life cycles and phases

Sequential phase relationship in a project.



2.5 project life cycles and phases

Overlapping relationship phase



2.5 project life cycles and phases

Parallel relationship phase



2.5 project life cycles and phases

Project life Cycle

3 Types of Project Life cycles (based on PMBOK5)

1. Predictive Life Cycle or Fully Plan Driven or Waterfall
2. Iterative & Incremental
3. Adaptive or Change Driven or Agile

2.5 project life cycles and phases

- Predictive:

- Used where the scope is well known.
- So go through series of phases and the end to deliver the product.
- E.g waterfall model

- Iteration

- Two iteration
- Two deliverables (version 1 and version 2)
- Inside the iteration there might be phases of water fall model
- First iteration or first version is the planning for next iteration. The feedback from first iteration is the input for the next iteration.

2.5 project life cycles and phases

- Adaptive:
 - Division of iteration into size of time like in week(1 to 4).
 - Have collection of requirement and develop them in small sizes rather doing in phases.
 - Each phases are executed in parallel in allocated time period of like 1 week.
 - Used when there is more uncertainties.

Questions

1. Differentiate Strong, weak and balanced organisation structure.
2. Differentiate Functional, projectized and matrix organisation structure.
3. How organisational structure can influence project?
4. Discuss advantages and disadvantages oforganisation structure
5. Explain Project life cycle and its phases in detail.

- Thankyou!!

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Chapter 3

- 3.1 Project Management Process 2hrs
- 3.2 Roles of major Knowledge areas on Processes
- 3.3 Understanding organizational Process Assets
- 3.4 Understanding Enterprise Environment Factor

Chapter 3

- | | |
|---|------|
| • 3.1 Project Management Process | 2hrs |
| • 3.2 Roles of major Knowledge areas on Processes | |
| • 3.3 Understanding organizational Process Assets | |
| • 3.4 Understanding Enterprise Environment Factor | |

2

3.1 Project Management Process

- Project are composed of process.
- Process is series of action bringing results.
- PMP helps in executing process well.
- PM is applying knowledge, skills, tools and techniques so that project can be managed effectively.
- We apply knowledge and skills using PMPs.
- As a project manager job begins with selecting right amount of processes
- PM filters / Determine which are relevant processes for the project.

3

3.1 Project Management Process

- This process of filtering the appropriate process is also called tailoring.
- Then process obtained after filtering is further divided into two types:
 - Project Management process:
 - Product Oriented Process

4

3.1 Project Management Process

- Project Management Process:
 - Describes , organize and complete the work of project. This process of filtering the appropriate process is also called tailoring.
 - Are defined in PMBOK
 - Constitutes good practices.
 - Applied across industries where process are relevant to each other.
 - As PMBOK there are 47 processes.

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3.1 Project Management Process

- Product Oriented Process:

- Specify and create project's product.
- Are not defined in PMBOK
- Are industries specific.
- Typically defined by the project life cycle.
- Process used for one industry is not relevant to another.
- Necessary for successful project management.

6

3.1 Project Management Process

- PM must have information about the combination of both PMPs. (Project Management Process + Product Oriented Process)
- Both overlap and interact through out the project.
- The scope of project cannot be defined in the absence of some basic understand of how to create the product.

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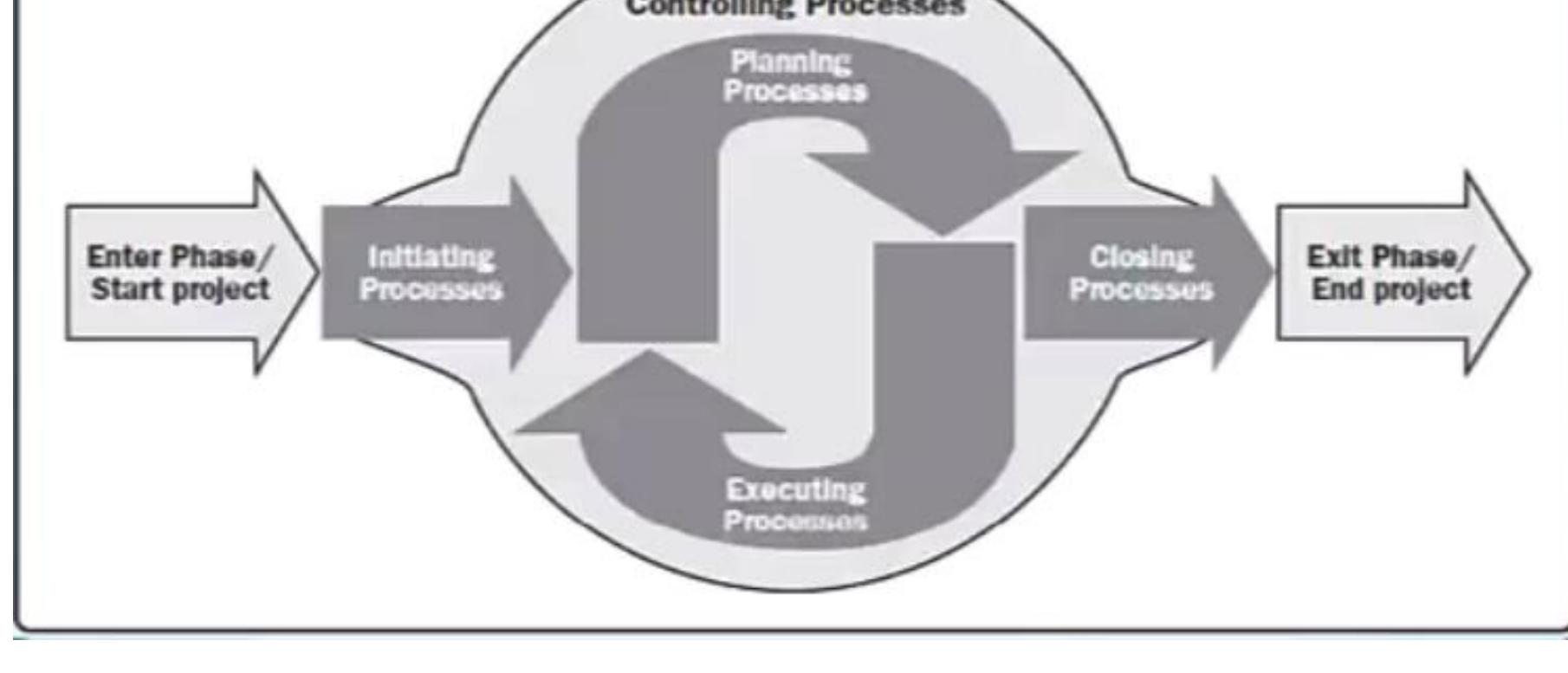
3.1 Project Management Process

- Project Management process are futher categorized into five groups:

- Initiating processes
- Planning processes
- Executing processes
- Monitoring and controlling processes
- Closing processes

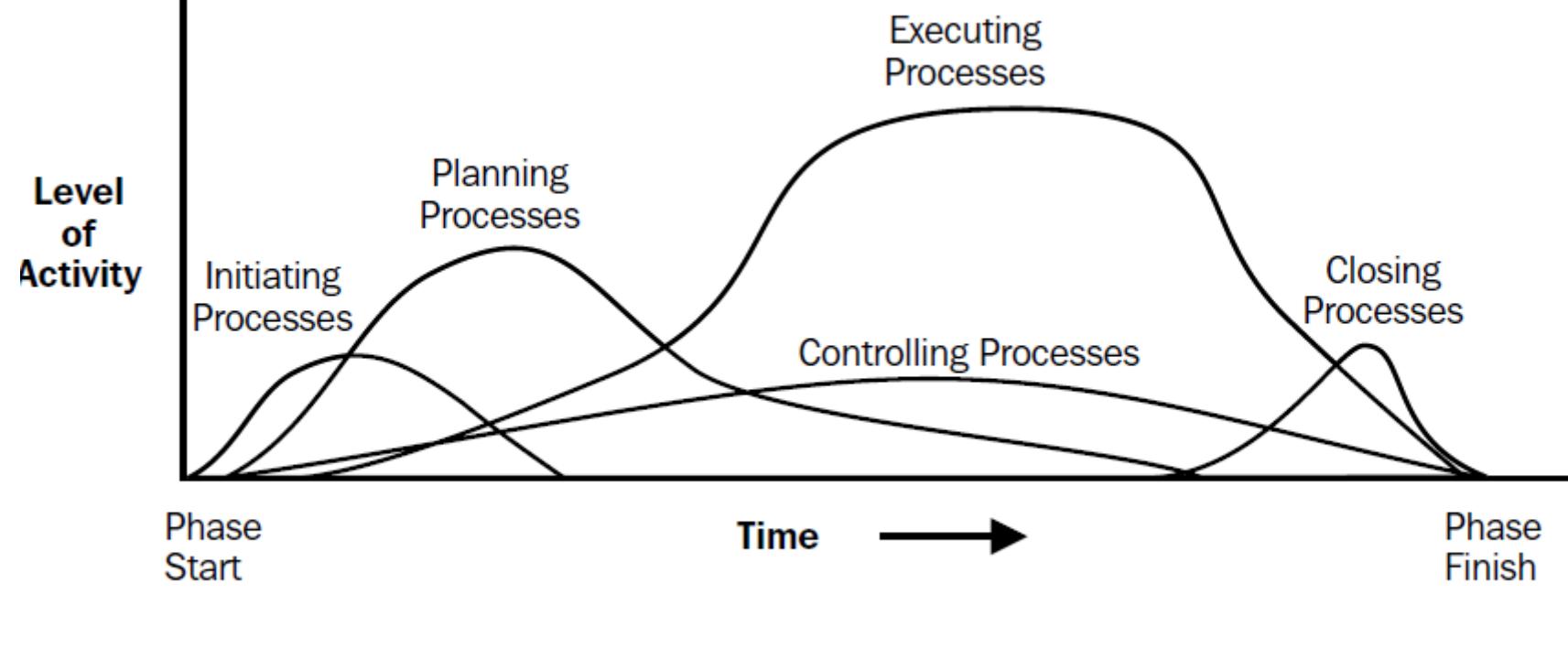
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3.1 Project Management Process



9

3.1 Project Management Process



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3.1 Project Management Process

- These process groups are sequential but not the process cycle.
- These define the process groups but life cycle doesn't defines the process group.
- The project begins at the initiating phase.
- Then planning and execution (work) occurs.
- Then project ends.
- But the monitoring activities are running through out the project i.e from start to end.
- Considering predictive life cycle, initially at starting phase, i.e initiating phase , the project starts with use of many efforts and then it goes down and at the same time planning also starts with more efforts and resources and after about 60 to 80 percent it slowly reduces.

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3.1 Project Management Process

- In case of project execution, it starts and goes high at the mid of the project planning and then goes down.
- In case of monitoring the , it is rigorous to all the process group in the project.
- At the end the project is closed and it occurs at the end of project process groups.
- In case of iterative life cycle, there will be different cycle of predictive cycle.

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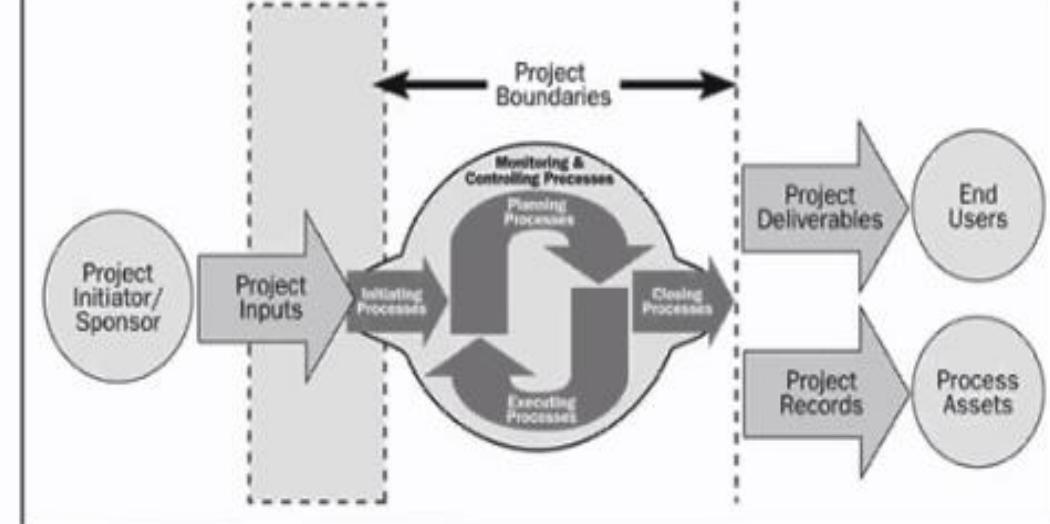
3.1 Project Management Process

- **Initiating processes:**
 - Initiating a project includes recognizing and starting a **new project** or **new project phase**.
 - The main goal is to formally select and start off projects.
 - Every organization has its own variations of what documents are required to initiate a project. It's important to identify the project need, stakeholders, and main goals.
- **Key outputs include:**
 - Assigning the project manager.
 - Identifying key stakeholders.
 - Completing a business case.
 - Completing a project charter and getting signatures on it.

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3.1 Project Management Process

- Performed to define **new project or new phase** of an existing project by obtaining authorization to start the project or phase
- When Project charter is approved, the project is officially authorized
- Two major processes are involved during initiation process groups.
 - ❖ Develop Project Charter
 - ❖ Identify Stakeholders



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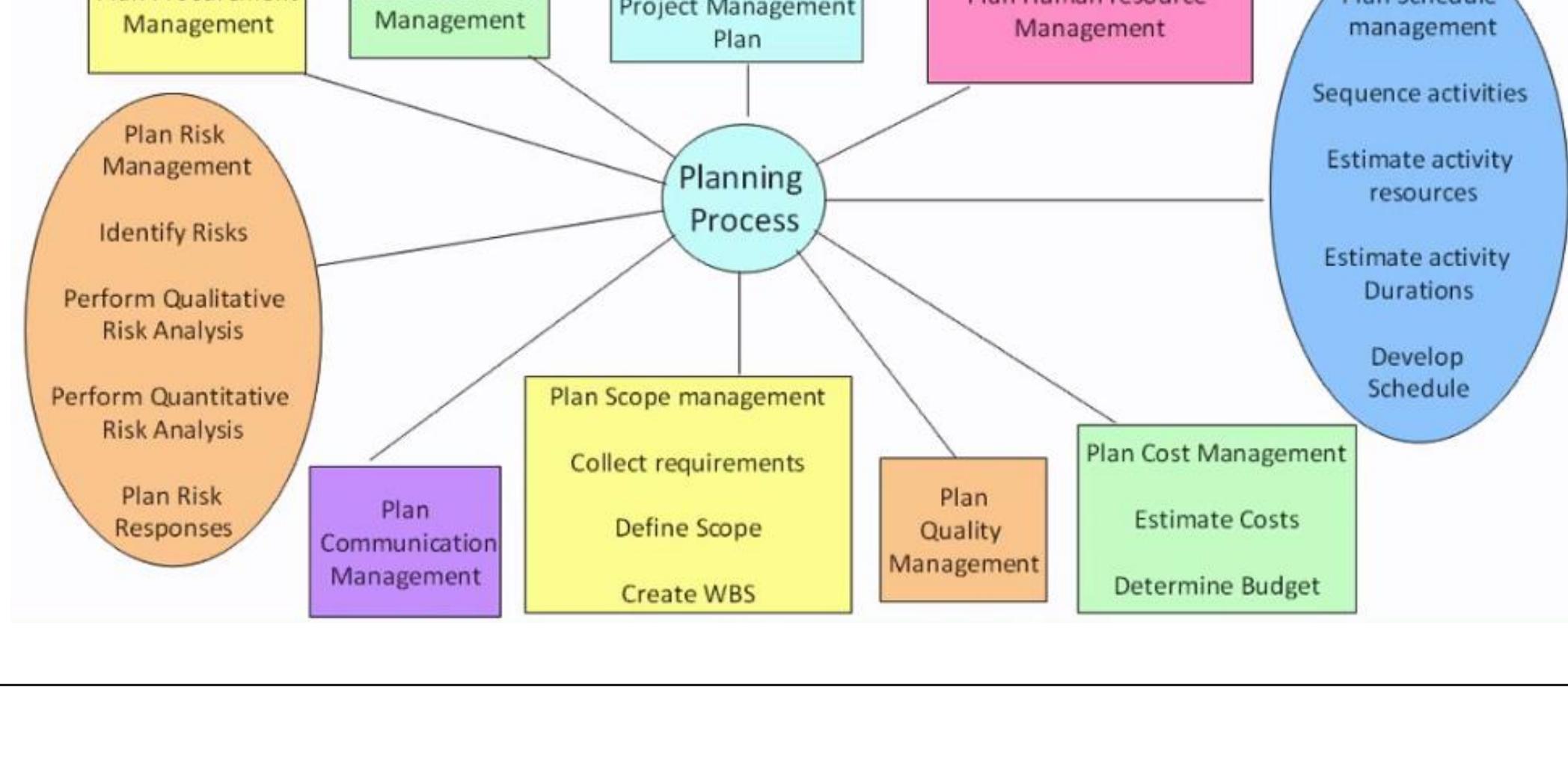
3.1 Project Management Process

- Project Planning Process:
 - The main purpose of project planning is to **guide execution**.
 - Every knowledge area includes planning information
 - Key outputs include:
 - A team contract.
 - A scope statement.
 - A work breakdown structure (WBS).
 - A project schedule, in the form of a Gantt chart with all dependencies and resources entered.
 - A list of prioritized risks.
 - This phase is key to successful project management and focuses on **developing a roadmap** that everyone will follow. This phase typically begins with setting goals. Two of the more popular methods for setting goals are S.M.A.R.T.

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3.1 Project Management Process

- Project Planning Process:



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3.1 Project Management Process

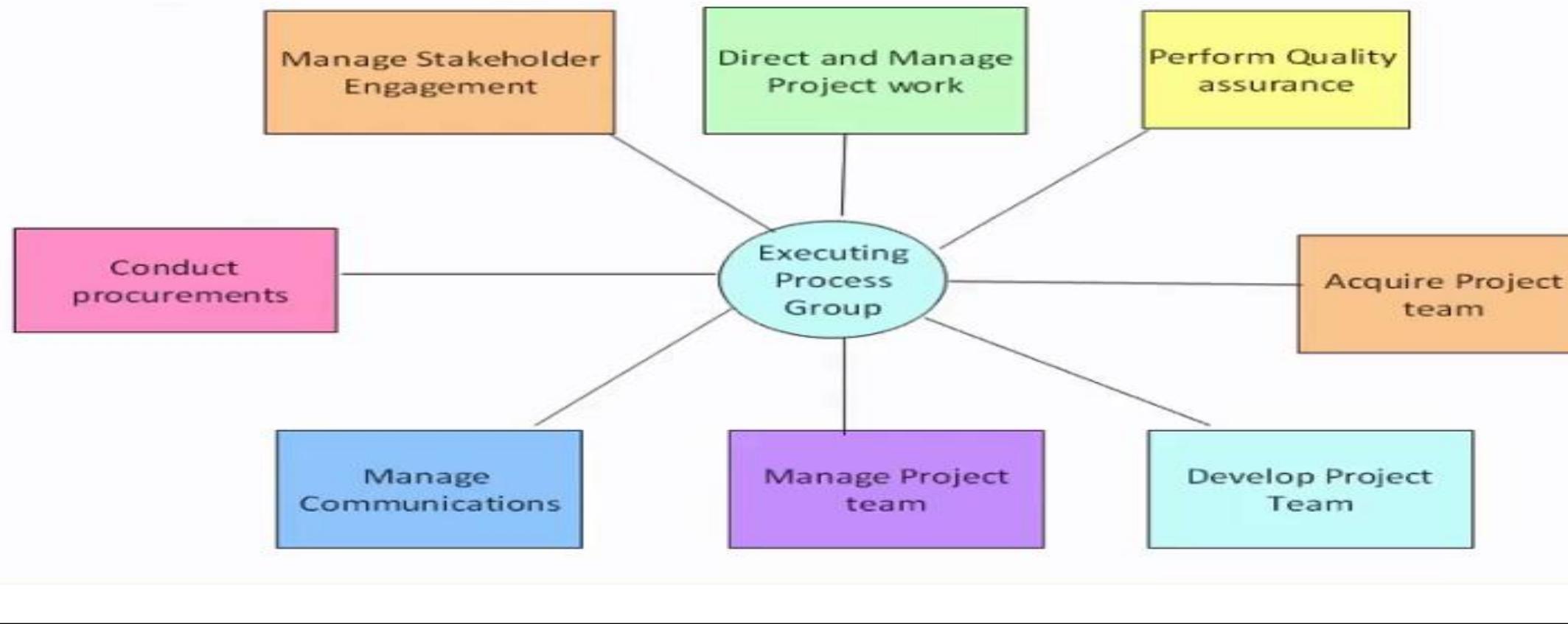
- Project Execution Process:
 - Project execution usually takes the most time and resources.
 - Project managers must use their leadership skills to handle the many challenges that occur during project execution.
 - Many project sponsors and customers focus on deliverables related to providing the products, services, or results desired from the project.
 - A milestone report can keep the focus on completing major milestones.

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3.1 Project Management Process

- Project Execution Process:

- Consists of those processes performed to **complete the work defined in the project management plan** to satisfy the project specifications
- Involves coordinating people and resources, managing stakeholder expectations, as well as integrating and performing the activities of the project in accordance with the project management plan



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3.1 Project Management Process

- Project Monitoring and Controlling Process:

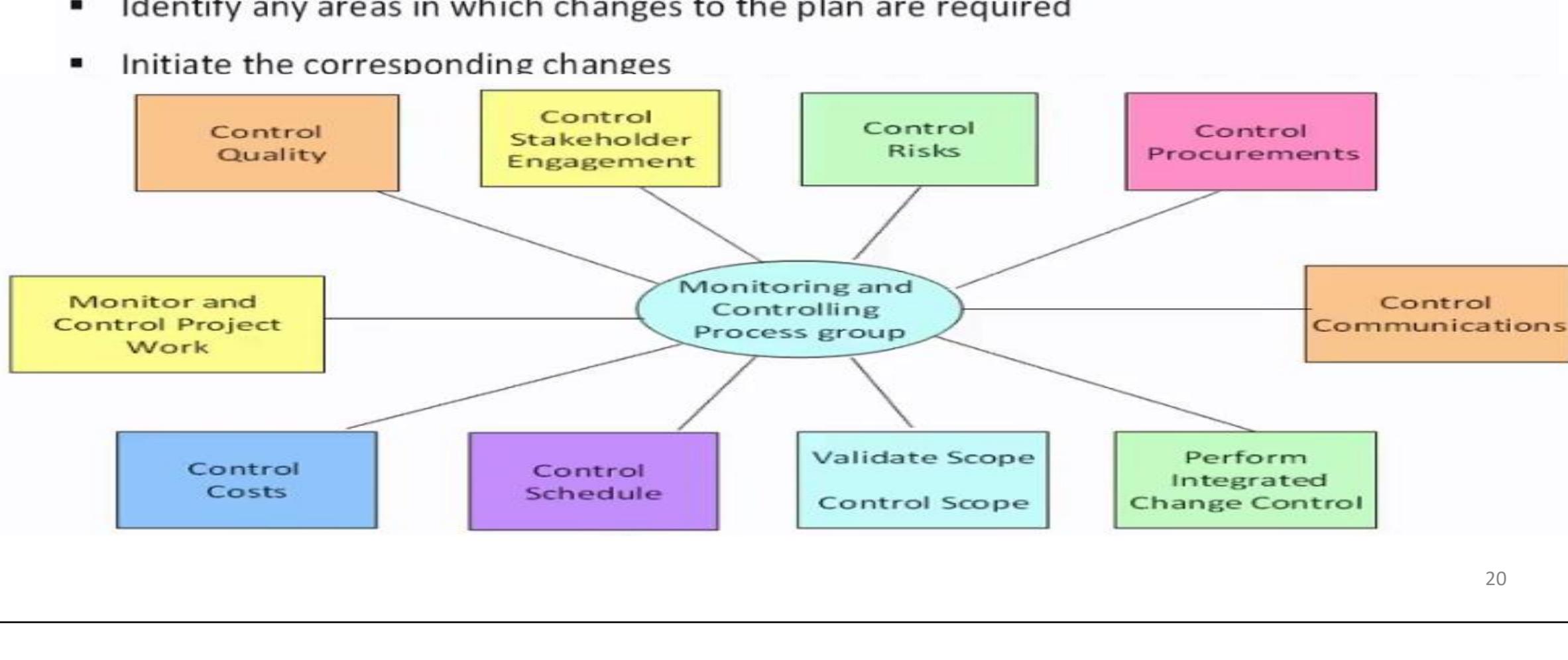
- Involves **measuring progress toward project objectives**, monitoring deviation from the plan, and taking corrective action to match progress with the plan.
- Affects all other process groups and occurs during all phases of the project life cycle.
- Outputs include performance reports, requested changes, and updates to various plans.

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3.1 Project Management Process

- Project Monitoring and Controlling Process:

- Consists of those processes required **to track, review, and orchestrate the progress and performance of the project**
- Identify any areas in which changes to the plan are required
- Initiate the corresponding changes



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3.1 Project Management Process

- Project Closing Process:

- Involves gaining stakeholder and customer **acceptance of the final products and services**.
- Even if projects are not completed, they should be formally closed in order to reflect on what can be learned to improve future projects.
- Outputs include project archives and lessons learned, which are part of organizational process assets.
- Most projects also include a final report and presentation to the sponsor or senior management.

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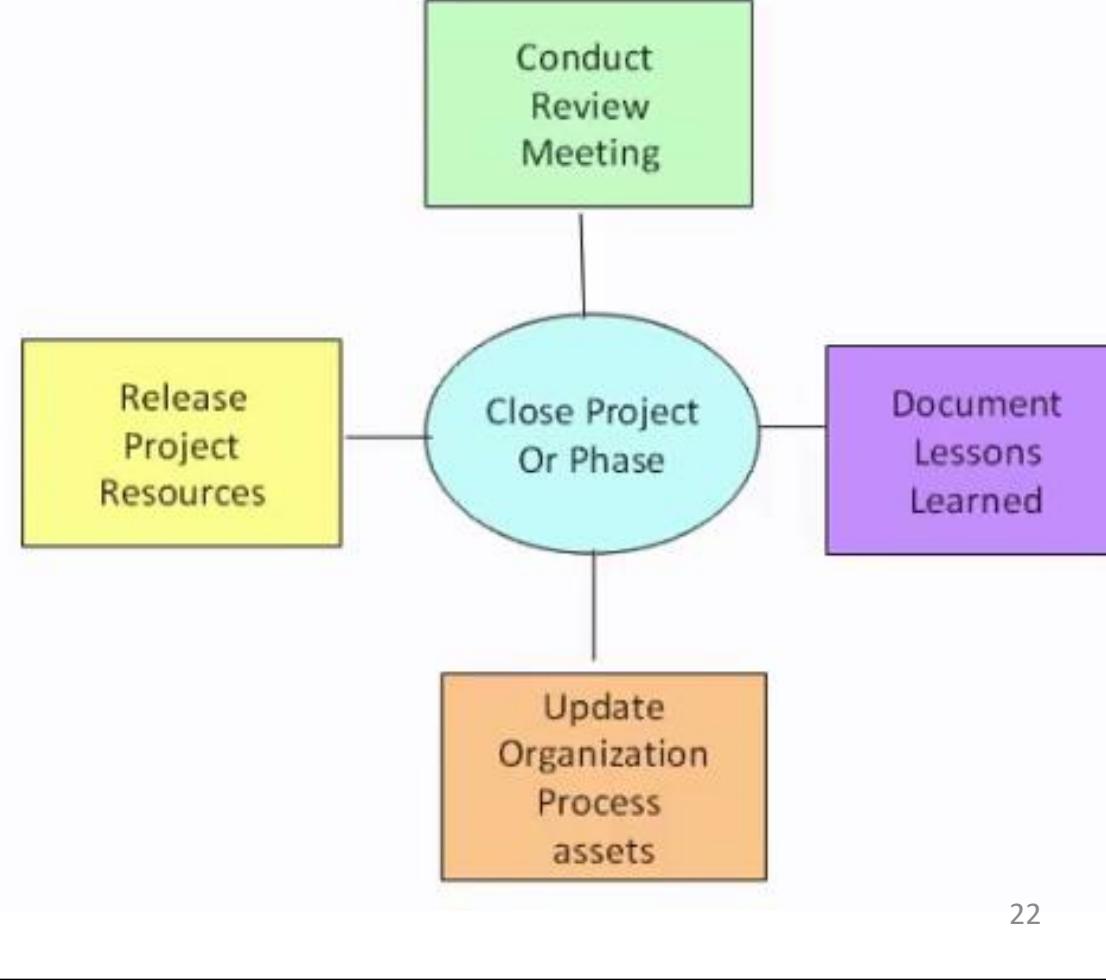
3.1 Project Management Process

- Project Closing Process:

Consists of those processes performed to conclude all activities across all Project Management Process Groups to formally complete the project, phase, or contractual obligations

At project or phase closure, the following may occur:

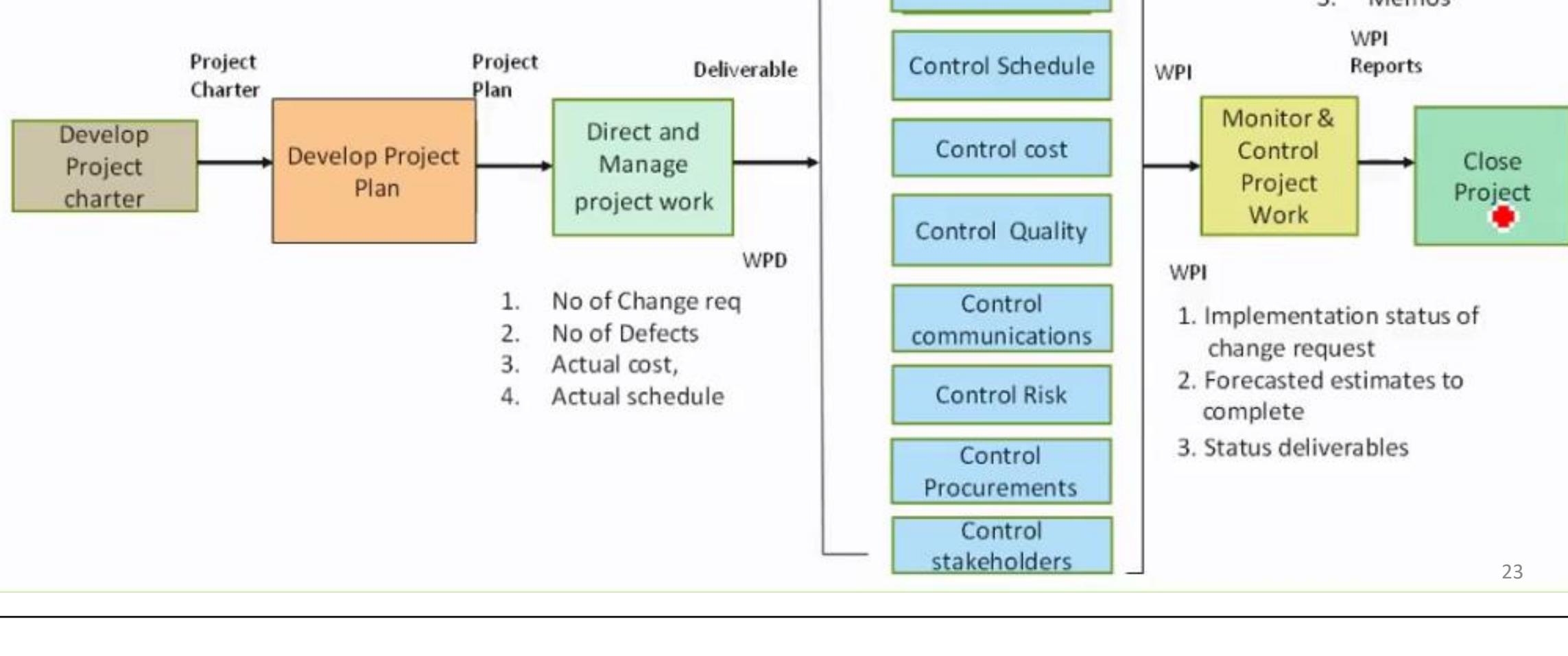
- Obtain acceptance by the customer or sponsor to formally close the project or phase
- Conduct post-project or phase-end review
- Record impacts of tailoring to any process
- Document lessons learned
- Apply appropriate updates to organizational process assets



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3.1 Project Management Process

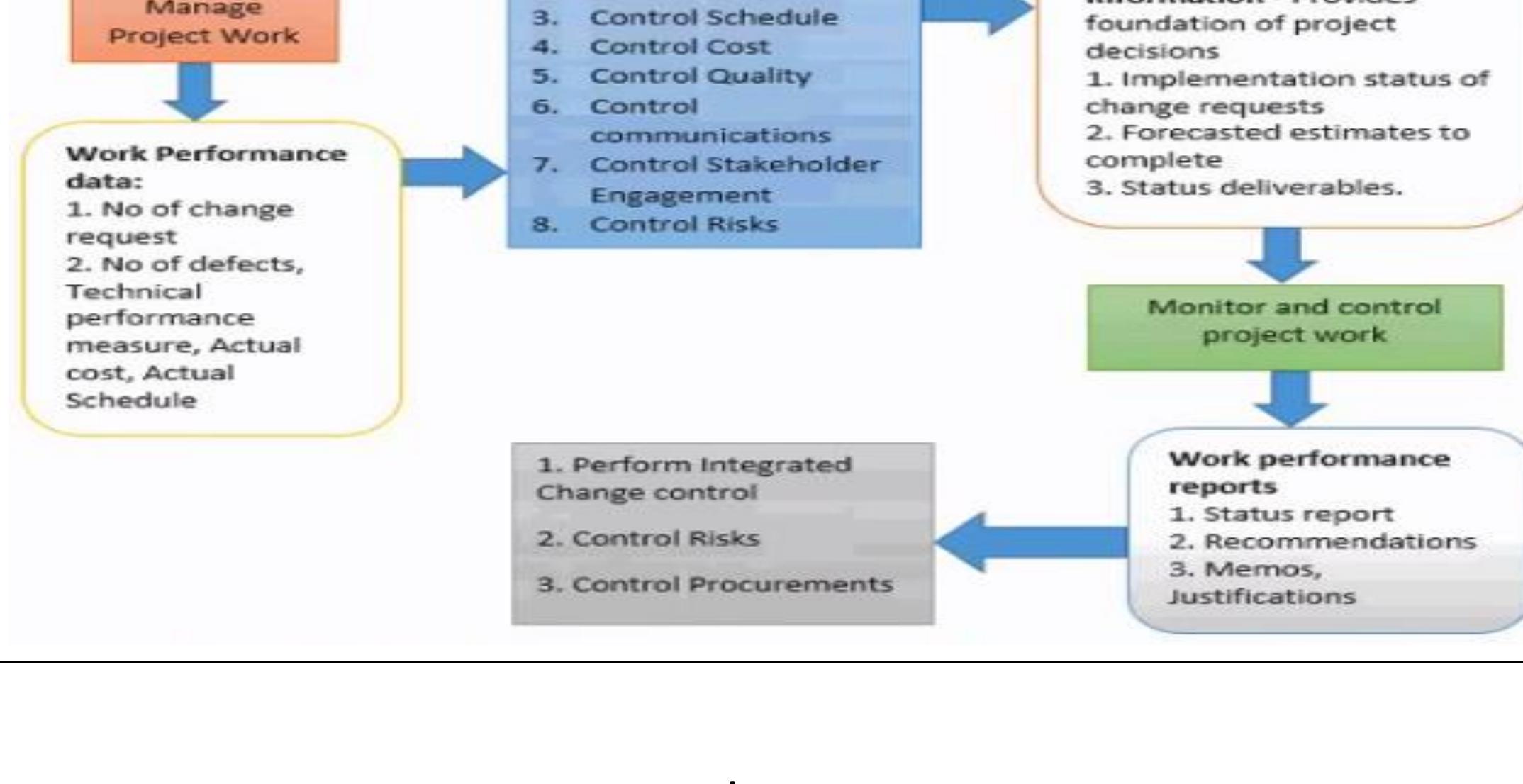
Logical sequence



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3.1 Project Management Process

Difference between WPD and WPI



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Chapter 3

- 3.1 Project Management Process
- 3.2 Roles of major Knowledge areas on Processes
- 3.3 Understanding organizational Process Assets
- 3.4 Understanding Enterprise Environment Factor

2hrs

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3.2 Roles of major Knowledge areas on Processes

- In PMBOK, there are ten knowledge areas (KA).
- Knowledge areas represent specialized skilled activities.
- For e.g. in project scope management, these KA represent all the process management which are dealing with defining and managing scope.
- These 10 KA represent specialized areas,
- Project integration management talks about integration of output of rest of KA processes.

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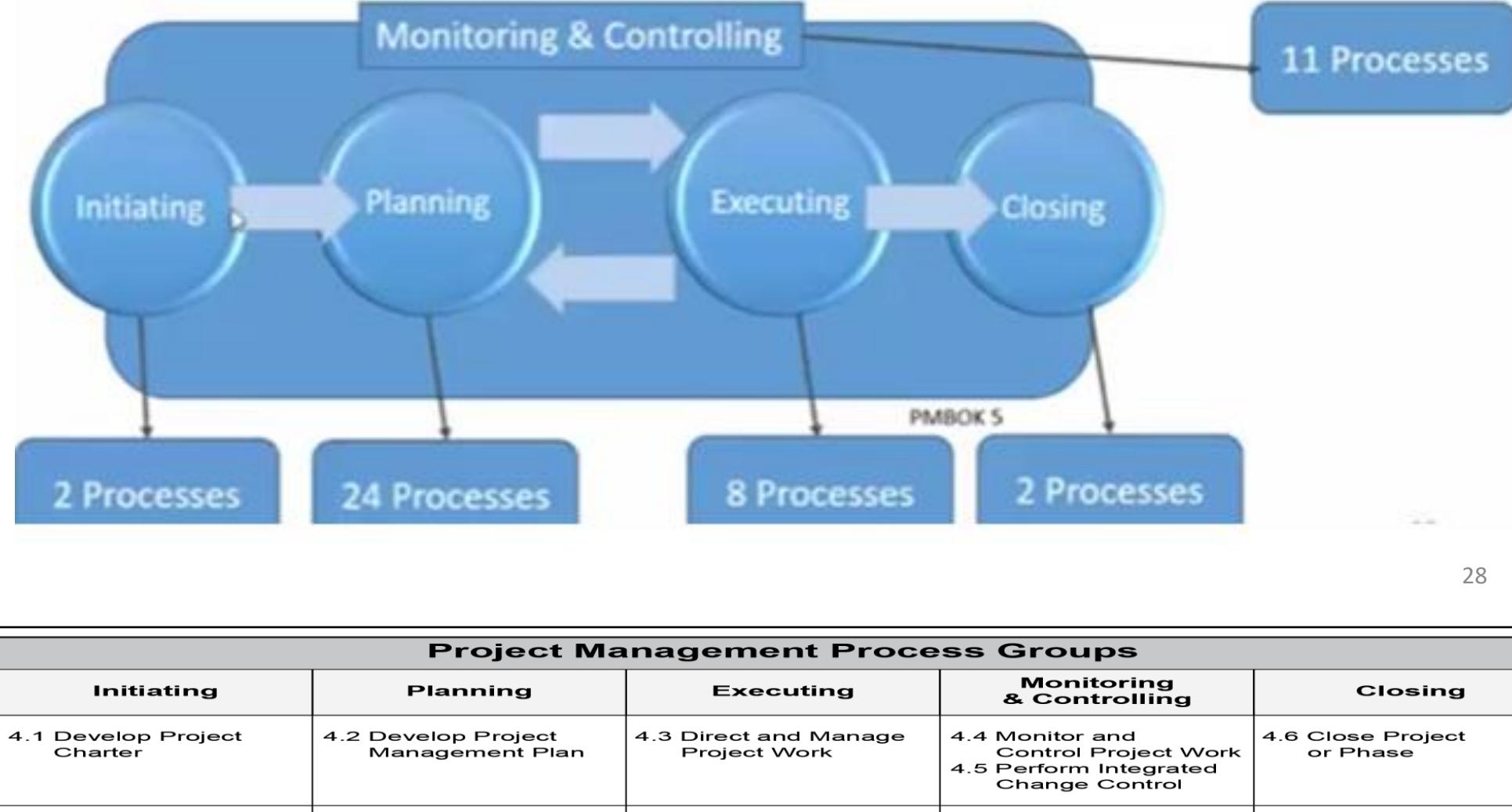
3.2 Roles of major Knowledge areas on Processes

The ten knowledge areas of project management are given below:

- Project Integration Management
- Project Scope Management
- Project Time Management
- Project Cost Management
- Project Quality Management
- Project Human Resources Management
- Project Communications Management
- Project Risk Management
- Project Procurement Management
- Project Stakeholder Management

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3.2 Roles of major Knowledge areas on Processes



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Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project team		
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

3.2 Roles of major Knowledge areas on Processes

KNOWLEDGE AREA		PROJECT MANAGEMENT PROCESS GROUPS				
		INITIATING	PLANNING	EXECUTING	MONITORING & CONTROLLING	CLOSING
Project Integration Management		Develop project charter, Develop preliminary project scope statement	Develop project management plan	Direct and manage project execution	Monitor and control project work, Integrated change control	Close project
Project Scope Management			Scope planning, Scope definition, Create WBS		Scope verification, Scope control	
Project Time Management			Activity definition, Activity sequencing, Activity resource estimating, Activity duration estimating, Schedule development		Schedule control	
Project Cost Management			Cost estimating, Cost budgeting		Cost control	

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3.2 Roles of major Knowledge areas on Processes

KNOWLEDGE AREA		PROJECT MANAGEMENT PROCESS GROUPS				
		INITIATING	PLANNING	EXECUTING	MONITORING & CONTROLLING	CLOSING
Project Quality Management			Quality planning	Perform quality assurance	Perform quality control	
Project Human Resource Management			Human resource planning	Acquire project team, Develop project team	Manage project team	
Project Communications Management			Communications planning	Information distribution	Performance reporting, Manage stakeholders	
Project Risk Management			Risk management planning, Risk identification, Qualitative risk analysis, Quantitative risk analysis, Risk response planning		Risk monitoring and control	
Project Procurement Management			Plan purchases and acquisitions, Plan contracting	Request seller responses, Select sellers	Contract administration	Contract closure

PMBOK® Guide 2004, p. 69

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3.2 Roles of major Knowledge areas on Processes

KNOWLEDGE AREA		PROJECT MANAGEMENT PROCESS GROUPS				
		INITIATING	PLANNING	EXECUTING	MONITORING & CONTROLLING	CLOSING

Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement		
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Chapter 3

- 3.1 Project Management Process 2hrs
- 3.2 Roles of major Knowledge areas on Processes
- 3.3 Understanding organizational Process Assets
- 3.4 Understanding Enterprise Environment Factor

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3.3 Understanding organizational Process Assets

- Assets:
 - a useful or valuable thing or property owned by a person or company, regarded as having value and available to meet debts, commitment, or legacies.
 - Simply assets are something that you can own, keep and make use of. For example, you can have a car which helps you move around, you can have a house to live in, a computer to work on, etc. This list is endless and these things are called assets.
- In the same way, organizations also have assets which help them in achieving their objectives.
- Here these assets are called organizational process assets (OPA). These organizational process assets are kept in some central repository so that they can be used whenever required by anyone.

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3.3 Understanding organizational Process Assets

- Organization process assets can be divided into two categories.
- The first category is for processes and procedures for conducting work, which includes the following:
 - Policies
 - Procedures
 - Standard template
 - General guidelines
- The second category includes corporate knowledge base for storing and retrieving information. For example:
 - Risk register
 - Lessons learned
 - Stakeholder register
 - Past project files
 - Historical information

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3.3 Understanding organizational Process Assets

- These organizational process assets influence the project success, and they keep growing as the organization gets larger.
- For example, let's say that you're in the identify risks process and are identifying the risks. You decide to start identifying risks by using the check list.
- Are you going to create this check list from scratch or will you look in any similar past project records to find it out?
- Of course you will go for the second option and find the risk check list from the previous records and customize it as per your project requirements. This will save you a lot of time.
- In project management, a very famous saying is "why re-invent the wheel", which means if you have something available to you, you don't have to remake it again.
- Organizational process assets are used extensively in project management. It is the responsibility of the project management team to look for any relevant documents in historical records before starting to build something from the beginning.

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Chapter 3

- 3.1 Project Management Process 2hrs
- 3.2 Roles of major Knowledge areas on Processes
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- 3.4 Understanding Enterprise Environment Factor

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3.4 Understanding Enterprise Environment Factor

- The environment can be defined as something related to the natural world and the impact of human activity on its condition, or the culture that an individual lives in, and the people and institutions with whom they interact (Wikipedia).
- The point is, the environment is a condition in which we have live with and it influences our behavior in certain way.
- For example, in cold weather we need to wear woolen clothes to keep ourselves warm. Here, the cold weather is the “environment” which forces us to cover ourselves with woolen clothes.
- This is the impact of this cold environment on us.

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3.4 Understanding Enterprise Environment Factor

- Likewise, the enterprise environmental factors influences the organization, the project and its outcome. Every organization has to live and work within the EEF.
- The enterprise environment factor can be either **internal or external**.
- Examples of **external** enterprise environmental factors are as follows:
 - Government regulation
 - Market conditions
 - Infrastructure
 - External political conditions
- And the following are a few examples of **internal** enterprise environmental factors:
 - Organizational culture
 - Type of organizational structure
 - Internal political conditions
 - Available resources

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3.4 Understanding Enterprise Environment Factor

- Organizational process **assets help organizations** to continuously improve their process, and help project management teams to learn and share the best practices by using a collective knowledge base. On the other hand, enterprise environmental factors **may or may not help your organizations**. These are the conditions in which your organization has to work. These do not fall under the control of the project management team. For example, if the government increases taxes, it will hurt your profit; however, if they decrease taxes, it will increase your profit.
- The other difference is that **it is not easy to change** the enterprise environmental factors; you have to live with them. On the other hand, **OPA can be customized** according to the suitability, and they make the project management team’s life much easier.
- The key point is that organizational process assets always support the project team, while enterprise environmental factors can sometimes help the project and other times may hurt it as well.

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3.4 Understanding Enterprise Environment Factor

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Questions

1. Discuss process groups of project management with necessary diagrams.
2. Compare Deming's business process model and PMBOK project process model with necessary diagram.
3. Describe EEF and OPA in detail.
4. What is project management plan? Explain.
5. Explain change control with examples.
6. Justify the statement :“PMBOK has organized 47 processes into knowledge areas and process group”

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4.	Project Integration Management	6 hrs
4.1.	Project Integration Management Process	
4.2.	Developing Project Charter	
4.3.	Developing Project Management Plan	
4.4.	Direct and Manage Project Execution	
4.5.	Monitoring and Controlling Project Work	
4.6.	Perform Integrated Change Control	
4.7.	Closing Project or Phase	

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4.6.	Perform Integrated Change Control	
4.7.	Closing Project or Phase	

4.1 Project Management Integration Process

- PIM ensures that the various elements of the project are properly coordinated.
- Project managers must coordinate all of the other knowledge areas throughout a project's life cycle
- Many new project managers have trouble looking at the “big picture” and want to focus on too many details.
- Project integration management is *not* the same thing as software integration

4.1 Project Management Integration Process

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

4.1 Project Management Integration Process

Project Management Process Groups					
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase

4.1 Project Management Integration Process

Develop the project charter: working with stakeholders to create the document that formally authorizes a project—the charter

Develop the preliminary project scope statement: working with stakeholders, especially users of the project’s products, services, or results, to develop the high-level scope requirements and create a preliminary project scope statement

Develop the project management plan: coordinating all planning efforts to create a consistent, coherent document—the project management plan

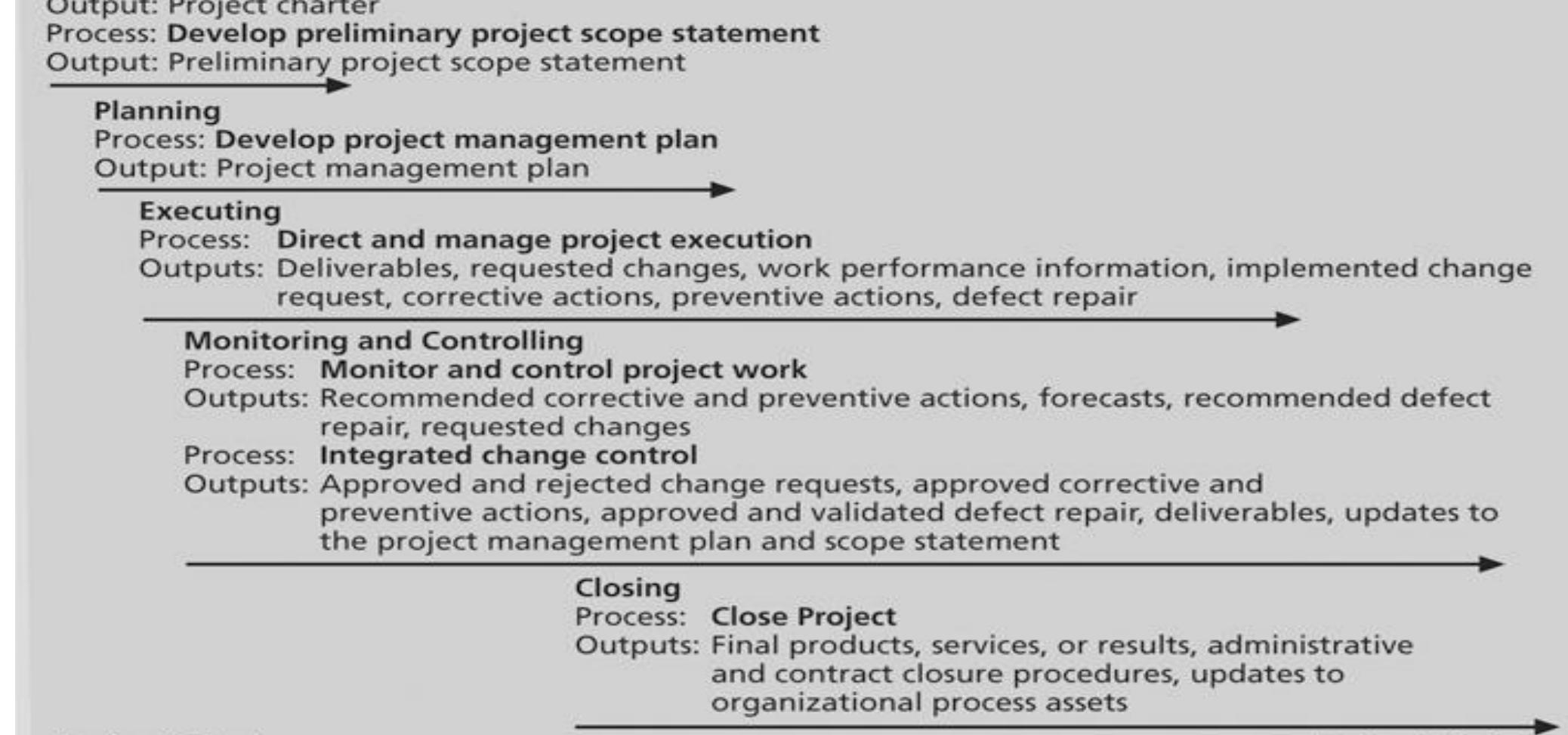
Direct and manage project execution: carrying out the project management plan by performing the activities included in it

Monitor and control the project work: overseeing project work to meet the performance objectives of the project

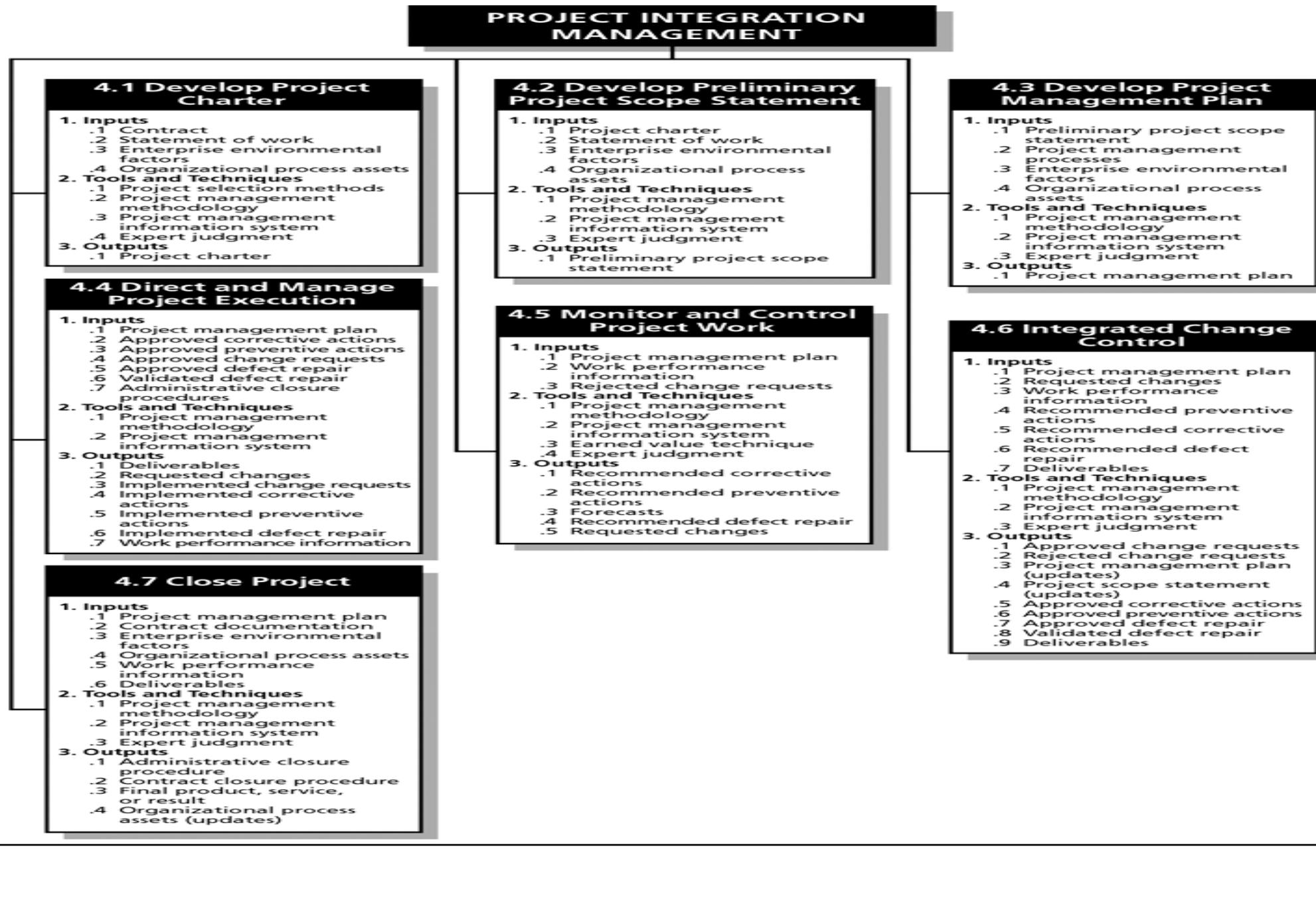
Perform integrated change control: coordinating changes that affect the project’s deliverables and organizational process assets

Close the project: finalizing all project activities to formally close the project

4.1 Project Management Integration Process



4.1 Project Management Integration Process



4. Project Integration Management 6 hrs

- 4.1. Project Integration Management Process
- 4.2. Developing Project Charter
- 4.3. Developing Project Management Plan
- 4.4. Direct and Manage Project Execution
- 4.5. Monitoring and Controlling Project Work
- 4.6. Perform Integrated Change Control
- 4.7. Closing Project or Phase

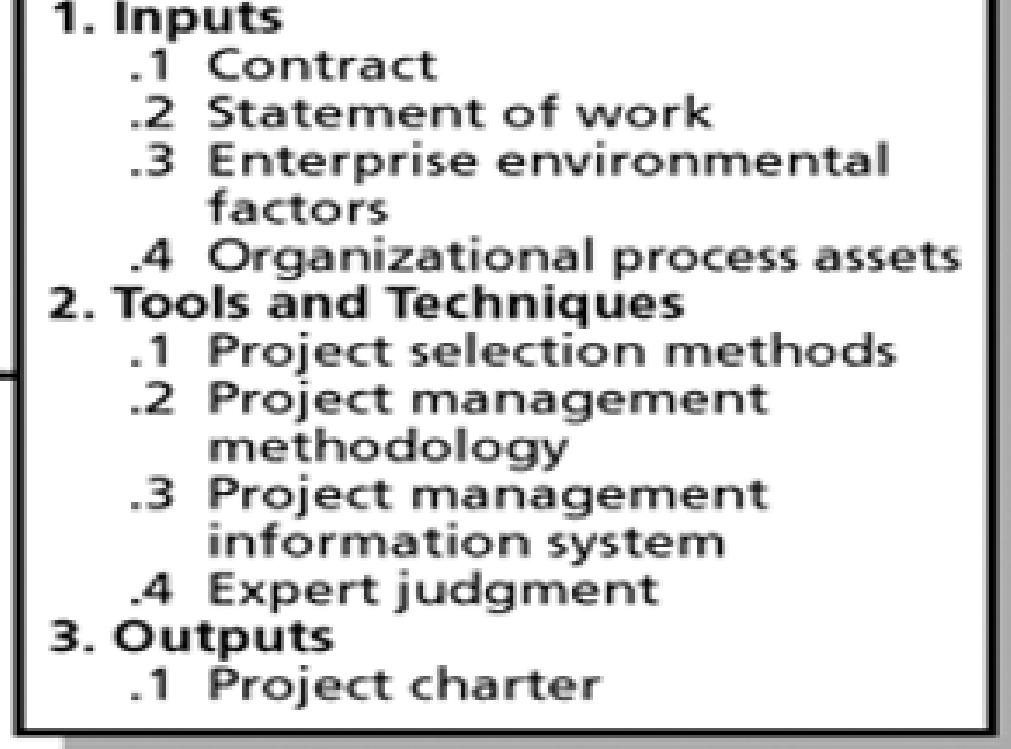
4.2 Developing Project Charter

Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work	4.6 Close Project or Phase

Across Project Management Process Groups

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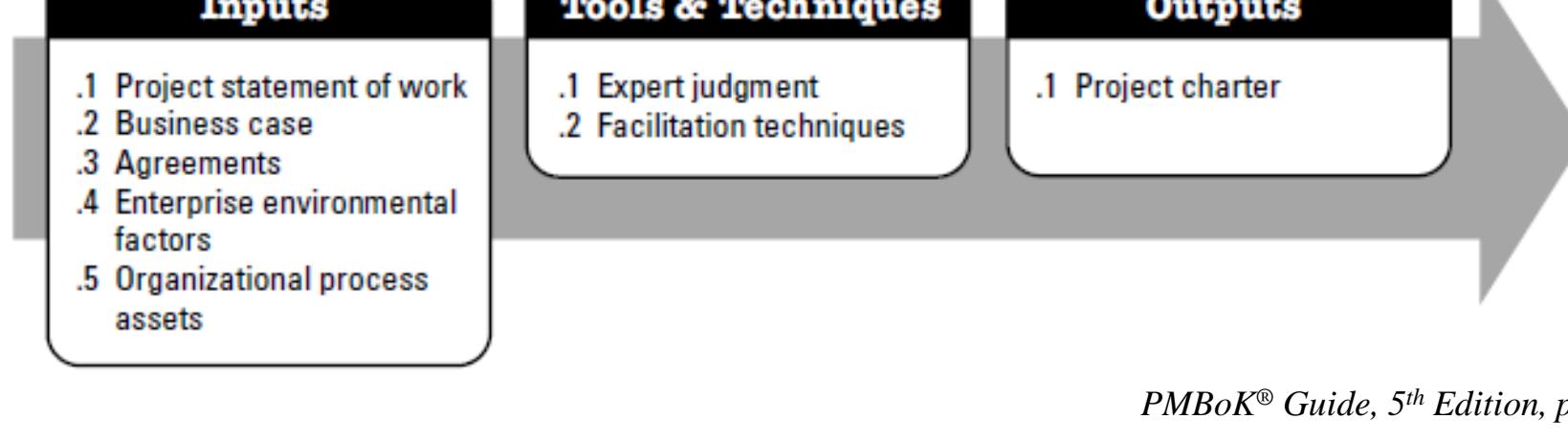
4.2 Developing Project Charter



4.2 Developing Project Charter

Definition: “The process of developing a document that formally authorizes the existence of a project and provides the project manager with the authority to apply organizational resources to the project activities”

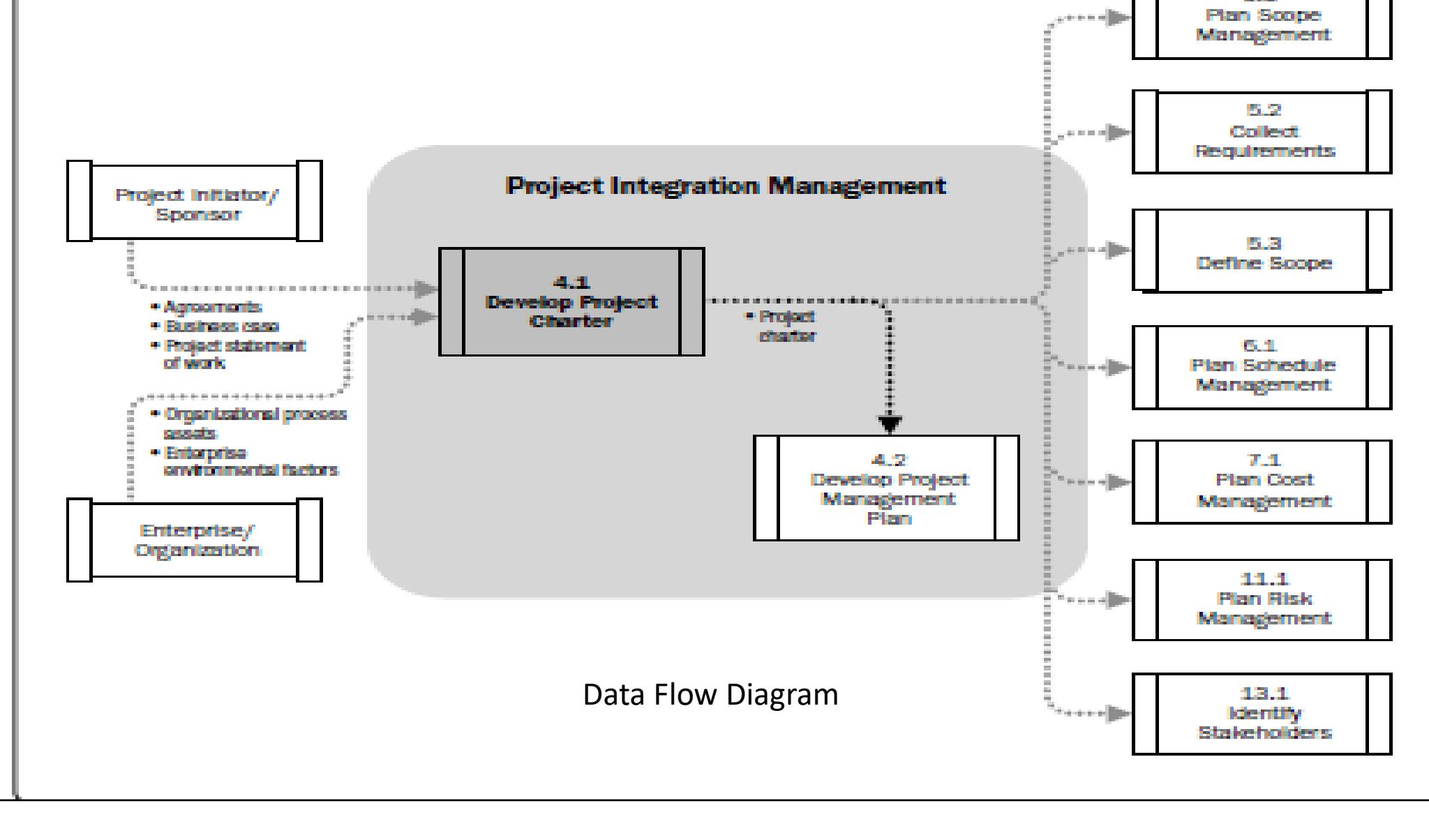
PMBOK® Guide, 5th Edition, p. 66



PMBOK® Guide, 5th Edition, p. 66

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4.2 Developing Project Charter



4.2 Developing Project Charter

inputs

1	Project Statement of Work	A narrative description of product or services to be supplied by the project: • Business need • Product scope description • Strategic plan
2	Business Case	The facts that determine whether the project is worth the investment to achieve the project objectives: ➢ Used to justify spending organizational assets (resources, time, money, etc.) ➢ Used to select projects from among a list of potential projects
3	Agreements	Define the goal of the project. Agreements can be formal or informal: • Contract • SLA's • Letter of Intent and Memorandums • eMails • Verbal agreement

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4.2 Developing Project Charter

4	Enterprise Environmental Factors	External and internal environmental conditions that influence the project: ➢ Government or industry standards ➢ Organization culture ➢ Organization structure ➢ Existing infrastructure ➢ Marketplace conditions
5	Organizational Process Assets	Process related assets (such as plans, policies, procedures and guidelines) that can be used for the project. ➢ The organization's standard and established policies and procedures ➢ Document and report templates ➢ Historical information (including lessons learned)

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4.2 Developing Project Charter

Tools and Techniques

1	Expert Judgment	Expertise provided by any group or individual with specialized knowledge or training: <ul style="list-style-type: none">➢ Within the organization➢ Consultants➢ Professional associations and industry groups➢ Subject matter experts (SME)➢ Project Management Office (PMO)
2	Facilitation Techniques	Used to guide the development of the charter: <ul style="list-style-type: none">➢ Brainstorming➢ Problem Solving➢ Conflict Resolution➢ Meeting Management

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4.2 Developing Project Charter

Develop Project Charter Outputs

1	Project Charter	<ul style="list-style-type: none">• Formally authorizes the project• Provides the Project Manager with the authority to apply organizational resources to project activities• The project charter is issued by the project sponsor:<ul style="list-style-type: none">➢ Sponsor can be an individual or a project portfolio steering committee or the Project Management Office➢ The sponsor must have the authority to fund the project
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4.2 Developing Project Charter

The Project Charter addresses:

- Project purpose or justification
 - Measurable objectives and success criteria
 - High level requirements
 - Assumptions and Constraints
 - High level project description
 - High level risks
 - Summary milestone schedule
 - Summary budget
 - Stakeholder list
 - Project approval requirements
 - Assigned Project Manager
 - Sponsor(s) of the project with authority level
- 
- Business Needs**

 - Market Demand
 - Organizational Need
 - Customer Request
 - Technological Advance
 - Legal Requirement
 - Ecological Impacts
 - Social Need

PMBOK® Guide, 5th Edition, p.69

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4.2 Developing Project Charter

The project cannot be started without a charter because the charter:

- Formally recognizes the existence of the project
- Gives the project manager the authority to spend money and commit resources.
- Provides the high level requirements and expectations
- Links the project to the organization's ongoing work

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4.2 Developing Project Charter

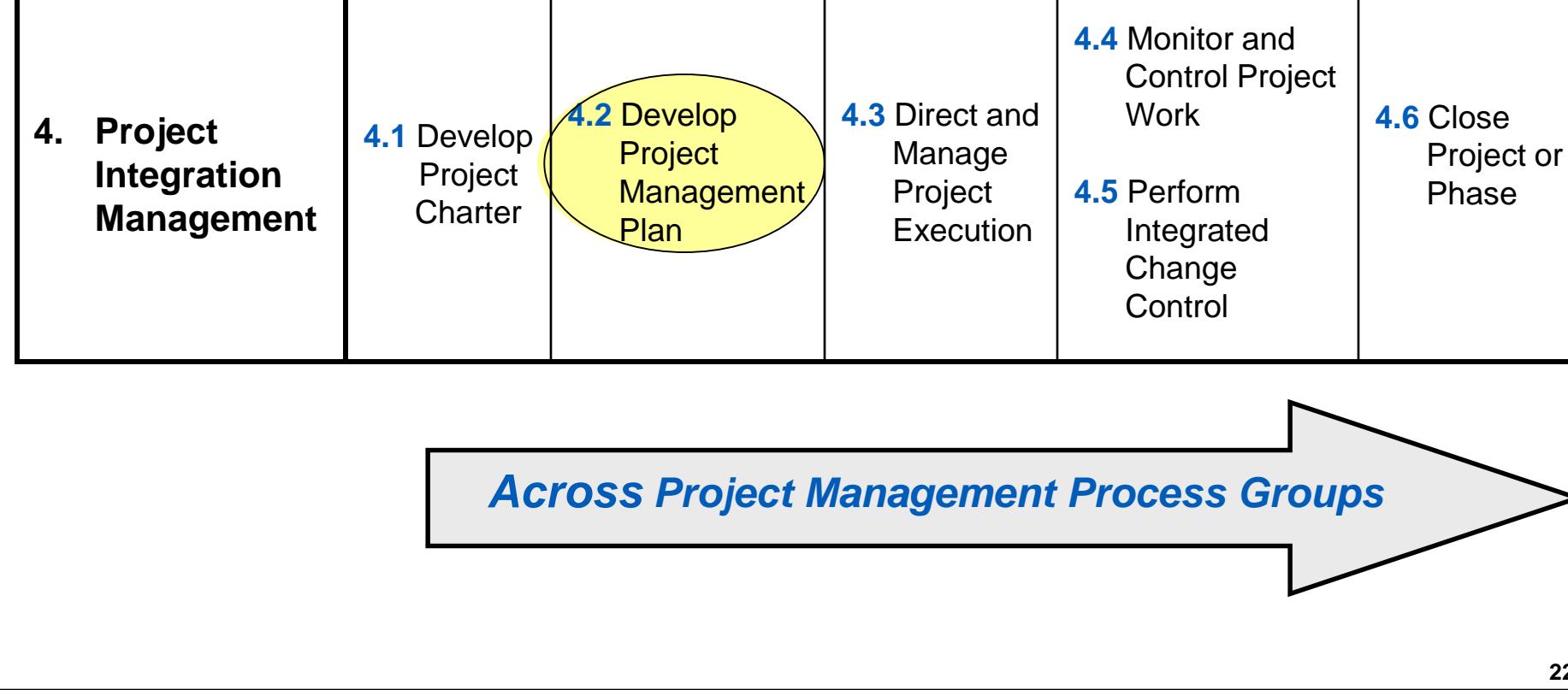
Miscellaneous facts

Who can issue the Project Charter?	A project initiator or sponsor external to the project at an organizational level appropriate to funding the project.
What factors are projects taken to address?	<ul style="list-style-type: none">● Market demand● Organizational need● Customer request● Technological advance● Legal or regulatory requirement● Ecological impacts● Social need

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4.	Project Integration Management	6 hrs
4.1.	Project Integration Management Process	
4.2.	Developing Project Charter	
4.3.	Developing Project Management Plan	
4.4.	Direct and Manage Project Execution	
4.5.	Monitoring and Controlling Project Work	
4.6.	Perform Integrated Change Control	
4.7.	Closing Project or Phase	

4.3 Developing Project Management Plan



Across Project Management Process Groups

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4.3 Developing Project Management Plan

4.2 Develop Preliminary Project Scope Statement	
1. Inputs	.1 Project charter .2 Statement of work .3 Enterprise environmental factors .4 Organizational process assets
2. Tools and Techniques	.1 Project management methodology .2 Project management information system .3 Expert judgment
3. Outputs	.1 Preliminary project scope statement

4.3 Develop Project Management Plan	
1. Inputs	.1 Preliminary project scope statement .2 Project management processes .3 Enterprise environmental factors .4 Organizational process assets
2. Tools and Techniques	.1 Project management methodology .2 Project management information system .3 Expert judgment
3. Outputs	.1 Project management plan

4.3 Developing Project Management Plan

Definition: “*The process of defining, preparing, and coordinating subsidiary plans and integrating them into a comprehensive project management plan.*”

PMBOK® Guide, 5th Edition, p. 72



PMBOK® Guide, 5th Edition, p. 72

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4.3 Developing Project Management Plan

- A project plan is a document used to coordinate all project planning documents.
- Its main purpose is to **guide project execution**.
- Project plans **assist the project manager** in leading the project team and **assessing project status**.
- Project performance should be measured against a **baseline plan**.
- At the **end of each phase** of a project, a **lessons learned document** must be prepared. The lessons learned document defines **what was done right, wrong** etc. It is required to be completed in order for the project to be completed.

4.3 Developing Project Management Plan

- **Project Management Information System (PMIS)** is a system that **keeps track of status of all the project tasks**. It is used to track the status of the project. The exam does not focus on any specific system (for example Microsoft Project).
- Project Management Plan is **developed by Project Manager** with **inputs from the team, stakeholders and management**. Project Management Plan development is **iterative**.
- A Project Management Plan includes -Project Charter, Budget, Schedule, Resources, Scope Statement, WBS, Responsibility charts/assignments, Management Plans.
- Projects plan should be dynamic, flexible, update, guide project execution.
- A Project Management Plan is bought into, approved, realistic and formal.

4.3 Developing Project Management Plan

- A Project Management Plan **consolidates other management plans**. These are : **Scope** management plan , **Requirement** management plan, **Schedule** management plan, **Cost** management plan, **Quality** management plan, **Process improvement** plan, **Human resource** plan, **Communication** management plan, **Risk** management plan, **Procurement** management plan.
- The Project Management Plan also includes project **baselines**. These are: **Schedule baseline**, **Cost performance** baseline, and **Scope** baseline.
- **Project baseline** refers to the **original version** of the **project management plan**. Once the project management plan is baselined, it may only be **changed by raising a change request**.

4.3 Developing Project Management Plan

Common elements of project

- **Introduction or overview** of the project.
- **Description** of how the project is organized.
- **Management and technical processes** used on the project.
- **Work to be done, schedule, and budget** information.

4.3 Developing Project Management Plan

inputs

4.3.1.1 Project Charter	As defined in project charter.
4.3.1.2 Outputs from Planning Processes	As defined in the different sections of knowledge areas.
4.3.1.3 Enterprise Environmental Factors	<ul style="list-style-type: none">• Government of industry standards• Project Management Information System (PMIS)• Organizational structure• Organizational culture• Existing infrastructure• Personnel administration policies and guidelines
4.3.1.4 Organizational Process Assets	<ul style="list-style-type: none">• Standardized guidelines, work instructions, proposal evaluation criteria, and performance measurement criteria• Project management plan template• Change control procedures• Project files from previous projects• Historical information and lessons learned from previous projects• Configuration management

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4.3 Developing Project Management Plan Tools & Techniques

4.3.2.1 Expert Judgment	When developing the project management plan use expert judgment to: <ul style="list-style-type: none">• Decide which processes are needed for the project and to what degree do they need to be applied• Determine resources needed and the level of involvement to complete the project work the plan• Develop the technical details to be included in the plan• Prioritize work to ensure resources are allocated appropriately
4.3.2.2 Facilitation Techniques	Used to guide developing the project management plan.

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4.3 Developing Project Management Plan Outputs

4.3.3.1 Project Management Plan	Integrates and consolidates all of the subsidiary management plans and baselines from the planning processes. It documents the outputs of the subsidiary management plans. It includes: <ul style="list-style-type: none">> Project management processes selected by the project management team> The level of implementation of each selected process> The tools and techniques to be used to accomplish the selected processes> How the selected processes will be used to manage the project> How work will be executed to accomplish the project objectives> How changes will be monitored and controlled> How configuration management will be performed> How integrity of performance baselines will be maintained and used> The need and technique for communication among stakeholders> The selected project life cycle and associated project phases> Key management reviews for content, extent and timing
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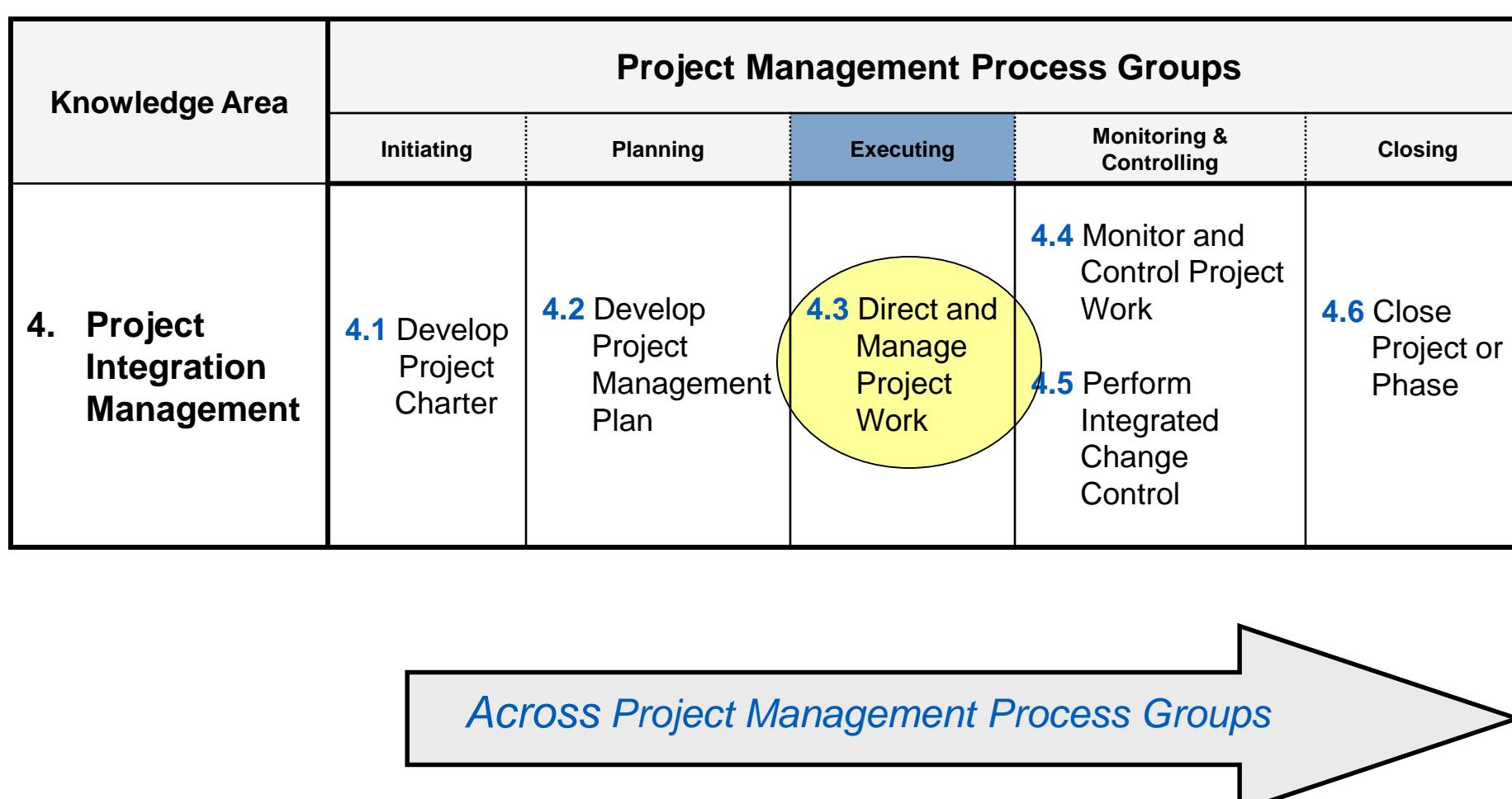
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4.3 Developing Project Management Plan (terms)

Stakeholder	Persons and organizations, such as customers, sponsors, performing organizations and the public, that are actively involved in the project, or whose interests may be positively or negatively affected by execution or completion of the project. They may also exert influence over the project and its deliverables.
Project Documents	Documents not part of the project management plan that are used to manage the project such as: <ul style="list-style-type: none"> ➢ Project Charter ➢ Contracts, Agreements, Statements of Work, etc. ➢ Work Performance Reports ➢ Risk and Issue Logs
Kickoff Meeting	A meeting of all parties to the project (customers, sellers, project team, senior management, agencies, functional management, sponsor) to make certain everyone is familiar with the details of the project and the people working on the project. It is held at the end of the planning process group, just before beginning work on the project.

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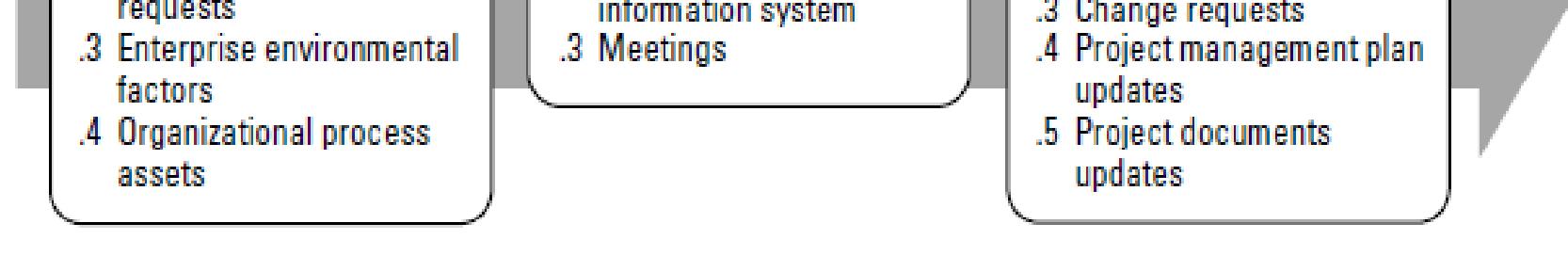


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4.4 Direct and Manage Project Execution

Definition: *"The process of leading and performing the work defined in the project management plan and implementing approved changes to achieve project objectives."*

PMBoK® Guide, 5th Edition, p. 79



PMBoK® Guide, 5th Edition, p. 79

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4.4 Direct and Manage Project Execution

- Direct and Manage Project Work process includes performing the work defined in the PMP to achieve project goals.
- **Directing and managing project work involves:**
 - Performing activities to accomplish project requirements.
 - Creating project deliverables.
 - Staffing, training and managing project team members.
 - Obtaining, managing, and using resources (materials, tools, equipment and facilities).
 - Implementing the planned methods and standards.
 - Establishing and managing project communication channels (external and internal)
 - Issuing change requests (corrective, preventive and defect repair).

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4.4 Direct and Manage Project Execution

- **Directing and managing project work involves:**
 - Managing risk and implementing risk response activities.
 - Managing sellers and suppliers.
 - Including approved changes into the project's scope, plans and environment.
 - Generating project data (cost, schedule, quality and progress) for reporting and forecasting.
 - Implementing approved process improvement activities.
 - Managing stakeholders.
 - Documenting lessons learned.

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4.4 Direct and Manage Project Execution Inputs

4.3.1.1 Project Management Plan	See Section 4.2.3.1
4.3.1.2 Approved Change Requests	<ul style="list-style-type: none">• Corrective Actions• Preventive Actions• Defect Repairs
4.3.1.3 Enterprise Environmental Factors	<ul style="list-style-type: none">• Organizational, company or customer culture and structure• Existing infrastructure• Personnel administration policies and guidelines• Stakeholder risk tolerances• Project Management Information System (PMIS)
4.3.1.4 Organizational Process Assets	<ul style="list-style-type: none">• Standardized guidelines and work instructions• Communication requirements and policies• Issue and defect management procedures• Process measurement database• Files and information from previous projects• Issue and defect management database

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4.4 Direct and Manage Project Execution Tools & Techniques

4.3.2.1 Expert Judgment	Previously defined
4.3.2.2 Project Management Information System (PMIS)	Previously defined
4.3.2.3 Meetings	Meetings are held to discuss topics pertinent to the project: <ul style="list-style-type: none">➢ Information exchange➢ Problem solving➢ Option evaluation➢ Decision making

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4.4 Direct and Manage Project Execution Outputs

4.3.3.1 Deliverables	
4.3.3.2 Work Performance Data	<p>Raw data on the activities being performed to accomplish the project work. This typically includes, but is not limited to:</p> <ul style="list-style-type: none"> ➢ Start and finish dates of activities ➢ Deliverables that have been completed and those not completed ➢ Costs authorized and incurred ➢ Percent physically complete of the in-progress schedule activities ➢ Documented lessons learned posted to the lessons learned knowledge base ➢ Resource utilization detail ➢ Number of defects ➢ Number of change requests

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4.4 Direct and Manage Project Execution Outputs

4.3.3.3 Change Requests	<ul style="list-style-type: none"> • Corrective Action • Preventive Action • Defect Repair • Documentation Updates
4.3.3.4 Project Management Plan Updates	<ul style="list-style-type: none"> • Subsidiary project plans
4.3.3.5 Project Document Updates	<ul style="list-style-type: none"> • Requirements • Stakeholder Register • Risks Register

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4.5 Monitoring and Controlling Project Work

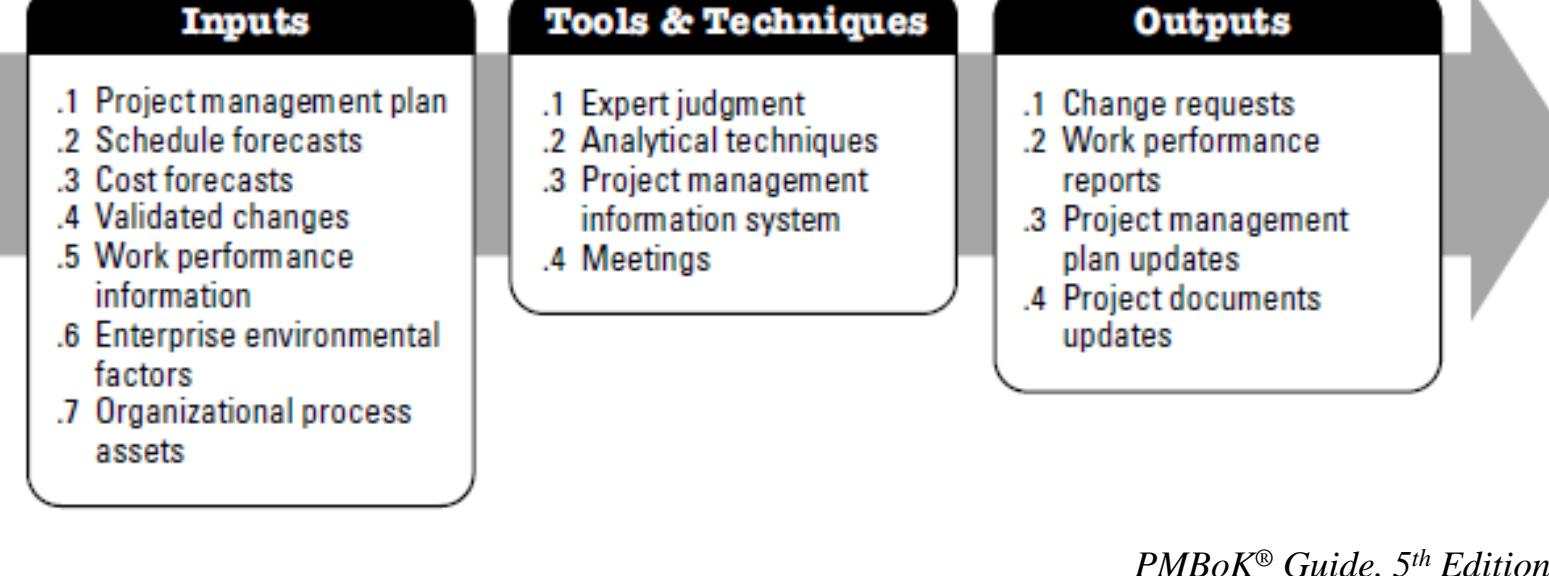
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Across Project Management Process Groups

4.5 Monitoring and Controlling Project Work

Definition: “*The process of tracking, reviewing, and reporting the progress to meet the performance objectives defined in the project management plan.*”

PMBOK® Guide, 5th Edition, p. 86



PMBOK® Guide, 5th Edition, p. 86

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4.5 Monitoring and Controlling Project Work

Inputs

1 Project Management Plan	Described in Section 4.3
2 Schedule Forecasts	Can be expressed in Earned Value terms or variances of planned finish dates vs. forecasted finish dates
3 Cost Forecasts	Can be expressed in Earned Value terms or variances of planned vs. actual expenditures and forecasted final costs
4 Validated Changes	Ensures approved changes were implemented
5 Work Performance Information	Analyzed data is transformed into information that can be used for decision making

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4.5 Monitoring and Controlling Project Work

Inputs

6 Enterprise Environmental Factors	<ul style="list-style-type: none">• Government or industry standards• Company work authorization system• Stakeholder risk tolerances• Project Management Information Systems
7 Organizational Process Assets	<ul style="list-style-type: none">• Organization communication requirements• Financial controls procedures• Issue and defect management procedures• Risk control procedures• Process measurement database• Lessons learned database

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4.5 Monitoring and Controlling Project Work

Tools and Techniques

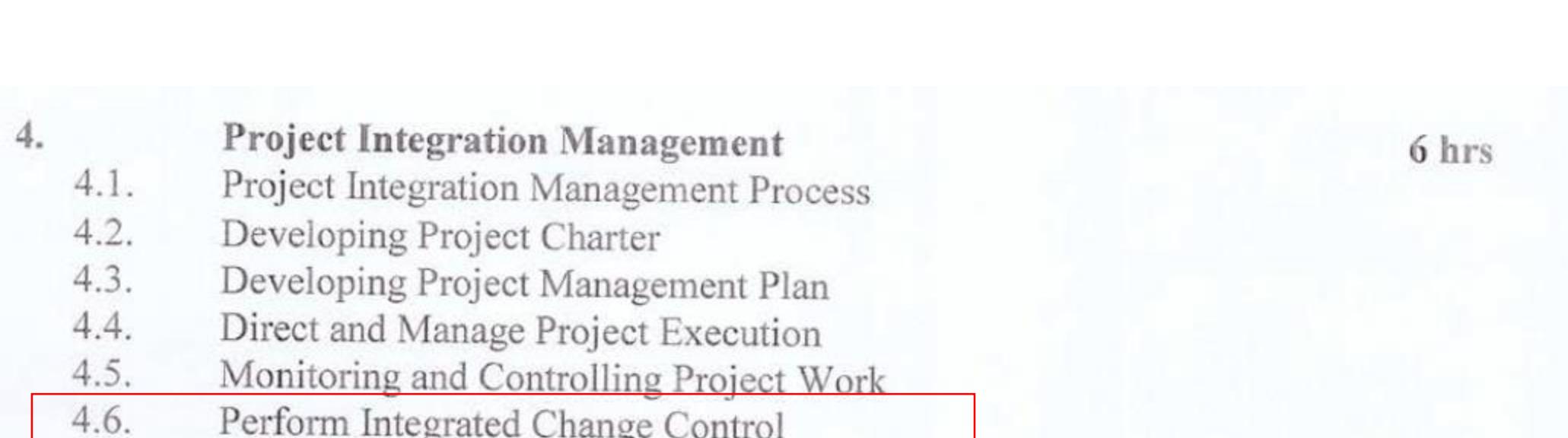
1 Expert Judgment	Previously defined
2 Analytical Techniques	Used to forecast outcomes: <ul style="list-style-type: none">• Regression analysis• Root Cause Analysis• Failure Mode Effect Analysis• Fault Tree Analysis• Earned Value Management• Variance Analysis

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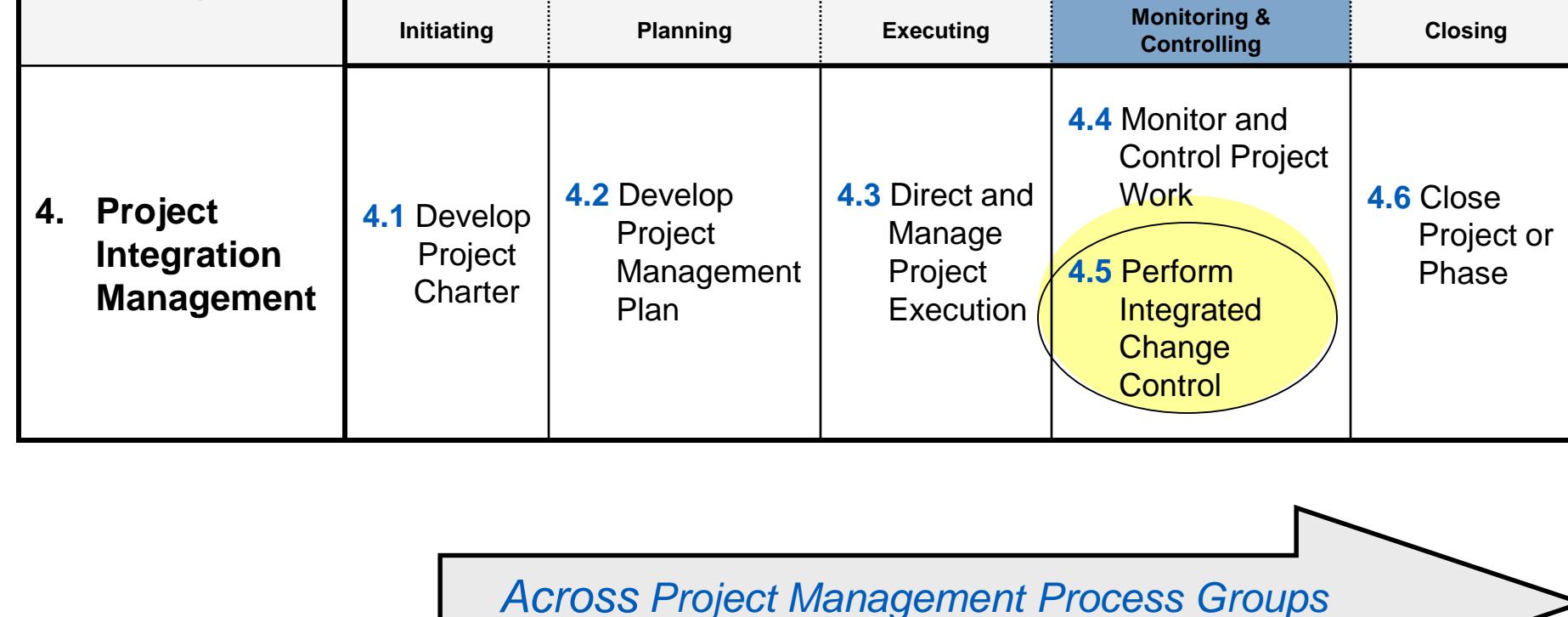
4.5 Monitoring and Controlling Project Work Outputs

1 Change Requests	<ul style="list-style-type: none"> • Corrective action • Preventive action • Defect repair
2 Work Performance Reports	Project documents that report work performance information that is used to communicate project progress and generate decisions or activity.
3 Project Management Plan Updates	<ul style="list-style-type: none"> • Schedule Management Plan • Cost Management Plan • Quality Management Plan • Baselines: Scope, Schedule, Cost
4 Project Document Updates	<ul style="list-style-type: none"> • Forecasts • Performance Reports • Issues log

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4.6 Perform Integrated Change Control



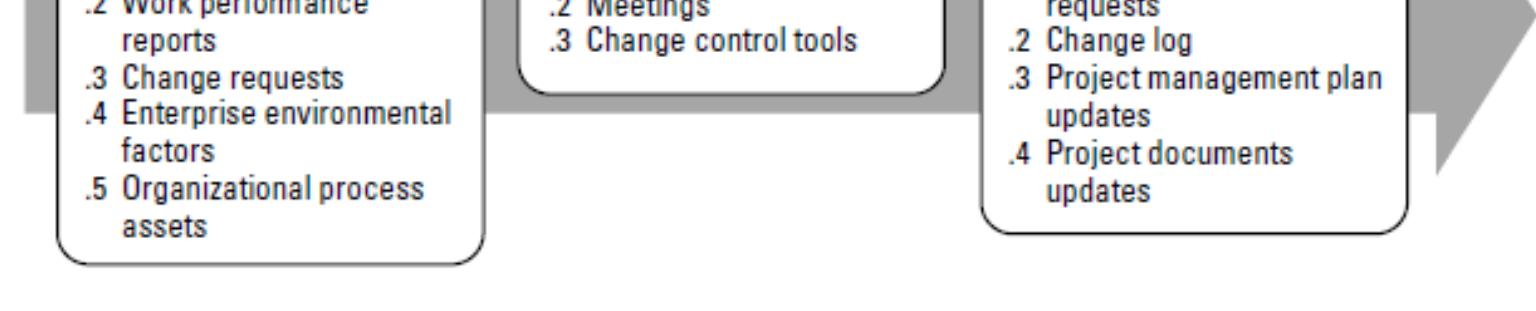
Across Project Management Process Groups

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4.6 Perform Integrated Change Control

Definition: “The process of reviewing all change requests, approving changes, and managing changes to the deliverables, organizational process assets, project documents, and the project management plan and communicating their disposition.”

PMBoK® Guide, 5th Edition, p. 94



PMBoK® Guide, 5th Edition, p. 94

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4.6 Perform Integrated Change Control

Integrated Change Control includes the following:

- Identifying that a change needs to occur or has occurred
- Influencing the factors that circumvent integrated change control so that only approved changes are implemented
- Reviewing, analyzing and approving requested changes
- Managing the approved changes by regulating the flow of requested changes
- Maintaining the integrity of baselines by releasing only approved changes
- Reviewing and approving all recommended corrective and preventive actions
- Controlling and updating the scope, cost, budget, schedule, and quality requirements based on approved changes
- Documenting the impact of requested changes
- Validating defect repair
- Controlling project quality to standards based on quality reports

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4.6 Perform Integrated Change Control

The Project Manager should be concerned with:

- Ensuring the change is beneficial
- Determining if change is needed
- Looking for alternatives to change
- Minimizing the negative impact of change
- Notifying stakeholders affected by the change

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4.6 Perform Integrated Change Control (Inputs)

1	Project Management Plan	Defined in Section 4
2	Work Performance Reports	Defined in Section 4
3	Change Requests	<ul style="list-style-type: none">• Corrective Action• Preventive Action• Defect Repair
4	Enterprise Environmental Factors	<ul style="list-style-type: none">• Project Management Information System
5	Organizational Process Assets	<ul style="list-style-type: none">• Change control procedures• Change approval and authorization procedures• Process measurement database• Project files• Configuration management knowledge base

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4.6 Perform Integrated Change Control Tools & Techniques

1	Expert Judgment	Previously defined
2	Meetings	Change Control Board Meetings: <ul style="list-style-type: none">• Roles and responsibilities defined in the change control procedures• Membership on the board will include major stakeholders• The customer may be included for projects being done under contract• Reviews change requests• Approves or rejects change requests
3	Change Control Tools	Used to manage change requests and the final disposition of those requests.

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4.6 Perform Integrated Change Control

Who can approve changes?

Changes to Project Charter	Project Sponsor who signed/approved the Project Charter. The Project Manager can provide input.
Changes to Project Baselines or any Constraints	The Change Control Board or Sponsor needs to be involved. The Project Manager can recommend options.
Changes within the Project Plan	Project Manager can make the change if the change is within the Project Manager's authority and does not require changes to any project baselines.

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4.6 Perform Integrated Change Control Outputs

1 Approved Change Requests	<ul style="list-style-type: none">• Approved Change Requests<ul style="list-style-type: none">➢ Corrective Actions➢ Preventive Actions➢ Defect Repair• Rejected Change Requests• Validated Defect Repair
2 Change Log	Documents changes made during a project
3 Project Management Plan Updates	
4 Project Document Updates	

Approved Change Requests are INPUTS for Directing and Managing Project Work

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4.6 Perform Integrated Change Control (Configuration Management)

A documented procedure used to apply technical and administrative direction and surveillance to:

- Identify and document the functional and physical characteristics of an item or system
- Control any changes to such characteristics
- Record and report the change and its implementation status
- Audit the items and system to verify conformance to requirements

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4.6 Perform Integrated Change Control Terms

Configuration Identification	Providing the basis from which the configuration of products is defined and verified, products and documents are labeled, changes are managed, and accountability is maintained.
Configuration Status Accounting	Capturing, storing, and accessing configuration information needed to manage products and product information effectively.
Configuration Verification and Auditing	Establishing that the performance and functional requirements defined in the configuration documentation have been met.
Change Control Board	All requested changes must be either accepted or rejected by some authority within the project management team or an external organization representing the initiator, sponsor, or customer. Oftentimes a Change Control Board is established to approve and reject changes. The roles and responsibilities of the Change Control Board are defined in the configuration and change control procedures.

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4.	Project Integration Management	6 hrs
4.1.	Project Integration Management Process	
4.2.	Developing Project Charter	
4.3.	Developing Project Management Plan	
4.4.	Direct and Manage Project Execution	
4.5.	Monitoring and Controlling Project Work	
4.6.	Perform Integrated Change Control	
4.7.	Closing Project or Phase	

4.7 Closing Project or Phase

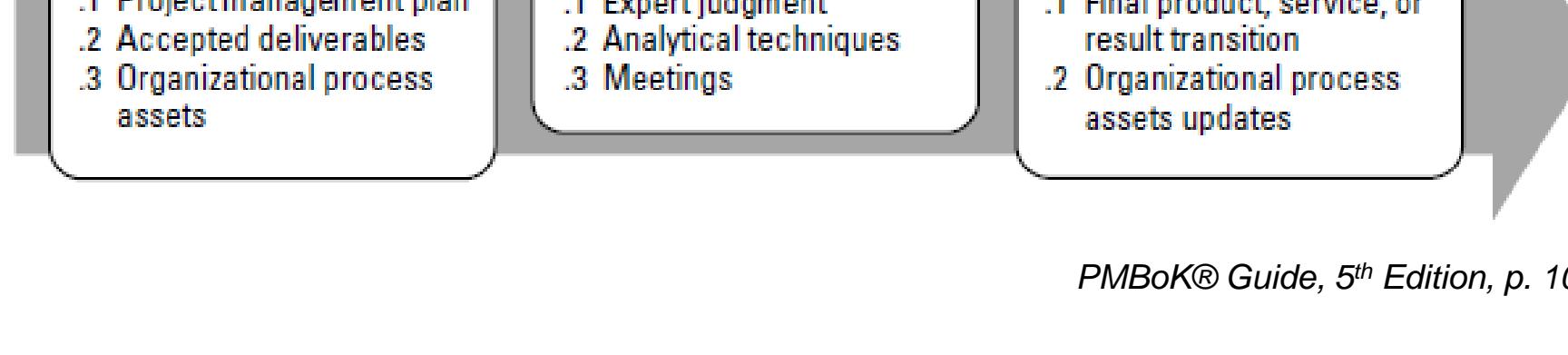
Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Execution	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase

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4.7 Closing Project or Phase

Definition: “The process of finalizing all activities across all of the Project Management Process Groups to formally complete the project or phase”

PMBOK® Guide, 5th Edition, p. 100



PMBOK® Guide, 5th Edition, p. 100

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4.7 Closing Project or Phase (inputs)

1 Project Management Plan	Described in Section 4
2 Accepted Deliverables	Scope Verification: Formal acceptance of the completed project deliverables
3 Organizational Process Assets	<ul style="list-style-type: none"> • Closure guidelines, requirements and procedures • Historical information • Lessons learned database

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4.7 Closing Project or Phase (Tools and techniques)

1	Expert Judgment	Previously defined
2	Analytical Techniques	Described in Section 4
3	Meetings	<ul style="list-style-type: none"> • Lessons Learned • User Groups • Review Meetings

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4.7 Closing Project or Phase (outputs)

1	Final Product, Service, or Result Transition	Transition of the project's (or phase's) product or result to: <ul style="list-style-type: none"> • The ongoing organization, or • The next phase of the project
2	Organizational Process Assets Updates	<ul style="list-style-type: none"> • Lessons Learned • Corporate Knowledge Base • Project Files • Project or phase closure documents • Historical information

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5.	Project Scope Management	3 hrs
5.1.	Project and Product Scope	
5.2.	Project Scope Management Process	
5.3.	Planning Project Scope Management	
5.4.	Collect Requirements	
5.5.	Define Scope	
5.6.	Creating Work Breakdown Structure	
5.7.	Scope Validation	
5.8.	Scope Control	

Project Integration Management Processes

Process Group	Integration Management Process	Major Output
Initiating	Developing the project charter	Project Charter
Planning	Developing the project management plan	Project Management Plan
Executing	Directing and managing project work	Deliverables, work performance info, change requests
Monitoring and Controlling	(1) Monitor/Control Project Work (2) Perform Integrated Change Control	(1) Change Requests (2) Status updates
Closing	Close Project/Phase	Product Transition

Project scope management

- Scope is the summation of work required to produce the end product, service, or result.
- **Scope** refers to *all the work* involved in **creating the products** of the project and the **processes used** to create them
- It defines what is or is not to be done
- **Deliverables** are **products** produced as part of a project, such as hardware or software, planning documents, or meeting minutes
- The project team and stakeholders must have the same understanding of what products will be produced as a result of a project and how they'll be produced.

Project scope management

- Project Scope Management is the knowledge area concerned with managing how the scope will be defined, verified, and controlled.

5.	Project Scope Management	3 hrs
5.1.	Project and Product Scope	
5.2.	Project Scope Management Process	
5.3.	Planning Project Scope Management	
5.4.	Collect Requirements	
5.5.	Define Scope	
5.6.	Creating Work Breakdown Structure	
5.7.	Scope Validation	
5.8.	Scope Control	

Project scope management

- **Product Scope** refers Product Scope is nothing but “What customer wants?” An organization can execute another project to identify a product scope or it could be the part of requirements gathering of your project.
- **An example of product scope would be:** On a project to build a new software application, the product scope is “a new workflow application that fulfills the requirements of our internal and external customers.” To determine if the project successfully achieved the product scope, the resulting application (the new product) is compared to the application requirements, which are recorded in the requirements documentation and the project scope statement for the project. It defines what is or is not to be done

Project scope management

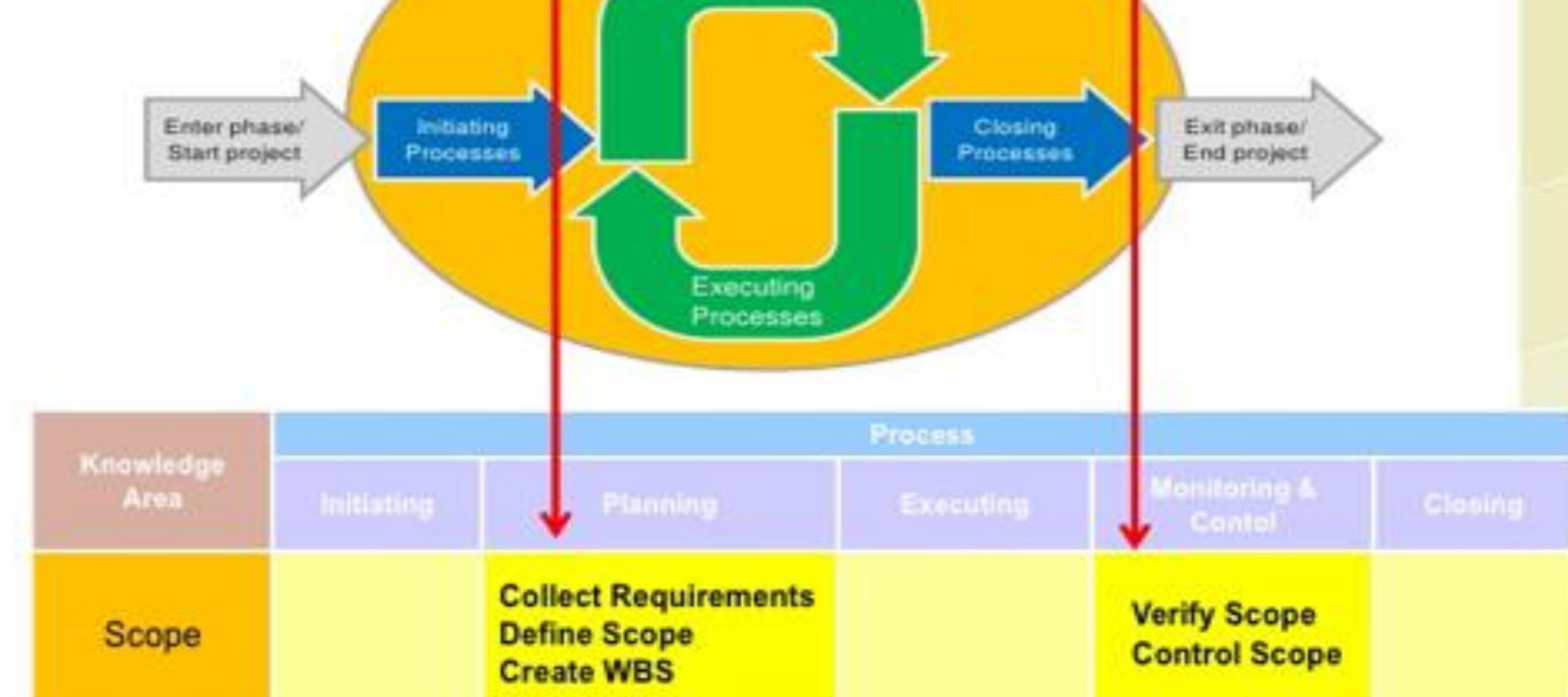
- The **project scope** is the work the project will do to deliver the product of the project (i.e. the product scope).
- In the software application development example, the project scope is the work that is to be done to develop the software application. This work includes the planning, coordination, and management activities (such as meetings and reports) that ensure the product scope is achieved.
- These efforts are a part of project management plan and are further a part of the scope management plan. At the end of the project or the phase, the completed work is compared against the scope baseline in the **project management plan** to determine if the scope has been successfully completed.

Project scope management

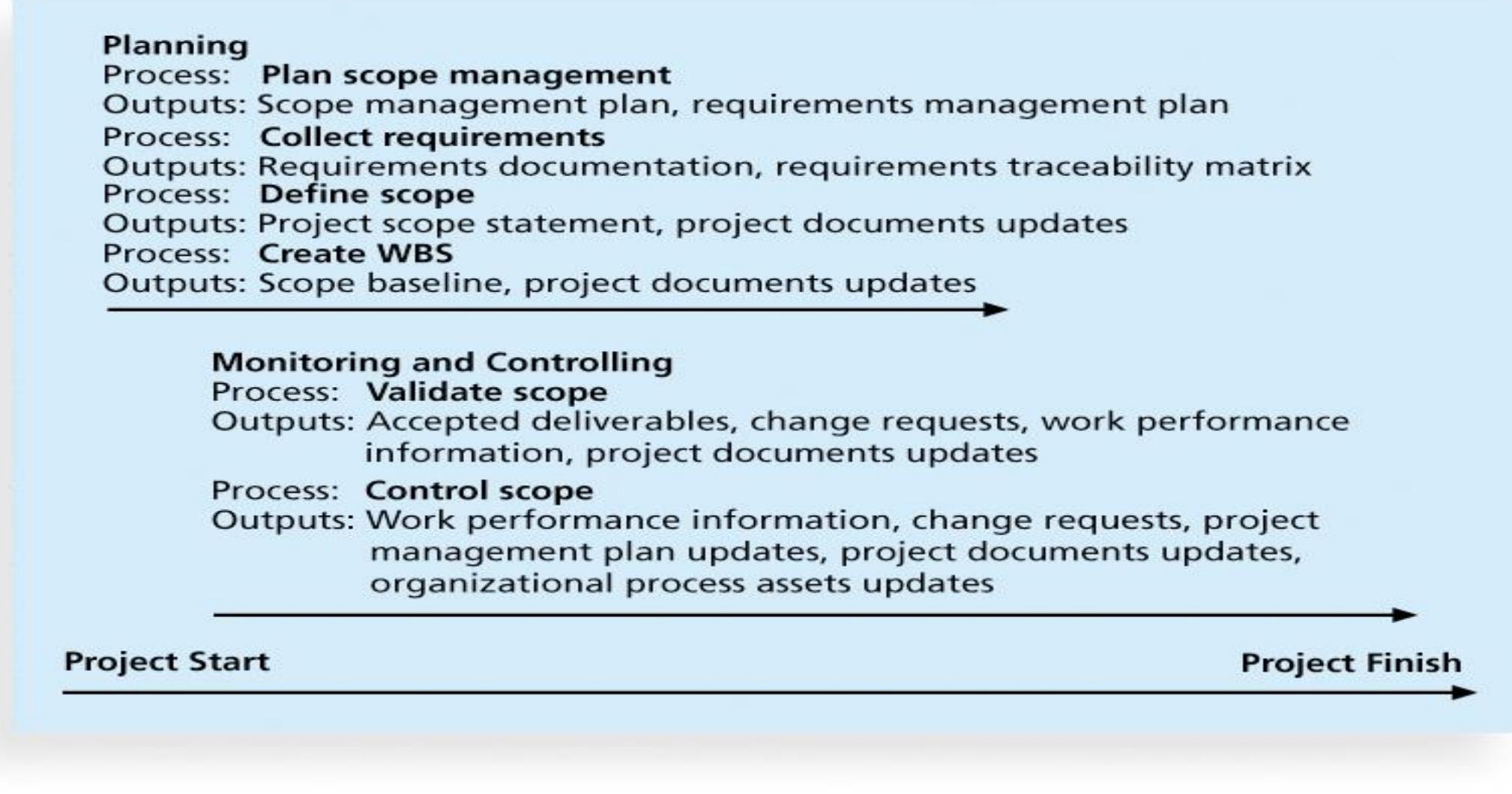
- Project scope management is the second knowledge area in the Project Management Institute's (PMI) [Project Management Body of Knowledge](#) (PMBOK).
- It includes the processes that ensure all of the required work (and only the required work!) is included in the project.
- Scope management plan should include the detailed process of scope determination, its management and its control.
- According to the PMBOK, scope management has six processes:
 - [Plan Scope Management](#): Planning the process, and creating a scope management plan.
 - [Collect Requirements](#): Defining and documenting the stakeholder's needs.
 - [Define Scope](#): Developing a detailed project scope statement.
 - [Create WBS](#): Subdividing project deliverables into smaller work units.
 - [Validate Scope](#): Formalizing the acceptance of the deliverables.
 - [Control Scope](#): The ongoing process of monitoring and managing changes to the project scope.

5.	Project Scope Management	3 hrs
5.1.	Project and Product Scope	
5.2.	Project Scope Management Process	
5.3.	Planning Project Scope Management	
5.4.	Collect Requirements	
5.5.	Define Scope	
5.6.	Creating Work Breakdown Structure	
5.7.	Scope Validation	
5.8.	Scope Control	

5.2 Project Scope Management Process



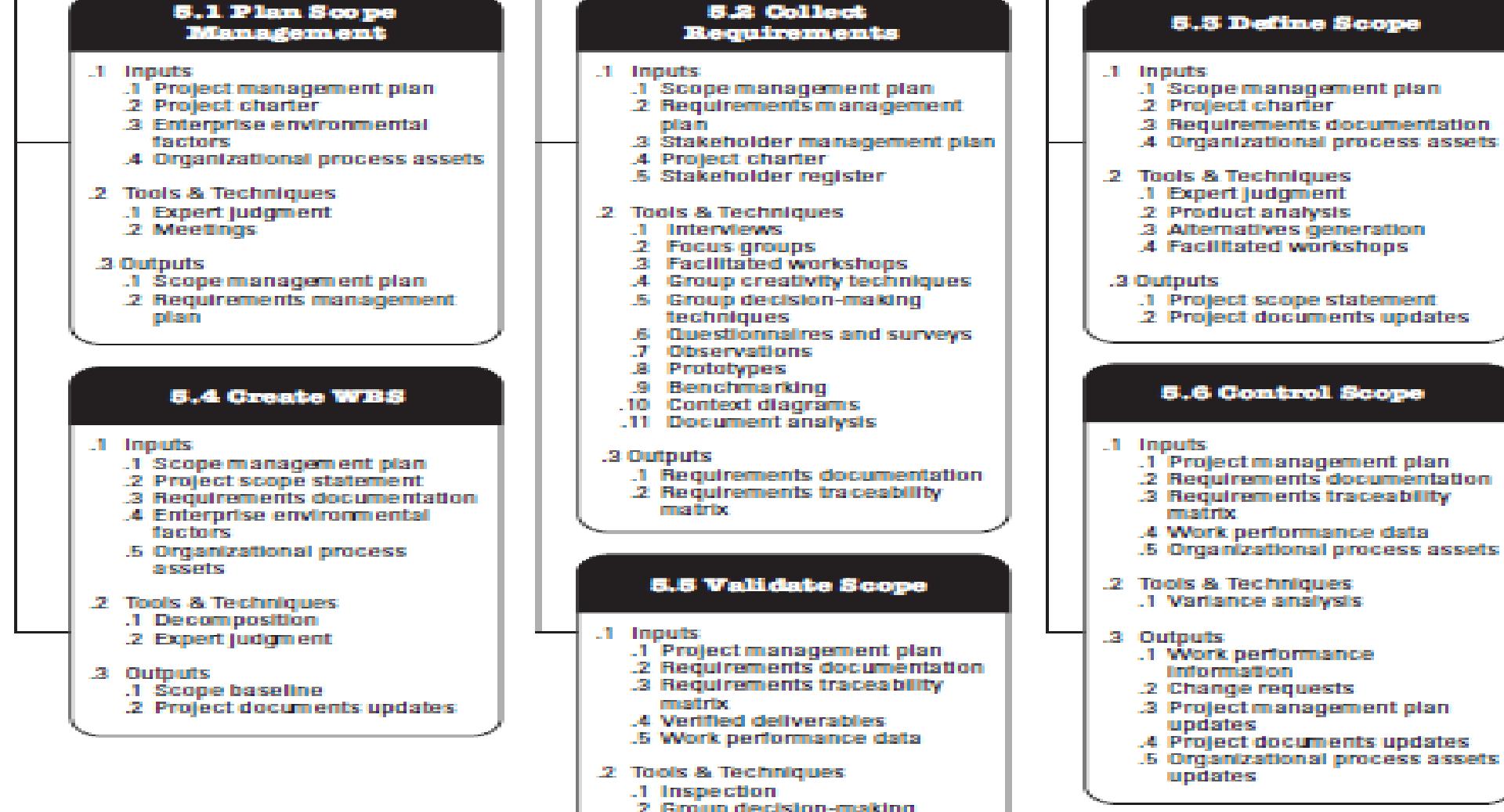
5.2 Project Scope Management Process



5.2 Project Scope Management Processes

Process Group	Integration Management Process	Major Output
Planning	P1: Plan Scope Management	Scope Mgmt Plan Requirement Mgmt Plan
	P2: Collect Requirements	Req. Documentation Req. Traceability Matrix
	P3: Define Scope	Project Scope Stmt Project Docs Update
	P4: Create WBS	Scope Baseline Project Docs Update
Monitoring and Controlling	MC1: Validate Scope	Accept Deliverables Change Requests Work Performance Info
	MC2: Control Scope	Change Requests Project Mgmt Plan Updates Org. Process Asset Updates

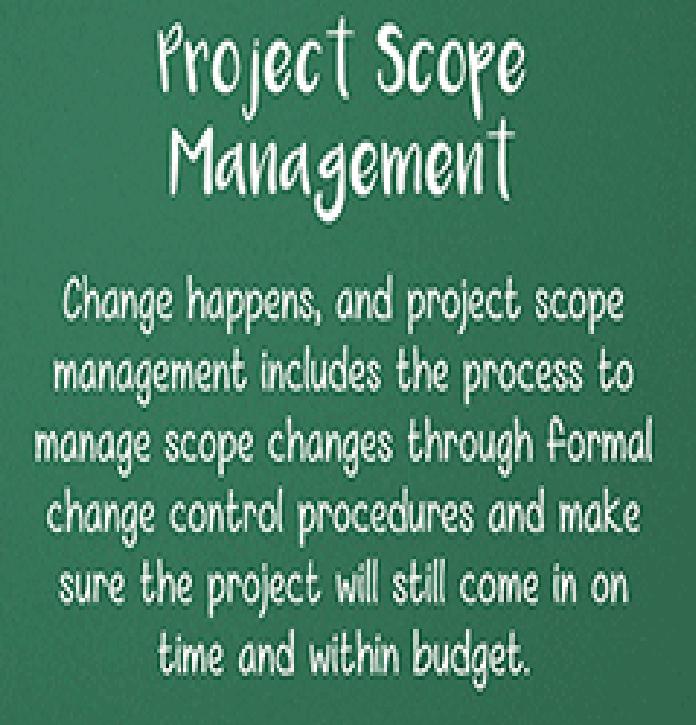
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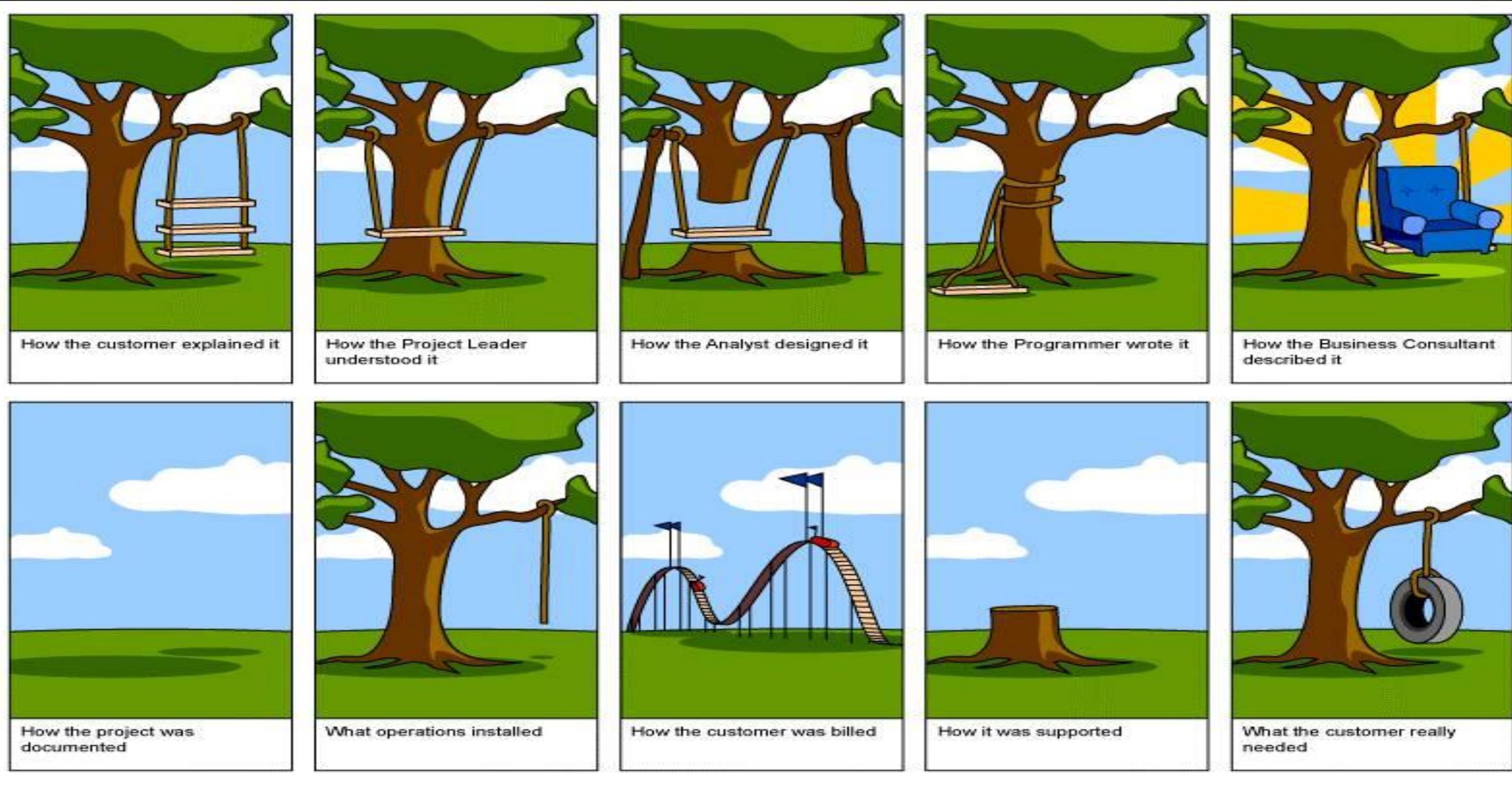


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5.	Project Scope Management	3 hrs
5.1.	Project and Product Scope	
5.2.	Project Scope Management Process	
5.3.	Planning Project Scope Management	
5.4.	Collect Requirements	
5.5.	Define Scope	
5.6.	Creating Work Breakdown Structure	
5.7.	Scope Validation	
5.8.	Scope Control	

5.3 Planning Project Scope Management

Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Scope Management		5.1 Plan scope Management 5.2 Collect Requirements 5.3 Define scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	

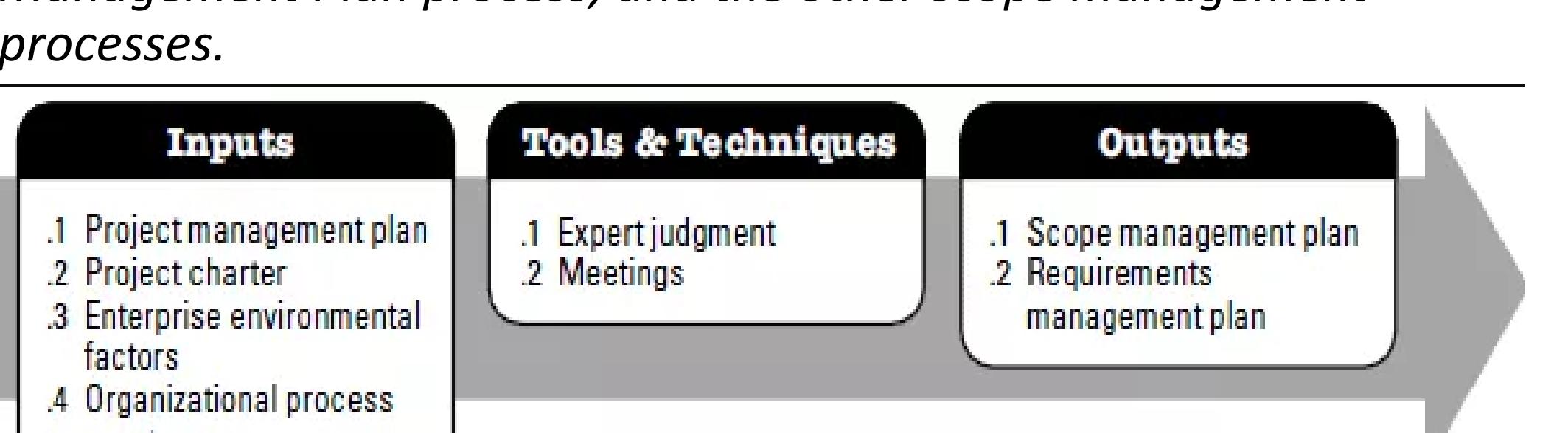
Across Project Management Process Groups

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5.3 Planning Project Scope Management

- The scope management plan is a component of the project or program management plan that describes how the scope will be defined, developed, monitored, controlled, and verified.

- The scope management plan is a major input into the Develop Project Management Plan process, and the other scope management processes.



5.3 Planning Project Scope Management (inputs)

1	Project Management Plan	Described in section 4
2	Project Charter	Described in section 4
3	Enterprise Environmental Factors	<ul style="list-style-type: none">• Organization's culture,• Infrastructure,• Personnel administration, and• Marketplace conditions.
4	Organizational Process Assets	<ul style="list-style-type: none">• Policies and procedures• Historical information• lessons learned knowledge base.

5.3 Planning Project Scope Management (Tools and Techniques)

1	Expert Judgement	Expert judgment refers to input received from knowledgeable and experienced parties. Expertise may be provided by any group or person with specialized education, knowledge, skill, experience, or training in developing scope management plans.
2	Meetings	Project teams may attend project meetings to develop the scope management plan. Attendees at these meetings may include the project manager, the project sponsor, selected project team members, selected stakeholders, anyone with responsibility for any of the scope management processes, and others as needed.

5.3 Planning Project Scope Management (Outputs)

1	Scope Management Plan	<ul style="list-style-type: none">• Process for preparing a detailed project scope statement;• Process that enables the creation of the WBS from the detailed project scope statement;• Process that establishes how the WBS will be maintained and approved;• Process that specifies how formal acceptance of the completed project deliverables will be obtained; and• Process to control how requests for changes to the detailed project scope statement will be processed.
2	Requirements Management Plan	describes how requirements will be analyzed, documented, and managed. : <ul style="list-style-type: none">• How requirements activities will be planned, tracked, and reported;• Configuration management activities such as: how changes to the product will be initiated, how impacts will be analyzed, how they will be traced, tracked, and reported, as well as the authorization levels required to approve these changes;• Requirements prioritization process;• Product metrics that will be used and the rationale for using them; and• Traceability structure to reflect which requirement attributes will be captured on the traceability matrix.

5.	Project Scope Management	3 hrs
5.1.	Project and Product Scope	
5.2.	Project Scope Management Process	
5.3.	Planning Project Scope Management	
5.4.	Collect Requirements	
5.5.	Define Scope	
5.6.	Creating Work Breakdown Structure	
5.7.	Scope Validation	
5.8.	Scope Control	

5.4 Collection Requirements

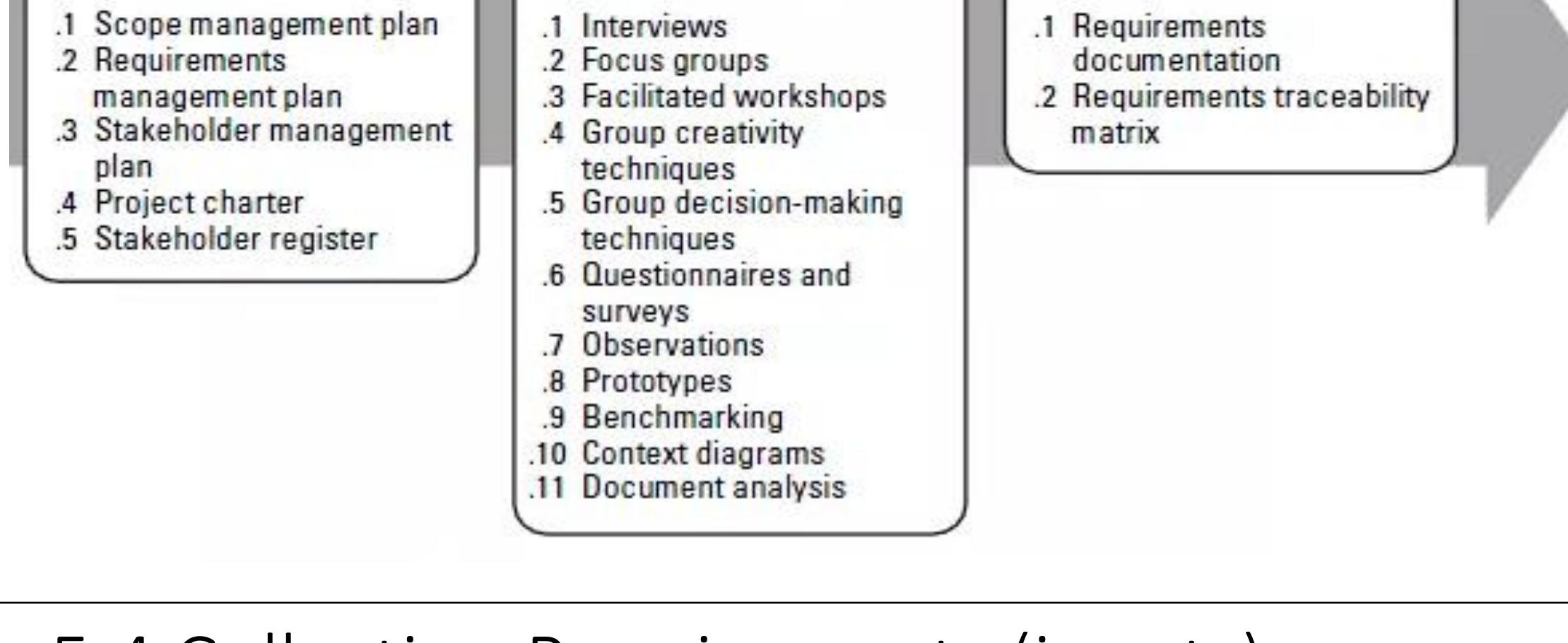
Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Scope Management		5.1 Plan Scope Management  5.2 Collect Requirements 5.3 Define scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	

Across Project Management Process Groups

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5.4 Collection Requirements

- Collect Requirements is the process of determining, documenting, and managing stakeholder needs and requirements to meet project objectives.
- The key benefit of this process is that it provides the basis for defining and managing the project scope including product scope..



5.4 Collection Requirements (inputs)

1	Scope Management Plan	Described in section 5
2	Requirements Management Plan	Described in section 5
3	Stakeholder Management Plan	The stakeholder management plan is used to understand stakeholder communication requirements and the level of stakeholder engagement in order to assess and adapt to the level of stakeholder participation in requirements activities.
4	Project Charter	Described in section 4
5	Stakeholder Register	The stakeholder register is used to identify stakeholders who can provide information on the requirements. The stakeholder register also captures major requirements and main expectations stakeholders may have for the project.

5.4 Collection Requirements (tools and techniques)

1	Interviews	<ul style="list-style-type: none"> • An interview is a formal or informal approach to elicit information from stakeholders by talking to them directly. • It is typically performed by asking prepared and spontaneous questions and recording the responses. Interviews • are often conducted on an individual basis between an interviewer and an interviewee, but may involve multiple interviewers and/or multiple interviewees. • Interviewing experienced project participants, sponsors and other executives, and subject matter experts can aid in identifying and defining the features and functions of the desired product deliverables. • Interviews are also useful for obtaining confidential information.
2	Focus Groups	<p>Focus groups bring together prequalified stakeholders and subject matter experts to learn about their expectations and attitudes about a proposed product, service, or result.</p> <p>A trained moderator guides the group through an interactive discussion, designed to be more conversational than a one-on-one interview.</p>
3	Facilitated Workshops	Facilitated workshops are focused sessions that bring key stakeholders together to define product requirements.

5.4 Collection Requirements (tools and techniques)

4	Group Creativity Techniques	Brainstorming. Nominal group technique. Idea/mind mapping. Affinity diagram Multicriteria decision analysis.
5	Group Decision-Making Techniques	Unanimity. Majority Plurality. Dictatorship.
6	Questionnaires and Surveys	written sets of questions designed to quickly accumulate information from a large number of respondents.
7	Observations	provide a direct way of viewing individuals in their environment and how they perform their jobs or tasks and carry out processes
8	Prototypes	obtaining early feedback on requirements by providing a working model of the expected product before actually building it.

5.4 Collection Requirements (tools and techniques)

9	Benchmarking	comparing actual or planned practices, such as processes and operations, to those of comparable organizations to identify best practices, generate ideas for improvement, and provide a basis for measuring performance.
10	Context Diagrams	visually depict the product scope by showing a business system (process, equipment, computer system, etc.), and how people and other systems (actors) interact with it. Context diagrams show inputs to the business system, the actor(s) providing the input, the outputs from the business system, and the actor(s) receiving the output.
11	Document Analysis	used to elicit requirements by analyzing existing documentation and identifying information relevant to the requirements

5.4 Collection Requirements (Output)

1	Requirement Documentation	describes how individual requirements meet the business need for the project. Includes Business Requirements, Stakeholders requirements, Solution Requirements , Project Requirements , Transitions Requirements , Requirements Assumptions, Dependencies and constraints.
2	Requirements Traceability Matrix	visually depict the product scope by showing a business system (process, equipment, computer system, etc.), and how people and other systems (actors) interact with it. Context diagrams show inputs to the business system, the actor(s) providing the input, the outputs from the business system, and the actor(s) receiving the output. Includes :Project objectives, Project scope/WBS deliverables,Product design, Product development, Test strategy and test scenarios and High-level requirements to more detailed requirements.

5. Project Scope Management 3 hrs

- 5.1. Project and Product Scope
- 5.2. Project Scope Management Process
- 5.3. Planning Project Scope Management
- 5.4. Collect Requirements
- 5.5. Define Scope**
- 5.6. Creating Work Breakdown Structure
- 5.7. Scope Validation
- 5.8. Scope Control

5.5 Define Scope

Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Scope Management		5.1 Plan Scope Management 5.2 Collection Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	

Across Project Management Process Groups

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5.5 Define Scope

- Define Scope is the process of developing a detailed description of the project and product.
- The key benefit of this process is that it describes the project, service, or result boundaries by defining which of the requirements collected will be included in and excluded from the project scope.



5.5 Define Scope (inputs)

1 Scope Management Plan	Described in section 5
2 Project Charter	Described in section 4
3 Requirements Documentation	Described in section 5
4 Organizational Process Assets	Described in section 2

5.5 Define Scope (Tools and Techniques)

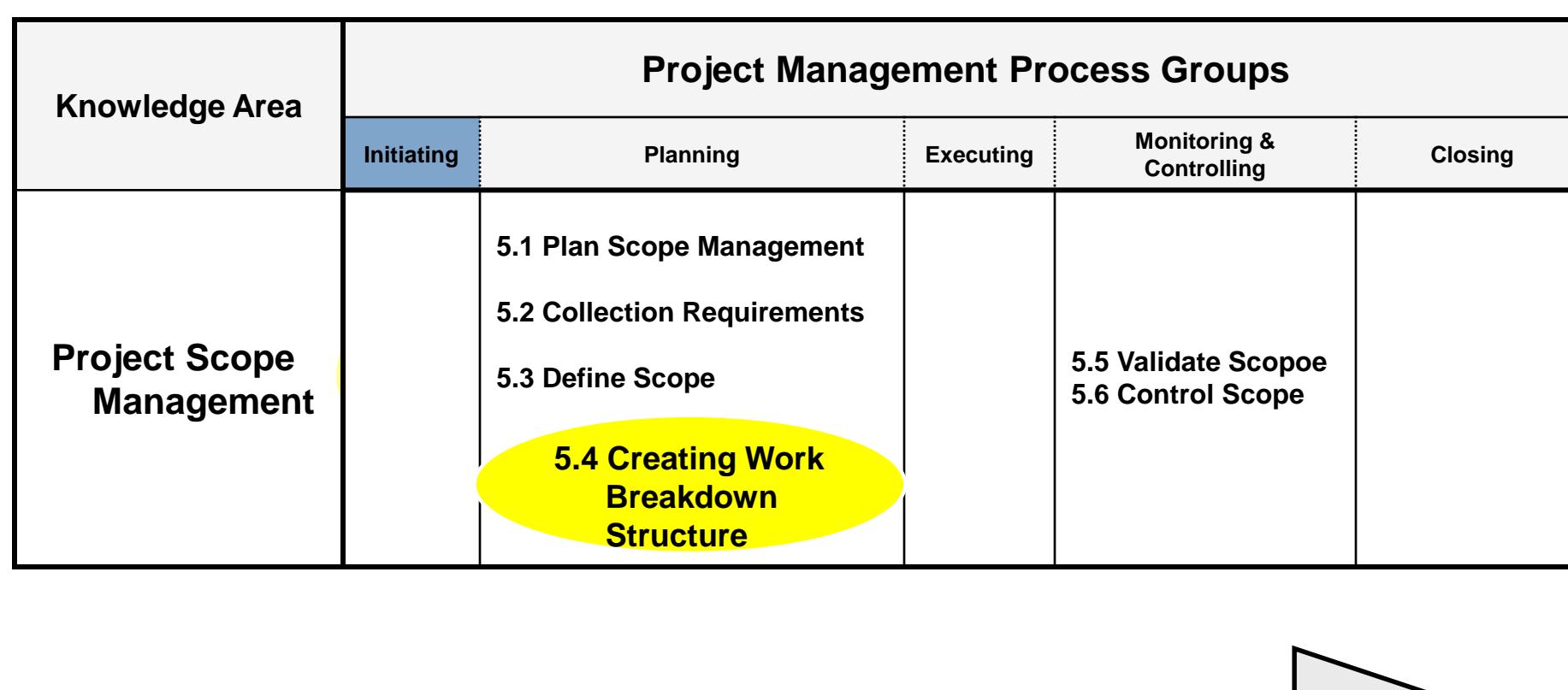
1 Expert Judgment	Described in section 4
2 Product Analysis	includes techniques such as product breakdown, systems analysis, requirements analysis, systems engineering, value engineering, and value analysis.
3 Alternatives Generation	technique used to develop as many potential options as possible in order to identify different approaches to execute and perform the work of the project. A variety of general management techniques can be used, such as brainstorming, lateral thinking, analysis of alternatives, etc.
4 Facilitated Workshops	Described in Section 5

5.5 Define Scope (Outputs)

1 Project Scope Statement	<p>description of the project scope, major deliverables, assumptions, and constraints.</p> <p>The project scope statement documents the entire scope, including project and product scope.</p> <p>It describes, in detail, the project's deliverables and the work required to create those deliverables.</p> <p>It also provides a common understanding of the project scope among project stakeholders.</p>
2 Project Documents Updates	<ul style="list-style-type: none"> • Stakeholder register, • Requirements documentation, and • Requirements traceability matrix.

5. Project Scope Management	3 hrs
5.1. Project and Product Scope 5.2. Project Scope Management Process 5.3. Planning Project Scope Management 5.4. Collect Requirements 5.5. Define Scope 5.6. Creating Work Breakdown Structure 5.7. Scope Validation 5.8. Scope Control	

5.6 Creating Work Breakdown Structure

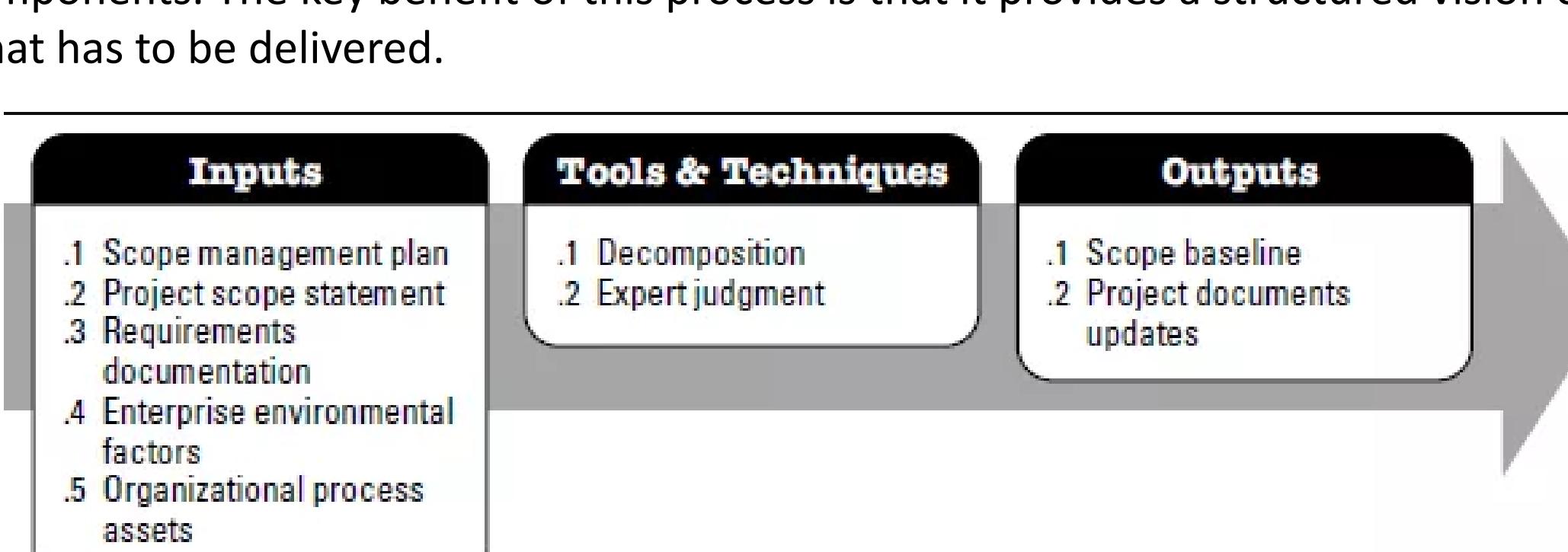


Across Project Management Process Groups

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5.6 Creating Work Breakdown Structure

Create WBS is the process of subdividing project deliverables and project work into smaller, more manageable components. The key benefit of this process is that it provides a structured vision of what has to be delivered.



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5.6 Creating Work Breakdown Structure(input)

1	Scope Management Plan	Describe in section 5
2	Project Scope Statement	Describe in section 5
3	Requirements Documentation	Describe in section 5
4	Enterprise Environmental Factors	Describe in section 2
5	Organizational Process Assets	Describe in section 2

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5.6 Creating Work Breakdown Structure(Tools and Techniques)

1	Decomposition	technique used for dividing and subdividing the project scope and project deliverables into smaller, more manageable parts. involves the following activities: <ul style="list-style-type: none">• Identifying and analyzing the deliverables and related work;• Structuring and organizing the WBS;• Decomposing the upper WBS levels into lower-level detailed components;• Developing and assigning identification codes to the WBS components; and• Verifying that the degree of decomposition of the deliverables is appropriate.
2	Expert Judgement	Describe in section 4

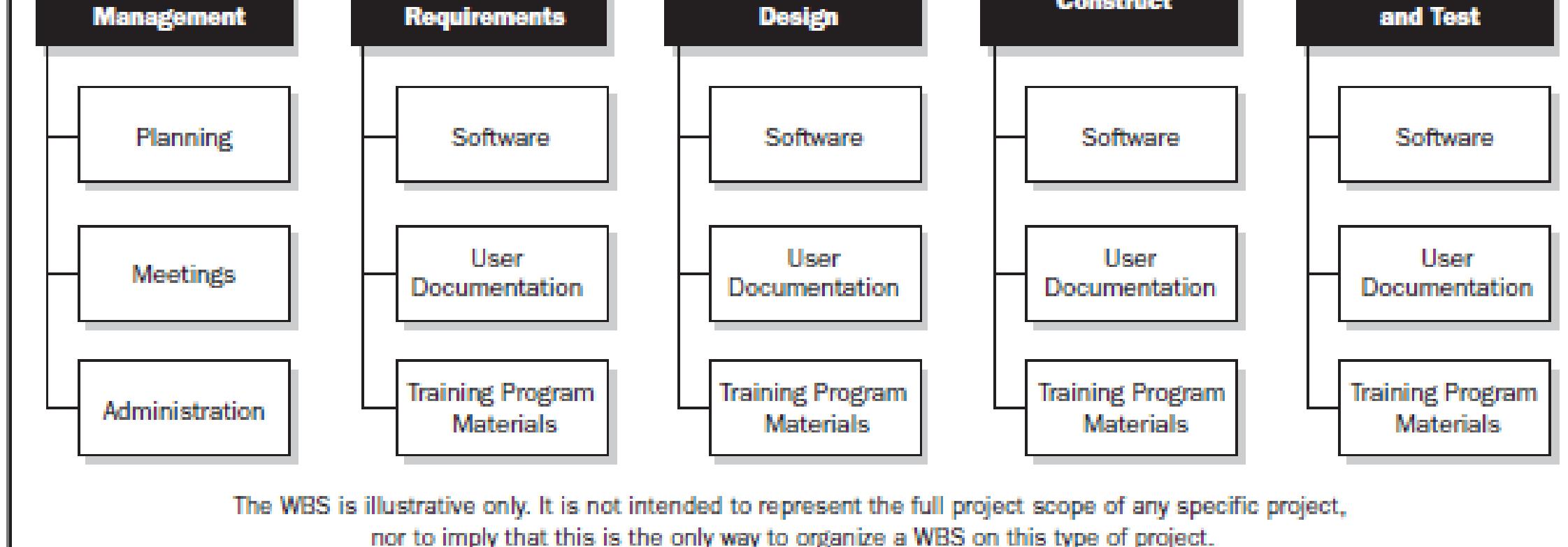
40

5.6 Creating Work Breakdown Output)

1	Scope Baseline	approved version of a scope statement, work breakdown structure (WBS), and its associated WBS dictionary, that can be changed only through formal change control procedures and is used as a basis for comparison. Components of the scope baseline include: <ul style="list-style-type: none">• Project scope statement.• WBS.: hierarchical decomposition of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables.• WBS dictionary: document that provides detailed deliverable, activity, and scheduling information about each component in the WBS and includes Code of account identifier, Description of work, Assumptions and constraints, Responsible organization, Schedule milestones, Associated schedule activities, Resources required, Cost estimates, Quality requirements, Acceptance criteria, Technical references, and Agreement information.
2	Project Documents Updates	Describe in section 4

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5.6 Creating Work Breakdown example)



5.	Project Scope Management	3 hrs
5.1.	Project and Product Scope	
5.2.	Project Scope Management Process	
5.3.	Planning Project Scope Management	
5.4.	Collect Requirements	
5.5.	Define Scope	
5.6.	Creating Work Breakdown Structure	
5.7.	Scope Validation	
5.8.	Scope Control	

5.7 Scope Validation

Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Scope Management		5.1 Plan Scope Management 5.2 Collection Requirements 5.3 Define Scope 5.4 Create Work Breakdown Structure		5.5 Validate Scope 5.6 Control Scope	

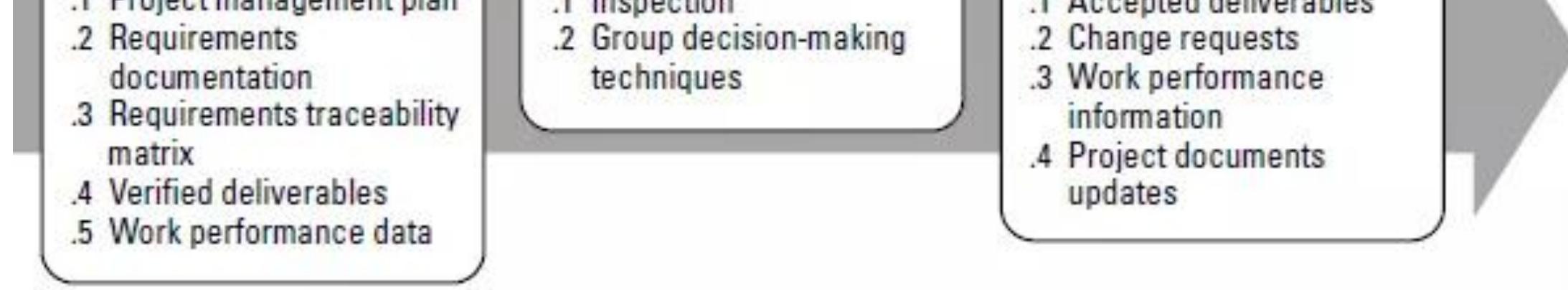
Across Project Management Process Groups

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5.7 Scope Validation

Validate Scope is the process of formalizing acceptance of the completed project deliverables.

The key benefit of this process is that it brings objectivity to the acceptance process and increases the chance of final product, service, or result acceptance by validating each deliverable.



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5.7 Scope Validation (inputs)

1	Project Management Plan	Describe in section 4
2	Requirements Documentation	Describe in section 5
3	Requirements Traceability Matrix	Describe in section 5
4	Verified Deliverables	Verified deliverables are project deliverables that are completed and checked for correctness through the Control Quality process.
5	Work Performance Data	Describe in section 4

46

5.7 Scope Validation (Tools and Techniques)

1 Inspection	Inspection includes activities such as measuring, examining, and validating to determine whether work and deliverables meet requirements and product acceptance criteria. Inspections are sometimes called reviews, product reviews, audits, and walkthroughs. In some application areas, these different terms have unique and specific meanings.
2 Group Decision-Making Techniques	Describe in section 5

47

5.7 Scope Validation (Outputs)

1 Accepted Deliverables	Deliverables that meet the acceptance criteria are formally signed off and approved by the customer or sponsor. Formal documentation received from the customer or sponsor acknowledging formal stakeholder acceptance of the project's deliverables is forwarded to the Close Project or Phase process (Section 4.6).
2 Change Requests	Describe in section 4
3 Work Performance Information	Work performance information includes information about project progress, such as which deliverables have started, their progress, which deliverables have finished, or which have been accepted.
4 Project Documents Updates	Project documents that may be updated as a result of the Validate Scope process include any documents that define the product or report status on product completion. Verified project documents may require approvals from the customer or sponsor in the form of signatures or signoffs.

48

5.	Project Scope Management	3 hrs
5.1.	Project and Product Scope	
5.2.	Project Scope Management Process	
5.3.	Planning Project Scope Management	
5.4.	Collect Requirements	
5.5.	Define Scope	
5.6.	Creating Work Breakdown Structure	
5.7.	Scope Validation	
5.8.	Scope Control	

5.8 Scope Control

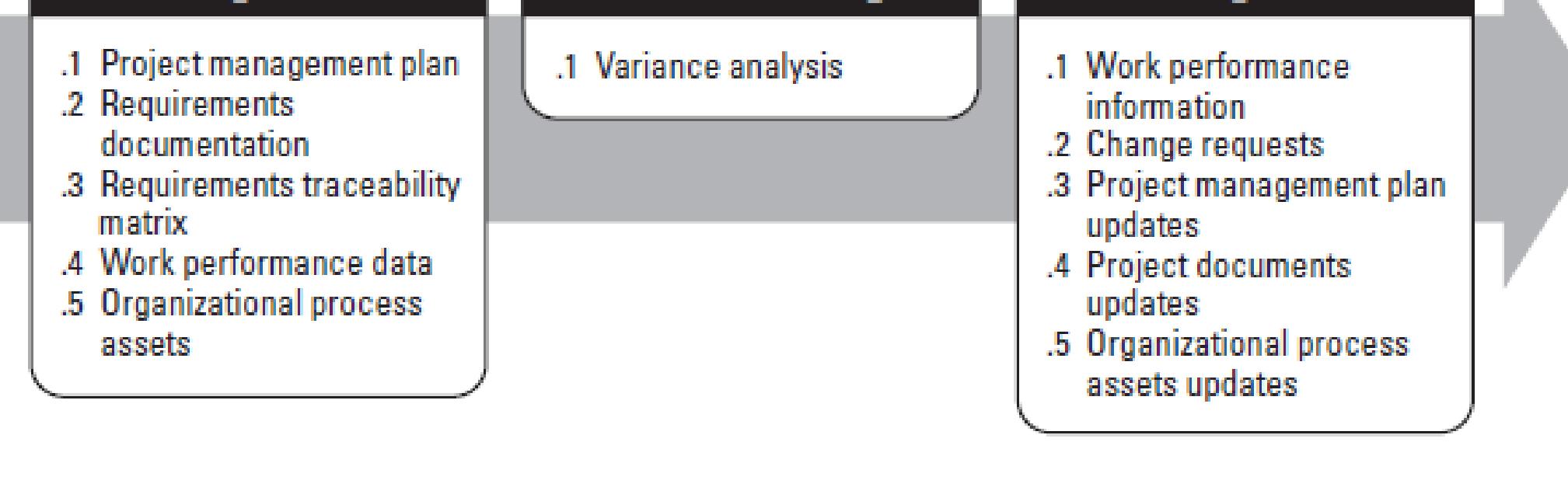
Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Scope Management		5.1 Plan Scope Management 5.2 Collection Requirements 5.3 Define Scope 5.4 Create Work Breakdown Structure		5.5 Validate Scope 5.6 Control Scope	

Across Project Management Process Groups

5.8 Scope Control

Control Scope is the process of monitoring the status of the project and product scope and managing changes to the scope baseline.

The key benefit of this process is that it allows the scope baseline to be maintained throughout the project.



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5.8 Scope Control (inputs)

1 Project Management Plan	Describe in section 5
2 Requirements Documentation	Describe in section 5
3 Requirements Traceability Matrix	Describe in section 5
4 Work Performance Data	Describe in section 4
5 Organizational Process Assets	Describe in section 2

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5.8 Scope Control (Tools and techniques)

1 Variance Analysis	Variance analysis is a technique for determining the cause and degree of difference between the baseline and actual performance. Project performance measurements are used to assess the magnitude of variation from the original scope baseline. Important aspects of project scope control include determining the cause and degree of variance relative to the scope baseline (Section 5.4.3.1) and deciding whether corrective or preventive action is required.
----------------------------	--

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5.8 Scope Control (Outputs)

1 Work Performance Information	Work performance information produced includes correlated and contextualized information on how the project scope is performing compared to the scope baseline. It can include the categories of the changes received, the identified scope variances and their causes, how they impact schedule or cost, and the forecast of the future scope performance. This information provides a foundation for making scope decisions.
2 Change Requests	Describe in section 4
3 Project Management Plan Updates	Scope Baseline Updates. Other Baseline Updates.
4 Project Documents Updates	<ul style="list-style-type: none">• Requirements documentation, and• Requirements traceability matrix.
5 Organizational Process Assets Updates	<ul style="list-style-type: none">• Causes of variances,• Corrective action chosen and the reasons, and• Other types of lessons learned from project scope control.

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Thank you



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6.	Project Time Management	6 hrs
6.1.	Project Time Management Process	
6.2.	Planning Project Time Management	
6.3.	Defining Event, Activity and Activity Attributes	
6.4.	Activity Sequencing	
6.5.	Network Analysis and Network Diagram	
6.6.	Activity Resource and Activity Duration Estimating	
6.7.	Schedule Development	
6.8.	Milestones and Gantt Charts	
6.9.	Forward and Backward Pass	
6.10.	CPM	
6.11.	PERT	
6.12.	Schedule Control	

6.	Project Time Management	6 hrs
6.1.	Project Time Management Process	
6.2.	Planning Project Time Management	
6.3.	Defining Event, Activity and Activity Attributes	
6.4.	Activity Sequencing	
6.5.	Network Analysis and Network Diagram	
6.6.	Activity Resource and Activity Duration Estimating	
6.7.	Schedule Development	
6.8.	Milestones and Gantt Charts	
6.9.	Forward and Backward Pass	
6.10.	CPM	
6.11.	PERT	
6.12.	Schedule Control	

Project Time Management Process

- Includes the process required to manage the timely completion of the project.
- Project time management isn't about being personally more effective. It relates to how you manage the time people are spending on their project tasks, and how long the project takes overall. This knowledge area helps you understand the activities in the project, the sequence of those activities, and how long they are going to take.
- Processes are:
 - Plan Schedule Management
 - Define Activities
 - Sequence Activities
 - Estimate Activity Resources
 - Estimate Activity Durations
 - Develop Schedule
 - Control Schedule

Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

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6. Project Time Management 6 hrs

- 6.1. Project Time Management Process
- 6.2. Planning Project Time Management
- 6.3. Defining Event, Activity and Activity Attributes
- 6.4. Activity Sequencing
- 6.5. Network Analysis and Network Diagram
- 6.6. Activity Resource and Activity Duration Estimating
- 6.7. Schedule Development
- 6.8. Milestones and Gantt Charts
- 6.9. Forward and Backward Pass
- 6.10. CPM
- 6.11. PERT
- 6.12. Schedule Control

6.2 Planning Project Time Management

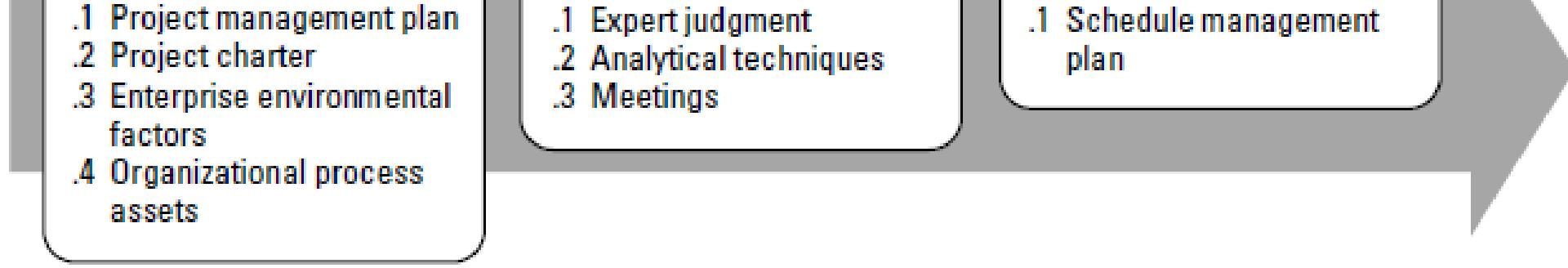
Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	

Across Project Management Process Groups

6

6.2 Planning Project Time Management

- Plan Schedule Management is the process of establishing the policies, procedures, and documentation for planning, developing, managing, executing, and controlling the project schedule.
- The key benefit of this process is that it provides guidance and direction on how the project schedule will be managed throughout the project.



6.2 Planning Project Time Management (Inputs)

1	Project management plan	Described in section 4 : contains information used to develop the schedule management plan which includes, but is not limited to: Scope baseline and other information.
2	Project Charter	Described in section 4 : defines the summary milestone schedule and project approval requirements that will influence the management of the project schedule.
3	Enterprise Environmental Factors	<ul style="list-style-type: none"> • Organization's culture, • Infrastructure, • Personnel administration, and • Marketplace conditions.
4	Organizational Process Assets	<p>influence the Plan Schedule Management process include, but are not limited to:</p> <ul style="list-style-type: none"> • Monitoring and reporting tools to be used; • Historical information; • Schedule control tools; • Existing formal and informal schedule control related policies, procedures, and guidelines; • Templates; • Project closure guidelines; • Change control procedures; and • Risk control procedures including risk categories, probability definition and impact, and probability and impact matrix.

6.2 Planning Project Time Management (Tools and Techniques)

1	Expert judgment	Described in section 4: <ul style="list-style-type: none"> • guided by historical information, provides valuable insight about the environment and information from prior similar projects. • also suggest whether to combine methods and how to reconcile differences between them. • Judgment based upon expertise in an application area, Knowledge Area, discipline, industry, etc., as appropriate for the activity being performed, should be used in developing the schedule management plan.
2	Analytical techniques	<ul style="list-style-type: none"> • The Plan Schedule Management process may involve choosing strategic options to estimate and schedule the project such as: scheduling methodology, scheduling tools and techniques, estimating approaches, formats, and project management software. • The schedule management plan may also detail ways to fast track or crash the project schedule such as undertaking work in parallel.
3	Meetings	<ul style="list-style-type: none"> • Project teams may hold planning meetings to develop the schedule management plan. • Participants at these meetings may include the project manager, the project sponsor, selected project team members, selected stakeholders, anyone with responsibility for schedule planning or execution, and others as needed.

6.2 Planning Project Time Management (Outputs)

1	Schedule management plan	<ul style="list-style-type: none"> • establishes the criteria and the activities for developing, monitoring, and controlling the schedule. • may be formal or informal, highly detailed or broadly framed, based upon the needs of the project, and includes appropriate control thresholds.
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6.	Project Time Management	6 hrs
6.1.	Project Time Management Process	
6.2.	Planning Project Time Management	
6.3.	Defining Event, Activity and Activity Attributes	
6.4.	Activity Sequencing	
6.5.	Network Analysis and Network Diagram	
6.6.	Activity Resource and Activity Duration Estimating	
6.7.	Schedule Development	
6.8.	Milestones and Gantt Charts	
6.9.	Forward and Backward Pass	
6.10.	CPM	
6.11.	PERT	
6.12.	Schedule Control	

6.3 Defining Event, Activity and Activity Schedules

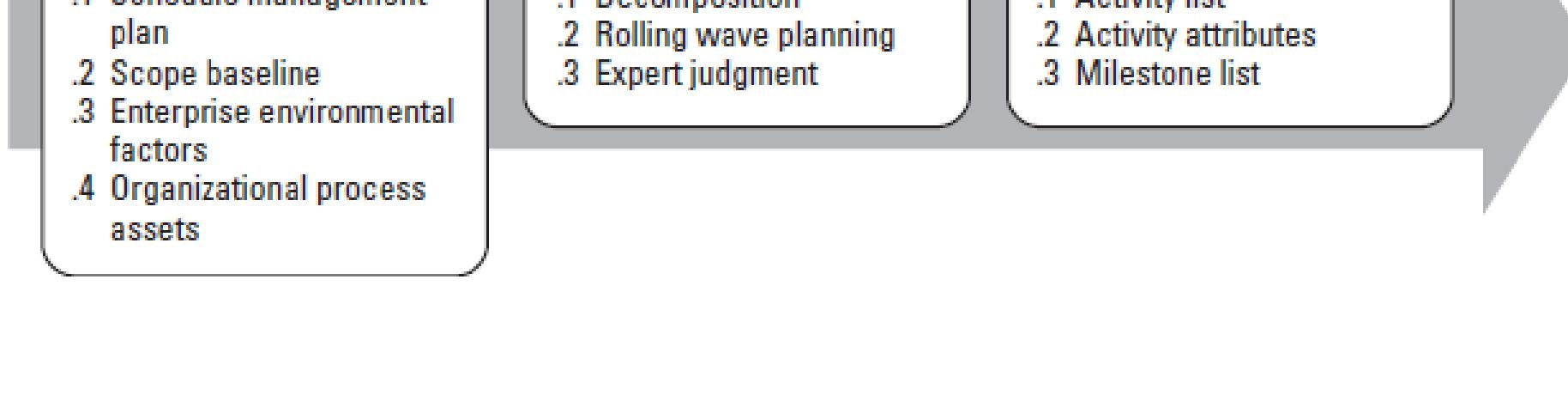
Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	

Across Project Management Process Groups

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6.3 Defining Event, Activity and Activity Schedules

- Define Activities is the process of identifying and documenting the specific actions to be performed to produce the project deliverables.
- The key benefit of this process is to break down work packages into activities that provide a basis for estimating, scheduling, executing, monitoring, and controlling the project work.



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6.3 Defining Event, Activity and Activity Schedules (Inputs)

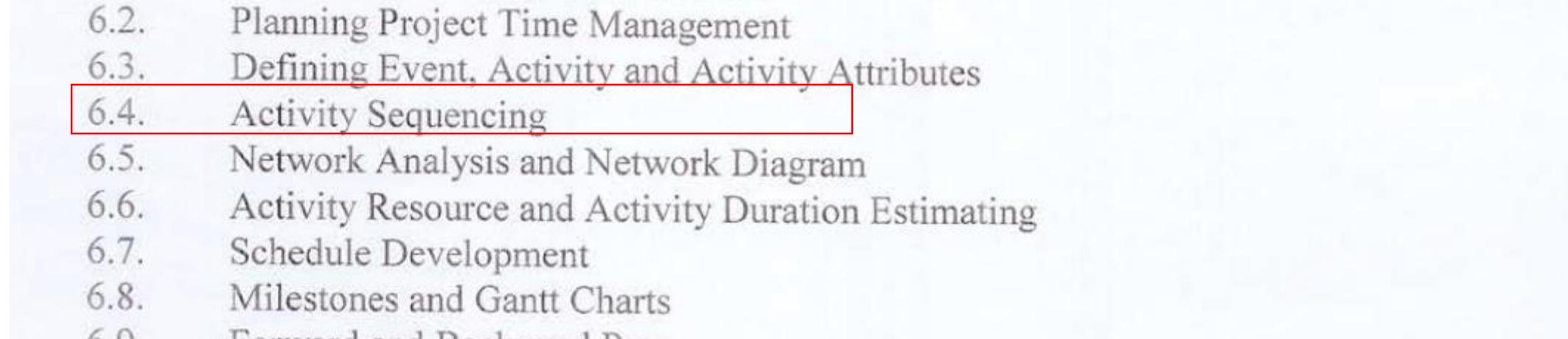
1	Schedule management plan	Described in section 6.1: contains information used to develop the schedule management plan which includes, but is not limited to: Scope baseline and other information .
2	Scope baseline	Described in section 5 : The project WBS, deliverables, constraints, and assumptions documented in the scope baseline are considered explicitly while defining activities.
3	Enterprise Environmental Factors	<ul style="list-style-type: none"> • Organization's culture, • Infrastructure, • Personnel administration, and • Marketplace conditions.
4	Organizational Process Assets	influence the Plan Schedule Management process include, but are not limited to: <ul style="list-style-type: none"> • Lessons learned knowledge base containing historical information regarding activity lists used by previous similar projects, • Standardized processes, • Templates that contain a standard activity list or a portion of an activity list from a previous project, and • Existing formal and informal activity planning-related policies, procedures, and guidelines, such as the scheduling methodology, that are considered in developing the activity definitions.

6.3 Defining Event, Activity and Activity Schedules (Tools and Techniques)

1	Decomposition	<ul style="list-style-type: none"> • Technique used for dividing and subdividing the project scope and project deliverables into smaller, more manageable parts. • Activities represent the effort needed to complete a work package. • The Define Activities process defines the final outputs as activities rather than deliverables, as done in the Create WBS process (as in section 5)
2	Rolling Wave Planning	<ul style="list-style-type: none"> • Rolling wave planning is an iterative planning technique in which the work to be accomplished in the near term is planned in detail, while the work in the future is planned at a higher level. • It is a form of progressive elaboration. • Therefore, work can exist at various levels of detail depending on where it is in the project life cycle. • During early strategic planning, when information is less defined, work packages may be decomposed to the known level of detail. As more is known about the upcoming events in the near term, work packages can be decomposed into activities.
3	Expert Judgment	<ul style="list-style-type: none"> • Project team members or other experts, who are experienced and skilled in developing detailed project scope statements, the WBS, and project schedules, can provide expertise in defining activities.

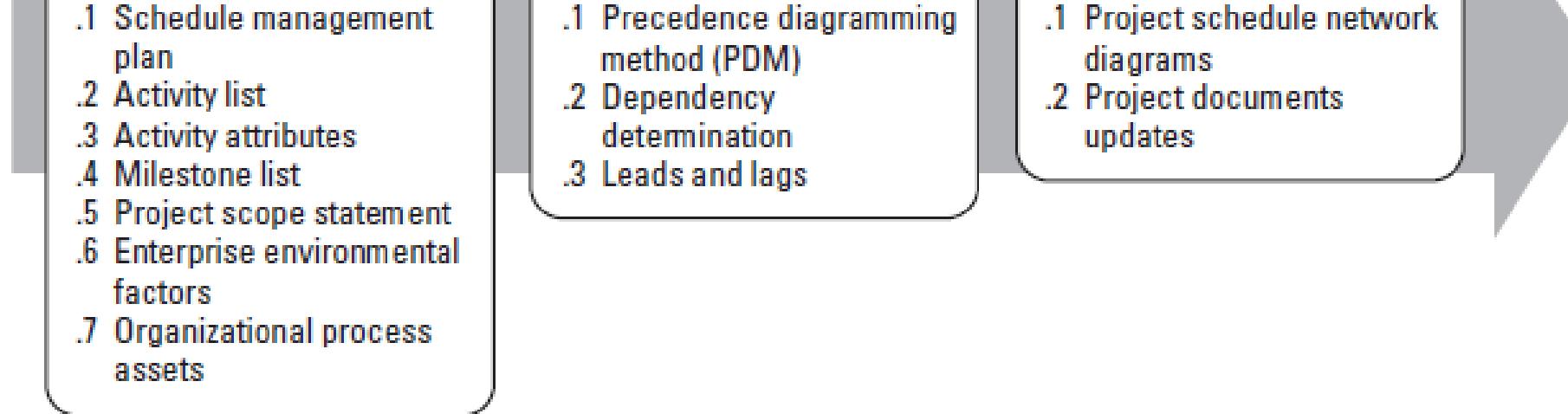
6.3 Defining Event, Activity and Activity Schedules (Outputs)

1	Activity List	<ul style="list-style-type: none">list that includes all schedule activities required on the project.includes the activity identifier and a scope of work description for each activity in sufficient detail to ensure that project team members understand what work is required to be completed.Each activity should have a unique title that describes its place in the schedule, even if that activity title is displayed outside the context of the project schedule.
2	Activity Attributes	<ul style="list-style-type: none">Activities, distinct from milestones, have durations, during which the work of that activity is performed, and may have resources and costs associated with that work.Activity attributes extend the description of the activity by identifying the multiple components associated with each activity.
3	Milestone List	<ul style="list-style-type: none">A milestone list is a list identifying all project milestones and indicates whether the milestone is mandatory, such as those required by contract, or optional, such as those based upon historical information.



6.4 Activity Sequencing

- Sequence Activities is the process of identifying and documenting relationships among the project activities.
- The key benefit of this process is that it defines the logical sequence of work to obtain the greatest efficiency given all project constraints



6.4 Activity Sequencing (Inputs)

1	Schedule management plan	Defined in section 6.1 The schedule management plan identifies the scheduling method and tool to be used for the project, which will guide how the activities may be sequenced.
2	Activity List	Defined in section 6.2 The activity list contains all schedule activities required on the project, which are to be sequenced. Dependencies and other constraints for these activities can influence the sequencing of the activities.
3	Activity Attributes	Defined in section 6.2 Activity attributes may describe a necessary sequence of events or defined predecessor or successor relationships.
4	Milestone List	Defined in section 6.2 The milestone list may have scheduled dates for specific milestones, which may influence the way activities are sequenced.
5	Project Scope Management	Defined in section 5 The project scope statement contains the product scope description, which includes product characteristics that may affect activity sequencing, such as the physical layout of a plant to be constructed or subsystem interfaces on a software project.

6.4 Activity Sequencing

(Inputs)

2 Enterprise Environmental Factors	Enterprise environmental factors that influence the Sequence Activities process include, but are not limited to: <ul style="list-style-type: none">• Government or industry standards,• Project management information system (PMIS),• Scheduling tool, and• Company work authorization systems.
3 Organizational process assets	<ul style="list-style-type: none">• Organization's culture,• Infrastructure,• Personnel administration, and• Marketplace conditions.

6.4 Activity Sequencing (Tools and Techniques)

1 Precedence diagramming method (PDM)	
2 Dependency determination	
3 Leads and lags	

6.4 Activity Sequencing (Tools and Techniques)

- Precedence diagramming method (PDM)
 - technique used for constructing a schedule model in which **activities** are represented by **nodes** and are **graphically linked** by one or more **logical relationships** to show the **sequence** in which the activities are to be performed.
 - Activity-on-node (AON) is one method of representing a precedence diagram. This is the method used by most project management software packages.
 - PDM includes **four types of dependencies** or logical relationships.
 - A predecessor activity is an activity that **logically comes before** a dependent activity in a schedule.
 - A successor activity is a dependent activity that **logically comes after** another activity in a schedule.

6.4 Activity Sequencing (Tools and Techniques)

- **Finish-to-start (FS).**
 - A logical relationship in which a successor activity cannot start until a predecessor activity has finished. Example: The development of software can only start after the completion of the design process.
 - **Once the activity A is finish then activity B can start.**

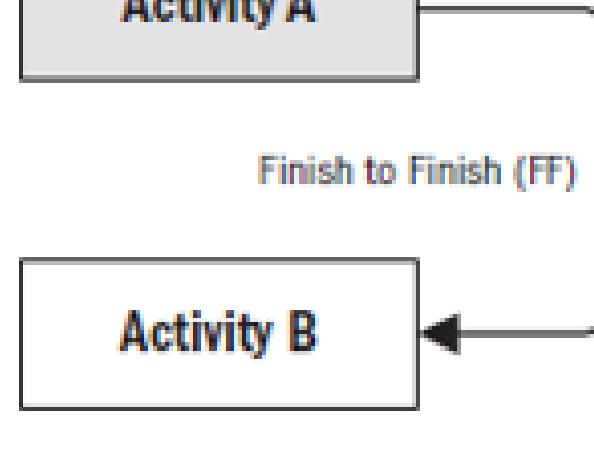


6.4 Activity Sequencing (Tools and Techniques)

- **Finish-to-finish (FF).**

- A logical relationship in which a successor activity cannot finish until a predecessor activity has finished. Example: Writing a document (predecessor) is required to finish before editing the document (successor) can finish.

- **Activity B cannot finish till the time Activity A cannot finish.**

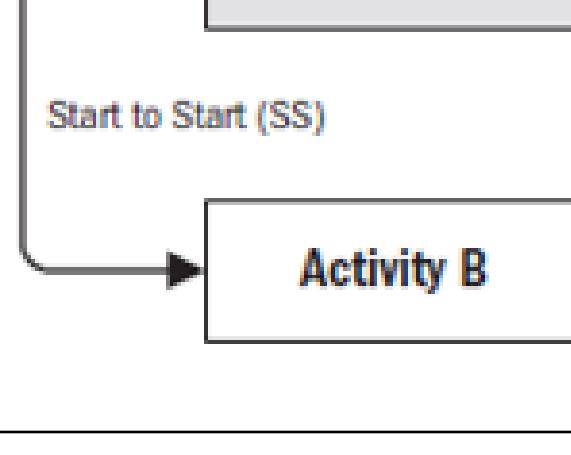


6.4 Activity Sequencing (Tools and Techniques)

- **Start-to-start (SS).**

A logical relationship in which a successor activity cannot start until a predecessor activity has started. Example: Level concrete (successor) cannot begin until pour foundation (predecessor) begins.

Activity B cannot start till the time Activity A is started.



6.4 Activity Sequencing (Tools and Techniques)

- **Start-to-finish (SF).**

A logical relationship in which a successor activity cannot finish until a predecessor activity has started. Example: The first security guard shift (successor) cannot finish until the second security guard shift (predecessor) starts.

Activity B cannot finish till the time A is started.



6.4 Activity Sequencing (Tools and Techniques)

1	Precedence diagramming method (PDM)
2	Dependency determination
3	Leads and lags

6.4 Activity Sequencing (Tools and Techniques)

- Dependency Determination

- characterized by the following attributes:

- mandatory
- discretionary
- internal
- external,

- Dependency has four attributes, but two can be applicable at the same time in following ways: mandatory external dependencies, mandatory internal dependencies, discretionary external dependencies or discretionary internal dependencies

6.4 Activity Sequencing (Tools and Techniques)

1. Mandatory Dependency:

- inherent in the nature of the work.
- Cannot be done any other way.
- sometimes referred to as hard logic or hard dependencies.
- E.g software application development cannot start before collecting requirements.

6.4 Activity Sequencing (Tools and Techniques)

2. Discretionary dependencies:

- Based on the preference of team can be changed if needed.
- sometimes referred to as soft logic.

• E.g order of developing an application's various modules.

6.4 Activity Sequencing (Tools and Techniques)

3. External dependencies:

- Something outside the project impact something internal to the project.
- E.g Application development team cannot install application until infrastructure team provide required setup.

6.4 Activity Sequencing (Tools and Techniques)

4. Internal dependencies.:

- Dependencies within the project team control.
- E.g testing team depends on development team to deliver the product to test.

6.4 Activity Sequencing (Tools and Techniques)

1	Precedence diagramming method (PDM)	
2	Dependency determination	
3	Leads and lags	

6.4 Activity Sequencing (Tools and Techniques)

Leads and lags:

- A lead is the amount of time whereby a successor activity can be advanced with respect to a predecessor activity.
- A lag is the amount of time whereby a successor activity will be delayed with respect to a predecessor activity.

6.4 Activity Sequencing (Outputs)

1	Project schedule network diagrams	<ul style="list-style-type: none">• graphical representation of the logical relationships, also referred to as dependencies, among the project schedule activities.• is produced manually or by using project management software.• It can include full project details, or have one or more summary activities.
2	Project documents updates	Project documents that may be updated include, but are not limited to: <ul style="list-style-type: none">• Activity lists,• Activity attributes,• Milestone list, and• Risk register.

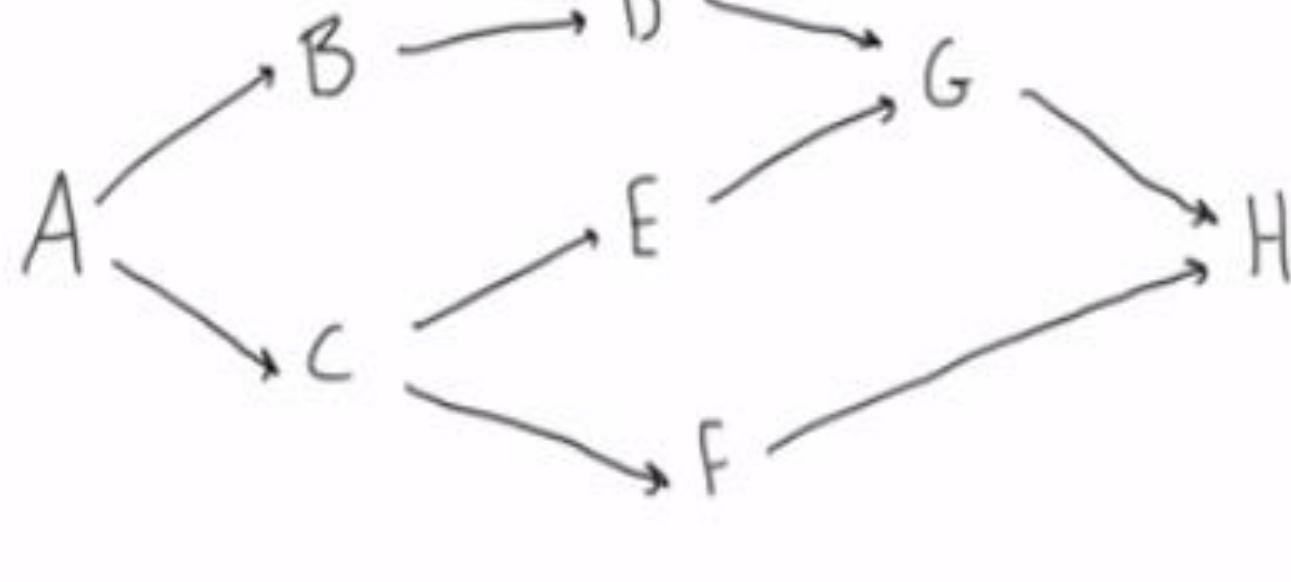
6.	Project Time Management	6 hrs
6.1.	Project Time Management Process	
6.2.	Planning Project Time Management	
6.3.	Defining Event, Activity and Activity Attributes	
6.4.	Activity Sequencing	
6.5.	Network Analysis and Network Diagram	
6.6.	Activity Resource and Activity Duration Estimating	
6.7.	Schedule Development	
6.8.	Milestones and Gantt Charts	
6.9.	Forward and Backward Pass	
6.10.	CPM	
6.11.	PERT	
6.12.	Schedule Control	

6.5 Network analysis and network diagram

Activity	Predecessor	Duration (days)
A	-	3
B	A	4
C	A	2
D	B	5
E	C	1
F	C	2
G	D,E	4
H	F,G	3

6.5 Network analysis and network diagram

Activity	Predecessor	Duration (days)
A	-	3
B	A	4
C	A	2
D	B	5
E	C	1
F	C	2
G	D,E	4
H	F,G	3



$$ES \text{ (Early start)} = EF + 1$$

$$EF = ES + D - 1$$

$$LF = LS - 1$$

$$LS = LF - D + 1$$

$$TF = LF - EF \text{ (finish float)}$$

$$TF = LS - ES \text{ (start float)}$$

In critical path TF=0

Early start	Activity name	Early Finish
Late Start	duration	Late finish

<p>6. Project Time Management</p> <p>6.1. Project Time Management Process</p> <p>6.2. Planning Project Time Management</p> <p>6.3. Defining Event, Activity and Activity Attributes</p> <p>6.4. Activity Sequencing</p> <p>6.5. Network Analysis and Network Diagram</p> <p>6.6. Activity Resource and Activity Duration Estimating</p> <p>6.7. Schedule Development</p> <p>6.8. Milestones and Gantt Charts</p> <p>6.9. Forward and Backward Pass</p> <p>6.10. CPM</p> <p>6.11. PERT</p> <p>6.12. Schedule Control</p>	6 hrs
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6.6 Defining Event, Activity and Activity Schedules

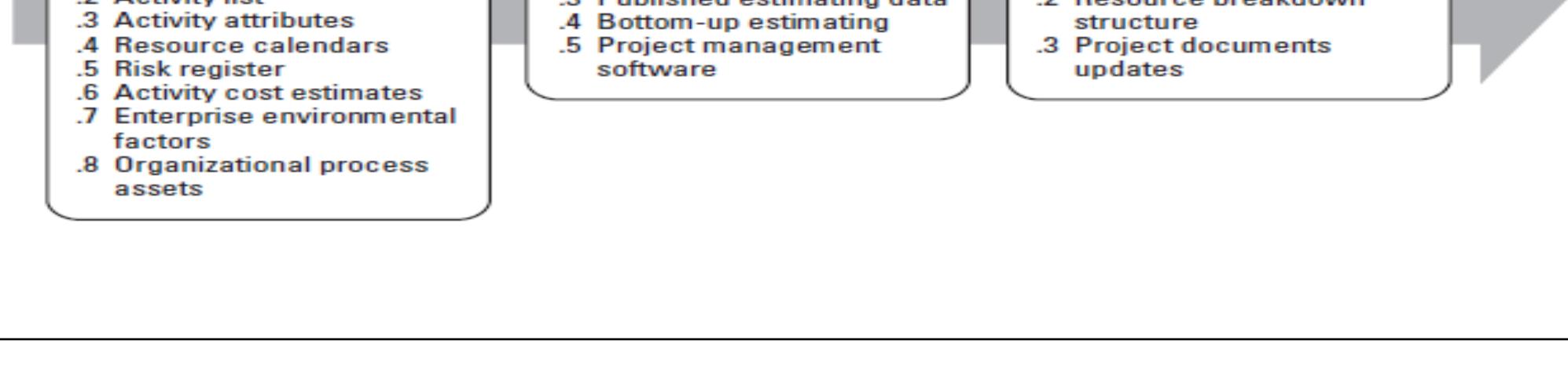
Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Time Management		<p>6.1 Plan Schedule Management</p> <p>6.2 Define Activities</p> <p>6.3 Sequence Activities</p> <p>6.4 Estimate Activity Resources</p> <p>6.5 Estimate Activity Durations</p> <p>6.6 Develop Schedule</p>		6.7 Control Schedule	

Across Project Management Process Groups

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6.6 Activity Resource Estimating

- Estimate Activity Resources is the process of estimating the type and quantities of material, human resources, equipment, or supplies required to perform each activity.
- The key benefit of this process is that it identifies the type, quantity, and characteristics of resources required to complete the activity which allows more accurate cost and duration estimates.



6.6 Activity Resource Estimating (inputs)

1 Schedule Management Plan	<ul style="list-style-type: none"> Described in Section 6
2 Activity List	<ul style="list-style-type: none"> Described in Section 6
3 Activity attributes	Described in Section 6
4 Activity resource Requirements	Described in Section 6
5 Resource Calenders	The resource calendars influence the duration of schedule activities due to the availability of specific resources, type of resources, and resources with specific attributes.
6 Project Scope Management	Described in Section 5
7 Risk Registers	The risk register provides the list of risks, along with the results of risk analysis and risk response planning.

Activity Resource (inputs)

8	Resource breakdown structure	The resource breakdown structure provides a hierarchical structure of the identified resources by resource category and resource type.
9	Enterprise environmental factors	<ul style="list-style-type: none">Described in Section 2
10	Organizational process Assets	Described in Section 2

Activity Resource Estimating (Tools and Techniques)

8	Resource breakdown structure	The resource breakdown structure provides a hierarchical structure of the identified resources by resource category and resource type.
9	Enterprise environmental factors	<ul style="list-style-type: none">Described in Section 2
10	Organizational process Assets	Described in Section 2

Activity Resource Estimating (Outputs)

8	Resource breakdown structure	The resource breakdown structure provides a hierarchical structure of the identified resources by resource category and resource type.
9	Enterprise environmental factors	<ul style="list-style-type: none">Described in Section 2
10	Organizational process Assets	Described in Section 2

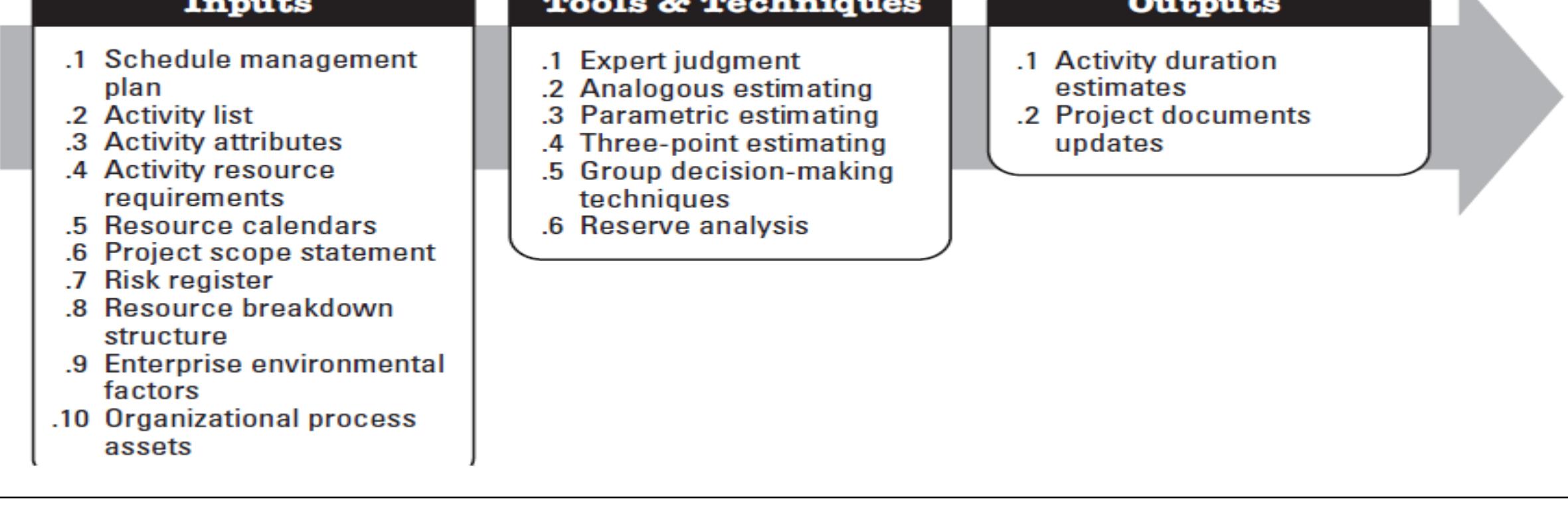
6.7 Activity Duration Estimating

Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Time Management		<p>6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources</p> <p>6.5 Estimate Activity Durations</p> <p>6.6 Develop Schedule</p>		<p>6.7 Control Schedule</p>	

Across Project Management Process Groups

Activity Duration Estimating

- Estimate Activity Durations is the process of estimating the number of work periods needed to complete individual activities with estimated resources.
- The key benefit of this process is that it provides the amount of time each activity will take to complete, which is a major input into the Develop Schedule process.



Activity Duration Estimating (inputs)

1 Schedule Management Plan	Defined in section 6. defines the method used and the level of accuracy along with other criteria required to estimate activity durations including the project update cycle.
2 Activity List	<ul style="list-style-type: none"> Described in Section 6. identifies the activities that will need duration estimates.
3 Activity Attributes	Described in Section 6. provide the primary data input for use in estimating durations required for each activity in the activity list.
4 Activity Resource Requirements	Described in Section 6
5 Resource Calendars	Described in Section 6. influence the duration of schedule activities due to the availability of specific resources, type of resources, and resources with specific attributes

Activity Duration Estimating (inputs)

6 Project Scope Statement	Defined in section 5.
7 Risk Register	Described in Section 6. provides the list of risks, along with the results of risk analysis and risk response planning
8 Resource Breakdown Structure	Described in Section 6 provides a hierarchical structure of the identified resources by resource category and resource type.
9 Enterprise Environmental Factors	Described in Section 2
10 Organizational Process Assets	Described in Section 2.

Activity Duration Estimating (Tools and Techniques)

1 Expert Judgement	Expert judgment, guided by historical information, can provide duration estimate information or recommended maximum activity durations from prior similar projects.
2 Analogous Estimating	<ul style="list-style-type: none"> technique for estimating the duration or cost of an activity or a project using historical data from a similar activity or project. uses parameters from a previous, similar project, such as duration, budget, size, weight, and complexity, as the basis for estimating the same parameter or measure for a future project.
3 Parametric Estimating	estimating technique in which an algorithm is used to calculate cost or duration based on historical data and project parameters. uses a statistical relationship between historical data and other variables (e.g., square footage in construction) to calculate an estimate for activity parameters, such as cost, budget, and duration.

Activity Duration Estimating (Tools and Techniques)

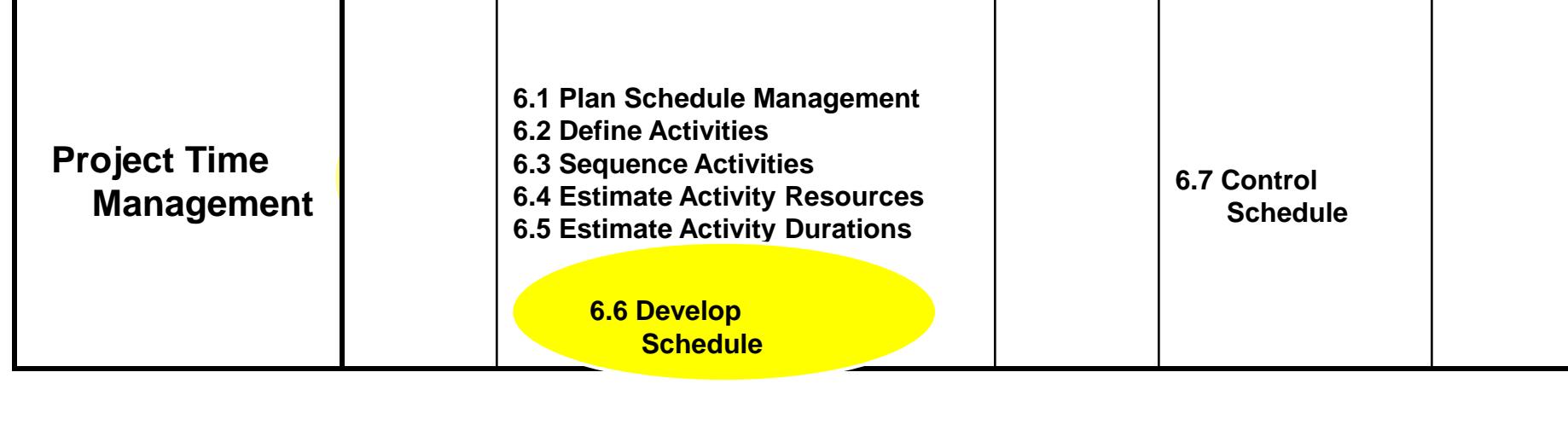
4	Three-Point Estimating	PERT uses three estimates to define an approximate range for an activity's duration: <ul style="list-style-type: none"> • Most likely (tM). This estimate is based on the duration of the activity, given the resources likely to be assigned, their productivity, realistic expectations of availability for the activity, dependencies on other participants, and interruptions. • Optimistic (tO). The activity duration based on analysis of the best-case scenario for the activity. • Pessimistic (tP). The activity duration based on analysis of the worst-case scenario for the activity.
4	Group Decision-Making Techniques	Team-based approaches, such as brainstorming are useful for engaging team members to improve estimate accuracy and commitment to the emerging estimates
5	Reserve Analysis	Duration estimates may include contingency reserves, sometimes referred to as time reserves or buffers, into the project schedule to account for schedule uncertainty. Contingency reserves are the estimated duration within the schedule baseline, which is allocated for identified risks that are accepted and for which contingent or mitigation responses are developed.

Activity Duration Estimating (Outputs)

1	Activity Duration Estimates	are quantitative assessments of the likely number of time periods that are required to complete an activity. Duration estimates do not include any lags
2	Project Documents Updates	<ul style="list-style-type: none"> • Described in Section 2

6.	Project Time Management	6 hrs
6.1.	Project Time Management Process	
6.2.	Planning Project Time Management	
6.3.	Defining Event, Activity and Activity Attributes	
6.4.	Activity Sequencing	
6.5.	Network Analysis and Network Diagram	
6.6.	Activity Resource and Activity Duration Estimating	
6.7.	Schedule Development	
6.8.	Milestones and Gantt Charts	
6.9.	Forward and Backward Pass	
6.10.	CPM	
6.11.	PERT	
6.12.	Schedule Control	

6.7 Schedule Development

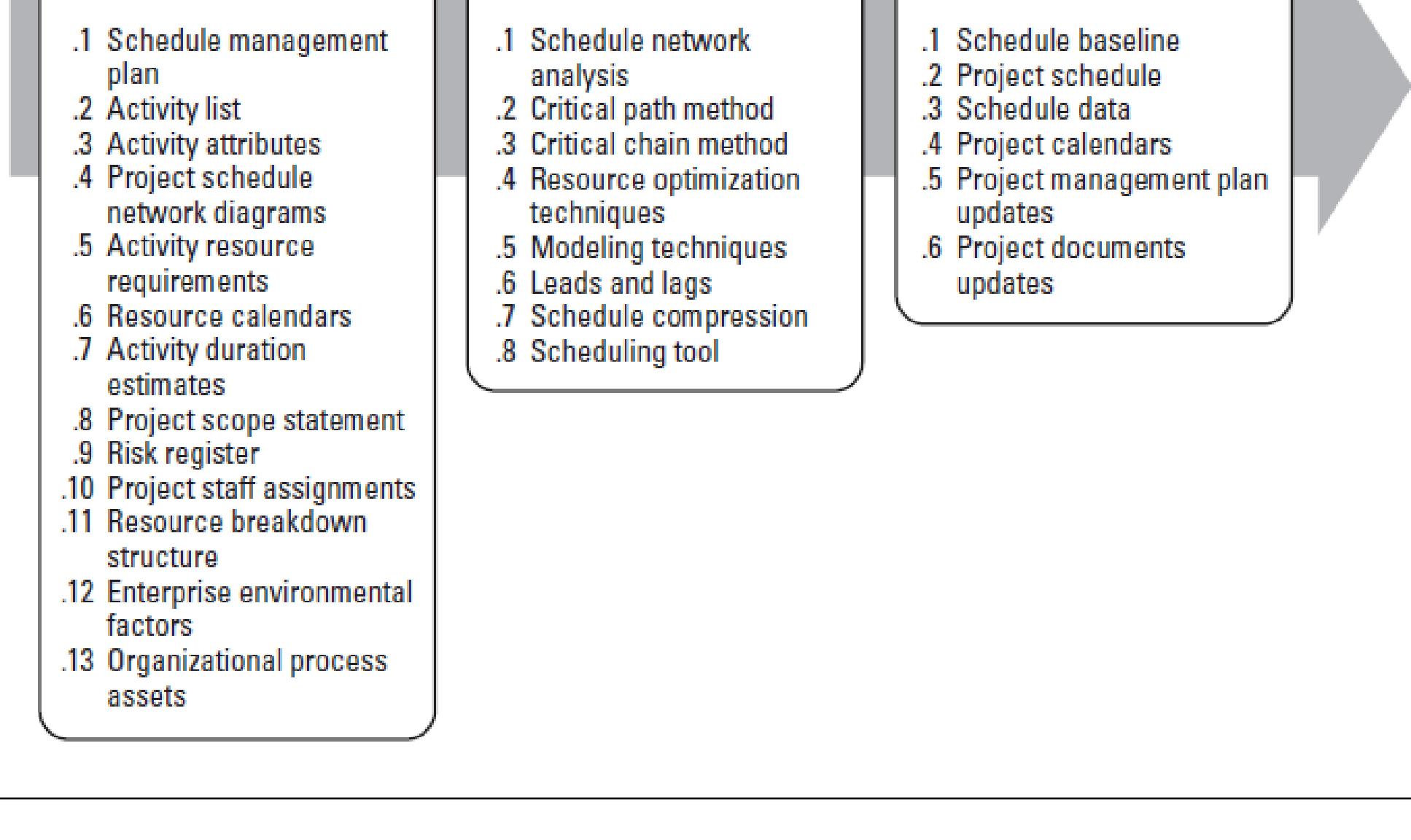


Across Project Management Process Groups

Schedule Development

- Develop Schedule is the process of analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule model.
- The key benefit of this process is that by entering schedule activities, durations, resources, resource availabilities, and logical relationships into the scheduling tool, it generates a schedule model with planned dates for completing project activities.

Schedule Development



Schedule Development(inputs)

1	Schedule Management Plan	Described in Section 6. The schedule management plan identifies the scheduling method and tool used to create the schedule, and how the schedule is to be calculated.
2	Activity List	• Described in Section 6. The activity list identifies the activities that will be included in the schedule model.
3	Activity Attributes	Described in Section 6. The activity attributes provide the details used to build the schedule model.
4	Activity Resource Requirements	Described in Section 6. The activity resource requirements identify the types and quantities of resources required for each activity used to create the schedule model.
5	Resource Calendars	The resource calendars contain information on the availability of resources during the project.

Schedule Development (inputs)

6	Project Scope Statement	Defined in section 5. The project scope statement contains assumptions and constraints that can impact the development of the project schedule.
7	Risk Register	The risk register provides the details of all identified risks and their characteristics that affect the schedule model..
8	Resource Breakdown Structure	Described in Section 6. The resource breakdown structure provides the details by which resource analysis and organizational reporting can be done.
9	Enterprise Environmental Factors	Described in Section 2
10	Organizational Process Assets	Described in Section 2.

Schedule Development (inputs)

11	Project schedule network diagrams	Defined in section 6. The project schedule network diagrams contain the logical relationships of predecessors and successors that will be used to calculate the schedule.
12	Project staff assignments	The project staff assignments specify which resources are assigned to each activity.
13	Activity Duration Estimates	Described in Section 6. The activity duration estimates contain the quantitative assessments of the likely number of work periods that will be required to complete an activity that will be used to calculate the schedule.

Schedule Development(Tools and Techniques)

1	Schedule network analysis	<ul style="list-style-type: none">• Schedule network analysis is a technique that generates the project schedule model.• It employs various analytical techniques, such as critical path method, critical chain method, what-if analysis, and resource optimization techniques to calculate the early and late start and finish dates for the uncompleted portions of project activities.
2	Critical path method	<p>The critical path method, which is a method used to estimate the minimum project duration and determine the amount of scheduling flexibility on the logical network paths within the schedule model.</p> <p>This schedule network analysis technique calculates the early start, early finish, late start, and late finish dates for all activities without regard for any resource limitations by performing a forward and backward pass analysis through the schedule network.</p>
3	Critical chain method	<p>The critical chain method (CCM) is a schedule method that allows the project team to place buffers on any project schedule path to account for limited resources and project uncertainties.</p> <p>It is developed from the critical path method approach and considers the effects of resource allocation, resource optimization, resource leveling, and activity duration uncertainty on the critical path determined using the critical path method.</p>

Schedule Development(Tools and Techniques)

4	Resource optimization techniques	used to adjust the schedule model due to demand and supply of resources include, but are not limited to Resource leveling, Resource Smoothing .
5	Modeling techniques	What-If Scenario Analysis, Simulation

Schedule Development(Tools and Techniques)

6	Leads and lags	Leads and lags are refinements applied during network analysis to develop a viable schedule by adjusting the start time of the successor activities. Leads are used in limited circumstances to advance a successor activity with respect to the predecessor activity, and lags are used in limited circumstances where processes require a set period of time to elapse between the predecessors and successors without work or resource impact.
7	Schedule compression	used to shorten the schedule duration without reducing the project scope, in order to meet schedule constraints, imposed dates, or other schedule objectives. Includes: Crashing, Fast tracking .
8	Scheduling tool	Automated scheduling tools contain the schedule model and expedite the scheduling process by generating start and finish dates based on the inputs of activities, network diagrams, resources and activity durations using schedule network analysis.

Schedule Development(Outputs)

1	Schedule baseline	approved version of a schedule model that can be changed only through formal change control procedures and is used as a basis for comparison to actual results.
2	Project schedule	output of a schedule model that presents linked activities with planned dates, durations, milestones, and resources; Can be represented as Bar charts, Milestone charts, Project schedule network diagrams
3	Project calendars	identifies working days and shifts that are available for scheduled activities. It distinguishes time periods in days or parts of days that are available to complete scheduled activities from time periods that are not available.
4	Project management plan updates	Elements of the project management plan
5	Project documents updates	Includes Activity resource requirements, Activity attributes, Calendars, Risk Registers
6	Schedule Data	the collection of information for describing and controlling the schedule. The schedule data includes at least the schedule milestones, schedule activities, activity attributes, and documentation of all identified assumptions and constraints.

6. Project Time Management 6 hrs

- 6.1. Project Time Management Process
- 6.2. Planning Project Time Management
- 6.3. Defining Event, Activity and Activity Attributes
- 6.4. Activity Sequencing
- 6.5. Network Analysis and Network Diagram
- 6.6. Activity Resource and Activity Duration Estimating
- 6.7. Schedule Development
- 6.8. Milestones and Gantt Charts
- 6.9. Forward and Backward Pass
- 6.10. CPM
- 6.11. PERT
- 6.12. Schedule Control

Milestone and Gantt Charts

• Milestone:

• A milestone is a significant event in the course of a project that is used to give visibility of progress in terms of achievement of predefined milestone goals.

• Failure to meet a milestone indicates that a project is not proceeding to plan and usually triggers corrective action by management.

Milestone and Gantt Charts

• Milestone:

• is a task with a duration of zero which signifies an achievement in the project.

• Could be in the form of Significant dates, Significant Deadlines, External events and dates.

• used as a way showing forward movement and progress and show people what is going on, even if they don't have a detailed knowledge of the tasks involved to get there.

• a great way to track project.

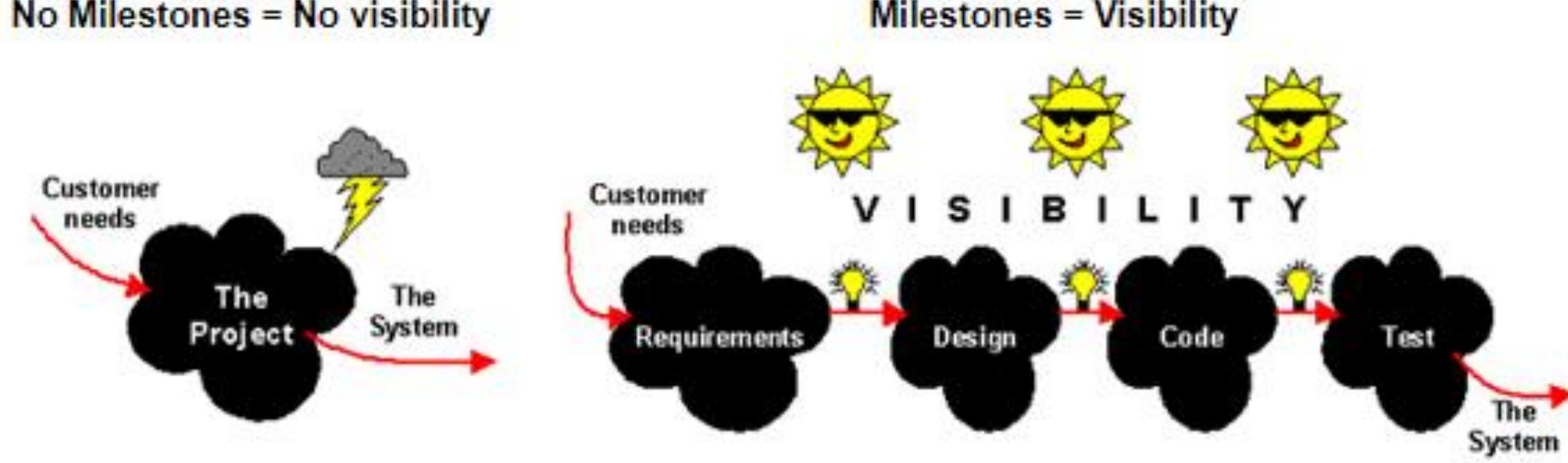
Milestone and Gantt Charts

- Milestones are one of the components of a Gantt chart and are shown on the chart as a diamond.
- When To Use Project Milestones
 - The start of significant phases of work
 - The end of significant phases of work
 - To mark the deadline for something
 - To show when an important decision is being made.
- Milestones are a really useful project management tool for planning, scheduling, and reporting and they are easy to use

Milestone and Gantt Charts

- Milestones have no duration, they represent instantaneous events that occur throughout the project.
- Typical project events that are marked with milestones are:
 - The completion of a project phase
 - The approval of a deliverable
 - The completion of a scheduled review
 - The completion of an activity
 - The commencement of an activity.

Milestone and Gantt Charts



Milestone and Gantt Charts

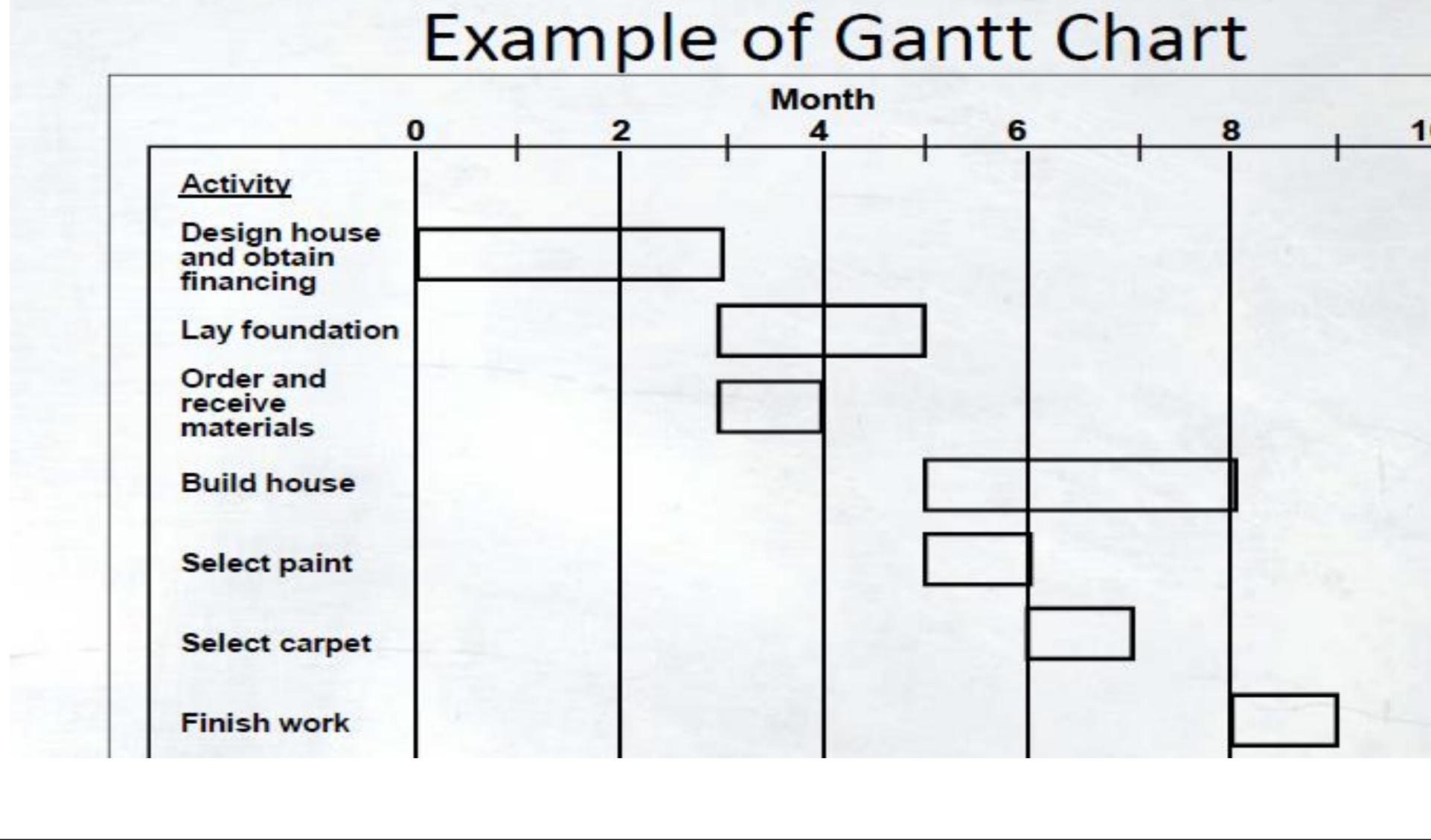
- Gantt Charts:
 - framework that shows a visual representation of large projects, broken into smaller pieces or activities with each of these activities spread out over time.
 - shows at a glance, what the individual activities are, when each one should begin and end, if there is any overlap between activities, and how the project can be completed within a given time limit.
 - Typical uses for a Gantt chart include: developing a software prototype, planning a large event, and writing a multi-departmental report.

Milestone and Gantt Charts

- Gantt Charts:

- monitor the progress of a large project.
- show at a glance how the project is progressing.
- motivate the project team to push for completion.
- Makes project efficient and flexible
- But doesnot indicate priority in project,
- Doesnot provide detail information of project.

Milestone and Gantt Charts



6.	Project Time Management	6 hrs
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Forward and Backward Pass

- There are two terms related to [Critical Path](#) that one may encounter. These are the terms *Forward Pass* and *Backward Pass*.
- These terms are related to ways of determining the early or late start [forward pass] or early or late finish [backward pass] for an activity.
- Forward pass is a technique to move forward through a diagram to calculate activity duration.
- Backward pass is a technique to move backward through a diagram to calculate activity duration.
- **Early Start (ES)** and **Early Finish (EF)** use the forward pass technique.
- To determine the **Early Start** of an activity, factor in all its dependencies and see its earliest start date. $ES=EF+1$

Forward and Backward Pass

- The **Early Finish (EF)** is the earliest calculated time an activity can end. $EF = (ES \text{ for the activity} + \text{Activity Duration}) - 1$.
- **Late Start (LS)** and **Late Finish(LF)** use the backward pass technique. **Late Start (LS)** is the latest time an activity may *begin* without delaying the project duration.

$$LS = (\text{Activity's LF} - \text{Activity Duration}) + 1.$$

- **Late Finish (LF)** latest time an activity may be *completed* without delaying the project duration.

$$LF = LS - 1.$$

If float of activity is zero, ES = LS and EF = LF.

Forward and Backward Pass

- ES (Early start)=EF+1
- EF=ES+D-1
- LF=LS-1
- LS=LF-D+1

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CPM

- Critical path project management (CPM) is a technique used to complete projects on time by focusing on key tasks.
- One path through all the inter-connected tasks is the fastest avenue to take when completing any project.
- By focusing on the tasks that make up the critical path, the project manager maximizes the chances of completing the project on time.

CPM

- mathematically-based algorithm for scheduling a set of project activities.
- The essential technique for using CPM is to construct a model of the project that includes the following:
 - A list of all activities required to complete the project,
 - The dependencies between the activities, and
 - The estimate of time (duration) that each activity will take to completion.

CPM

- Using these values, CPM usually calculates the longest path of planned activities to the end of the project, and the earliest and latest points that each activity can start and finish without making the project longer.
- This process determines which activities are "critical" (i.e. on the longest path) and which have "total float" (i.e. can be delayed without making the project longer).

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6.12.	Schedule Control	

PERT

- PERT is a project management planning tool used to calculate the amount of time it will take to realistically finish a project.
- PERT stands for **Program Evaluation Review Technique**.
- PERT charts are tools used to plan tasks within a project – making it easier to schedule and coordinate team members accomplishing the work.
- PERT charts were created in the 1950s to help manage the creation of weapons and defense projects for the US Navy.
- While PERT was being introduced in the Navy, the private sector simultaneously gave rise to a similar method called Critical Path.
- PERT is similar to critical path in that they are both used to visualize the timeline and the work that must be done for a project.

PERT

- PERT has three time estimates: Optimal, Normal (most likely), and Pessimistic.
- These are used to compute for Expected Time, with the formula
Expected Time = (Optimistic time (to) + 4 x Most Likely time (tm) + Pessimistic time (tp)) / 6
- Variance=square of [(pessimistic time(tp)- optimistic time(to))/6]

PERT

- PERT analysis calculates an Expected (Te) activity duration using a weighted average of these three estimates:
- $Te = (To+4Tm+Tp)/ 6$
- Duration estimates based on this equation (or even on a simple average of the three points) may provide more accuracy, and the three points clarify the range of uncertainty Of the duration estimates.

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6.7 Control Schedule

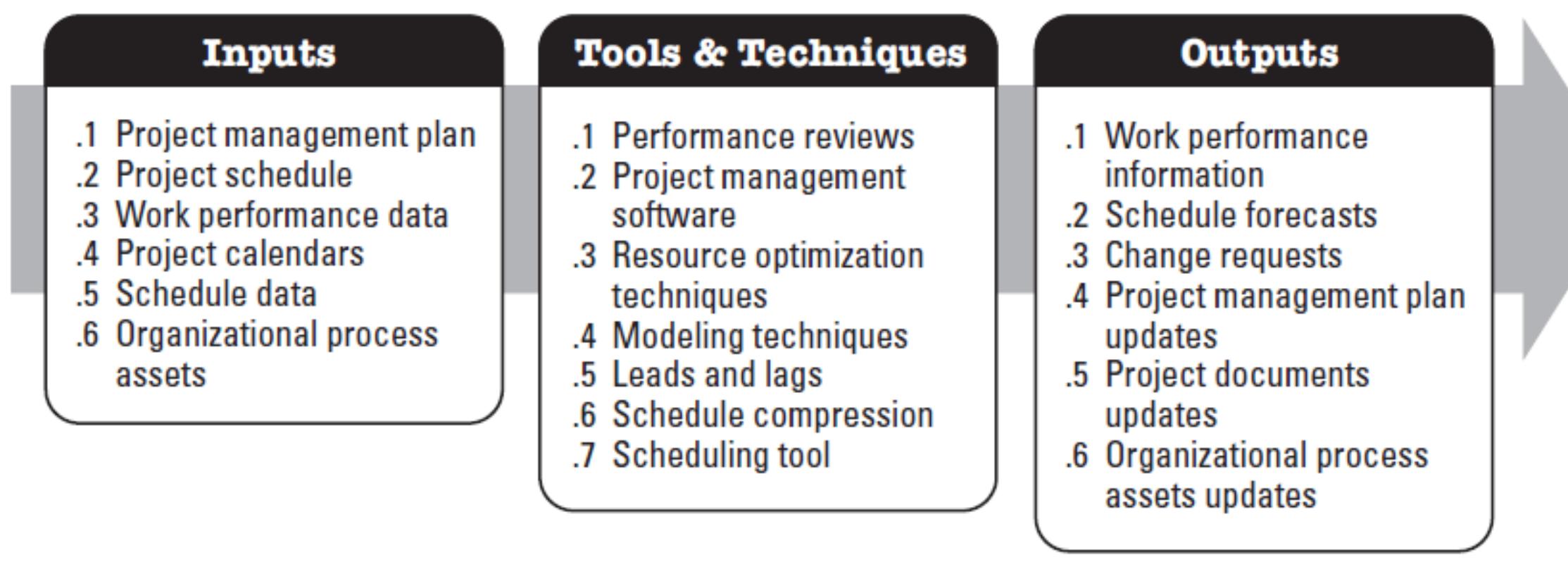
Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	

Across Project Management Process Groups

Control Schedule

- Control Schedule is the process of monitoring the status of project activities to update project progress and manage changes to the schedule baseline to achieve the plan.
- The key benefit of this process is that it provides the means to recognize deviation from the plan and take corrective and preventive actions and thus minimize risk.

Control Schedule



Control Schedule(inputs)

1	Project management plan
2	Project schedule
3	Work performance data
4	Project calendars
5	Schedule data
6	Organizational process assets

Control Schedule(Tools and Techniques)

1	Performance reviews	measure, compare, and analyze schedule performance such as actual start and finish dates, percent complete, and remaining duration for work in progress. Various techniques includes: Trend analysis, Critical path method, Critical chain method e.t.c
2	Project management software	scheduling provides the ability to track planned dates versus actual dates, to report variances to and progress made against the schedule baseline, and to forecast the effects of changes to the project schedule model.
3	Resource optimization techniques	Resource optimization techniques involve the scheduling of activities and the resources required by those activities while taking into consideration both the resource availability and the project time.

Control Schedule(Tools and Techniques)

4 Modeling techniques	are used to review various scenarios guided by risk monitoring to bring the schedule model into alignment with the project management plan and approved baseline.
5 Leads and lags	applied during network analysis to find ways to bring project activities that are behind into alignment with the plan
6 Schedule compression	used to find ways to bring project activities that are behind into alignment with the plan by fast tracking or crashing schedule for the remaining work.
7 Scheduling tool	are used to perform schedule network analysis to generate an updated project schedule.

Control Schedule(Outputs)

1 Work performance information	
2 Schedule forecasts	
3 Change requests	
4 Project management plan updates	
5 Project documents updates	
6 Schedule Data	.
7 Organizational process assets updates	

7.	Project Cost Management	5 hrs
7.1.	Fundamentals of Project Cost	
7.2.	Project Cost Estimation Process	
7.3.	Review of Cost Estimation and Its Types	
7.4.	Planning Cost Management	
7.5.	Estimating Cost	
7.6.	Determining Budget	
7.7.	Cost Control and Its Measures	
7.8.	Earned Value Analysis <ul style="list-style-type: none"> • Cost Variance • Schedule Variance • Cost Performance Index • Schedule Performance Index • Earned Value Management 	



7.	Project Cost Management	5 hrs
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7.1 Fundamentals of Project Cost

- **Cost** is a resource sacrificed or foregone to achieve a specific objective or something given up in exchange
 - Costs are usually measured in monetary units like dollars
- Project Cost Management includes the processes involved in **planning, estimating, budgeting, financing, funding, managing, and controlling costs** so that the project can be completed within the approved budget.
- Project Cost Management should consider the **stakeholder requirements** for managing costs.
- Different stakeholders will measure project costs in different ways and at different times.
- For example, the cost of an acquired item may be measured when the acquisition decision is made or committed, the order is placed, the item is delivered, or the actual cost is incurred or recorded for project accounting purposes.

7.1 Fundamentals of Project Cost

• Reasons for cost Overruns

- Not emphasizing the importance of realistic project cost estimates from the outset
 - Many of the original cost estimates for IT projects are low to begin with and based on very unclear project requirements

- Many IT professionals think preparing cost estimates is a job for accountants when in fact it is a very demanding and important skill that project managers need to acquire

- Many IT projects involve new technology or business processes which involve untested products and inherent risks

7. Project Cost Management		5 hrs
7.1.	Fundamentals of Project Cost	
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7.5.	Estimating Cost	
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7.7.	Cost Control and Its Measures	
7.8.	Earned Value Analysis <ul style="list-style-type: none">• Cost Variance• Schedule Variance• Cost Performance Index• Schedule Performance Index• Earned Value Management	



7.2 Project Cost Estimation Process

- There are three project cost management processes:
 - **Cost estimating:** developing an approximation or estimate of the costs of the resources needed to complete a project
 - **Cost budgeting:** allocating the overall cost estimate to individual work items to establish a baseline for measuring performance
 - **Cost control:** controlling changes to the project budget

Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
	Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Plan	4.3 Direct and Manage Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
	Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope
	Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule
	Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs
	Project Quality Management		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality
	Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team	
	Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications
	Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks
	Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements
	Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement

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7.2 Project Cost Estimation Process

Planning

Process: Cost estimating

Outputs: Activity cost estimates and supporting detail, requested changes, updates to the cost management plan

Process: Cost budgeting

Outputs: Cost baseline, project funding requirements, requested changes, updates to the cost management plan

Monitoring and Controlling

Process: Cost control

Outputs: Performance measurements, forecasted completion information, requested changes, recommended corrective actions, and updates to the project management plan, cost estimate, cost baseline, organizational process assets

Project Start

Project Finish



7.2 Project Cost Estimation Process

Phase of Software Development	Relative Cost to Repair Defects
Requirements and Analysis	1X
Coding and Unit Test	5X
Integration and System Test	10X
Beta Test	15X
Post-Product Release	30X

*Note: X is a normalized unit of cost and can be expressed in dollars, person-hours, etc.

- It is much more cost-effective to spend money on defining user requirements and doing early testing on IT projects than to wait for problems to appear after implementation
 - If it would cost \$1,000 to repair a software defect in the requirements and analysis phase but it would cost \$30,000 to fix it in the post-product release phase

7.2 Project Cost Estimation Process

- Basic Principles of cost management:

Cash flow analysis determines the estimated annual costs and benefits for a project and the resulting annual cash flow.

Tangible costs or benefits are those costs or benefits that an organization can easily measure in dollars.

Intangible costs or benefits are costs or benefits that are difficult to measure in monetary terms

Costs – resources used to research related areas of a project but not billed to the project

Benefits – goodwill, prestige, general statements of improved productivity not easily translated in dollars

7.2 Project Cost Estimation Process

- Basic Principles of cost management:

Direct costs are costs that can be directly related to producing the products and services of the project

Salaries, cost of hardware and software purchased specifically for the project

Indirect costs are costs that are not directly related to the products or services of the project, but are indirectly related to performing the project

Cost of electricity, paper towels

Sunk cost is money that has been spent in the past; when deciding what projects to invest in or continue, you should *not* include sunk costs

To continue funding a failed project because a great deal of money has already been spent on it is not a valid way to decide on which projects to fund

Sunk costs should be forgotten

7.2 Project Cost Estimation Process

Reserves are dollars included in a cost estimate to mitigate cost risk by allowing for future situations that are difficult to predict

Contingency reserves allow for future situations that may be partially planned for (sometimes called **known unknowns**) and are included in the project cost baseline

Recruiting and training costs for expected personnel turnover during a project

Management reserves allow for future situations that are unpredictable (sometimes called **unknown unknowns**)

Extended absence of a manager; supplier goes out of business

7. Project Cost Management		5 hrs
7.1.	Fundamentals of Project Cost	
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7.8.	Earned Value Analysis	
	• Cost Variance	
	• Schedule Variance	
	• Cost Performance Index	
	• Schedule Performance Index	
	• Earned Value Management	



7.4 Planning Cost Management

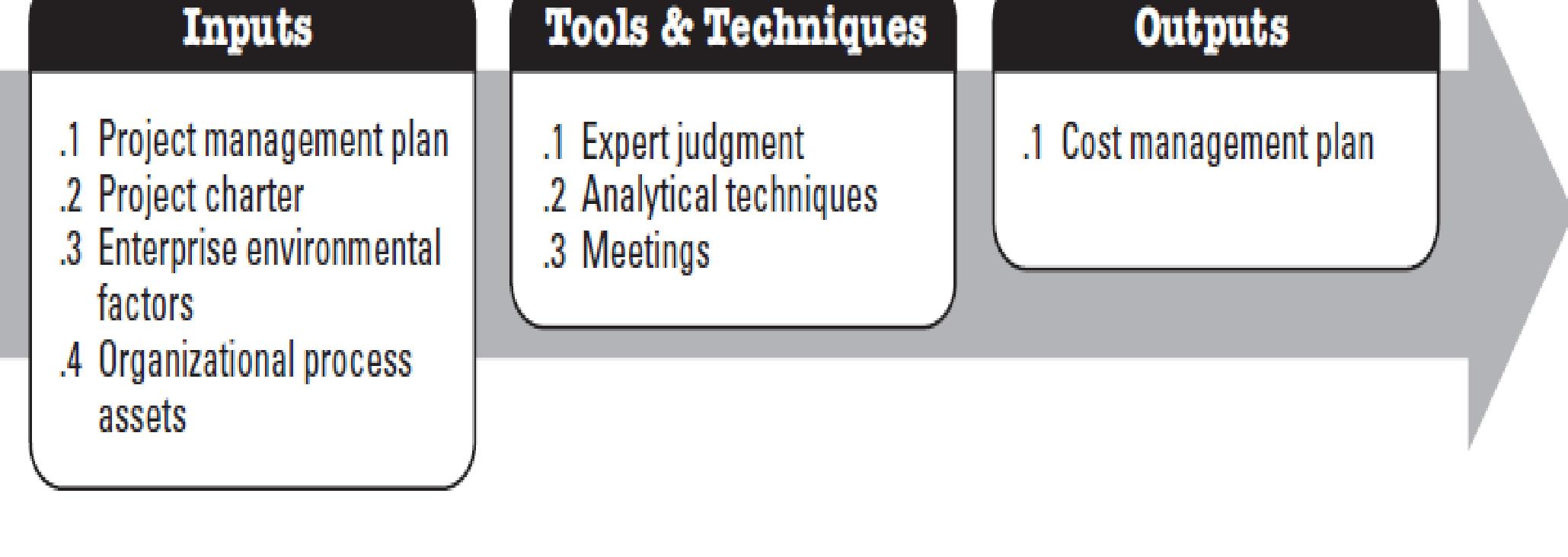
Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Cost 7.3 Determine Budget		7.4 Control Costs	

Across Project Management Process Groups

7.4 Planning Cost Management

- Plan Cost Management is the process that establishes the policies, procedures, and documentation for planning, managing, expending, and controlling project costs.
- The key benefit of this process is that it provides guidance and direction on how the project costs will be managed throughout the project

7.4 Planning Cost Management



7.4 Planning Cost Management(Inputs)

1	Project management plan	Described in section 4 : contains information used to develop the cost management plan which includes, but is not limited to: Scope baseline and Schedule baseline other information (risk, decisions e.t.c.) .
2	Project Charter	Described in section 4 : budget from which the detailed project costs are developed. The project charter also defines the project approval requirements that will influence the management of the project costs.
3	Enterprise Environmental Factors	<ul style="list-style-type: none">• Organization's culture, • Infrastructure, • Personnel administration, and• Marketplace conditions, Currency exchange rates for project costs sourced from more than one country;
4	Organizational Process Assets	influence the Plan Schedule Management process include, but are not limited to: <ul style="list-style-type: none">• Monitoring and reporting tools to be used;• Historical information;• Schedule control tools;• Existing formal and informal schedule control related policies, procedures, and guidelines;• Templates;• Project closure guidelines;• Change control procedures; and• Risk control procedures including risk categories, probability definition and impact, and probability and impact matrix.

7.4 Planning Cost Management(Tools and Techniques)

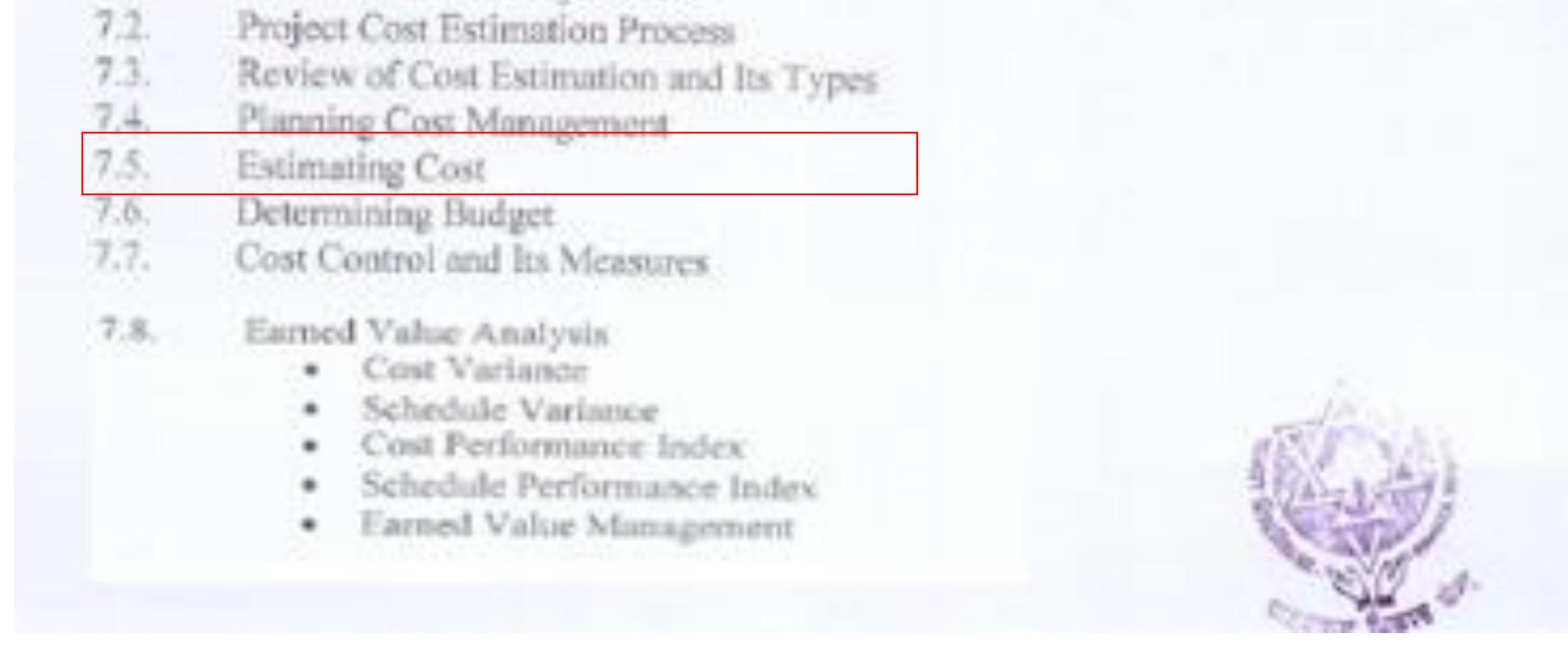
1	Expert Judgement	Expert judgment, guided by historical information, provides valuable insight about the environment and information from prior similar projects. Judgment based upon expertise in an application area, Knowledge Area, discipline, industry, etc., as appropriate for the activity being performed should be used in developing the cost management plan.
2	Analytical Techniques	Developing the cost management plan may involve choosing strategic options to fund the project such as: self-funding, funding with equity, or funding with debt. The cost management plan may also detail ways to finance project resources such as making, purchasing, renting, or leasing. These decisions, like other financial decisions affecting the project, may affect project schedule and/or risks
3	Meetings	Project teams may hold planning meetings to develop the cost management plan. Attendees at these meetings may include the project manager, the project sponsor, selected project team members, selected stakeholders, anyone with responsibility for project costs, and others as needed.

7.4 Planning Cost Management (Outputs)

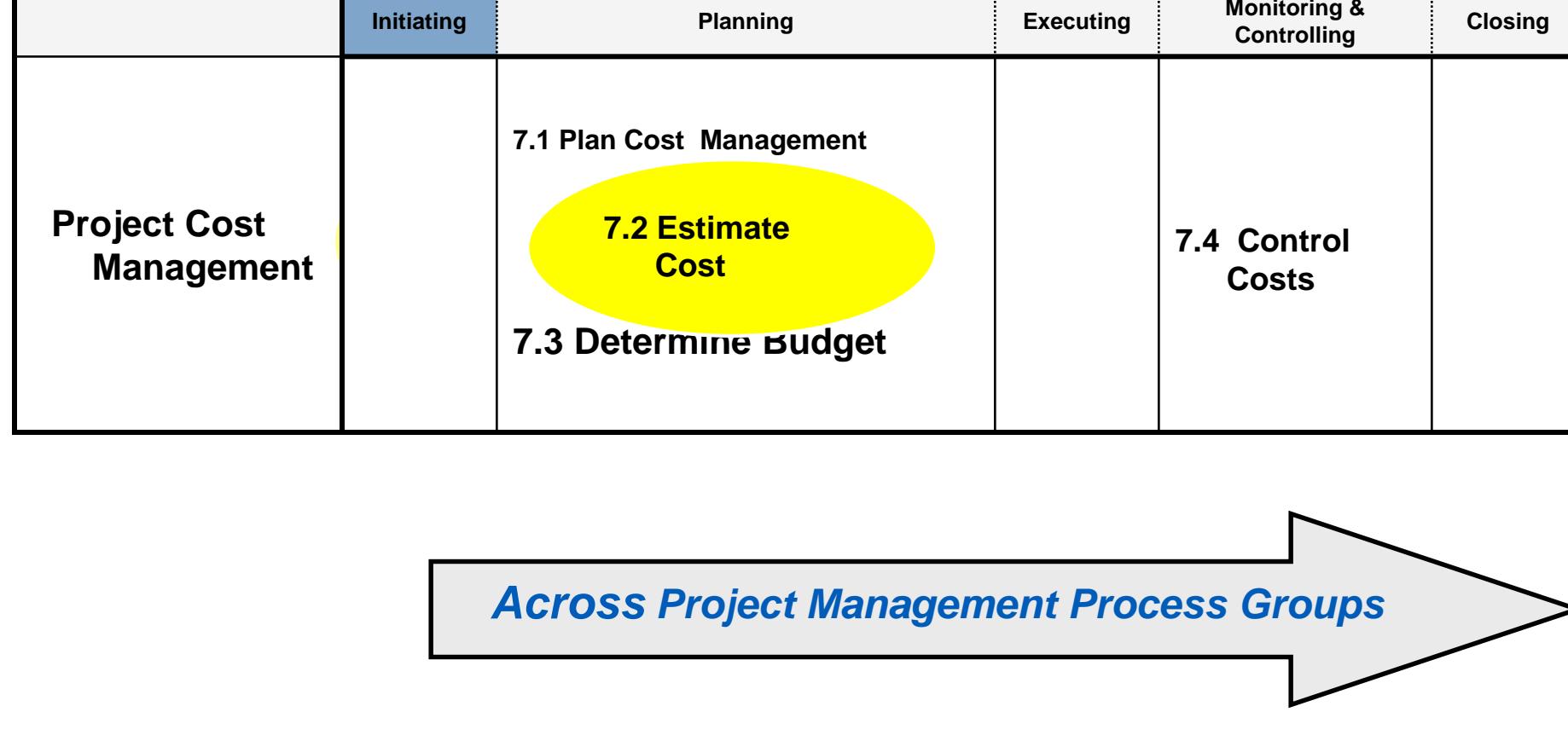
1 Cost Management Plan	<p>The cost management plan is a component of the project management plan and describes how the project costs will be planned, structured, and controlled.</p> <p>The cost management processes and their associated tools and techniques are documented in the cost management plan.</p> <p>For example, the cost management plan can establish the following:</p> <ul style="list-style-type: none"> Units of measure. Each unit used in measurements (such as staff hours, staff days, weeks for time measures; or meters, liters, tons, kilometers, or cubic yards for quantity measures; or lump sum in currency form) is defined for each of the resources. • Level of precision. The degree to which activity cost estimates will be rounded up or down (e.g., US\$100.49 to US\$100, or US\$995.59 to US\$1,000), based on the scope of the activities and magnitude of the project. • Level of accuracy. The acceptable range (e.g., -10%) used in determining realistic activity cost estimates is specified, and may include an amount for contingencies;
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7.4 Planning Cost Management (Outputs)

1 Cost Management Plan	<p>Organizational procedures links. The work breakdown structure (WBS) (Section 5) provides the framework for the cost management plan, allowing for consistency with the estimates, budgets, and control of costs. The WBS component used for the project cost accounting is called the control account. Each control account is assigned a unique code or account number(s) that links directly to the performing organization's accounting system.</p> <ul style="list-style-type: none"> • Control thresholds. Variance thresholds for monitoring cost performance may be specified to indicate an agreed-upon amount of variation to be allowed before some action needs to be taken. Thresholds are typically expressed as percentage deviations from the baseline plan. • Reporting formats. The formats and frequency for the various cost reports are defined. • Process descriptions. Descriptions of each of the other cost management processes are documented. • Additional details. Additional details about cost management activities include, but are not limited to: Description of strategic funding choices, Procedure to account for fluctuations in currency exchange rates, and Procedure for project cost recording.
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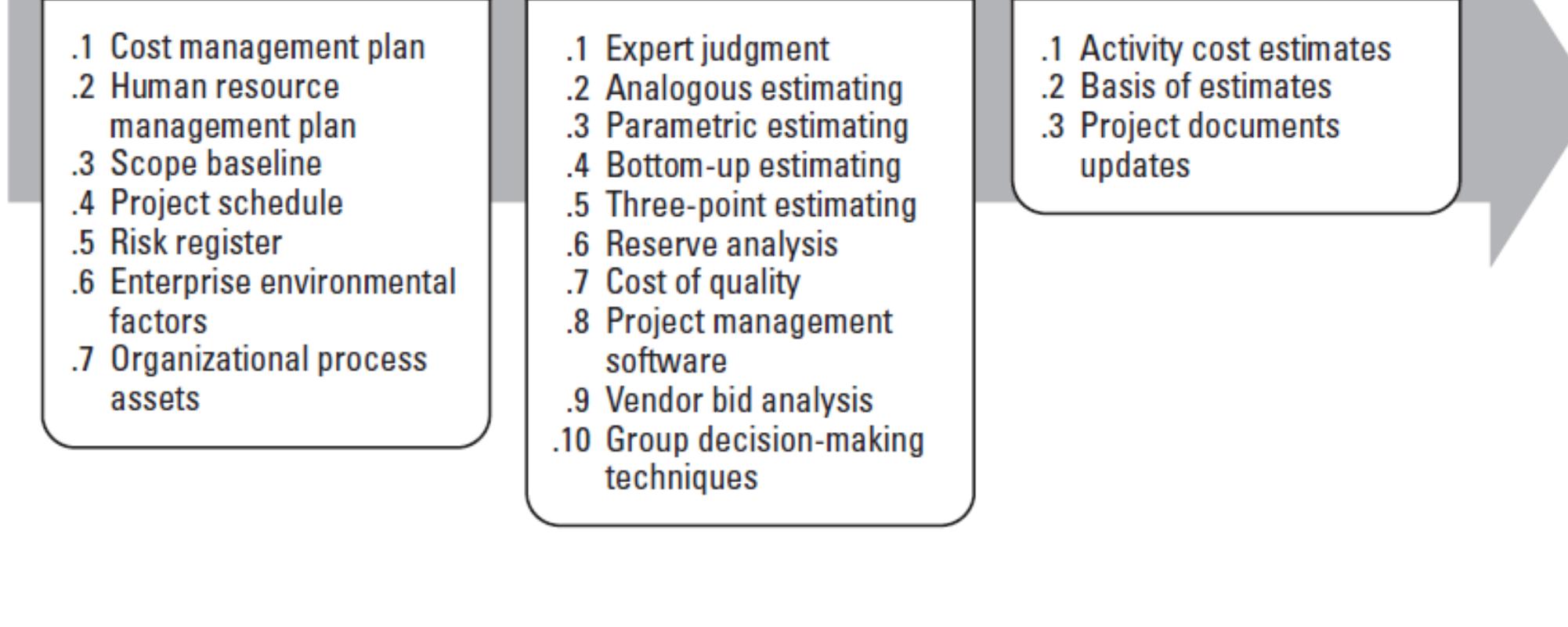
7.5 Estimating Cost



7.5 Estimating Costs

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

7.5 Estimating Costs



7.5 Estimating Costs(Inputs)

1	Cost management plan	Described in section 7 : The cost management plan defines how project costs will be managed and controlled. It includes the method used and the level of accuracy required to estimate activity cost.
2	Human resource management plan	The human resource management plan provides project staffing attributes, personnel rates, and related rewards/recognition, which are necessary components for developing the project cost estimates.
3	Scope baseline	Includes Project scope statement, Work breakdown structure, WBS dictionary
4	Project schedule	Described in Section 6 , The type and quantity of resources and the amount of time which those resources are applied to complete the work of the project are major factors in determining the project cost. Estimate Activity Resources (Section 6.4), Activity duration estimates (Section 6.5) will affect cost estimates on any project .

7.5 Estimating Costs(Inputs)

5	Risk Register	The risk register should be reviewed to consider risk response costs. Risks, which can be either threats or opportunities, typically have an impact on both activity and overall project costs
6	Enterprise Environmental Factors	<ul style="list-style-type: none">• Organization's culture,• Infrastructure,• Personnel administration, and• Marketplace conditions, Currency exchange rates for project costs sourced from more than one country;
7	Organizational Process Assets	influence the Plan Schedule Management process include, but are not limited to: <ul style="list-style-type: none">•cost estimating policiesCost estimating templates• Historical information;• Schedule control tools;• Existing formal and informal schedule control related policies, procedures, and guidelines;• Templates;• Project closure guidelines;• Change control procedures; and• Risk control procedures including risk categories, probability definition and impact, and probability and impact matrix.

7.5 Estimating Costs(Tools and Techniques)

1 Expert Judgement	Expert judgment, guided by historical information, provides valuable insight about the environment and information from prior similar projects.
2 Analogous estimating	<ul style="list-style-type: none"> Analogous cost estimating uses the values such as scope, cost, budget, and duration or measures of scale such as size, weight, and complexity from a previous, similar project as the basis for estimating the same parameter or measurement for a current project. When estimating costs, this technique relies on the actual cost of previous, similar projects as the basis for estimating the cost of the current project. Analogous cost estimating is frequently used to estimate a value when there is a limited amount of detailed information about the project
3 Parametric estimating	Parametric estimating is the task of looking at past projects to get a good estimate of how long a current project will take and how much it will cost. It also allows to measure individual tasks within the project to get a more accurate cost and time frame.

7.5 Estimating Costs(Tools and Techniques)

Area	Work Item	Cost	Duration
Entire House	Framing Walls	\$30,000	1 week
	Insulation	\$15,000	1 week
	Drywall	\$40,000	2 weeks
	Flooring	\$50,000	2 weeks
	Electric	\$15,000	2 weeks
	Heat	\$10,000	1 week
	Plumbing	\$15,000	1 week
	Total	\$175,000	10 weeks

7.5 Estimating Costs(Tools and Techniques)

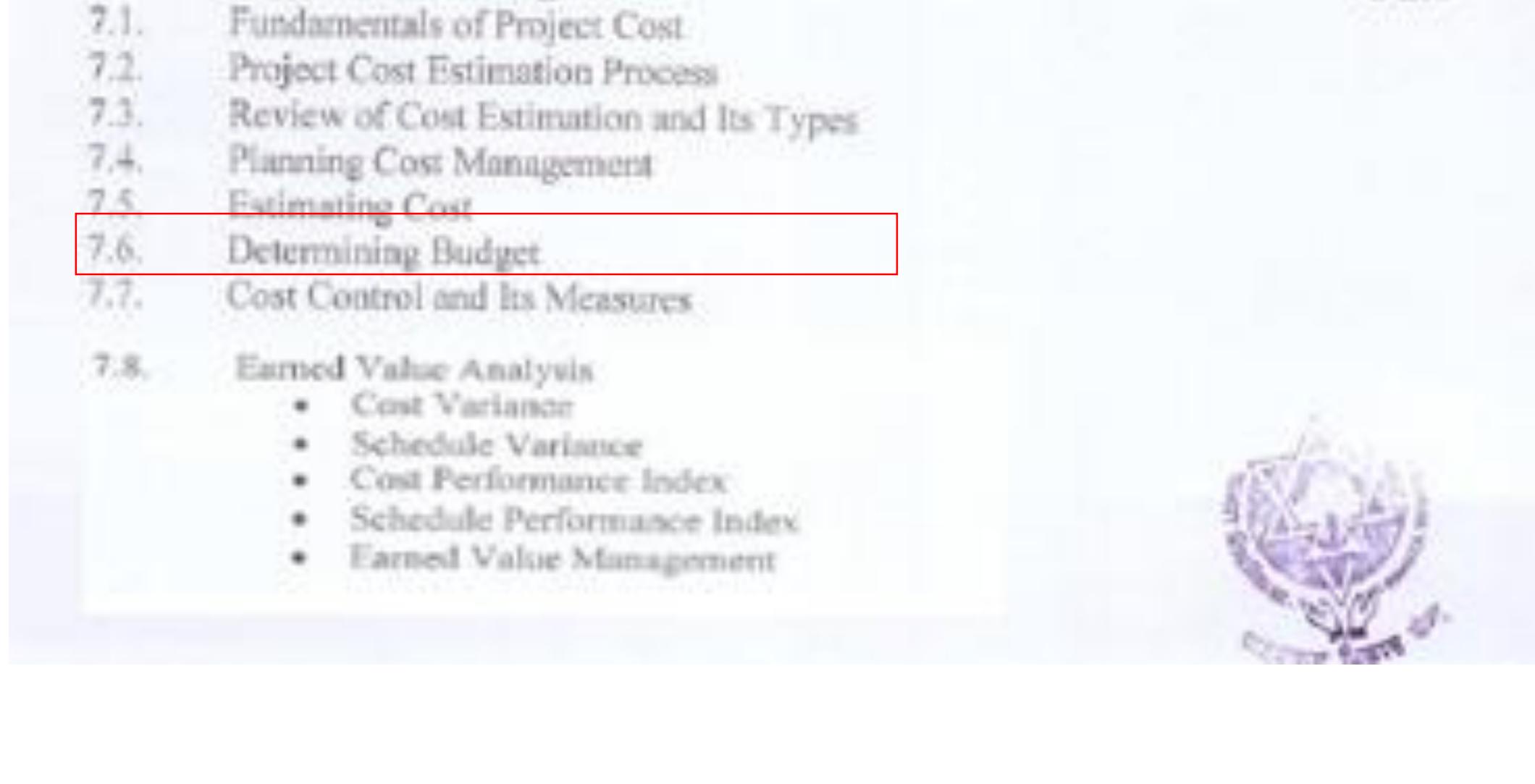
5 Three-point estimating	<p>The accuracy of single-point activity cost estimates may be improved by considering estimation uncertainty and risk and using three estimates to define an approximate range for an activity's cost:</p> <p>Most likely (cM). The cost of the activity, based on realistic effort assessment for the required work and any predicted expenses.</p> <ul style="list-style-type: none"> Optimistic (cO). The activity cost based on analysis of the best-case scenario for the activity. Pessimistic (cP). The activity cost based on analysis of the worst-case scenario for the activity.
6 Reserve analysis	<ul style="list-style-type: none"> reserves are the Cost estimates may include contingency reserves (sometimes called contingency allowances) to account for cost uncertainty. Contingency Budget within the cost baseline that is allocated for identified risks, which are accepted and for which contingent or mitigating responses are developed
7 Cost of quality	Cost of quality may be used to prepare the activity cost estimate.
8 Project management software	<p>Project management software applications, computerized spreadsheets, simulation, and statistical tools are used to assist with cost estimating.</p> <p>Such tools can simplify the use of some cost-estimating techniques and thereby facilitate rapid consideration of cost estimate alternatives.</p>

7.5 Estimating Costs(Tools and Techniques)

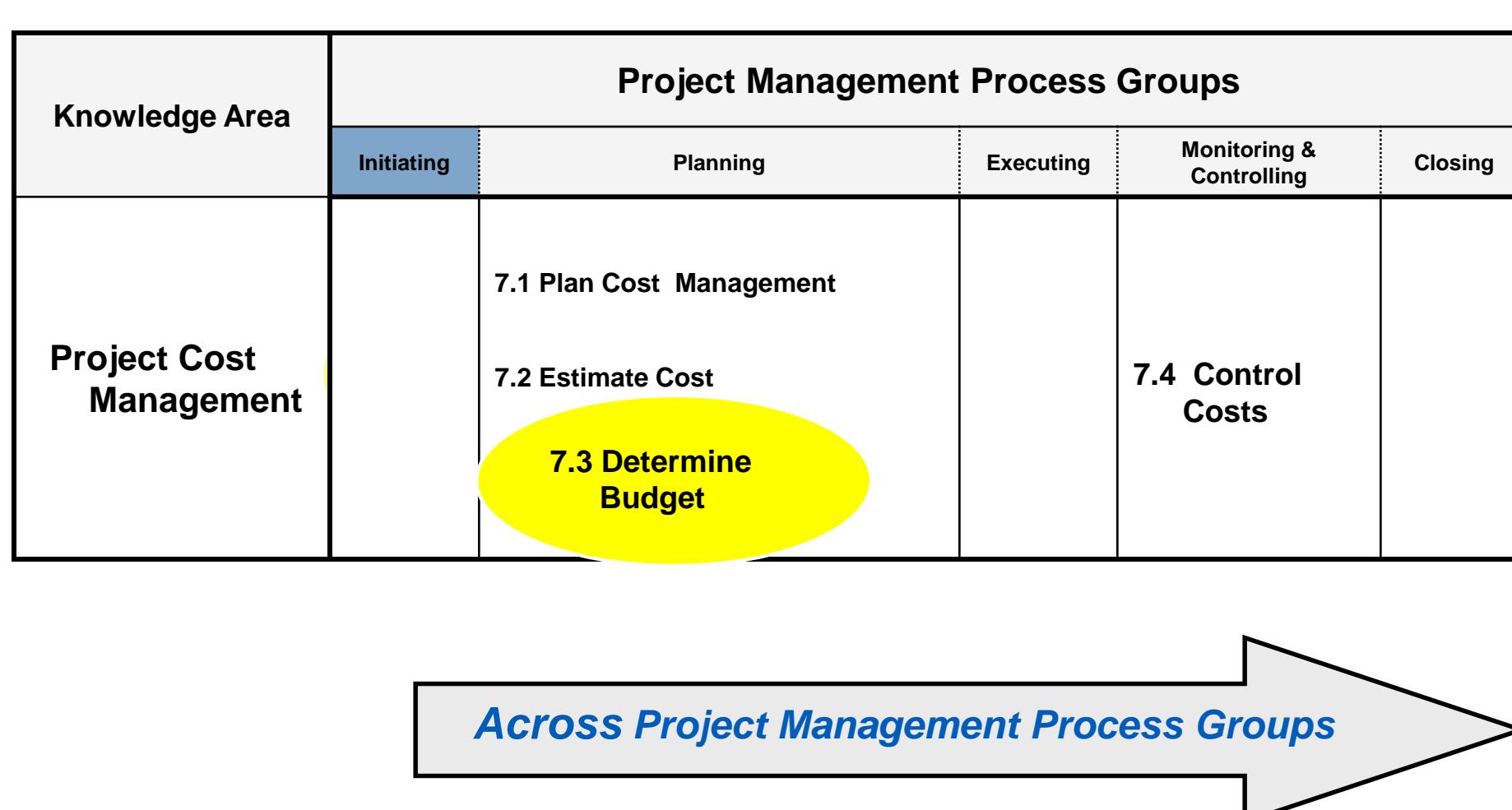
9 Vendor bid analysis	<ul style="list-style-type: none"> Cost estimating methods may include analysis of what the project should cost, based on the responsive bids from qualified vendors. When projects are awarded to a vendor under competitive processes, additional cost estimating work may be required of the project team
10 Group decision-making techniques	<ul style="list-style-type: none"> Team-based approaches, such as brainstorming are useful for engaging team members to improve estimate accuracy and commitment to the emerging estimates. By involving a structured group of people who are close to the technical execution of work in the estimation process, additional information is gained and more accurate estimates are obtained. Additionally, when people are involved in the estimation process, their commitment towards meeting the resulting estimates increases.

7.5 Estimating Costs (Outputs)

1	Activity cost estimates	Activity cost estimates are quantitative assessments of the probable costs required to complete project work. This includes, but is not limited to, direct labor, materials, equipment, services, facilities, information technology, and special categories such as cost of financing (including interest charges), an inflation allowance, exchange rates, or a cost contingency reserve.
2	Basis of estimates	The amount and type of additional details supporting the cost estimate vary by application area. Regardless of the level of detail, the supporting documentation should provide a clear and complete understanding of how the cost estimate was derived (e.g Documentation of the basis of the estimate, all assumptions made, e.t.c)
3	Project documents updates	Project documents that may be updated include, but are not limited to, the risk register.



7.5 Estimating Cost

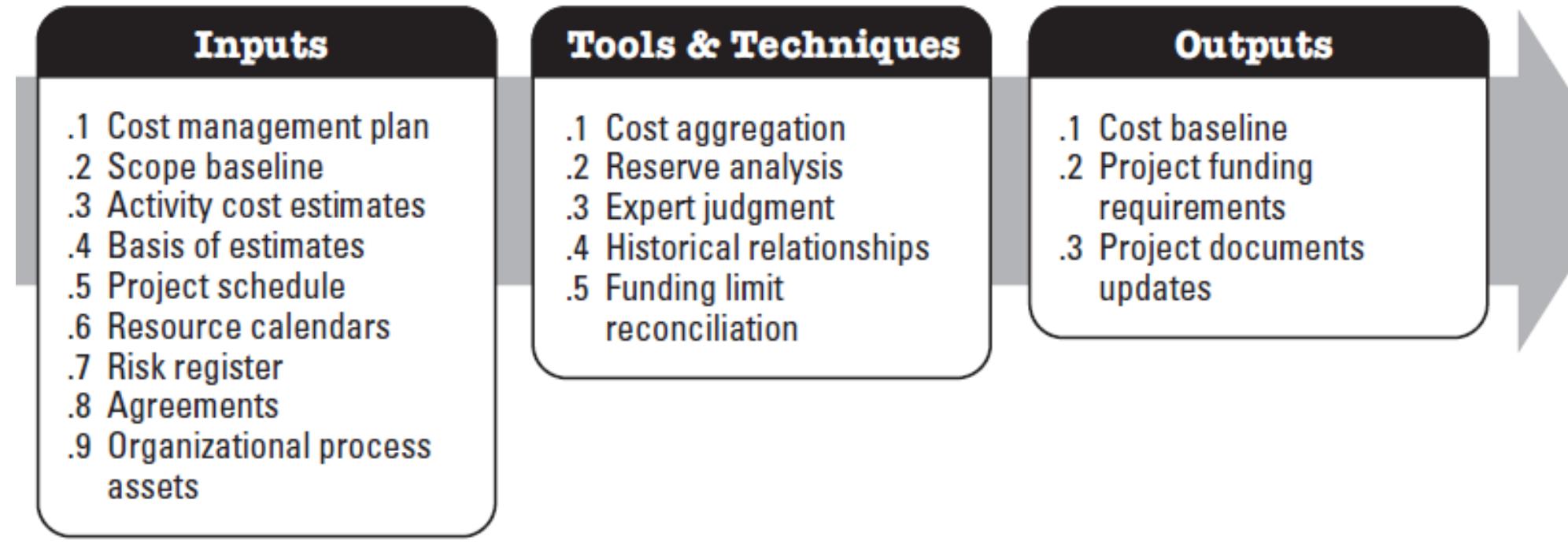


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7.6 Determining Budget

- Determine Budget is the process of aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline.
- The key benefit of this process is that it determines the cost baseline against which project performance can be monitored and controlled.

7.6 Determining Budget



7.6 Determining Budget (inputs)

1 Cost management plan	The cost management plan describes how the project costs will be managed and controlled.
2 Scope baseline	Includes project scope management, WBS, WBS Dictionary
3 Activity Cost Estimates	Cost estimates for each activity within a work package are aggregated to obtain a cost estimate for each work package.
4 Basis of estimates	Supporting detail for cost estimates contained in the basis for estimates should specify any basic assumptions dealing with the inclusion or exclusion of indirect or other costs in the project budget.

7.6 Determining Budget (inputs)

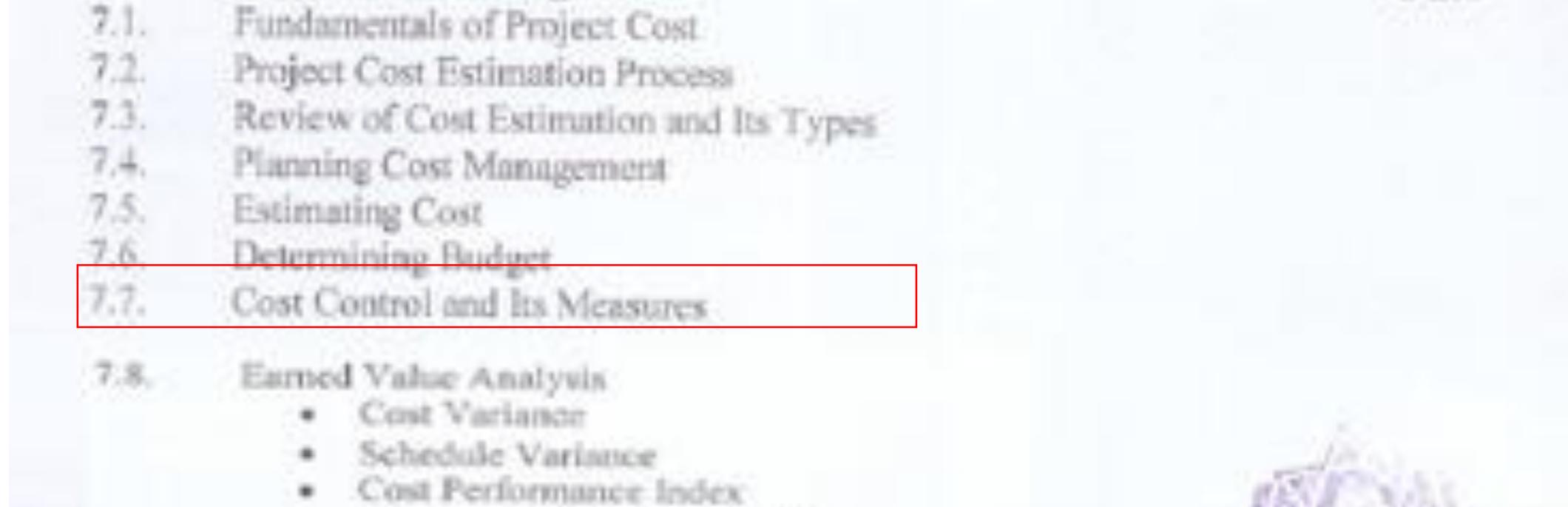
5 Project schedule	The project schedule includes planned start and finish dates for the project's activities, milestones, work packages, and control accounts. This information can be used to aggregate costs to the calendar periods in which the costs are planned to be incurred.
6 Resource calendars	Resource calendars provide information on which resources are assigned to the project and when they are assigned. This information can be used to indicate resource costs over the duration of the project.
7 Risk register	The risk register should be reviewed to consider how to aggregate the risk response costs. Updates to the risk register are included with project document updates
8 Agreements	Applicable agreement information and costs relating to products, services, or results that have been or will be purchased are included when determining the budget.
9 Organizational process assets	The organizational process assets that influence the Determine Budget process

7.6 Determining Budget (Tools and Techniques)

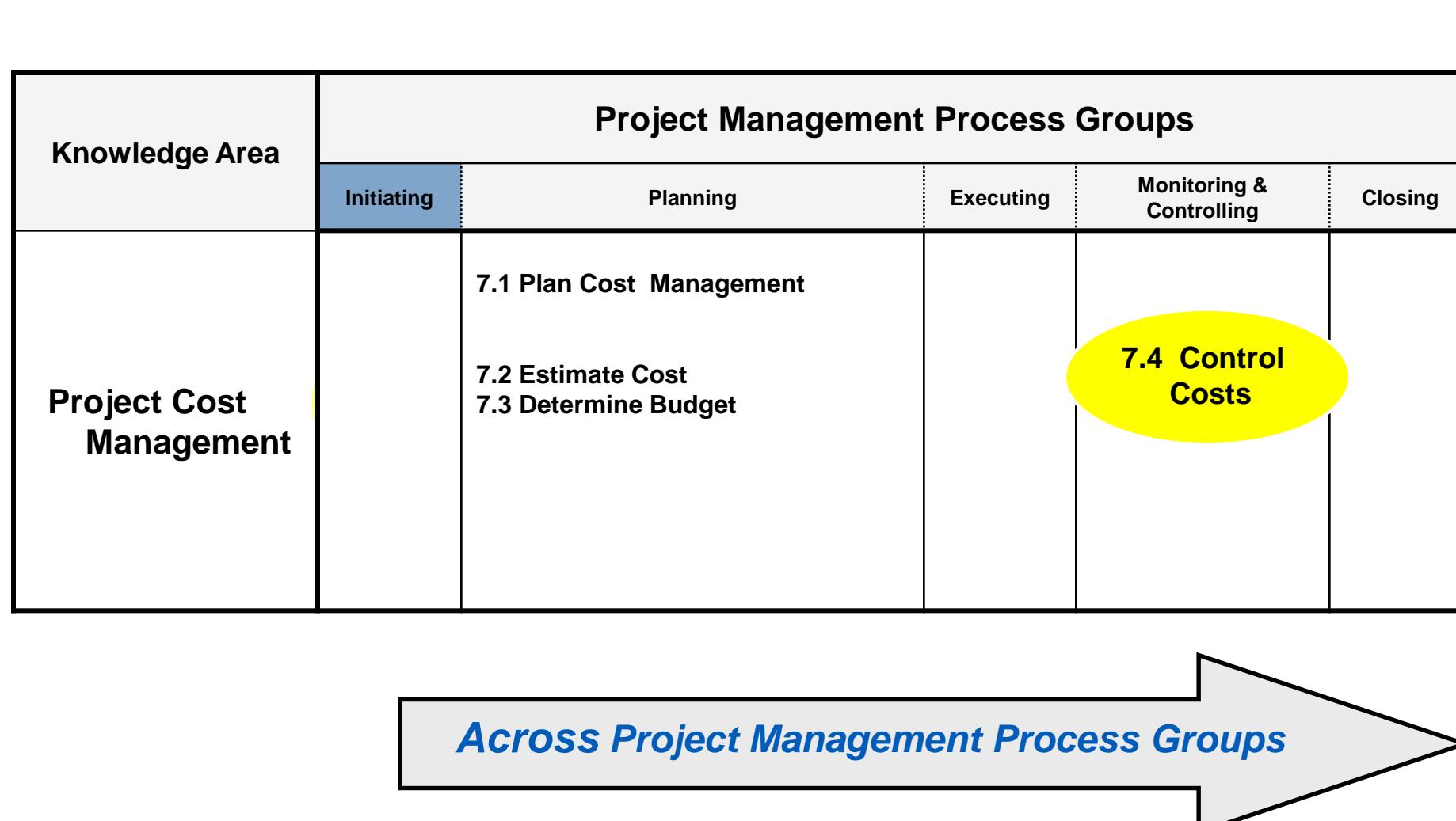
1 Cost aggregation	Cost estimates are aggregated by work packages in accordance with the WBS. The work package cost estimates are then aggregated for the higher component levels of the WBS (such as control accounts) and ultimately for the entire project.
2 Reserve analysis	Budget reserve analysis can establish both the contingency reserves and the management reserves for the project. Management and contingency reserves are addressed in more detail in Section 7
3 Expert judgment	Expert judgment, guided by experience in an application area, Knowledge Area, discipline, industry, or similar project, aids in determining the budget.
4 Historical relationships	Any historical relationships that result in parametric estimates or analogous estimates involve the use of project characteristics (parameters) to develop mathematical models to predict total project costs.
5 Funding limit reconciliation	The expenditure of funds should be reconciled with any funding limits on the commitment of funds for the project.

7.6 Determining Budget (outputs)

1 Cost baseline	Activity cost estimates are quantitative assessments of the probable costs required to complete project work. This includes, but is not limited to, direct labor, materials, equipment, services, facilities, information technology, and special categories such as cost of financing (including interest charges), an inflation allowance, exchange rates, or a cost contingency reserve.
2 Project funding requirements	The amount and type of additional details supporting the cost estimate vary by application area. Regardless of the level of detail, the supporting documentation should provide a clear and complete understanding of how the cost estimate was derived (e.g Documentation of the basis of the estimate, all assumptions made, e.t.c)
3 Project documents updates	Project documents that may be updated include, but are not limited to, the risk register.



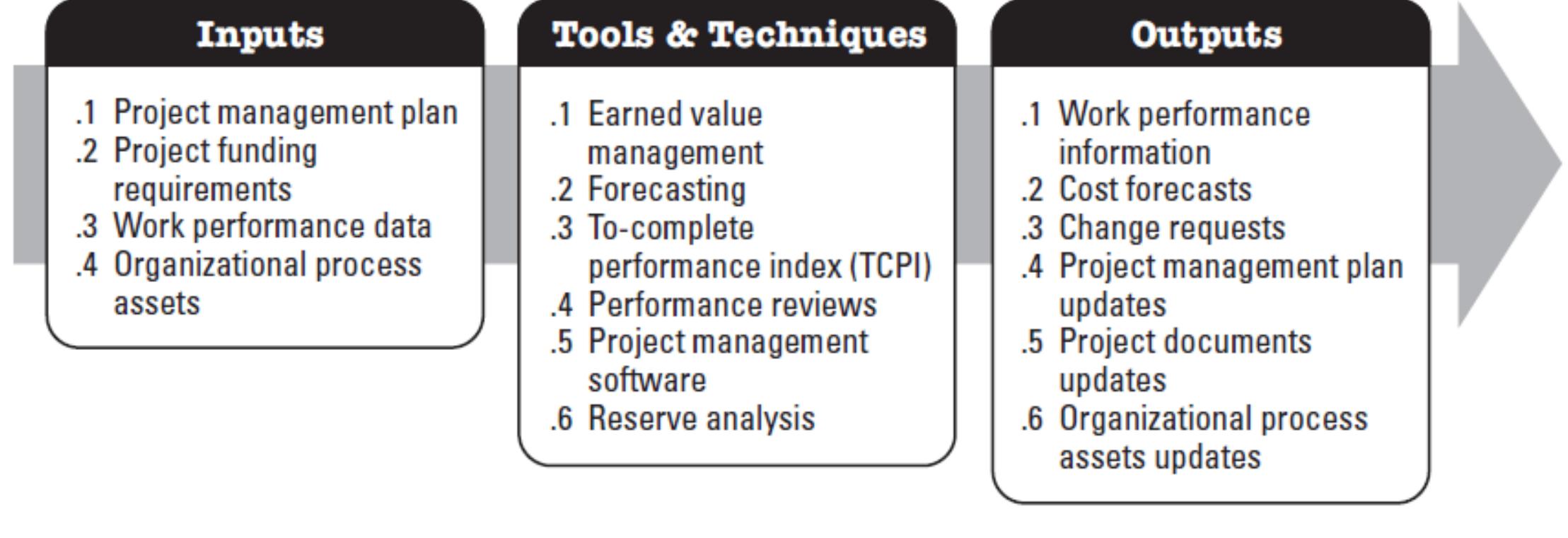
7.7 Cost Control and its Measures



7.7 Cost Control and its Measures

- Control Costs is the process of monitoring the status of the project to update the project costs and managing changes to the cost baseline.
- The key benefit of this process is that it provides the means to recognize variance from the plan in order to take corrective action and minimize risk.

7.7 Cost Control and its Measures



7.7 Cost Control (inputs)

1 Project management plan	Described in Section 4. The project management plan contains Cost baseline , Cost management plan used to control cost:
2 Project funding requirements	Described in Section 7
3 Work performance data	Described in Section 4. Work performance data includes information about project progress, such as which activities have started, their progress, and which deliverables have finished
4 Organizational process assets	Described in Section 2 . he organizational process assets that can influence the Control Costs process.

7.7 Cost Control (Tools and Techniques)

1 Earned value management	
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- **the earned value analysis answers the following questions:**
 - Am I behind schedule if my actual costs are lower than the planned costs?
 - What will the project end up costing? Is that within the budget?
 - Am I using the available time and resources efficiently?
 - How high will the profit/return on investment (ROI) be at the end of the project?
- The earned value analysis is a project controlling procedure that, along with the planned and actual costs, includes the earned value. Through this the project's cost efficiency and time efficiency can be calculated.

7.7 Cost Control (Tools and Techniques)

- Earned Value Analysis (EVA) is an industry standard method of measuring a project's progress at any given point in time, forecasting its completion date and final cost, and analyzing variances in the schedule and budget as the project proceeds.
- It compares the planned amount of work with what has actually been completed, to determine if the cost, schedule, and work accomplished are progressing in accordance with the plan.
- As work is completed, it is considered "earned". Earned value management (EVM) is a methodology that combines **scope**, **schedule**, and **resource measurements** to assess project performance and progress.
- It answers two key questions:
- At the end of the project, is it likely that the cost will be less than, equal to or greater than the original estimate?
- Will the project likely be completed on time?

7.7 Cost Control (Tools and Techniques)

1) Planned value

is defined as the amount of the task that is supposed to have been completed. It is in monetary terms as a portion of the task budget

The task budget is \$5,000,

The task start date is January 1, and

The task finish date is January 10.

If it's January 6 today, the task is supposed to be 60% complete.

Therefore, $PV = \$5,000 \times 60\% = \$3,000$.

7.7 Cost Control (Tools and Techniques)

2) Earned value

is the amount of the task that is actually complete. It is, again, in monetary terms as a portion of the task budget.

The task budget is \$5,000, (same as above)

The task start date is January 1, and (same as above)

The task finish date is January 10. (same as above)

Let's say the actual percent complete of the task (step 1) is 40%.

Therefore, $EV = \$5,000 \times 40\% = \$2,000$.

3) Actual cost

Actual cost (AC) is the realized cost incurred for the work performed on an activity during a specific time period.

let's say the actual cost of the example task is \$1,500.

7.7 Cost Control (Tools and Techniques)

Variances from the approved baseline will also be monitored:

1) **Schedule variance**:represents the schedule status of the project.

$SV = EV - PV$

In above example the schedule variance is: $SV = \$2,000 - \$3,000 = -\$1,000$.

A negative schedule variance means the task is behind schedule.

A positive schedule variance means it is ahead of schedule.

The amount can be compared to worker charge out rates or similar metrics to get an idea of how difficult it would be to recover.

7.7 Cost Control (Tools and Techniques)

2)**Cost variance**:represents the cost status of the project.

$CV = EV - AC$.

In above example the cost variance is: $CV = \$2,000 - \$1,500 = \$500$.

A negative cost variance means the task is over budget.

A positive cost variance means it is under budget.

7.7 Cost Control (Tools and Techniques)

Schedule performance index:

The schedule variance expressed in percentage terms, for example, SPI = 0.8 means the project 20% behind schedule.

$$SPI = EV/PV$$

$SPI < 1$; less work completed

$SPI > 1$; more work completed

Cost performance index.

The cost variance expressed in percentage terms, for example, CPI = 0.9 means the project is 10% over budget.

$$CPI = EV/AC$$

$CPI < 1$; cost overrun for work completed

$CPI > 1$; cost underrun of performance to date

7.7 Cost Control (Tools and Techniques)

Schedule performance index:

The schedule variance expressed in percentage terms, for example, SPI = 0.8 means the project 20% behind schedule.

$$SPI = EV/PV$$

$SPI < 1$; less work completed

$SPI > 1$; more work completed

Cost performance index.

The cost variance expressed in percentage terms, for example, CPI = 0.9 means the project is 10% over budget.

$$CPI = EV/AC$$

$CPI < 1$; cost overrun for work completed

$CPI > 1$; cost underrun of performance to date

7.7 Cost Control (Tools and Techniques)

Estimate to Complete (ETC):

ETC represents the expected cost required to complete the project.

It measures only the **future** budget needed to complete the project, not the **entire** budget).

It allows the [project manager](#) to compare the funding needs to finish the project with funding available.

The ETC can be calculated either for each task or for the whole project.

There are two ways to calculate ETC:

1) Based on past project performance:

$$ETC = (BAC - EV) / CPI$$

2) Based on a new estimate

This is called a **Management ETC**. This means that a new estimate of the remaining tasks in the project is performed.

7.7 Cost Control (Tools and Techniques)

Estimate at Completion (EAC)

The EAC is the full task or project cost expected at completion (the new project budget).

It can be calculated on a task by task basis or once for the entire project.

There are multiple ways to calculate it based on how you expect the future of the performance of the project to be:

1) Future performance will be based on the budgeted cost

If the existing variance was a unique event and the rest of the project should go according to plan, simply add the remaining project budget to the actual cost incurred to date (AC). This method does not assume the project finishes on budget. Rather it takes into account the one time event and adjusts the whole project plan upward or downward to determine the final result.

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

7.7 Cost Control (Tools and Techniques)

Estimate at Completion (EAC)

2) Future cost performance will be based on past cost performance

If you think the past performance is not unusual and there is no reason to expect the project to perform any differently than it already has, you would use this formula.

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

3) Future cost performance will be influenced by past schedule performance

Since schedule and cost performance are usually related, there could be a reason to adjust the cost performance by the schedule performance.

In this case an average of the CPI and SPI are used to extrapolate the final project cost.

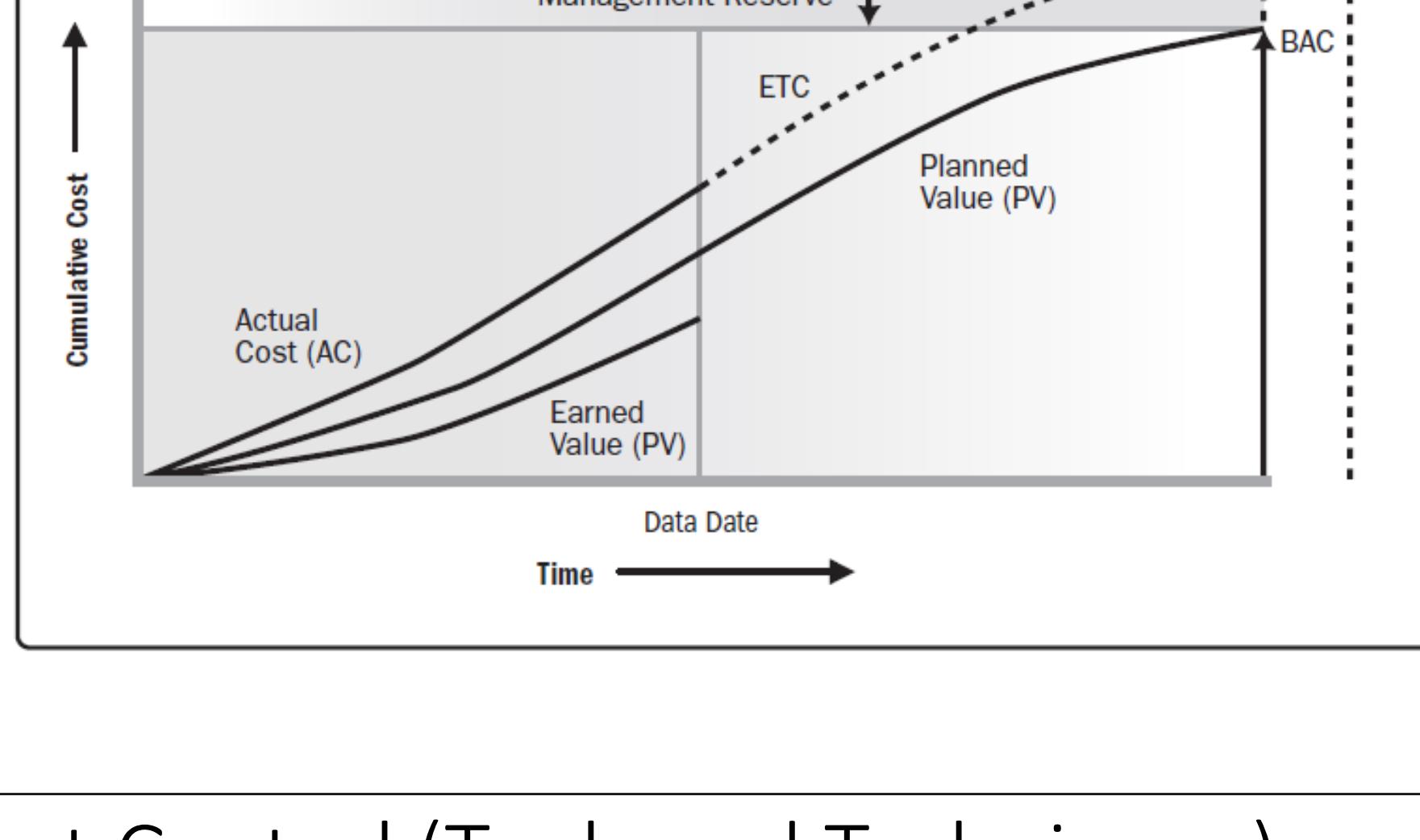
$$EAC = AC + [(BAC - EV) / (CPI \times SPI)]$$

4) A new estimate is produced

In this case a Management ETC can be added to the to-date cost (AC) to determine the final EAC.

$$EAC = AC + ETC$$

7.7 Cost Control (Tools and Techniques)



7.7 Cost Control (Tools and Techniques)

2 Forecasting	Forecasting the estimate at completion (EAC) involves making projections of conditions and events in the project's future based on current performance information and other knowledge available at the time of the forecast.
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7.7 Cost Control (Tools and Techniques)

3 To-complete performance index (TCPI)	<p>The to-complete performance index (TCPI) is a measure of the cost performance that is required to be achieved with the remaining resources in order to meet a specified management goal, expressed as the ratio of the cost to finish the outstanding work to the remaining budget.</p> <p>1) There are two ways to calculate TCPI: If the goal is to achieve the original project budget, that is, the overrun or underrun has not resulted in a change to the project schedule and/or budget, the following formula applies:</p> $TCPI = (BAC - EV) / (BAC - AC)$ <p>2) To achieve the revised budget If the goal is to achieve the project's EAC, that is, the budget has been revised and an approved change to the project schedule/budget has occurred, use this formula. If additional funds covering the cost overrun have been requested and approved by the project sponsor, the EAC becomes the target of the project, and this scenario applies.</p> $TCPI = (BAC - EV) / (EAC - AC)$
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7.7 Cost Control (Tools and Techniques)

4	Performance reviews	Performance reviews compare cost performance over time, schedule activities or work packages overrunning and underrunning the budget, and estimated funds needed to complete work in progress.
		Trend analysis. Trend analysis examines project performance over time to determine if performance is improving or deteriorating. Graphical analysis techniques are valuable for understanding performance to date and for comparison to future performance goals in the form of BAC versus EAC and completion dates.
		Earned value performance. Earned value performance compares the performance measurement baseline to actual schedule and cost performance. If EVM is not being used, then the analysis of the cost baseline against actual costs for the work performed is used for cost performance comparisons.

7.7 Cost Control (Tools and Techniques)

Abbreviation	Name	Lexicon Definition	How Used	Equation	Interpretation of Result
PV	Planned Value	The authorized budget assigned to scheduled work.	The value of the work planned to be completed to a point in time, usually the data date, or project completion.		
EV	Earned Value	The measure of work performed expressed in terms of the budget authorized for that work.	The planned value of all the work completed (earned) to a point in time, usually the data date, without reference to actual costs.	$EV = \text{sum of the planned value of completed work}$	
AC	Actual Cost	The realized cost incurred for the work performed on an activity during a specific time period.	The actual cost of all the work completed to a point in time, usually the data date.		
BAC	Budget at Completion	The sum of all budgets established for the work to be performed.	The value of total planned work, the project cost baseline.		

7.7 Cost Control (Tools and Techniques)

Abbreviation	Name	Lexicon Definition	How Used	Equation	Interpretation of Result
CV	Cost Variance	The amount of budget deficit or surplus at a given point in time, expressed as the difference between the earned value and the actual cost.	The difference between the value of work completed to a point in time, usually the data date, and the actual costs to the same point in time.	$CV = EV - AC$	Positive = Under planned cost Neutral = On planned cost Negative = Over planned cost
SV	Schedule Variance	The amount by which the project is ahead or behind the planned delivery date, at a given point in time, expressed as the difference between the earned value and the planned value.	The difference between the work completed to a point in time, usually the data date, and the work planned to be completed to the same point in time.	$SV = EV - PV$	Positive = Ahead of Schedule Neutral = On schedule Negative = Behind Schedule
VAC	Variance at Completion	A projection of the amount of budget deficit or surplus, expressed as the difference between the budget at completion and the estimate at completion.	The estimated difference in cost at the completion of the project.	$VAC = BAC - EAC$	Positive = Under planned cost Neutral = On planned cost Negative = Over planned cost

7.7 Cost Control (Tools and Techniques)

Abbreviation	Name	Lexicon Definition	How Used	Equation	Interpretation of Result
CPI	Cost Performance Index	A measure of the cost efficiency of budgeted resources expressed as the ratio of earned value to actual cost.	A CPI of 1.0 means the project is exactly on budget, that the work actually done so far is exactly the same as the cost so far. Other values show the percentage of how much costs are over or under the budgeted amount for work accomplished.	$CPI = EV/AC$	Greater than 1.0 = Under planned cost Exactly 1.0 = On planned cost Less than 1.0 = Over planned cost
SPI	Schedule Performance Index	A measure of schedule efficiency expressed as the ratio of earned value to planned value.	An SPI of 1.0 means that the project is exactly on schedule, that the work actually done so far is exactly the same as the work planned to be done so far. Other values show the percentage of how much costs are over or under the budgeted amount for work planned.	$SPI = EV/PV$	Greater than 1.0 = Ahead of schedule Exactly 1.0 = On schedule Less than 1.0 = Behind schedule

7.7 Cost Control (Tools and Techniques)

Abbreviation	Name	Lexicon Definition	How Used	Equation	Interpretation of Result
EAC	Estimate At Completion	The expected total cost of completing all work expressed as the sum of the actual cost to date and the estimate to complete.	If the CPI is expected to be the same for the remainder of the project, EAC can be calculated using: If future work will be accomplished at the planned rate, use: If the initial plan is no longer valid, use: If both the CPI and SPI influence the remaining work, use:	$EAC = BAC/CPI$ $EAC = AC + BAC - EV$ $EAC = AC + \text{Bottom-up ETC}$ $EAC = AC + [(BAC - EV) / (CPI \times SPI)]$	
ETC	Estimate to Complete	The expected cost to finish all the remaining project work.	Assuming work is proceeding on plan, the cost of completing the remaining authorized work can be calculated using: Reestimate the remaining work from the bottom up.	$ETC = EAC - AC$ $ETC = \text{Reestimate}$	

7.7 Cost Control (Tools and Techniques)

Abbreviation	Name	Lexicon Definition	How Used	Equation	Interpretation of Result
TCPI	To Complete Performance Index	A measure of the cost performance that must be achieved with the remaining resources in order to meet a specified management goal, expressed as the ratio of the cost to finish the outstanding work to the budget available.	The efficiency that must be maintained in order to complete on plan. The efficiency that must be maintained in order to complete the current EAC.	$TCPI = (BAC - EV) / (BAC - AC)$ $TCPI = (BAC - EV) / (EAC - AC)$	Greater than 1.0 = Harder to complete Exactly 1.0 = Same to complete Less than 1.0 = Easier to complete Greater than 1.0 = Harder to complete Exactly 1.0 = Same to complete Less than 1.0 = Easier to complete

7.7 Cost Control (Tools and Techniques)

5	Project management Software	Project management software is often used to monitor the three EVM dimensions (PV, EV, and AC), to display graphical trends, and to forecast a range of possible final project results.
6	Reserve analysis	During cost control, reserve analysis is used to monitor the status of contingency and management reserves for the project to determine if these reserves are still needed or if additional reserves need to be requested. As work on the project progresses, these reserves may be used as planned to cover the cost of risk mitigation events or other contingencies. Or, if the probable risk events do not occur, the unused contingency reserves may be removed from the project budget to free up resources for other projects or operations. Additional risk analysis during the project may reveal a need to request that additional reserves be added to the project budget. Management and contingency reserves are addressed in more detail in Section 7.

7.7 Cost Control (Output)

1	Work performance information	The calculated CV, SV, CPI, SPI, TCPI, and VAC values for WBS components, in particular the work packages and control accounts, are documented and communicated to stakeholders.
2	Cost forecasts	Either a calculated EAC value or a bottom-up EAC value is documented and communicated to stakeholders
3	Change requests	Analysis of project performance may result in a change request to the cost baseline or other components of the project management plan. Change requests may include preventive or corrective actions, and are processed for review and disposition through the Perform Integrated Change Control process (Section 4)
4	Project management plan updates	Elements of the project management plan that may be updated includes cost baseline, cost management plan e.t.c
5	Project documents updates	Project documents that may be updated include Cost estimates, Basis of estimates e.t.c

7.7 Cost Control (Output)

6	Organizational process assets updates	Organizational process assets that may be updated includes Causes of variances, Corrective action chosen and the reasons, Financial databases e.t.c
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7.	Project Cost Management	5 hrs
7.1.	Fundamentals of Project Cost	
7.2.	Project Cost Estimation Process	
7.3.	Review of Cost Estimation and Its Types	
7.4.	Planning Cost Management	
7.5.	Estimating Cost	
7.6.	Determining Budget	
7.7.	Cost Control and Its Measures	
7.8.	Earned Value Analysis	
	• Cost Variance	
	• Schedule Variance	
	• Cost Performance Index	
	• Schedule Performance Index	
	• Earned Value Management	



8.	Project Quality Management	2 hrs
8.1.	Project Quality Management Process	
8.2.	Planning Project Quality Management	
8.3.	Review of Quality Assurance and Quality Control	

8 Project Quality Management

- Project Quality Management includes the processes and activities of the performing organization that determine quality policies, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken.
- Project Quality Management uses policies and procedures to implement, within the project's context, the organization's quality management system and, as appropriate, it supports continuous process improvement activities as undertaken on behalf of the performing organization.
- Project Quality Management works to ensure that the project requirements, including product requirements, are met and validated.

8 Project Quality Management (importance)

- Many people joke about the poor quality of IT products (cars and computers joke)
- People seem to accept systems being down occasionally or needing to reboot their PCs
- But quality is very important in many IT projects
- Unfortunate quality control incidents in products from China – baby food, materials in toys

8 Project Quality Management

- Project quality:
- **Car Quality**
 - Ride, Reliability, Fit and Finish, Audio System?
- **Food Quality**
 - Taste, Smell, Color, Texture, Freshness?
- **Shoe Quality**
 - Fit, Stitching, Comfort, Wear?
- **Baby Furniture Quality**
 - Safety, Goo Proof, Durability, Easy to Assemble?

8 Project Quality Management

- The International Organization for Standardization (ISO) defines quality as “the degree to which a set of inherent characteristics fulfills requirements” (ISO9000:2000)
- Other experts define quality based on:
 - Conformance to requirements: the project’s processes and products meet written specifications
 - Fitness for use: a product can be used as it was intended

8 Project Quality Management

- The International Organization for Standardization (ISO) defines quality as “the degree to which a set of inherent characteristics fulfills requirements” (ISO9000:2000)
- Other experts define quality based on:
 - Conformance to requirements: the project’s processes and products meet written specifications.
 - Fitness for use: a product can be used as it was intended.
 - Transcendent definition: Excellence
 - Product-based definition: Quantities of product attributes

8 Project Quality Management

- User-based definition: Fitness for intended use
- Value-based definition: Quality vs. Price
- Manufacturing-based definition: Conformance to specifications

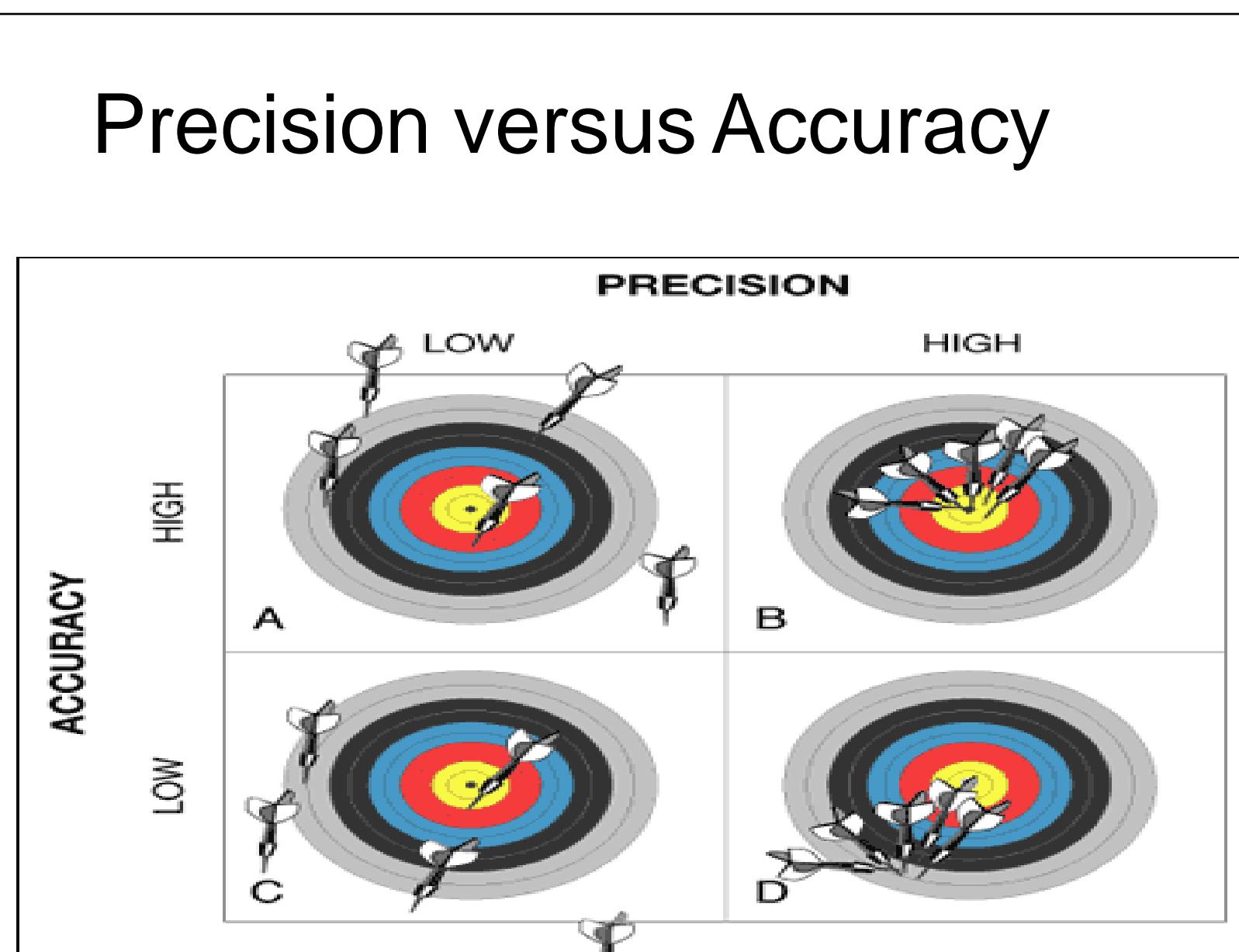
Quality versus Grade

- Quality & Grade are not the same..
- Quality : Degree to which a set of characteristics fulfill requirements
- Grade : Category assigned to products or services having the same functional use but different technical characteristics
- While a quality level that fails to meet quality requirements is always a problem, low grade may not be

Precision versus Accuracy

- Precision and Accuracy are not equivalent..
- Precision : repeated measurements are clustered and have little scatter
- Accuracy : measured value is very close to the true value
- Precise measurements are not necessarily accurate

Precision versus Accuracy



Nature of PQM

- Project quality management must address both the management of the project and the product of the project.
- Failure to meet quality requirements in either dimension can have serious and negative consequences for any or all of the project stakeholders



Examples of Negative Consequences

- Meeting the customer requirement by over working the project team may lead to negative consequence in employee turnover



- Meeting project schedules by rushing planned quality inspections may produce negative consequences when errors go undetected.



Common understanding

- **Customer Satisfaction :**

- Conformance to requirements
- Fitness for use

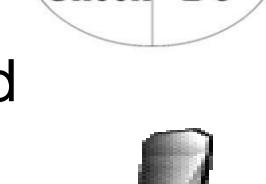


- **Prevention over inspection :** cost of preventing mistakes is generally less than the cost of correcting



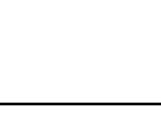
- **Continuous improvement**

- (plan – do – check – act)
- Keep looking



- **Management responsibility**

- Complete team is responsible and management should provide necessary environment and support



Common understanding

- **Cost of Quality**

- The **Cost of Quality (COQ)** includes money spent during the project to avoid failures and money spent during and after the project because of failures. These are known as the **Cost of Conformance** and the **Cost of Nonconformance**.
- The cost of preventing mistakes is usually much less than the cost of correcting them.

8.	Project Quality Management	2 hrs
8.1.	Project Quality Management Process	
8.2.	Planning Project Quality Management	
8.3.	Review of Quality Assurance and Quality Control	

Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
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8.	Project Quality Management	2 hrs
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8.2.	Planning Project Quality Management	
8.3.	Review of Quality Assurance and Quality Control	

8.1 Planning Quality Management

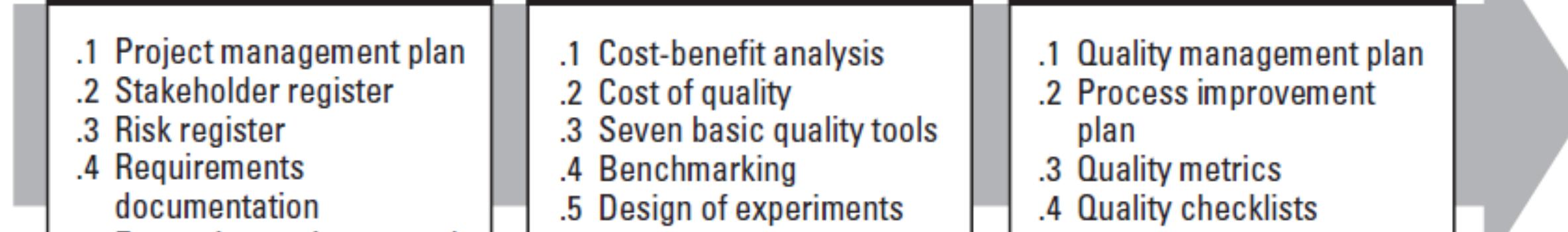
Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Quality Management		8.1 Plan Quality Management		8.2 Perform Quality Assurance 8.3 Control Quality	

Across Project Management Process Groups

8.1 Planning Quality Management

- Plan Quality Management is the process of identifying quality requirements and/or standards for the project and its deliverables, and documenting how the project will demonstrate compliance with relevant quality requirements.
- The key benefit of this process is that it provides guidance and direction on how quality will be managed and validated throughout the project.

8.1 Planning Quality Management



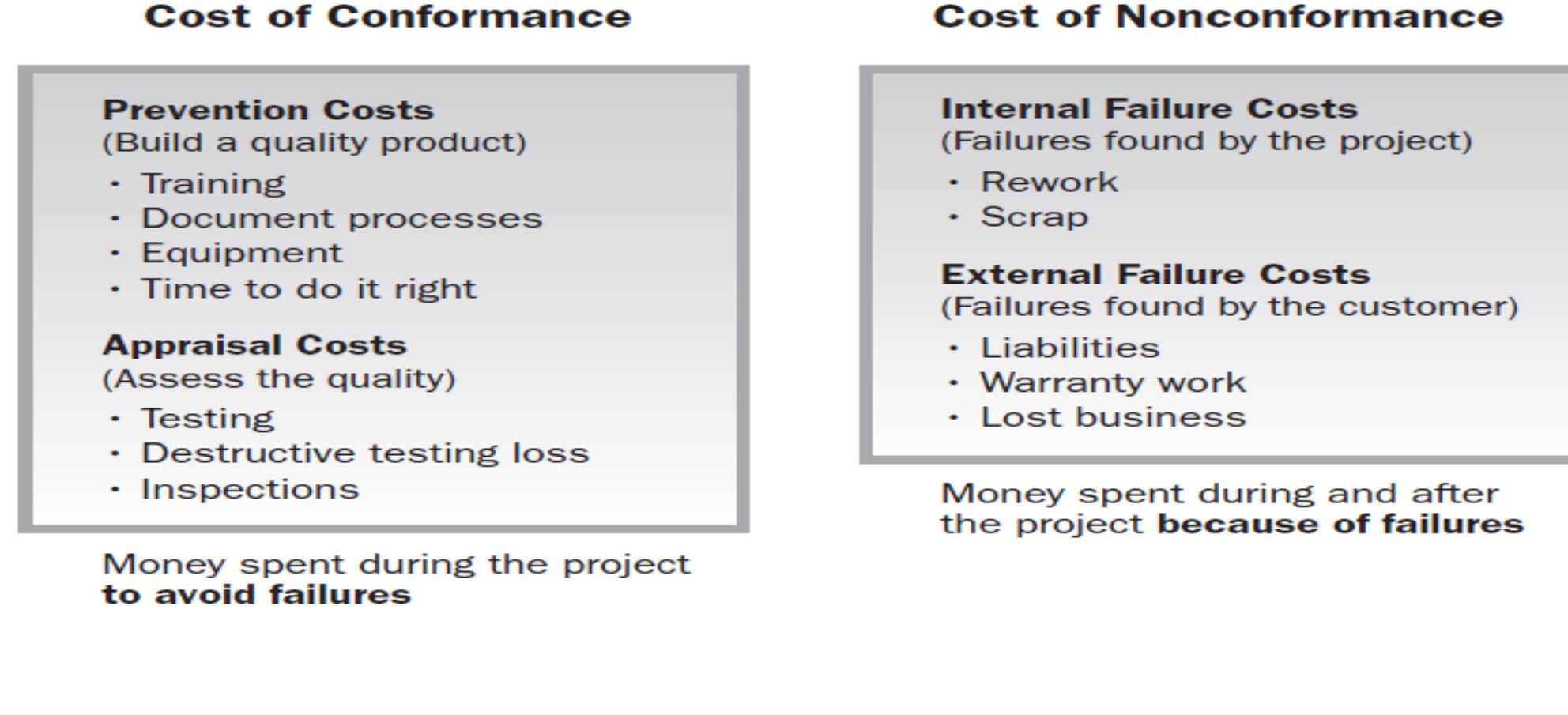
8.1 Planning Quality Management(Inputs)

1	Project management plan	Described in section 4 : contains information used to develop the quality management plan which includes, but is not limited to: Scope baseline and Schedule baseline , cost baseline, other information (risk, decisions e.t.c).
2	Stakeholder register	The stakeholder register aids in identifying those stakeholders possessing a particular interest in, or having an impact on, quality.
3	Risk register	The risk register contains information on threats and opportunities that may impact quality requirements.
4	Requirements documentation	Described in Section 5; Requirements documentation captures the requirements that the project shall meet pertaining to stakeholder expectations
5	Enterprise environmental factors	Described in Section 2;
6	Organizational Process Assets	Described in Section 2;

8.1 Planning Quality Management(Tools and Techniques)

1	Cost-benefit analysis	The primary benefits of meeting quality requirements include less rework, higher productivity, lower costs, increased stakeholder satisfaction, and increased profitability. A cost-benefit analysis for each quality activity compares the cost of the quality step to the expected benefit.
2	Cost of quality	Cost of quality includes all costs incurred over the life of the product by investment in preventing nonconformance to requirements, appraising the product or service for conformance to requirements, and failing to meet requirements (rework). Failure costs are often categorized into internal (found by the project) and external (found by the customer). Failure costs are also called cost of poor quality.

8.1 Planning Quality Management(Tools and Techniques)



8.1 Planning Quality Management(Tools and Techniques)

3 Seven basic quality tools	<p>The seven basic quality tools, also known in the industry as 7QC Tools, are used within the context of the PDCA Cycle to solve quality-related problems.</p> <p>Cause-and-effect diagrams(fishbone diagrams or as Ishikawa diagrams).</p> <ul style="list-style-type: none"> • The causes are found by looking at the problem statement and asking “why” until the actionable root cause has been identified or until the reasonable possibilities on each fishbone have been exhausted. • Fishbone diagrams often prove useful in linking the undesirable effects seen as special variation to the assignable cause upon which project teams should implement corrective actions to eliminate the special variation detected in a control chart.
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8.1 Planning Quality Management(Tools and Techniques)

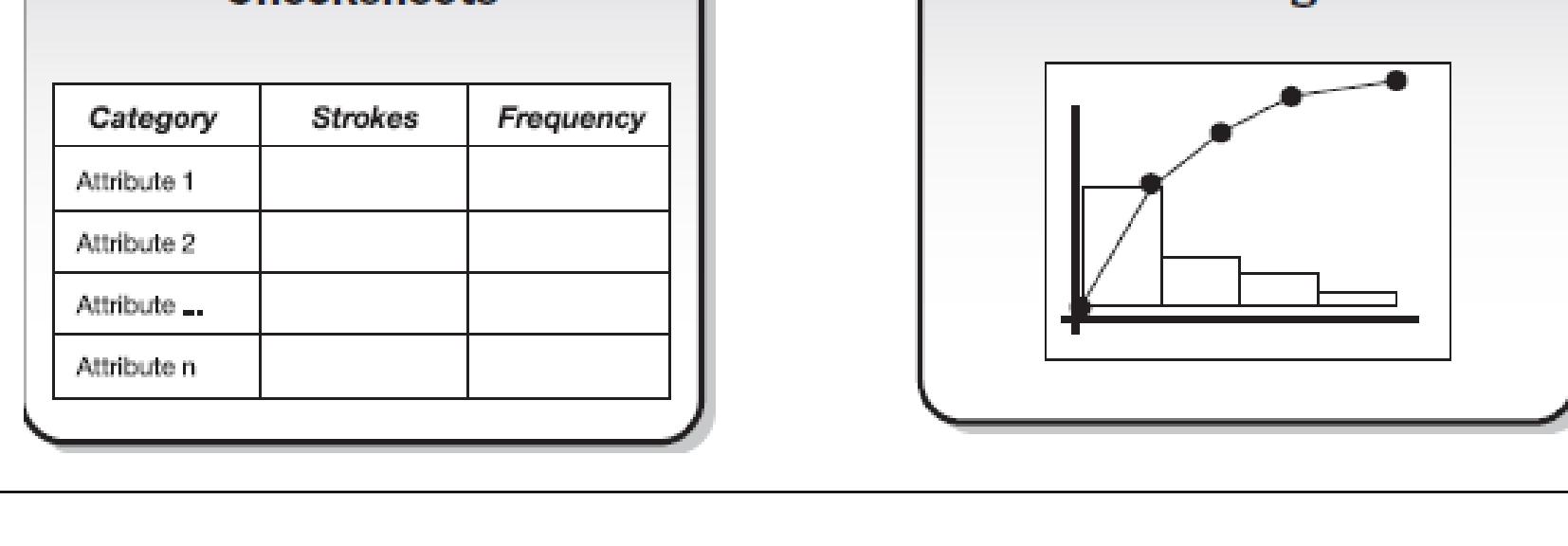
3 Seven basic quality tools	<p>Cause-and-effect diagrams(fishbone diagrams or as Ishikawa diagrams).</p> <div style="border: 2px solid black; border-radius: 10px; padding: 10px; text-align: center;"> <h3 style="margin: 0;">Cause & Effect Diagram</h3> </div>
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8.1 Planning Quality Management(Tools and Techniques)

3 Seven basic quality tools	<p>2) Flowcharts (process maps)</p> <ul style="list-style-type: none"> • display the sequence of steps and the branching possibilities that exist for a process that transforms one or more inputs into one or more outputs. • show the activities, decision points, branching loops, parallel paths, and the overall order of processing by mapping the operational details of • This is obtained by using the workflow branching logic and associated relative frequencies to estimate expected monetary value for the conformance and nonconformance work required to deliver the expected conforming output. <div style="border: 2px solid black; border-radius: 10px; padding: 10px; text-align: center;"> <h3 style="margin: 0;">Flowcharts</h3> </div>
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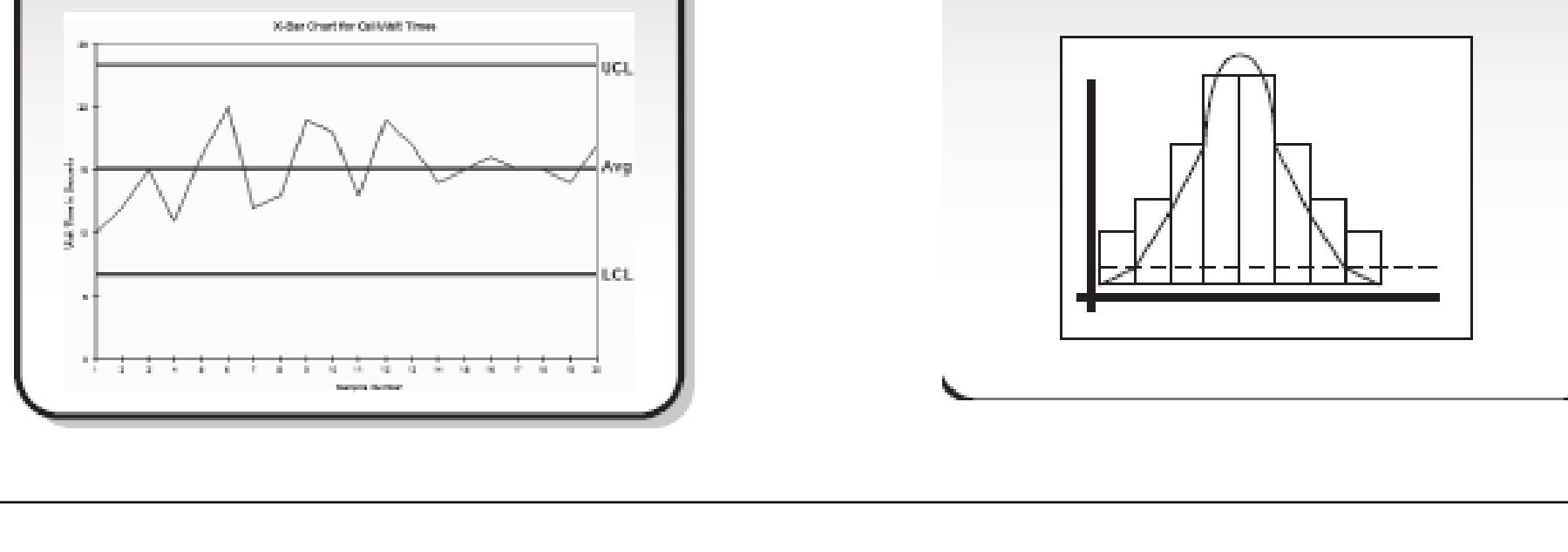
8.1 Planning Quality Management(Tools and Techniques)

3 Seven basic quality tools	<p>3) Checksheets(tally sheets)</p> <ul style="list-style-type: none">used as a checklist when gathering data, used to organize facts in a manner that will facilitate the effective collection of useful data about a potential quality problem.useful for gathering attributes data while performing inspections to identify defects. <p>4) Pareto diagrams,</p> <ul style="list-style-type: none">exist as a special form of vertical bar chart and are used to identify the vital few sources that are responsible for causing most of a problem's effects.the Pareto diagram will be organized into categories that measure either frequencies or consequences.
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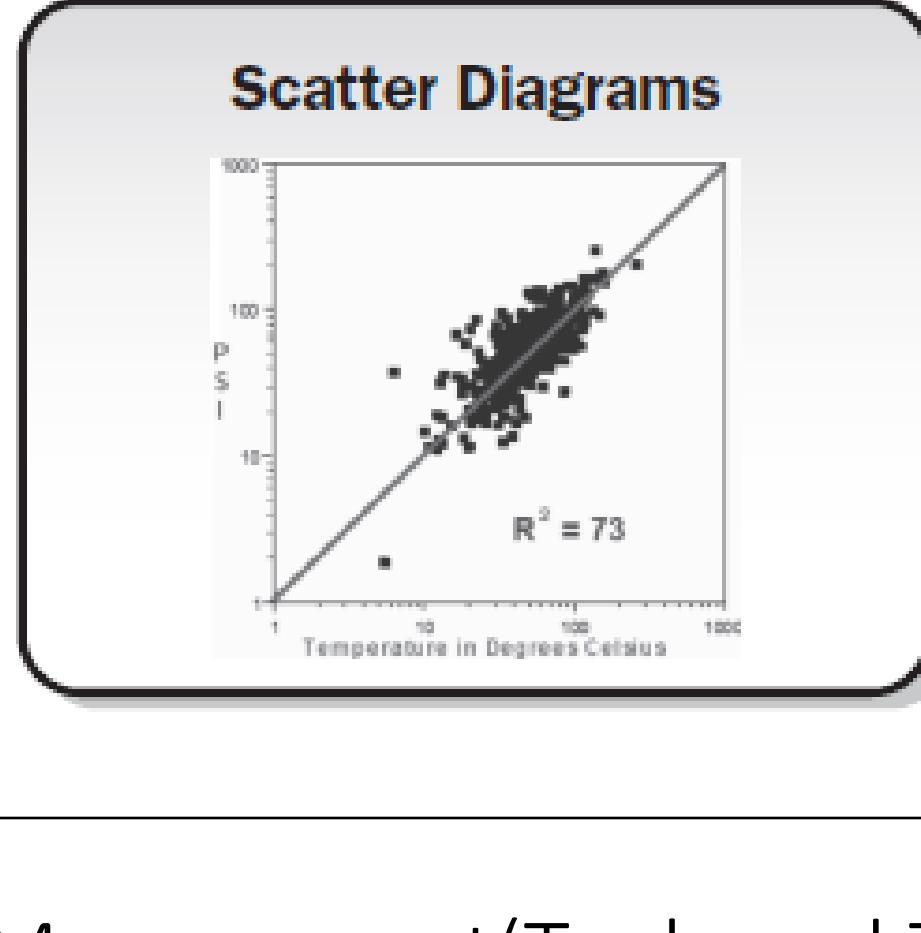
8.1 Planning Quality Management(Tools and Techniques)

3 Seven basic quality tools	<p>5) Histograms</p> <p>are a special form of bar chart and are used to describe the central tendency, dispersion, and shape of a statistical distribution.</p> <p>6), Control charts</p> <p>are used to determine whether or not a process is stable or has predictable performance. Upper and lower specification limits are based on requirements of the agreement. They reflect the maximum and minimum values allowed.</p>
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8.1 Planning Quality Management(Tools and Techniques)

3 Seven basic quality tools	<p>7) Scatter diagrams,</p> <p>plot ordered pairs (X, Y) and are sometimes called correlation charts because they seek to explain a change in the dependent variable, Y, in relationship to a change observed in the corresponding independent variable, X.</p>
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8.1 Planning Quality Management(Tools and Techniques)

4 Benchmarking	<ul style="list-style-type: none">Benchmarking involves comparing actual or planned project practices to those of comparable projects to identify best practices, generate ideas for improvement, and provide a basis for measuring performance.Benchmarked projects may exist within the performing organization or outside of it, or can be within the same application area. Benchmarking allows for analogies from projects in a different application area to be made.
5 Design of experiments	Design of experiments (DOE) is a statistical method for identifying which factors may influence specific variables of a product or process under development or in production..

8.1 Planning Quality Management(Tools and Techniques)

6	Statistical sampling	<ul style="list-style-type: none">• Statistical sampling involves choosing part of a population of interest for inspection (for example, selecting ten engineering drawings at random from a list of seventy-five).• Sample frequency and sizes should be determined during the Plan Quality Management process so the cost of quality will include the number of tests, expected scrap, etc.
7	Additional quality planning tools	Other quality planning tools are used to define the quality requirements and to plan effective quality management activities. These include, but are not limited to: Brainstorming., Force field analysis, Nominal group technique, Quality management and control tools
8	Meetings	Project teams may hold planning meetings to develop the quality management plan.

8.1 Planning Quality Management(Output)

1	Quality management plan	<ul style="list-style-type: none">• The quality management plan is a component of the project management plan that describes how the organization's quality policies will be implemented.• It describes how the project management team plans to meet the quality requirements set for the project.• The quality management plan may be formal or informal, detailed, or broadly framed.• The style and detail of the quality management plan are determined by the requirements of the project.
2	Process improvement plan	Described in section 4 The process improvement plan details the steps for analyzing project management and product development processes to identify activities that enhance their value.

8.1 Planning Quality Management(Output)

3	Quality metrics	<ul style="list-style-type: none">• A quality metric specifically describes a project or product attribute and how the control quality process will measure it.• A measurement is an actual value. The tolerance defines the allowable variations to the metric.• Quality metrics are used in the perform quality assurance and control quality processes.• Some examples of quality metrics include on-time performance, cost control, defect frequency, failure rate, availability, reliability, and test coverage.
4	Quality checklists	A checklist is a structured tool, usually component-specific, used to verify that a set of required steps has been performed.
5	Project documents updates	Project documents that may be updated include, but are not limited to: <ul style="list-style-type: none">• Stakeholder register (Section 13); and• Responsibility assignment matrix (Section 9); and• WBS and WBS Dictionary.

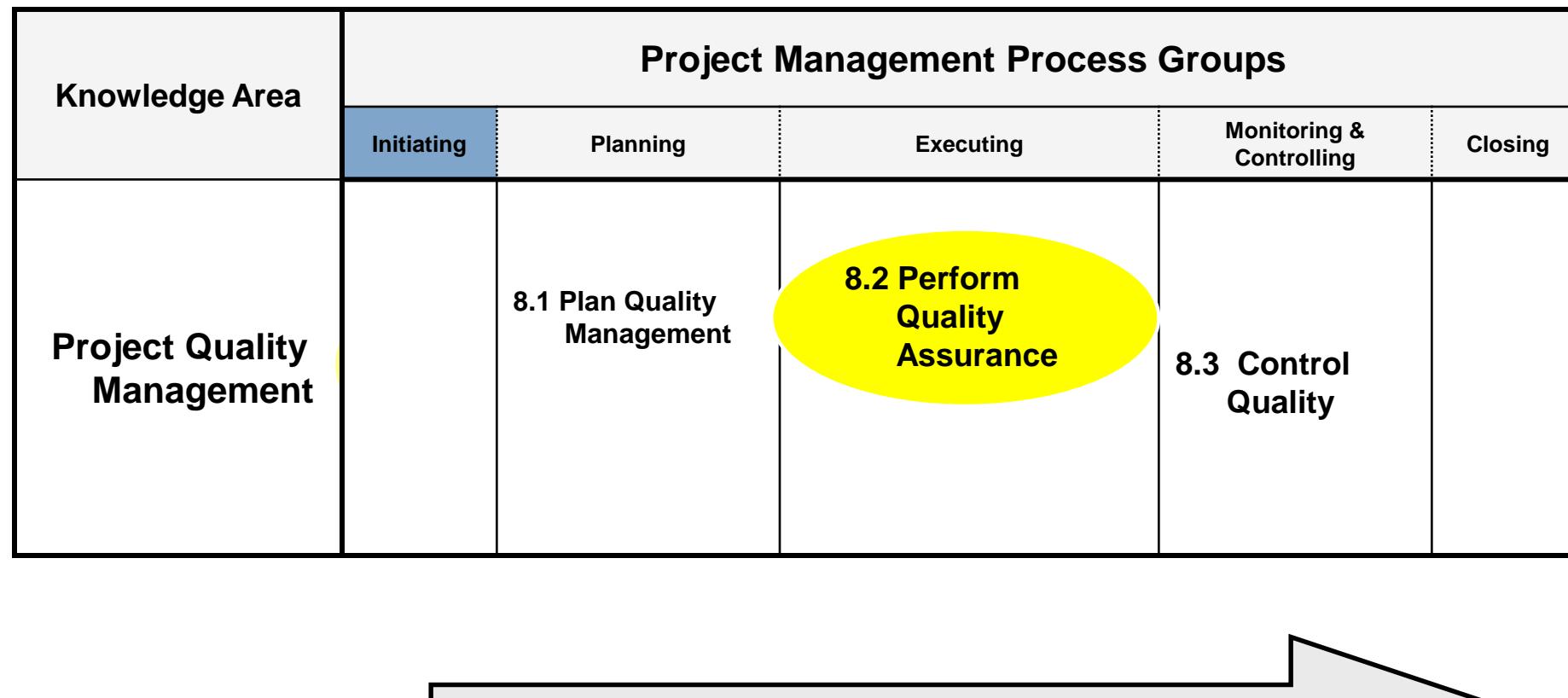
8. Project Quality Management 2 hrs

8.1. Project Quality Management Process

8.2. Planning Project Quality Management

8.3. Review of Quality Assurance and Quality Control

8.2 Review of Quality Assurance and Quality Control



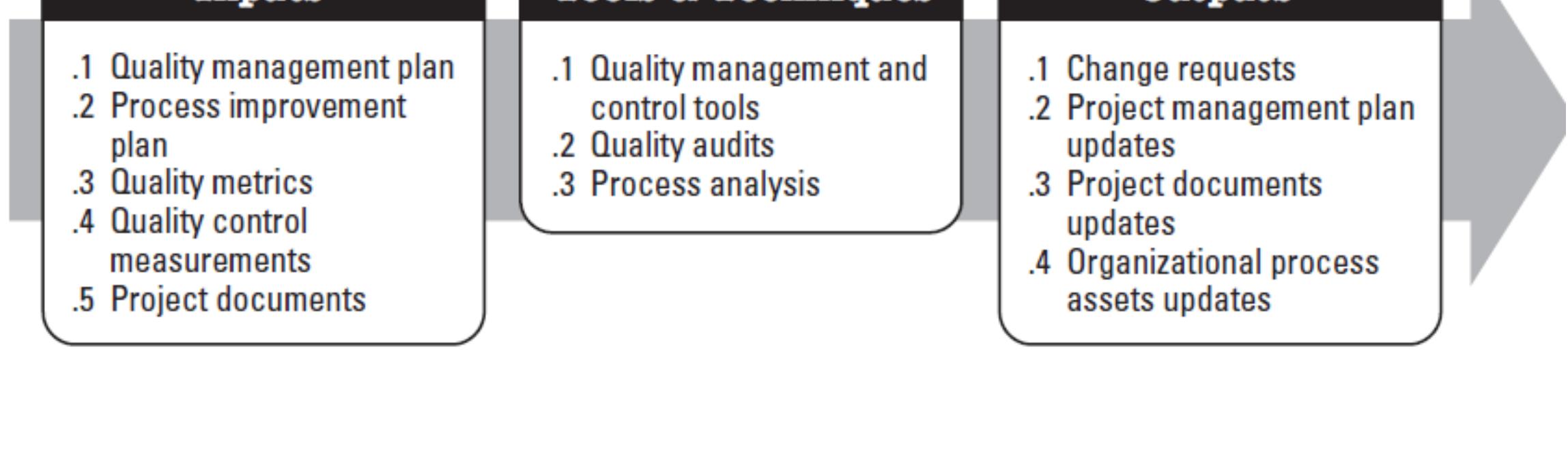
Across Project Management Process Groups

35

8.2 Performance Quality Assurance

- Perform Quality Assurance is the process of auditing the quality requirements and the results from quality control measurements to ensure that appropriate quality standards and operational definitions are used.
- The key benefit of this process is that it facilitates the improvement of quality processes.

8.2 Performance Quality Assurance

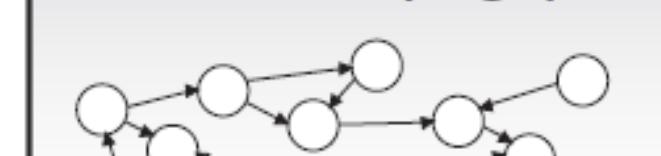
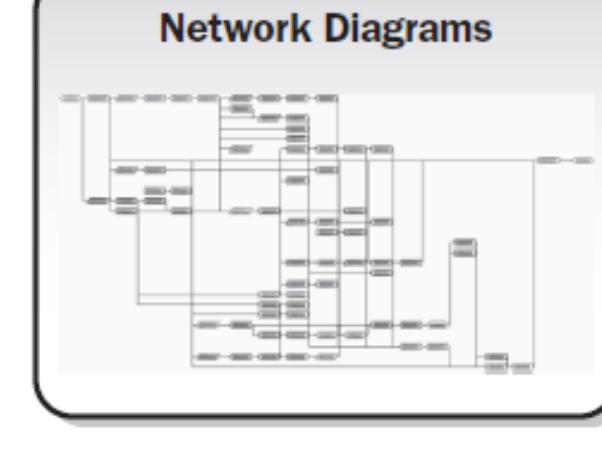
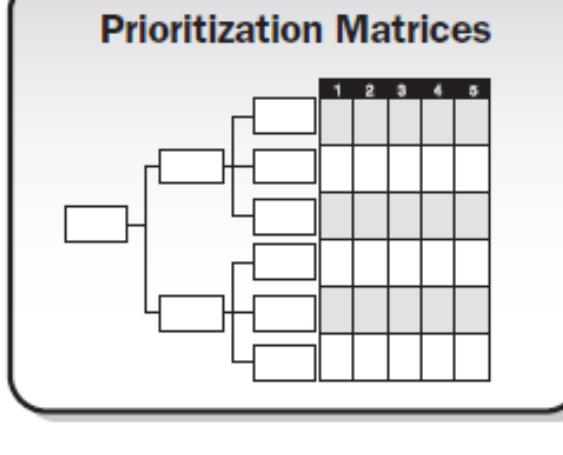
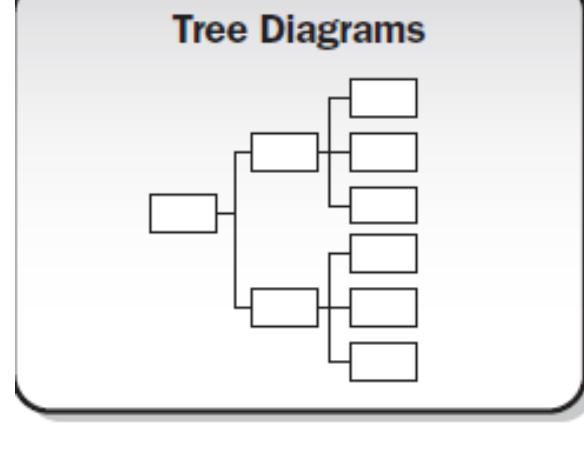


8.2 Performance Quality Assurance (input)

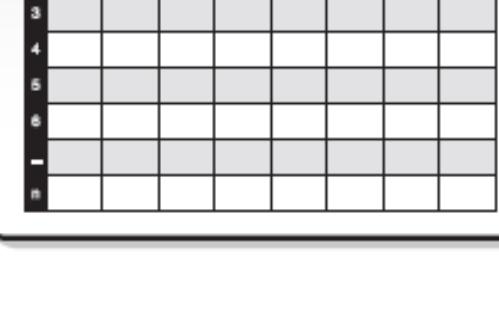
1 Quality management plan	Described in Section 8; The quality management plan describes the quality assurance and continuous process improvement approaches for the project.
2 Process improvement plan	Described in Section 8; The project's quality assurance activities should be supportive of and consistent with the performing organization's process improvement plans.
3 Quality metrics	Described in Section 8; The quality metrics provide the attributes that should be measured and the allowable variations.
4 Quality control measurements	Described in Section 8. Quality control measurements are the results of control quality activities. They are used to analyze and evaluate the quality of the processes of the project against the standards of the performing organization or the requirements specified. Quality control measurements can also compare the process
5 Project documents	Project documents may influence quality assurance work and should be monitored within the context of a system for configuration management.

8.2 Performance Quality Assurance (Tools and Techniques)

1	Quality management and control tools	The Perform Quality Assurance process uses the tools and techniques of the Plan Quality Management and Control Quality processes like • Interrelationship digraphs, Tree diagrams, Activity network diagrams, Matrix diagramse.t.c
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Matrix Diagrams



8.2 Performance Quality Assurance (Tools and Techniques)

2	Quality audits	A quality audit is a structured, independent process to determine if project activities comply with organizational and project policies, processes, and procedures. The objectives of a quality audit may include: <ul style="list-style-type: none">• Identify all good and best practices being implemented;• Identify all nonconformity, gaps, and shortcomings;• Share good practices introduced or implemented in similar projects in the organization and/or industry;• Proactively offer assistance in a positive manner to improve implementation of processes to help the team raise productivity; and• Highlight contributions of each audit in the lessons learned repository of the organization.
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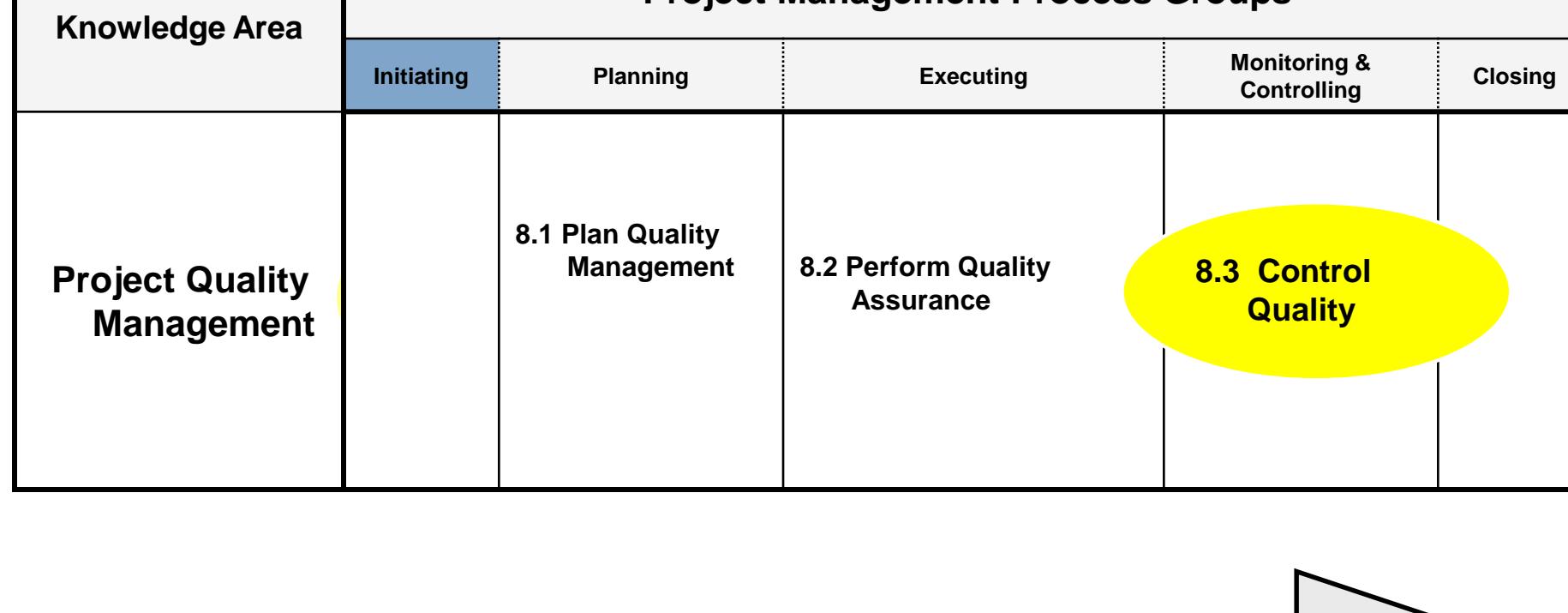
8.2 Performance Quality Assurance (Tools and Techniques)

3	Process analysis	Process analysis follows the steps outlined in the process improvement plan to identify needed improvements. This analysis also examines problems experienced, constraints experienced, and non-value-added activities identified during process operation. Process analysis includes root cause analysis—a specific technique used to identify a problem, discover the underlying causes that lead to it, and develop preventive actions.
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8.2 Performance Quality Assurance (Outputs)

1	Change requests	<ul style="list-style-type: none"> • Change requests are created and used as input into the Perform Integrated Change Control process (Section 4.5) to allow full consideration of the recommended improvements. • Change requests are used to take corrective action, preventive action, or to perform defect repair.
2	Project management plan updates	Elements of the project management plan that may be updated include, but are not limited to: <ul style="list-style-type: none"> • Quality management plan (Section 8), • Scope management plan (Section 5), • Schedule management plan (Section 6), and • Cost management plan (7).
3	Project documents updates	Project documents that may be updated include, but are not limited to: <ul style="list-style-type: none"> • Quality audit reports, • Training plans, and • Process documentation.
4	Organizational process assets updates	Elements of the organizational process assets that may be updated include, but are not limited to, the organization's quality standards and the quality management system.

8.2 Review of Quality Assurance and Quality Control



Across Project Management Process Groups

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8.2 Control Quality

- Control Quality is the process of monitoring and recording results of executing the quality activities to assess performance and recommend necessary changes.
- The key benefits of this process include:
 - 1) identifying the causes of poor process or product quality and recommending and/or taking action to eliminate them; and
 - (2) validating that project deliverables and work meet the requirements specified by key stakeholders necessary for final acceptance.

8.2 Control Quality



8.2 Control Quality (inputs)

1 Project management plan	Described in Section 8 The project management plan contains the quality management plan, which is used to control quality. The quality management plan describes how quality control will be performed within the project.
2 Quality metrics	Described in Section 4 A quality metric describes a project or product attribute and how it will be measured.
3 Quality checklists	Described in Section 8 Quality checklists are structured lists that help to verify that the work of the project and its deliverables fulfill a set of requirements.
4 Work performance data	Described in Section 4 Work performance data can include: <ul style="list-style-type: none">• Planned vs. actual technical performance,• Planned vs. actual schedule performance, and• Planned vs. actual cost performance.

8.2 Control Quality (Inputs)

5 Approved change requests	<ul style="list-style-type: none">• As part of the Perform Integrated Change Control process, a change log update indicates that some changes are approved and some are not.• Approved change requests may include modifications such as defect repairs, revised work methods, and revised schedule.• The timely implementation of approved changes needs to be verified.
6 Deliverables	Described in Section 4. A deliverable is any unique and verifiable product, result, or capability that results in a validated deliverable required by the project.
7 Project documents	Project documents may include, but are not limited to: <ul style="list-style-type: none">• Agreements,• Quality audit reports and change logs supported with corrective action plans,• Training plans and assessments of effectiveness, and
8 Organizational process assets	Described in Section 2 The organizational process assets that influence the Control Quality process include, but are not limited to: <ul style="list-style-type: none">• The organization's quality standards and policies,• Standard work guidelines, and• Issue and defect reporting procedures and communication policies.

8.2 Control Quality (Tools and Techniques)

1 Seven basic quality tools	Described in Section 8
2 Statistical sampling	Described in Section 8
3 Inspection	<ul style="list-style-type: none">• An inspection is the examination of a work product to determine if it conforms to documented standards.• The results of an inspection generally include measurements and may be conducted at any level.• Inspections may be called reviews, peer reviews, audits, or walkthroughs.• Inspections also are used to validate defect repairs.
4 Approved change requests review	All approved change requests should be reviewed to verify that they were implemented as approved.

8.2 Control Quality (Outputs)

1 Quality control measurements	Quality control measurements are the documented results of control quality activities.
2 Validated changes	Any changed or repaired items are inspected and will be either accepted or rejected before notification of the decision is provided. Rejected items may require rework.
3 Verified deliverables	A goal of the Control Quality process is to determine the correctness of deliverables. The results of performing the Control Quality process are verified deliverables. Verified deliverables are an input to Validate Scope (5) for formalized acceptance.
4 Work performance information	Work performance information is the performance data collected from various controlling processes, analyzed in context and integrated based on relationships across areas. Examples include information about the project requirements fulfillment such as causes for rejections, rework required, or the need for process adjustments.

8.2 Control Quality (Outputs)

5	Change requests	If the recommended corrective or preventive actions or a defect repair requires a change to the project management plan, a change request (Section 4) should be initiated in accordance with the defined Perform Integrated Change Control (4) process.
6	Project management plan updates	Elements of the project management plan that may be updated include, but are not limited to: • Quality management plan (Section 8), and • Process improvement plan (Section 8).
7	Project documents updates	Project documents that may be updated include, but are not limited to, • Quality standards; • Agreements; • Quality audit reports and change logs supported with corrective action plans; • Training plans and assessments of effectiveness; and • Process documentation, such as information obtained using the seven basic quality tools or the quality management and control tools.
8	Organizational process assets updates	Elements of the organizational process assets that may be updated include, but are not limited to: • Completed checklists. When checklists are used, the completed checklists become part of the project documents and organizational process assets (Section 4). • Lessons learned documentation. The causes of variances, the reasoning behind the corrective action chosen, and other types of lessons learned from control quality are documented so they become part of the historical database for both the project and the performing organization.

9 Project Human Resource Management

9. Project Human Resource Management 4 hrs

- 9.1. Project Human Resource Management Process
- 9.2. Planning Project Human Resource Management
- 9.3. Acquire Project Team
- 9.4. Develop Project Team
- 9.5. Manage Project Team

9 Project Human Resource management

- Project Human Resource Management includes the processes that organize, manage, and lead the project team.
- The project team is comprised of the people with assigned roles and responsibilities for completing the project.
- Project team members may have varied skill sets, may be assigned full or part-time, and may be added or removed from the team as the project progresses.
- Project team members may also be referred to as the project's staff.
- Although specific roles and responsibilities for the project team members are assigned, the involvement of all team members in project planning and decision making is beneficial.
- Participation of team members during planning adds their expertise to the process and strengthens their commitment to the project.

9. Project Human Resource Management 4 hrs

- 9.1. Project Human Resource Management Process
- 9.2. Planning Project Human Resource Management
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9. Project Human Resource Management 4 hrs

9.1. Project Human Resource Management Process

9.2. Planning Project Human Resource Management

9.3. Acquire Project Team

9.4. Develop Project Team

9.5. Manage Project Team

9.2 Planning Project Human Resource Management

Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		

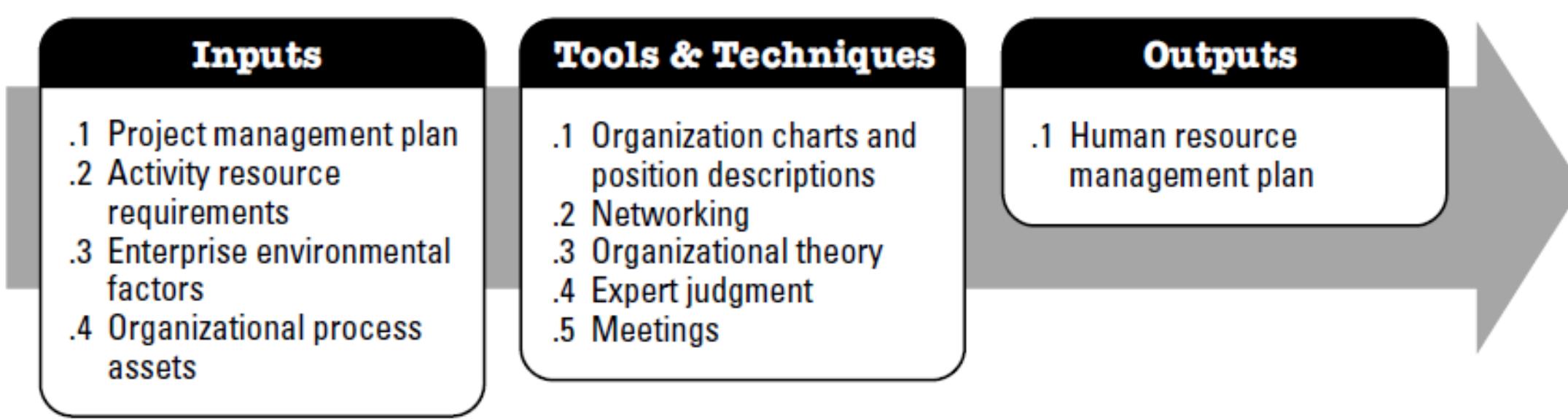
Across Project Management Process Groups

6

9.2 Planning Project Human Resource Management

- Plan Human Resource Management is the process of identifying and documenting project roles, responsibilities, required skills, reporting relationships, and creating a staffing management plan.
- The key benefit of this process is that it establishes project roles and responsibilities, project organization charts, and the staffing management plan including the timetable for staff acquisition and release.

9.2 Planning Project Human Resource Management

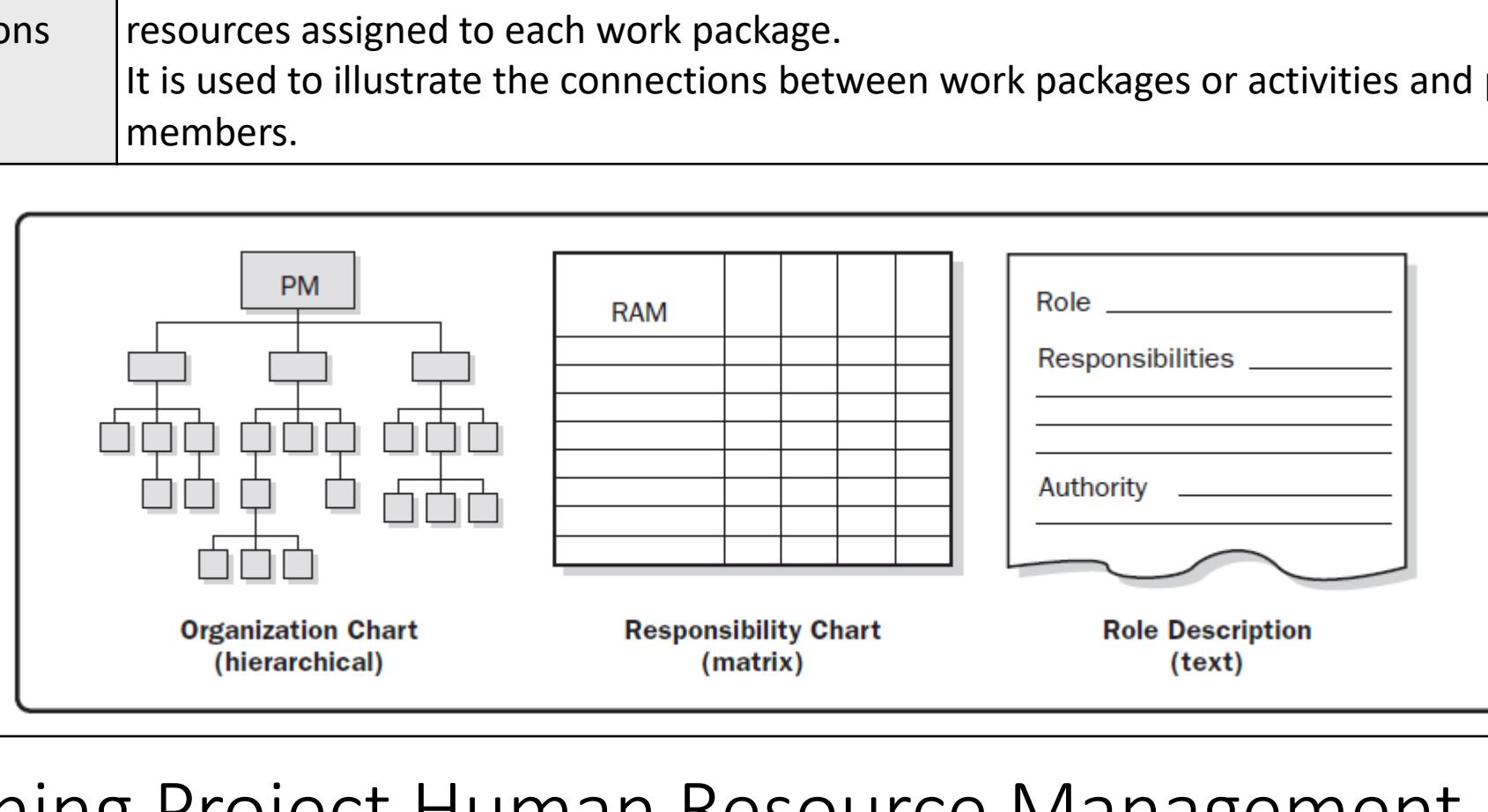


9.2 Planning Project Human Resource Management (Inputs)

1 Project management plan	Described in section 4 : contains information used to develop the human resource management plan.
2 Activity resource requirements	Described in Section 6.4.3.1. Human resource planning uses activity resource requirements to determine the human resource needs for the project. The preliminary requirements regarding the required project team members and their competencies are progressively elaborated as part of the Plan Human Resource Management process.
3 Enterprise environmental factors	Described in Section 2;
4 Organizational Process Assets	Described in Section 2;

9.2 Planning Project Human Resource Management (Tools and Techniques)

1 Organization charts and position descriptions	Various formats exist to document team member roles and responsibilities Hierarchical-type charts. The traditional organization chart structure can be used to show positions and relationships in a graphical, top-down format.
	Matrix-based charts. A responsibility assignment matrix (RAM) is a grid that shows the project resources assigned to each work package. It is used to illustrate the connections between work packages or activities and project team members.



9.2 Planning Project Human Resource Management (Tools and Techniques)

1 Organization charts and position descriptions	<table border="1"> <thead> <tr> <th>RACI Chart</th><th colspan="5">Person</th></tr> <tr> <th>Activity</th><th>Ann</th><th>Ben</th><th>Carlos</th><th>Dina</th><th>Ed</th></tr> </thead> <tbody> <tr> <td>Create charter</td><td>A</td><td>R</td><td>I</td><td>I</td><td>I</td></tr> <tr> <td>Collect requirements</td><td>I</td><td>A</td><td>R</td><td>C</td><td>C</td></tr> <tr> <td>Submit change request</td><td>I</td><td>A</td><td>R</td><td>R</td><td>C</td></tr> <tr> <td>Develop test plan</td><td>A</td><td>C</td><td>I</td><td>I</td><td>R</td></tr> </tbody> </table>	RACI Chart	Person					Activity	Ann	Ben	Carlos	Dina	Ed	Create charter	A	R	I	I	I	Collect requirements	I	A	R	C	C	Submit change request	I	A	R	R	C	Develop test plan	A	C	I	I	R
RACI Chart	Person																																				
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Submit change request	I	A	R	R	C																																
Develop test plan	A	C	I	I	R																																

R = Responsible A = Accountable C = Consult I = Inform

9.2 Planning Project Human Resource Management (Tools and Techniques)

1	Organization charts and position descriptions Text-oriented formats. Team member responsibilities that require detailed descriptions can be specified in text-oriented formats. Usually in outline form, the documents provide information such as responsibilities, authority, competencies, and qualifications. The documents are known by various names including position descriptions and role-responsibility-authority forms.
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9.2 Planning Project Human Resource Management (Tools and Techniques)

2	Networking • Networking is the formal and informal interaction with others in an organization, industry, or professional environment. • It is a constructive way to understand political and interpersonal factors that will impact the effectiveness of various staffing management options. • Human resource management benefits from successful networking by improving knowledge of and access to human resource assets such as strong competencies, specialized experience, and external partnership opportunities.
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3	Organizational theory • Organizational theory provides information regarding the way in which people, teams, and organizational units behave. • Effective use of common themes identified in organizational theory can shorten the amount of time, cost, and effort needed to create the Plan Human Resource Management process outputs and improve planning efficiency. • It is important to recognize that different organizational structures have different individual response, individual performance, and personal relationship characteristics.
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9.2 Planning Project Human Resource Management (Tools and Techniques)

4	Expert judgment When developing the human resource management plan, expert judgment is used to: <ul style="list-style-type: none">• List the preliminary requirements for the required skills;• Assess the roles required for the project based on standardized role descriptions within the organization;• Determine the preliminary effort level and number of resources needed to meet project objectives;• Determine reporting relationships needed based on the organizational culture;• Provide guidelines on lead time required for staffing, based on lessons learned and market conditions;• Identify risks associated with staff acquisition, retention, and release plans; and• Identify and recommend programs for complying with applicable government and union contracts.
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5	Meetings When planning human resource management of the project, the project management team will hold planning meetings. These meetings leverage a combination of other tools and techniques to allow for all project management team members to reach consensus on the human resource management plan.
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9.2 Planning Project Human Resource Management (Outputs)

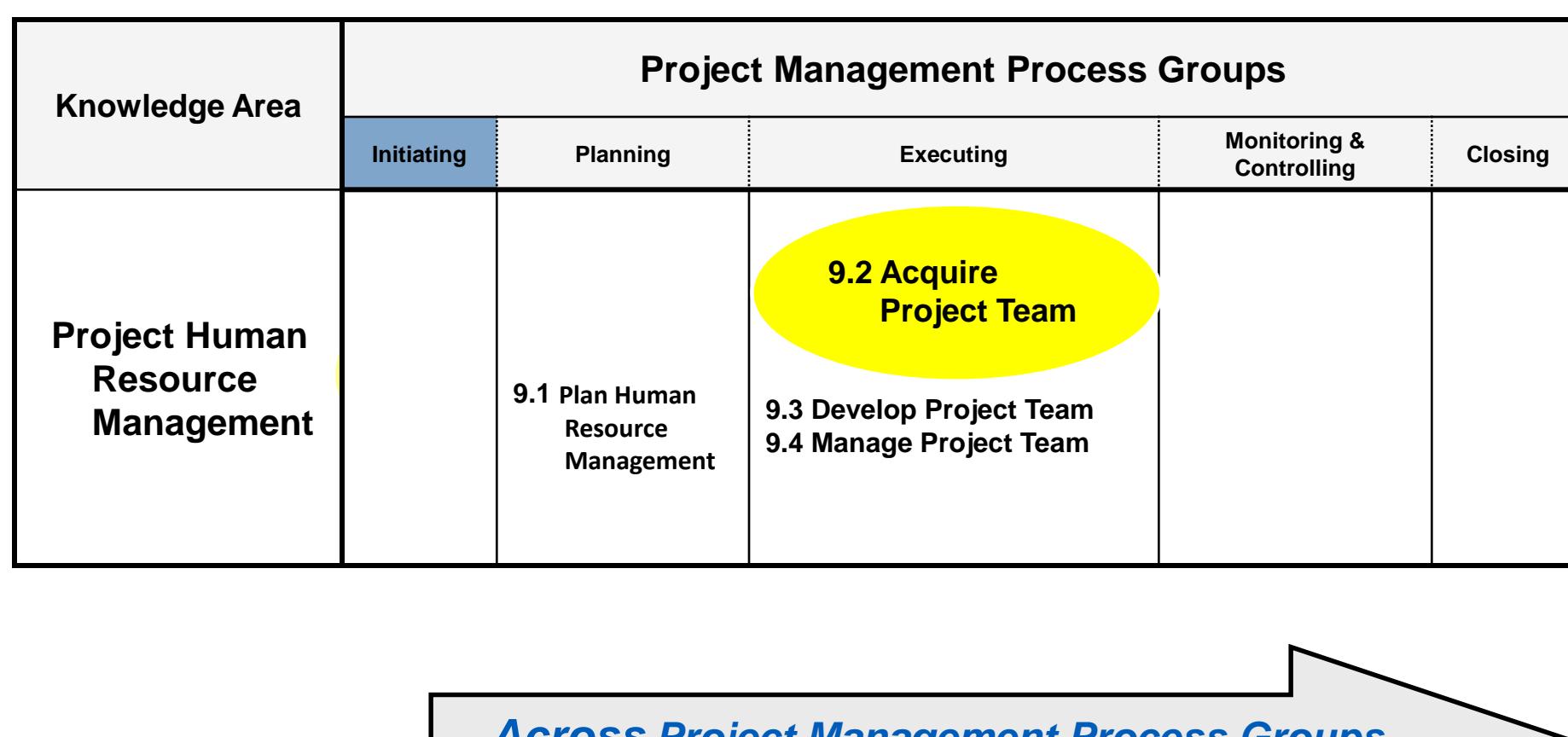
1	Human resource management plan The human resource management plan, a part of the project management plan, provides guidance on how project human resources should be defined, staffed, managed, and eventually released. The human resource management plan and any subsequent revisions are also inputs into the Develop Project Management Plan process. Roles and responsibilities. The following should be addressed when listing the roles and responsibilities needed to complete a project: <ul style="list-style-type: none">oo Role. The function assumed by or assigned to a person in the project. Examples of project roles are civil engineer, business analyst, and testing coordinator. Role clarity concerning authority, responsibilities, and boundaries should also be documented.oo Authority. The right to apply project resources, make decisions, sign approvals, accept deliverables, and influence others to carry out the work of the project. Examples of decisions that need clear authority include the selection of a method for completing an activity, quality acceptance, and how to respond to project variances. Team members operate best when their individual levels of authority match their individual responsibilities.oo Responsibility. The assigned duties and work that a project team member is expected to perform in order to complete the project's activities.oo Competency. The skill and capacity required to complete assigned activities within the project constraints. If project team members do not possess required competencies, performance can be jeopardized. When such mismatches are identified, proactive responses such as training, hiring, schedule changes, or scope changes are initiated.
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9.2 Planning Project Human Resource Management (Outputs)

1 Human resource management plan	<p>Project organization charts. A project organization chart is a graphic display of project team members and their reporting relationships. It can be formal or informal, highly detailed or broadly framed, based on the needs of the project. For example, the project organization chart for a 3,000-person disaster response team will have greater detail than a project organization chart for an internal, twenty-person project.</p> <p>Staffing management plan. The staffing management plan is a component of the human resource management plan that describes when and how project team members will be acquired and how long they will be needed. It describes how human resource requirements will be met. The staffing management plan can be formal or informal, highly detailed, or broadly framed, depending upon the needs of the project. The plan is updated continually during the project to direct ongoing team member acquisition and development actions. Information in the staffing management plan varies by application area and project size, but items to consider include:</p> <ul style="list-style-type: none">oo Staff acquisition, Resource calendars, Staff release plan., Training needs, Recognition and rewards, Compliance, Safety
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9.	Project Human Resource Management	4 hrs
9.1.	Project Human Resource Management Process	
9.2.	Planning Project Human Resource Management	
9.3.	Acquire Project Team	
9.4.	Develop Project Team	
9.5.	Manage Project Team	

9.3 Acquire Project Team



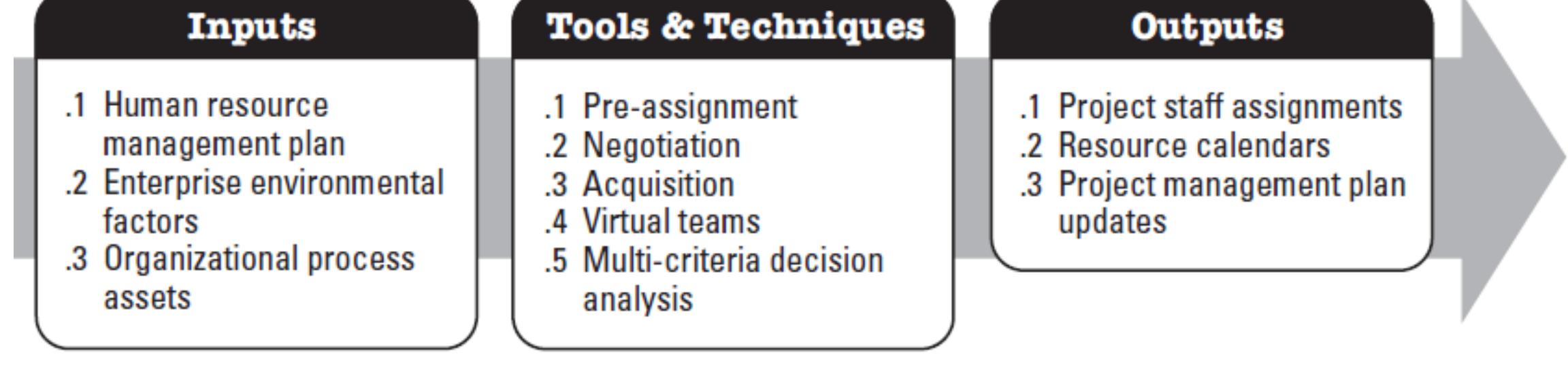
Across Project Management Process Groups

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9.3 Acquire Project Team

- Acquire Project Team is the process of confirming human resource availability and obtaining the team necessary to complete project activities.
- The key benefit of this process consists of outlining and guiding the team selection and responsibility assignment to obtain a successful team.

9.3 Acquire Project Team



9.3 Acquire Project Team (Inputs)

1	Human resource management plan	Described in Section 9. The human resource management plan provides guidance on how project human resources should be identified, staffed, managed, and eventually released. It
2	Enterprise environmental factors	Described in Section 2;
3	Organizational Process Assets	Described in Section 2;

9.3 Acquire Project Team (Tools and Techniques)

1	Pre-assignment	When project team members are selected in advance, they are considered pre-assigned. This situation can occur if the project is the result of specific people being identified as part of a competitive proposal, if the project is dependent upon the expertise of particular persons, or if some staff assignments are defined within the project charter.
2	Negotiation	Staff assignments are negotiated on many projects. For example, the project management team may need to negotiate with: <ul style="list-style-type: none">• Functional managers, to ensure that the project receives appropriately competent staff in the required time frame and that the project team members will be able, willing, and authorized to work on the project until their responsibilities are completed;• Other project management teams within the performing organization, to appropriately assign scarce or specialized human resources; and• External organizations, vendors, suppliers, contractors, etc., for appropriate, scarce, specialized, qualified, certified, or other such specified human resources.
3	Acquisition	<ul style="list-style-type: none">• When the performing organization is unable to provide the staff needed to complete a project, the required services may be acquired from outside sources.• This can involve hiring individual consultants or subcontracting work to another organization.

9.3 Acquire Project Team (Tools and Techniques)

4	Virtual teams	<ul style="list-style-type: none">• The use of virtual teams creates new possibilities when acquiring project team members. Virtual teams can be defined as groups of people with a shared goal who fulfill their roles with little or no time spent meeting face to face.• The availability of communication technology such as e-mail, audio conferencing, social media, web-based meetings and video conferencing has made virtual teams feasible
5	Multi-criteria decision analysis	<p>Selection criteria are often used as a part of acquiring the project team. By use of a multi-criteria decision analysis tool, criteria are developed and used to rate or score potential team members. The criteria are weighted according to the relative importance of the needs within the team. Some examples of selection criteria that can be used to score team members are shown as follows:</p> <ul style="list-style-type: none">• Availability. Identify whether the team member is available to work on the project within the time period needed. If there are any concerns for availability during the project timeline.• Cost. Verify if the cost of adding the team member is within the prescribed budget.• Experience. Verify that the team member has the relevant experience that will contribute to the project success.• Ability. Verify that the team member has the competencies needed by the project.

9.3 Acquire Project Team (Tools and Techniques)

5 Multi-criteria decision analysis	<p>Knowledge. Consider if the team member has relevant knowledge of the customer, similar implemented projects, and nuances of the project environment.</p> <ul style="list-style-type: none"> • Skills. Determine whether the member has the relevant skills to use a project tool, implementation, or training. • Attitude. Determine whether the member has the ability to work with others as a cohesive team. • International factors. Consider team member location, time zone and communication capabilities.
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9.3 Acquire Project Team (Outputs)

1 Project staff assignments	<ul style="list-style-type: none"> • The project is staffed when appropriate people have been assigned to the team. • The documentation of these assignments can include a project team directory, memos to team members, and names inserted into other parts of the project management plan, such as project organization charts and schedules.
2 Resource calendars	<ul style="list-style-type: none"> • Resource calendars document the time periods that each project team member is available to work on the project. • Creating a reliable schedule (Section 6) depends on having a good understanding of each person's availability and schedule constraints, including time zones, work hours, vacation time, local holidays, and commitments to other projects.
3 Project management plan updates	<ul style="list-style-type: none"> • Elements of the project management plan that may be updated include, but are not limited to, the human resource management plan. • When gaps occur, the project management plan needs to be updated to change the team structure, roles, or responsibilities

9.	Project Human Resource Management	4 hrs
9.1.	Project Human Resource Management Process	
9.2.	Planning Project Human Resource Management	
9.3.	Acquire Project Team	
9.4.	Develop Project Team	
9.5.	Manage Project Team	

9.4 Develop Project Team

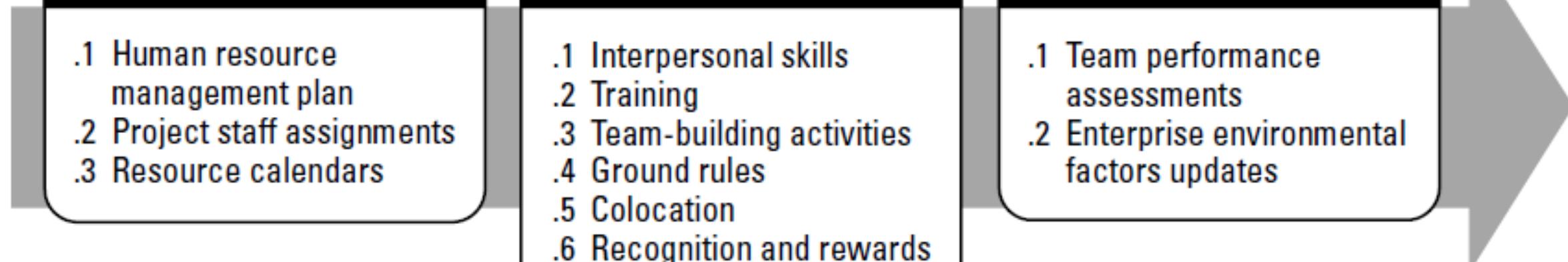
Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team	9.3 Develop Project Team	

Across Project Management Process Groups

9.4 Develop Project Team

- Develop Project Team is the process of improving competencies, team member interaction, and overall team environment to enhance project performance.
- The key benefit of this process is that it results in improved teamwork, enhanced people skills and competencies, motivated employees, reduced staff turnover rates, and improved overall project performance.

9.4 Develop Project Team



9.4 Develop Project Team(Inputs)

1	Human resource management plan	Described in Section 9. The human resource management plan provides guidance on how project human resources should be identified, staffed, managed, and eventually released. It
2	Project staff assignments	Described in Section 9. Team development starts with a list of the project team members. Project staff assignment documents identify the people who are on the team.
3	Resource calendars	Described in Section 9. Resource calendars identify times when the project team members can participate in team development activities.

9.4 Develop Project Team (Tools and Techniques)

1	Interpersonal skills	<ul style="list-style-type: none">• Interpersonal skills, sometimes known as “soft skills,” are behavioral competencies that include proficiencies such as communication skills, emotional intelligence, conflict resolution, negotiation, influence, team building, and group facilitation.• These soft skills are valuable assets when developing the project team.• For example, the project management team can use emotional intelligence to reduce tension and increase cooperation by identifying, assessing, and controlling the sentiments of project team members, anticipating their actions, acknowledging their concerns, and following up on their issues.
2	Training	<ul style="list-style-type: none">• Training includes all activities designed to enhance the competencies of the project team members.• Training can be formal or informal.• Examples of training methods include classroom, online, computer-based, on-the-job training from another project team member, mentoring, and coaching.• If project team members lack the necessary management or technical skills, such skills can be developed as part of the project work.
3	Team-building activities	<ul style="list-style-type: none">• The objective of team-building activities is to help individual team members work together effectively.• Informal communication and activities can help in building trust and establishing good working relationships.

9.4 Develop Project Team (Tools and Techniques)

4	Ground rules	<ul style="list-style-type: none">• Ground rules establish clear expectations regarding acceptable behavior by project team members.• Early commitment to clear guidelines decreases misunderstandings and increases productivity.
5	Colocation	Colocation, also referred to as “tight matrix,” involves placing many or all of the most active project team members in the same physical location to enhance their ability to perform as a team.
6	Recognition and rewards	<ul style="list-style-type: none">• Part of the team development process involves recognizing and rewarding desirable behavior.• The original plans concerning ways in which to reward people are developed during the Plan Human Resource Management process.• It is important to recognize that a particular reward given to any individual will be effective only if it satisfies a need which is valued by that individual.

9.4 Develop Project Team (Tools and Techniques)

7	Personnel assessment tools	<ul style="list-style-type: none">• Personnel assessment tools give the project manager and the project team insight into areas of strength and weakness.• These tools help project managers assess the team preferences, aspirations, how they process and organize information, how they tend to make decisions, and how they prefer to interact with people.
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9.4 Develop Project Team (Output)

1	Team performance assessments	<ul style="list-style-type: none">• As project team development efforts such as training, team building, and colocation are implemented, the project management team makes formal or informal assessments of the project team’s effectiveness.• Effective team development strategies and activities are expected to increase the team’s performance, which increases the likelihood of meeting project objectives.• Team performance assessment criteria should be determined by all appropriate parties and incorporated in the Develop Project Team inputs.
2	Enterprise environmental factors updates	The enterprise environmental factors that may be updated as a result of the Develop Project Team process include, but are not limited to, personnel administration, employee training records, and skill assessments.

9.	Project Human Resource Management	4 hrs
9.1.	Project Human Resource Management Process	
9.2.	Planning Project Human Resource Management	
9.3.	Acquire Project Team	
9.4.	Develop Project Team	
9.5.	Manage Project Team	

9.5 manage Project Team

Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		

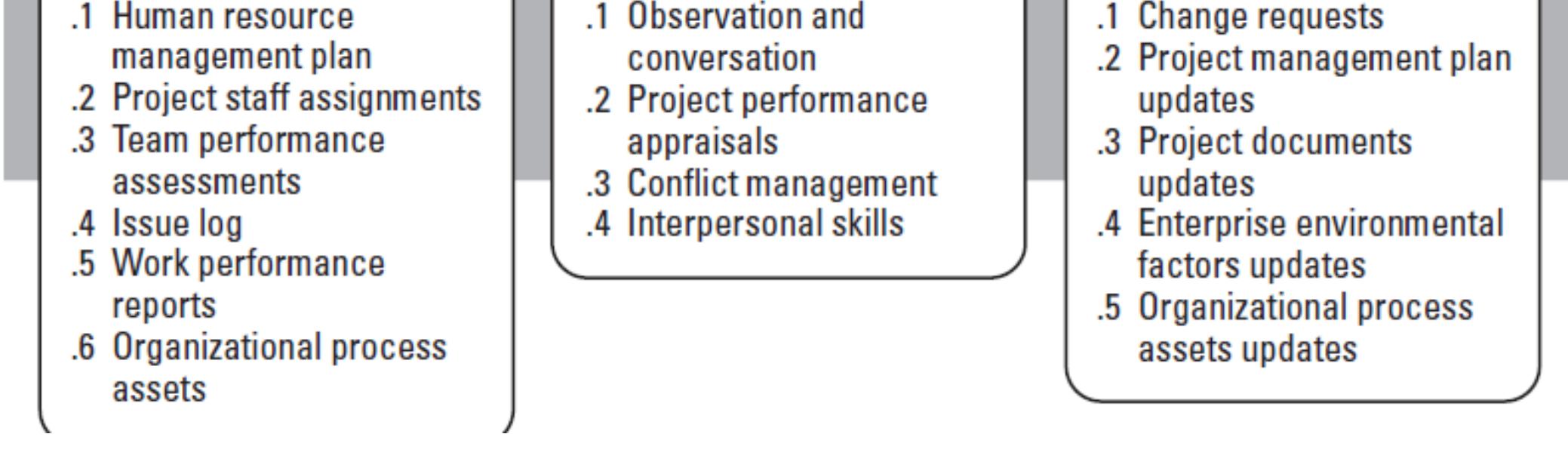
Across Project Management Process Groups

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9.5 manage Project Team

- Manage Project Team is the process of tracking team member performance, providing feedback, resolving issues, and managing team changes to optimize project performance.
- The key benefit of this process is that it influences team behavior, manages conflict, resolves issues, and appraises team member performance.

9.5 manage Project Team



9.5 manage Project Team (Inputs)

1	Human resource management plan	Described in Section 9. The human resource management plan provides guidance on how project human resources should be identified, staffed, managed, and eventually released. It
2	Project staff assignments	Described in Section 9. Project staff assignments provide documentation, which includes the list of project team members.
3	Team performance Assessments	Described in Section 9. The project management team makes ongoing formal or informal assessments of the project team's performance.
4	Issue log	<ul style="list-style-type: none"> • Issues arise in the course of managing the project team. • An issue log can be used to document and monitor who is responsible for resolving specific issues by a target date.
5	Work performance reports	Described in Section 4. Work performance reports provide documentation about the current project status compared to project forecasts.
6	Organizational process assets	Described in Section 2

9.5 manage Project Team (Tools and Techniques)

1	Observation and conversation	<ul style="list-style-type: none">• Observation and conversation are used to stay in touch with the work and attitudes of project team members.• The project management team monitors progress toward project deliverables, accomplishments that are a source of pride for team members, and interpersonal issues.
2	Project performance appraisals	<ul style="list-style-type: none">• Objectives for conducting performance appraisals during the course of a project can include clarification of roles and responsibilities, constructive feedback to team members, discovery of unknown or unresolved issues, development of individual training plans, and the establishment of specific goals for future time periods.
3	Conflict management	<ul style="list-style-type: none">• Conflict is inevitable in a project environment. Sources of conflict include scarce resources, scheduling priorities, and personal work styles.• Team ground rules, group norms, and solid project management practices, like communication planning and role definition, reduce the amount of conflict
4	Interpersonal skills	<ul style="list-style-type: none">• Project managers use a combination of technical, personal, and conceptual skills to analyze situations and interact appropriately with team members.• Using appropriate interpersonal skills allows project managers to capitalize on the strengths of all team members.

9.5 manage Project Team (Outputs)

1	Change requests	<ul style="list-style-type: none">• Staffing changes, whether by choice or by uncontrollable events, can affect the rest of the project management plan.• When staffing issues disrupt the project team from adhering to the project management plan such as causing the schedule to be extended or the budget to be exceeded, a change request can be processed through the Perform Integrated Change Control process.• Staffing changes may include moving people to different assignments, outsourcing some of the work, and replacing team members who leave.
2	Project management plan updates	Elements of the project management plan that may be updated include, but are not limited to, the human resource management plan.
3	Project documents updates	Project documents that may indirectly be updated include, but are not limited to: <ul style="list-style-type: none">• Issue log,• Roles description, and• Project staff assignments.

9.5 manage Project Team (Outputs)

4	Enterprise environmental factors updates	Enterprise environmental factors that may require updates as a result of the Manage Project Team process include, but are not limited to: <ul style="list-style-type: none">• Input to organizational performance appraisals, and• Personnel skill updates.
5	Organizational process assets updates	Organizational process assets that may require updates as a result of the Manage Project Team process include, but are not limited to: <ul style="list-style-type: none">• Historical information and lessons learned documentation,• Templates, and• Organizational standard processes.

10. Project Communication Management 3 hrs

- 10.1. Basics of Communication
- 10.2. Project Communication Management Processes
- 10.3. Importance of Communication Management
- 10.4. Planning Project Communication Management
- 10.5. Manage Communication
- 10.6. Control Communication

10 Project Communication Management

- Project Communications Management includes the processes that are required to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and the ultimate disposition of project information.

10.	Project Communication Management	3 hrs
10.1.	Basics of Communication	
10.2.	Project Communication Management Processes	
10.3.	Importance of Communication Management	
10.4.	Planning Project Communication Management	
10.5.	Manage Communication	
10.6.	Control Communication	

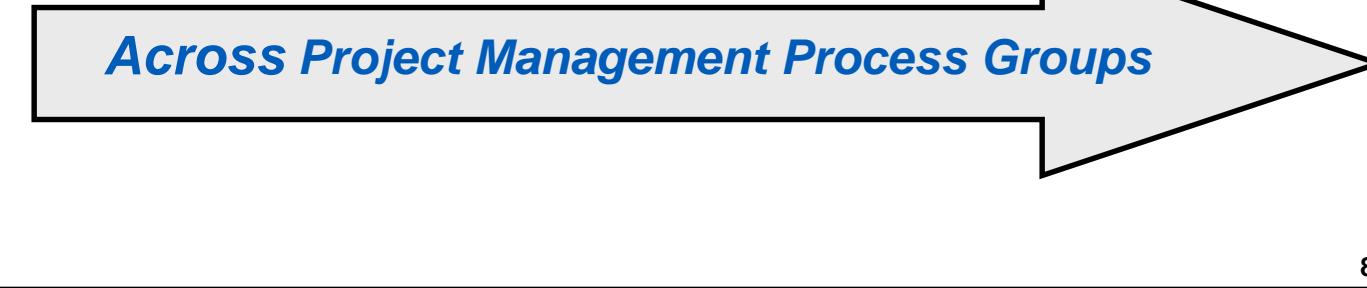
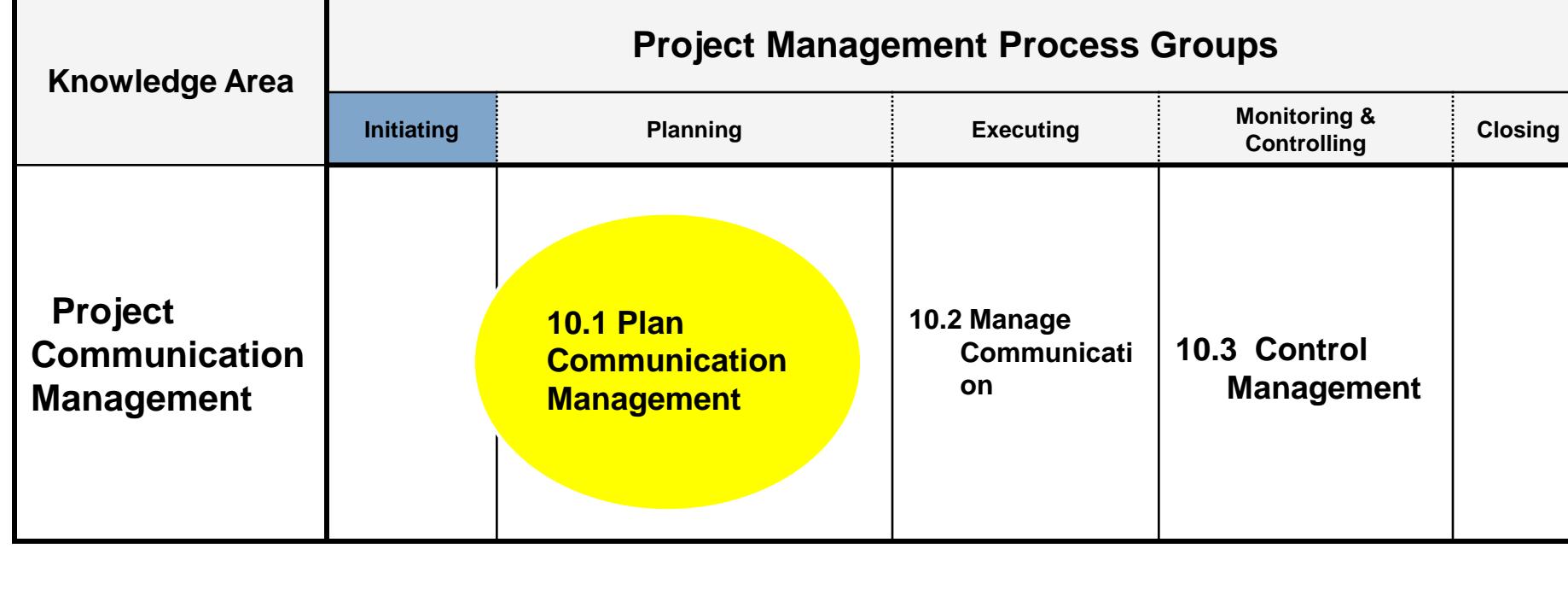
10.	Project Communication Management	3 hrs
10.1.	Basics of Communication	
10.2.	Project Communication Management Processes	
10.3.	Importance of Communication Management	
10.4.	Planning Project Communication Management	
10.5.	Manage Communication	
10.6.	Control Communication	

Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

10.	Project Communication Management	3 hrs
10.1.	Basics of Communication	
10.2.	Project Communication Management Processes	
10.3.	Importance of Communication Management	
10.4.	Planning Project Communication Management	
10.5.	Manage Communication	
10.6.	Control Communication	

10.	Project Communication Management	3 hrs
10.1.	Basics of Communication	
10.2.	Project Communication Management Processes	
10.3.	Importance of Communication Management	
10.4.	Planning Project Communication Management	
10.5.	Manage Communication	
10.6.	Control Communication	

10.4 Plan Communications Management

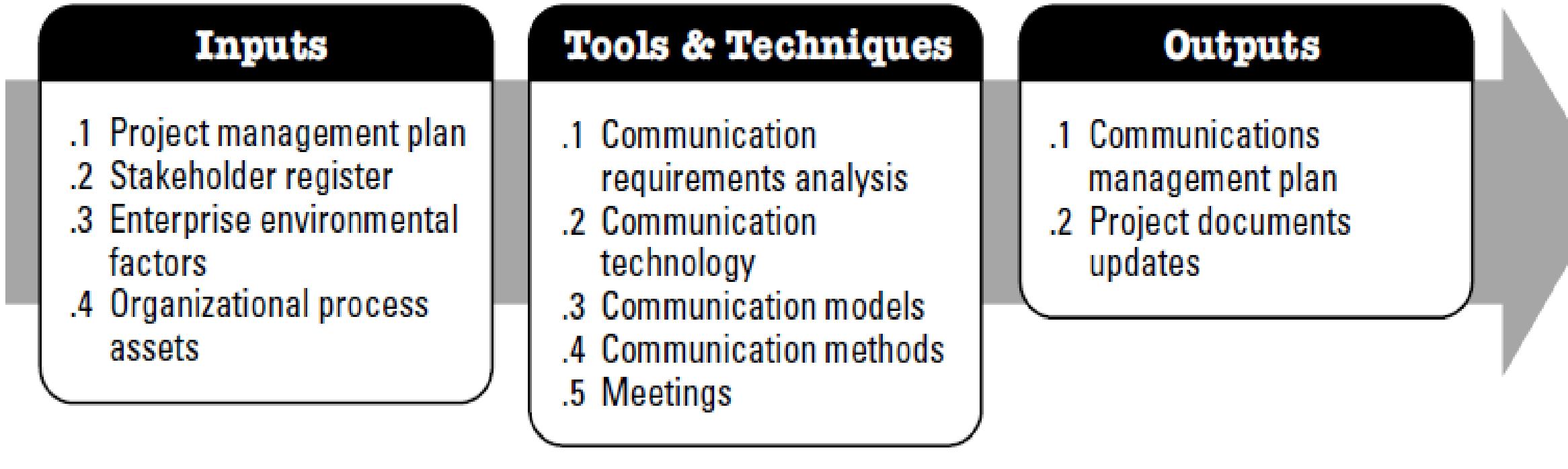


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Plan Communication Management

- Plan Communications Management is the process of developing an appropriate approach and plan for project communications based on stakeholder's information needs and requirements, and available organizational assets.
- The key benefit of this process is that it identifies and documents the approach to communicate most effectively and efficiently with stakeholders

Plan Communication Management



Plan Communication Management (Inputs)

1 Project management plan	Described in Section 4. The project management plan provides information on how the project will be executed, monitored, controlled, and closed.
2 Stakeholder register	The stakeholder register provides the information needed to plan the communication with project stakeholders.
3 Enterprise environmental factors	Described in Section 2;
4 Organizational Process Assets	Described in Section 2;

Plan Communication Management (Tools and techniques)

1 Communication requirements analysis	<ul style="list-style-type: none"> The analysis of the communication requirements determines the information needs of the project stakeholders. These requirements are defined by combining the type and format of information needed with an analysis of the value of that information. Project resources should be expended only on communicating information that contributes to the success of the project or where a lack of communication can lead to failure.
2 Communication technology	<ul style="list-style-type: none"> The methods used to transfer information among project stakeholders may vary significantly. For example, a project team may use techniques from brief conversations to extended meetings, or from simple written documents to extensive materials (e.g., schedules, databases, and websites), which are accessible online as methods of communication. Urgency of the need for information, Availability of Technology, Ease of use, Project environment, Sensitivity and confidentiality of the information

Plan Communication Management (Tools and techniques)

3 Communication models	<p>The sequence of steps in a basic communication model is:</p> <p>Encode.: Thoughts or ideas are translated (encoded) into language by the sender.</p> <p>Transmit Message: This information is then sent by the sender using communication channel (medium). The transmission of this message may be compromised by various factors (e.g., distance, unfamiliar technology, inadequate infrastructure, cultural difference, and lack of background information). These factors are collectively termed as noise.</p> <p>Decode. The message is translated by the receiver back into meaningful thoughts or ideas.</p> <p>Acknowledge. Upon receipt of a message, the receiver may signal (acknowledge) receipt of the message but this does not necessarily mean agreement with or comprehension of the message.</p> <ul style="list-style-type: none"> Feedback/Response. When the received message has been decoded and understood, the receiver encodes thoughts and ideas into a message and then transmits this message to the original sender.
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Plan Communication Management (Tools and techniques)

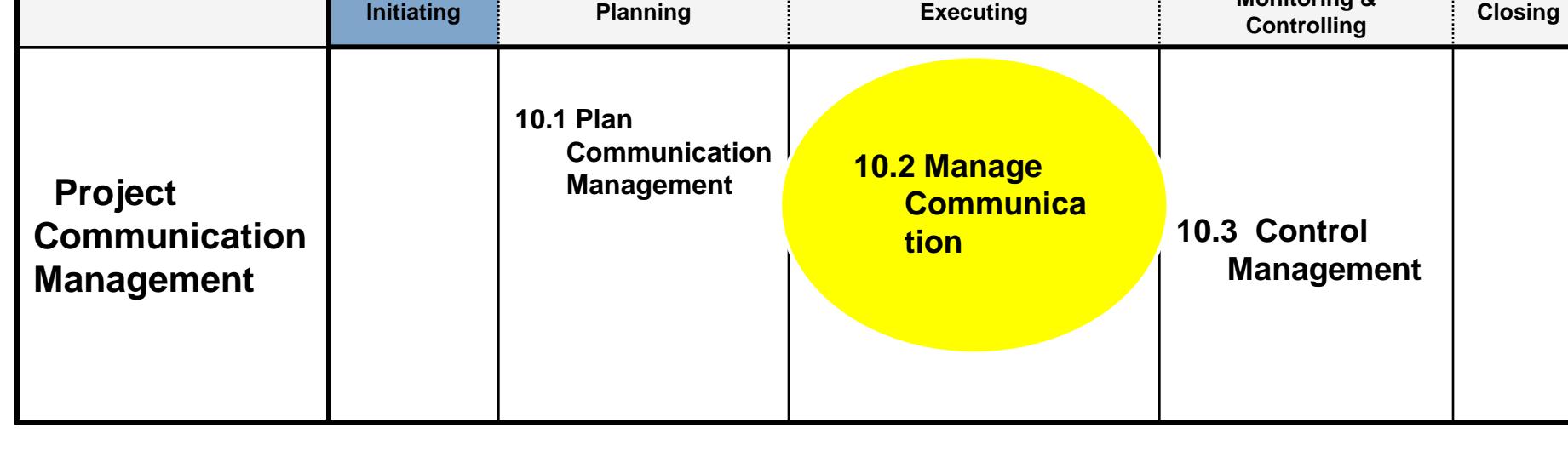
	Interactive communication. Between two or more parties performing a multidirectional exchange of information. It is the most efficient way to ensure a common understanding by all participants on specified topics, and includes meetings, phone calls, instant messaging, video conferencing, etc.
4 Communication methods	Push communication. Sent to specific recipients who need to receive the information. This ensures that the information is distributed but does not ensure that it actually reached or was understood by the intended audience. Push communications include letters, memos, reports, emails, faxes, voice mails, blogs, press releases, etc. Pull communication. Used for very large volumes of information, or for very large audiences, and requires the recipients to access the communication content at their own discretion. These methods include intranet sites, e-learning, lessons learned databases, knowledge repositories, etc.
5 meetings	Communication through mass involvement of people and sharing of ideas.

Plan Communication Management (Outputs)

1 Communications management plan	The communications management plan is a component of the project management plan that describes how project communications will be planned, structured, monitored, and controlled. The plan contains the following information: <ul style="list-style-type: none">• Stakeholder communication requirements;• Information to be communicated, including language, format, content, and level of detail;• Reason for the distribution of that information;• Time frame and frequency for the distribution of required information and receipt of acknowledgment or response, if applicable;• Methods or technologies used to convey the information, such as memos, e-mail, and/or press releases;• Resources allocated for communication activities, including time and budget;• Escalation process identifying time frames and the management chain (names) for escalation of issues that cannot be resolved at a lower staff level;• Method for updating and refining the communications management plan as the project progresses and develops; Glossary of common terminology;
2 Project documents updates	The stakeholder register aids in identifying those stakeholders possessing a particular interest in, or having an impact on, quality.

10.	Project Communication Management	3 hrs
10.1.	Basics of Communication	
10.2.	Project Communication Management Processes	
10.3.	Importance of Communication Management	
10.4.	Planning Project Communication Management	
10.5.	Manage Communication	
10.6.	Control Communication	

10.5 Manage Communications

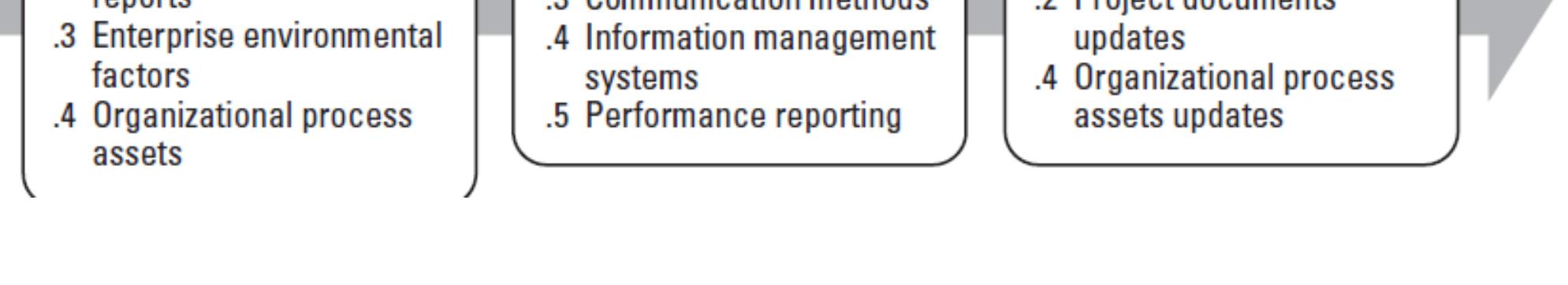
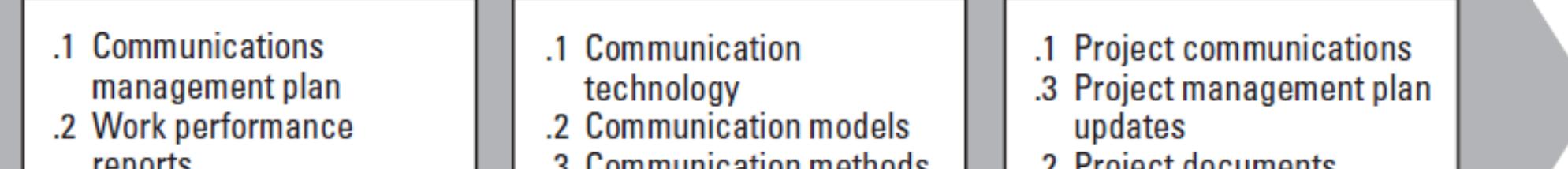


Across Project Management Process Groups

10.5 Manage Communication

- Manage Communications is the process of creating, collecting, distributing, storing, retrieving, and the ultimate disposition of project information in accordance to the communications management plan.
- The key benefit of this process is that it enables an efficient and effective communications flow between project stakeholders

10.5 Manage Communication



Manage Communication(Inputs)

1	Communications management plan	Described in Section 10. The communications management plan describes how project communications will be planned, structured, monitored, and controlled.
2	Work performance reports	Described in Section 4. Work performance reports are a collection of project performance and status information that may be used to facilitate discussion and to create communications. To optimize this process, it is important that reports be comprehensive, accurate, and available in a timely manner.
3	Enterprise environmental factors	Described in Section 2;
4	Organizational Process Assets	Described in Section 2;

Manage Communication(Tools and Techniques)

1	Communication technology	Described in Section 10. The choice of communication technology is an important consideration in the Manage Communications process.
2	Communication models	Described in Section 10. The choice of communication models is an important consideration in this process.
3	Communication methods	Described in Section 10. The choice of communication methods is an important consideration in this process. As there can be many potential barriers and challenges during this process, the focus is to ensure that the information that has been created and distributed has been received and understood to enable response and feedback.
4	Information management systems	Project information is managed and distributed using a variety of tools, including: <ul style="list-style-type: none">• Hard-copy document management: letters, memos, reports, and press releases;• Electronic communications management: e-mail, fax, voice mail, telephone, video and web conferencing, websites, and web publishing; and• Electronic project management tools: web interfaces to scheduling and project management software, meeting and virtual office support software, portals, and collaborative work management tools.

Manage Communication(Tools and Techniques)

5 Performance reporting	<ul style="list-style-type: none">• Performance reporting is the act of collecting and distributing performance information, including status reports, progress measurements, and forecasts.• Performance reporting involves the periodic collection and analysis of baseline versus actual data to understand and communicate the project progress and performance as well as to forecast the project results.• More elaborate reports may include:<ul style="list-style-type: none">• Analysis of past performance,• Analysis of project forecasts (including time and cost),• Current status of risks and issues,• Work completed during the period,• Work to be completed in the next period,• Summary of changes approved in the period, and• Other relevant information, which is reviewed and discussed.
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Manage Communication(Outputs)

1 Project communications	The Manage Communications process involves the activities that are required for information to be created, distributed, received, acknowledged, and understood. Project communications may include but are not limited to: performance reports, deliverables status, schedule progress, and cost incurred. Project communications can vary significantly and are influenced by factors such as, but not limited to, the urgency and impact of the message, its method of delivery, and level of confidentiality.
2 Project management plan updates	The project management plan provides information on project baselines, communications management, and stakeholder management
3 Project documents updates	Project documents that may be updated include, but are not limited to: <ul style="list-style-type: none">• Issue log,• Project schedule, and• Project funding requirements.

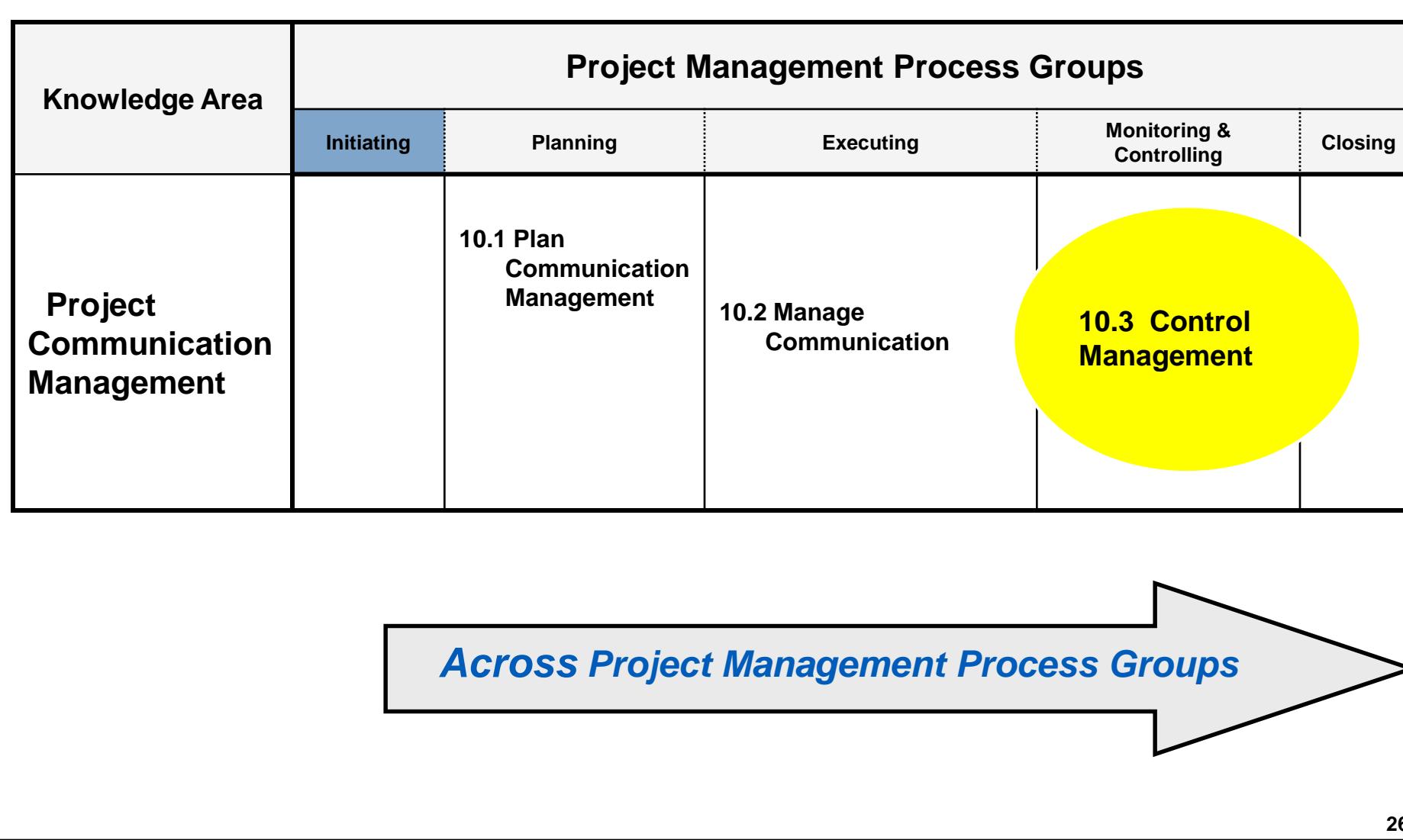
Manage Communication(Outputs)

4 Organizational process assets updates	The organizational process assets, which may be updated include, but are not limited to: <ul style="list-style-type: none">• Stakeholder notifications. Information may be provided to stakeholders about resolved issues, approved changes, and general project status.• Project reports. Formal and informal project reports describe project status and include lessons learned, issue logs, project closure reports, and outputs from other Knowledge Areas (Sections 4-13).• Project presentations. The project team provides information formally or informally to any or all of the project stakeholders. The information and presentation method should be relevant to the needs of the audience.• Project records. Project records may include correspondence, memos, meeting minutes, and other documents describing the project. This information should, to the extent possible and appropriate, be maintained in an organized manner. Project team members can also maintain records in a project notebook or register, which could be physical or electronic. <p>Feedback from stakeholders. Information received from stakeholders concerning project operations is distributed and used to modify or improve future performance of the project.</p> <ul style="list-style-type: none">• Lessons learned documentation. Documentation includes the causes of issues, reasoning behind the corrective action chosen, and other types of lessons learned about communications management. Lessons learned need to be documented and distributed so that it becomes part of the historical database for both the project and the performing organization.
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10. Project Communication Management 3 hrs

- 10.1. Basics of Communication
- 10.2. Project Communication Management Processes
- 10.3. Importance of Communication Management
- 10.4. Planning Project Communication Management
- 10.5. Manage Communication
- 10.6. Control Communication

10.6 Control Communications

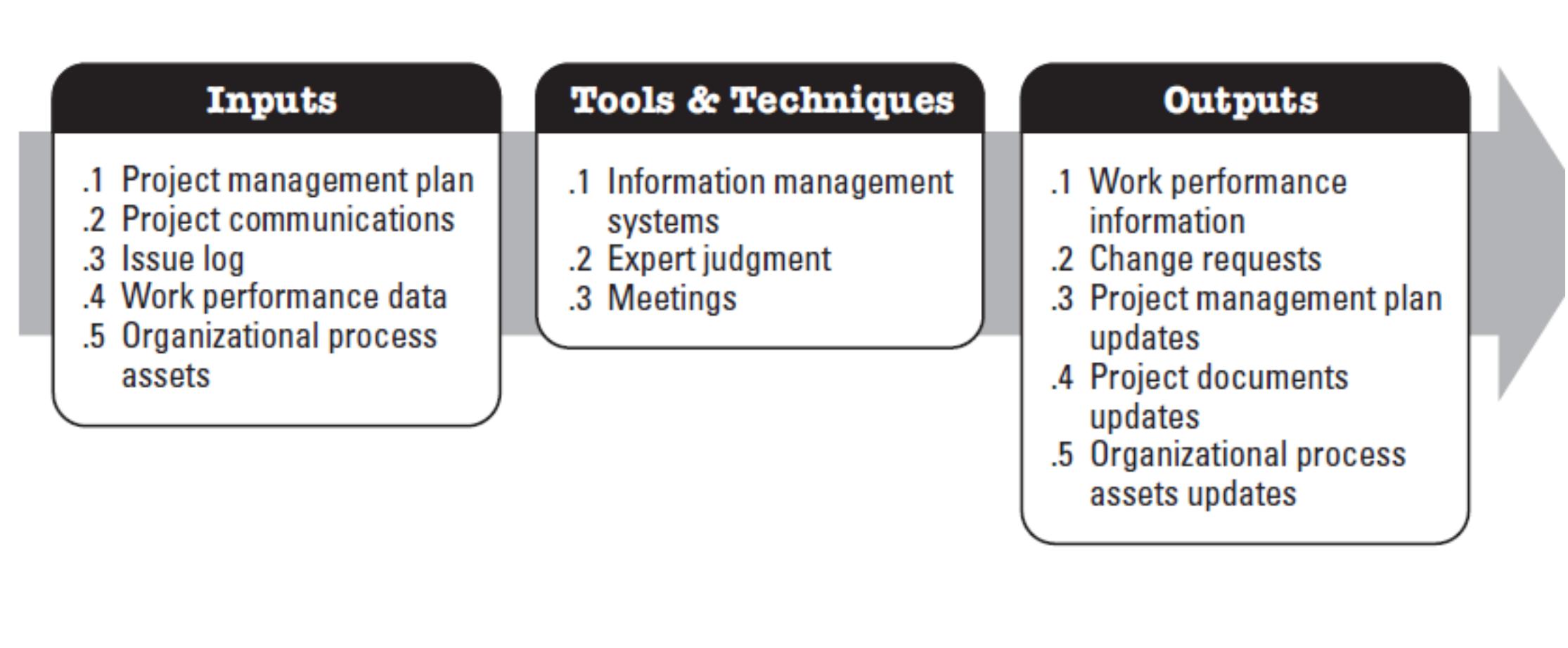


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Control Communication

- Control Communications is the process of monitoring and controlling communications throughout the entire project life cycle to ensure the information needs of the project stakeholders are met.
- The key benefit of this process is that it ensures an optimal information flow among all communication participants, at any moment in time.

Control Communication



Control Communication(Inputs)

1	Project management plan	Described in Section 4. The project management plan describes how the project will be executed, monitored, controlled, and closed.
2	Project communications	Described in Section 10. The Control Communications process involves the activities that are required for information and communications to be monitored, acted upon, and released to stakeholders.
3	Issue log	Described in Section 13. An issue log is used to document and monitor the resolution of issues. It may be used to facilitate communication and ensure a common understanding of issues
4	Work performance data	Described in Section 4. Work performance data organizes and summarizes the information gathered, and presents the results of comparative analysis to the performance measurement baseline.
5	Organizational process assets	Described in Section 2;

Control Communication(Tools and Techniques)

1	Information management systems	<ul style="list-style-type: none">An information management system provides a set of standard tools for the project manager to capture, store, and distribute information to stakeholders about the project's costs, schedule progress, and performance.Some software packages allow the project manager to consolidate reports from several systems and facilitate report distribution to the project stakeholders.Examples of distribution formats may include table reporting, spreadsheet analysis, and presentations. Graphic capabilities can be used to create visual representations of project performance information.
2	Expert judgment	<ul style="list-style-type: none">Expert judgment is often relied upon by the project team to assess the impact of the project communications, need for action or intervention, actions that should be taken, responsibility for taking such actions, and the timeframe for taking action.Expert judgment may need to be applied to technical and/or management details and may be provided by any group or individual with specialized knowledge or training.
3	Meetings	<ul style="list-style-type: none">The Control Communications process requires discussion and dialogue with the project team to determine the most appropriate way to update and communicate project performance, and to respond to requests from stakeholders for information.These discussions and dialogues are commonly facilitated through meetings, which may be conducted face to face or online and in different locations, such as the project site or the client's site.

Control Communication(Outputs)

1	Work performance information	Described in Section 4. Work performance information organizes and summarizes the performance data gathered. This performance data typically provides status and progress information on the project at the level of detail required by the various stakeholders
2	Change requests	Described in Section 4. The Control Communications process often results in the need for adjustment, action, and intervention.
3	Project management plan updates	Control Communications process may trigger updates to the communications management plan as well as other components of the project management plan (e.g. stakeholders and human resource management plans).
4	Project documents updates	Project documents may be updated as a result of the Control Communications process. These updates may include, but are not limited to: <ul style="list-style-type: none">Forecasts,Performance reports, andIssue log.
5	Organizational process assets updates	The organizational process assets that may be updated include, but are not limited to, report formats and lessons learned documentation. This documentation may become part of the historical database for both this project and the performing organization and may include the causes of issues, reasons behind the corrective action chosen, and other types of lessons learned during the project.

11.	Project Risk Management	3 hrs
11.1.	Reviewing Risks and Its Types	
11.2.	Risk Management Process	
11.3.	Planning Risk Management	
11.4.	Reviewing Risk Identification	
11.5.	Reviewing Risk Analysis	
11.6.	Quantitative and Qualitative Risk Assessment Processes	
11.7.	Risk Response Planning	
11.8.	Controlling Risk	

11 Project Risk Management

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

11. Project Risk Management	3 hrs
11.1. Reviewing Risks and Its Types	
11.2. Risk Management Process	
11.3. Planning Risk Management	
11.4. Reviewing Risk Identification	
11.5. Reviewing Risk Analysis	
11.6. Quantitative and Qualitative Risk Assessment Processes	
11.7. Risk Response Planning	
11.8. Controlling Risk	

11. Project Risk Management	3 hrs
11.1. Reviewing Risks and Its Types	
11.2. Risk Management Process	
11.3. Planning Risk Management	
11.4. Reviewing Risk Identification	
11.5. Reviewing Risk Analysis	
11.6. Quantitative and Qualitative Risk Assessment Processes	
11.7. Risk Response Planning	
11.8. Controlling Risk	

Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

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11. Project Risk Management	3 hrs
11.1. Reviewing Risks and Its Types	
11.2. Risk Management Process	
11.3. Planning Risk Management	
11.4. Reviewing Risk Identification	
11.5. Reviewing Risk Analysis	
11.6. Quantitative and Qualitative Risk Assessment Processes	
11.7. Risk Response Planning	
11.8. Controlling Risk	

11.3 Planning Risk Management

Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Plan Risk Management		11.1 Plan Risk Management 11.2 Identify risk 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risk	

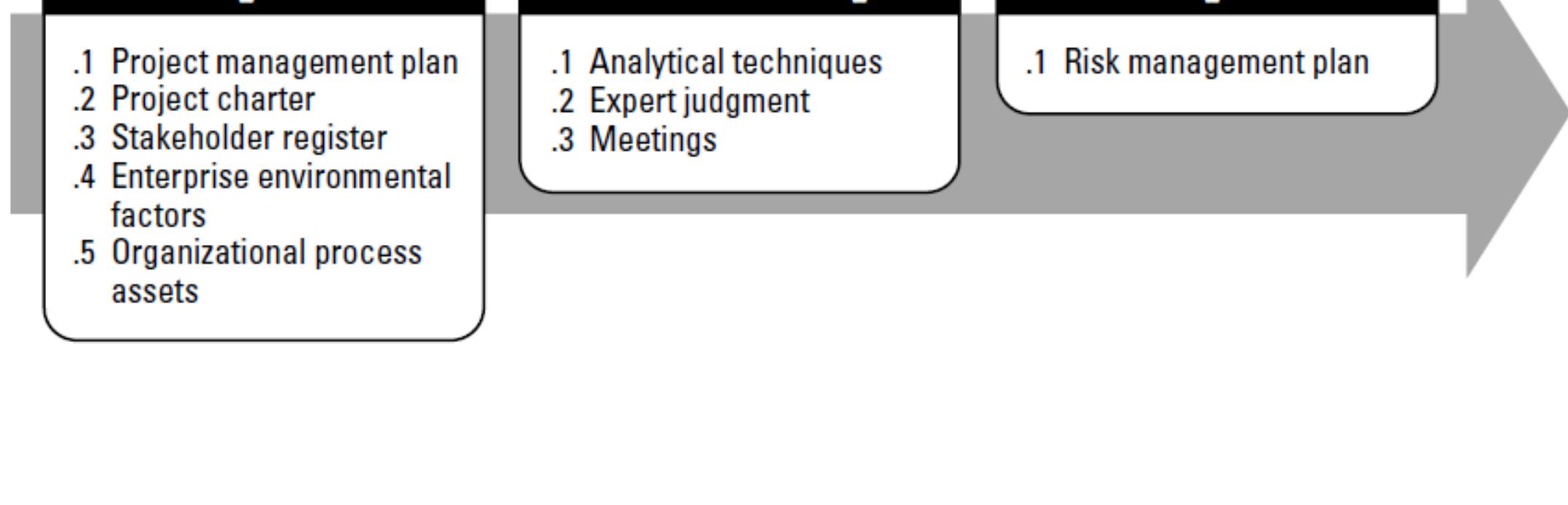
Across Project Management Process Groups

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11.3 Planning Risk Management

- Plan Risk Management is the process of defining how to conduct risk management activities for a project.
- The key benefit of this process is it ensures that the degree, type, and visibility of risk management are commensurate with both the risks and the importance of the project to the organization.
- The risk management plan is vital to communicate with and obtain agreement and support from all stakeholders to ensure the risk management process is supported and performed effectively over the project life cycle.

11.3 Planning Risk Management



Planning Risk Management (Inputs)

1	Project management plan	<ul style="list-style-type: none"> In planning risk management, all approved subsidiary management plans and baselines should be taken into consideration in order to make the risk management plan consistent with them. The risk management plan is also a component of the project management plan. The project management plan provides baseline or current state of risk-affected areas including scope, schedule, and cost.
2	Project charter	Described in Section 4. The project charter can provide various inputs such as high-level risks, high-level project descriptions, and high-level requirements.
3	Stakeholder register	The stakeholder register, which contains all details related to the project's stakeholders, provides an overview of their roles.
4	Enterprise environmental factors	Described in Section 2;
5	Organizational Process Assets	Described in Section 2;

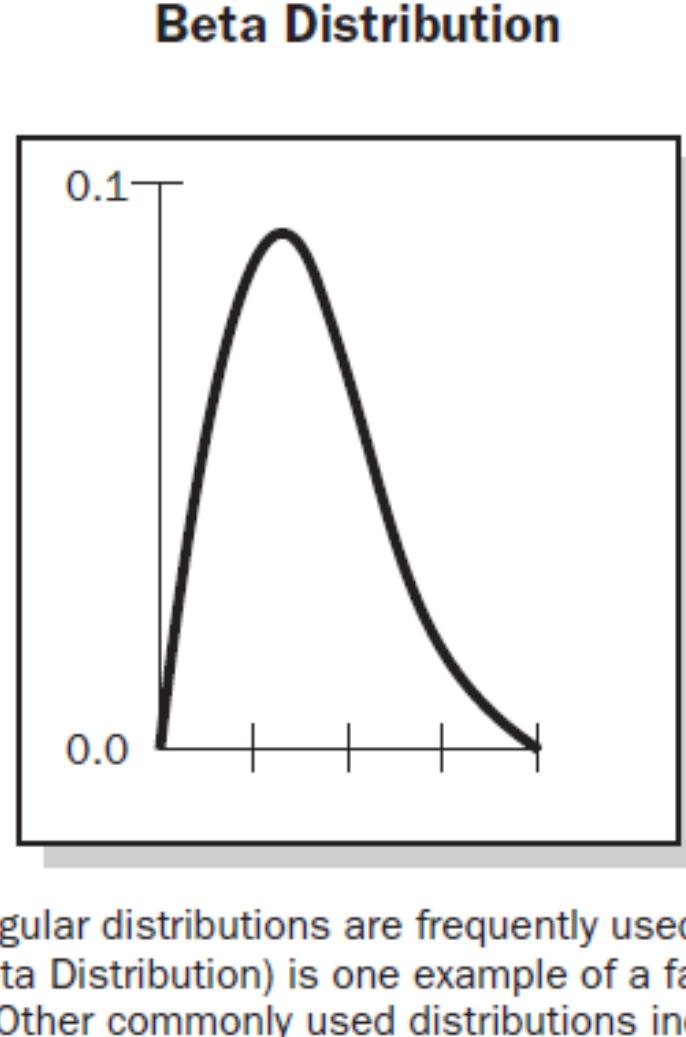
Planning Risk Management (Tools and techniques)

1	Analytical techniques	<p>Analytical techniques are used to understand and define the overall risk management context of the project.</p> <p>Risk management context is a combination of stakeholder risk attitudes and the strategic risk exposure of a given project based on the overall project context. For example, a stakeholder risk profile analysis may be performed to grade and qualify the project stakeholder risk appetite and tolerance.</p>
2	Expert judgment	<p>To ensure a comprehensive establishment of the risk management plan, judgment, and expertise should be considered from groups or individuals with specialized training or knowledge on the subject area, such as:</p> <ul style="list-style-type: none">• Senior management,• Project stakeholders,• Project managers who have worked on projects in the same area (directly or through lessons learned),• Subject matter experts (SMEs) in business or project area,
3	Meetings	Project teams hold planning meetings to develop the risk management plan.

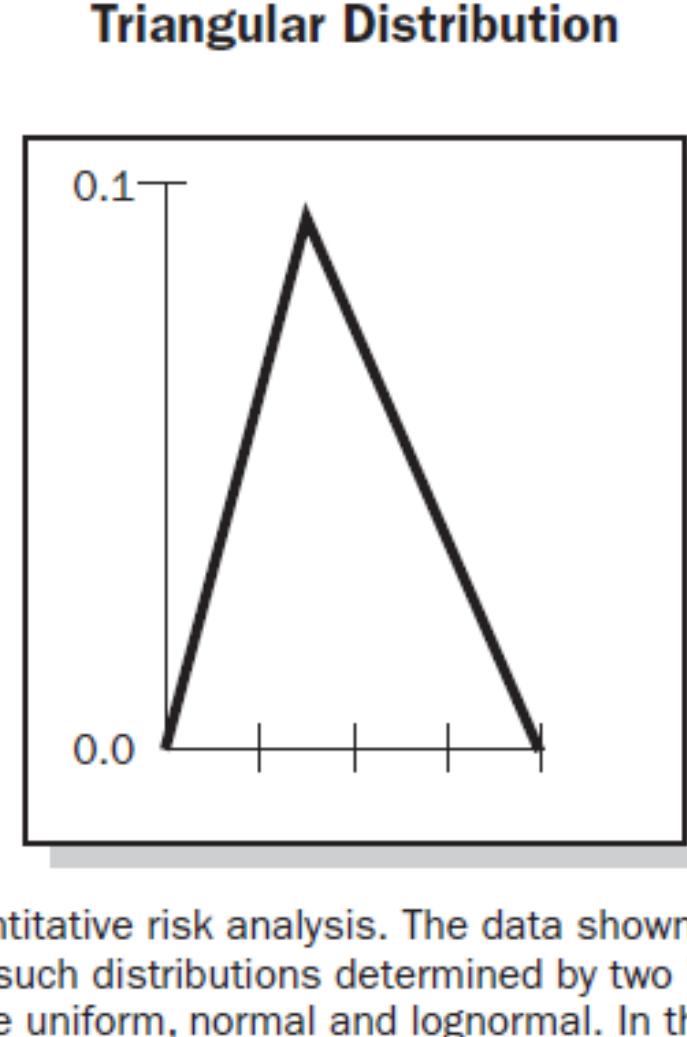
Planning Risk Management (Outputs)

1	Risk management plan	<p>The risk management plan is a component of the project management plan and describes how risk management activities will be structured and performed.</p> <p>The risk management plan includes the following:</p> <ul style="list-style-type: none">• Methodology. Defines the approaches, tools, and data sources that will be used to perform risk management on the project.• Roles and responsibilities. Defines the lead, support, and risk management team members for each type of activity in the risk management plan, and clarifies their responsibilities.• Budgeting. Estimates funds needed, based on assigned resources, for inclusion in the cost baseline and establishes protocols for application of contingency and management reserves.• Timing. Defines when and how often the risk management processes will be performed throughout the project life cycle, establishes protocols for application of schedule contingency reserves, and establishes risk management activities for inclusion in the project schedule. <p>Risk categories. Provide a means for grouping potential causes of risk. Several approaches can be used, for example, a structure based on project objectives by category. A risk breakdown structure (RBS) helps the project team to look at many sources from which project risk may arise in a risk identification exercise. Different RBS structures will be appropriate for different types of projects. An organization can use a previously prepared custom categorization framework, which may take the form of a simple list of categories or may be structured into an RBS. The RBS is a hierarchical representation of risks according to their risk categories.</p>
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Beta Distribution



Triangular Distribution



Beta and triangular distributions are frequently used in quantitative risk analysis. The data shown in the figure on the left (Beta Distribution) is one example of a family of such distributions determined by two "shape parameters". Other commonly used distributions include the uniform, normal and lognormal. In these charts the horizontal (X) axes represent possible values of time or cost and the vertical (Y) axes represent relative likelihood.

- **Definitions of risk probability and impact.** The quality and credibility of the risk analysis requires that different levels of risk probability and impact be defined that are specific to the project context. General definitions of probability levels and impact levels are tailored to the individual project during the Plan Risk Management process for use in subsequent processes. Table 11-1 is an example of definitions of negative impacts that could be used in evaluating risk impacts related to four project objectives. (Similar tables may be established with a positive impact perspective). Table 11-1 illustrates both relative and numerical (in this case, nonlinear) approaches.

Defined Conditions for Impact Scales of a Risk on Major Project Objectives

(Examples are shown for negative impacts only)

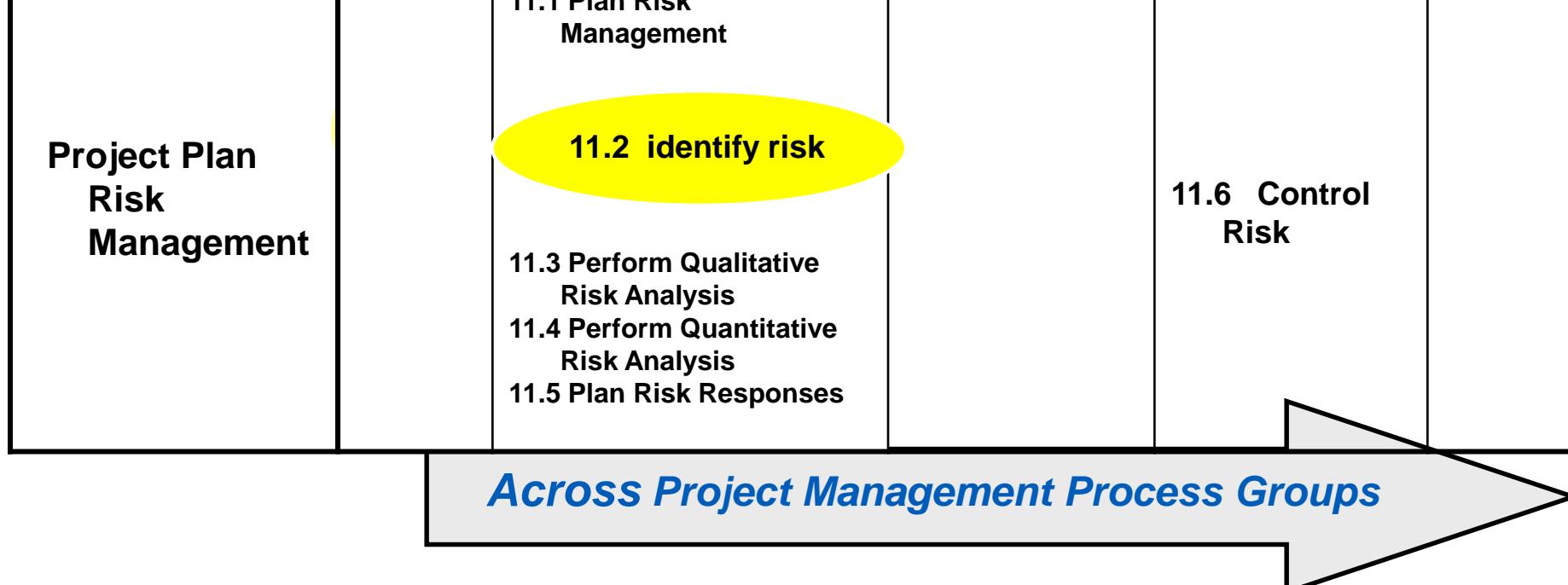
Project Objective	Relative or numerical scales are shown				
	Very low /0.05	Low /0.10	Moderate /0.20	High /0.40	Very high /0.80
Cost	Insignificant cost increase	< 10% cost increase	10 – 20% cost increase	20 – 40% cost increase	> 40% cost increase
Time	Insignificant time increase	< 5% time increase	5 – 10% time increase	10 – 20% time increase	> 20% time increase
Scope	Scope decrease barely noticeable	Minor areas of scope affected	Major areas of scope affected	Scope reduction unacceptable to sponsor	Project end item is effectively useless
Quality	Quality degradation barely noticeable	Only very demanding applications are affected	Quality reduction requires sponsor approval	Quality reduction unacceptable to sponsor	Project end item is effectively useless

This table presents examples of risk impact definitions for four different project objectives. They should be tailored in the Risk Management Planning process to the individual project and to the organization's risk thresholds. Impact definitions can be developed for opportunities in a similar way.

- **Probability and impact matrix.** A probability and impact matrix is a grid for mapping the probability of each risk occurrence and its impact on project objectives if that risk occurs. Risks are prioritized according to their potential implications for having an effect on the project's objectives. A typical approach to prioritizing risks is to use a look-up table or a probability and impact matrix. The specific combinations of probability and impact that lead to a risk being rated as "high," "moderate," or "low" importance are usually set by the organization.
- **Revised stakeholders' tolerances.** Stakeholders' tolerances, as they apply to the specific project, may be revised in the Plan Risk Management process.
- **Reporting formats.** Reporting formats define how the outcomes of the risk management process will be documented, analyzed, and communicated. It describes the content and format of the risk register as well as any other risk reports required.
- **Tracking.** Tracking documents how risk activities will be recorded for the benefit of the current project and how risk management processes will be audited.

11. Project Risk Management <ul style="list-style-type: none"> 11.1. Reviewing Risks and Its Types 11.2. Risk Management Process 11.3. Planning Risk Management 11.4. Reviewing Risk Identification 11.5. Reviewing Risk Analysis 11.6. Quantitative and Qualitative Risk Assessment Processes 11.7. Risk Response Planning 11.8. Controlling Risk 	3 hrs
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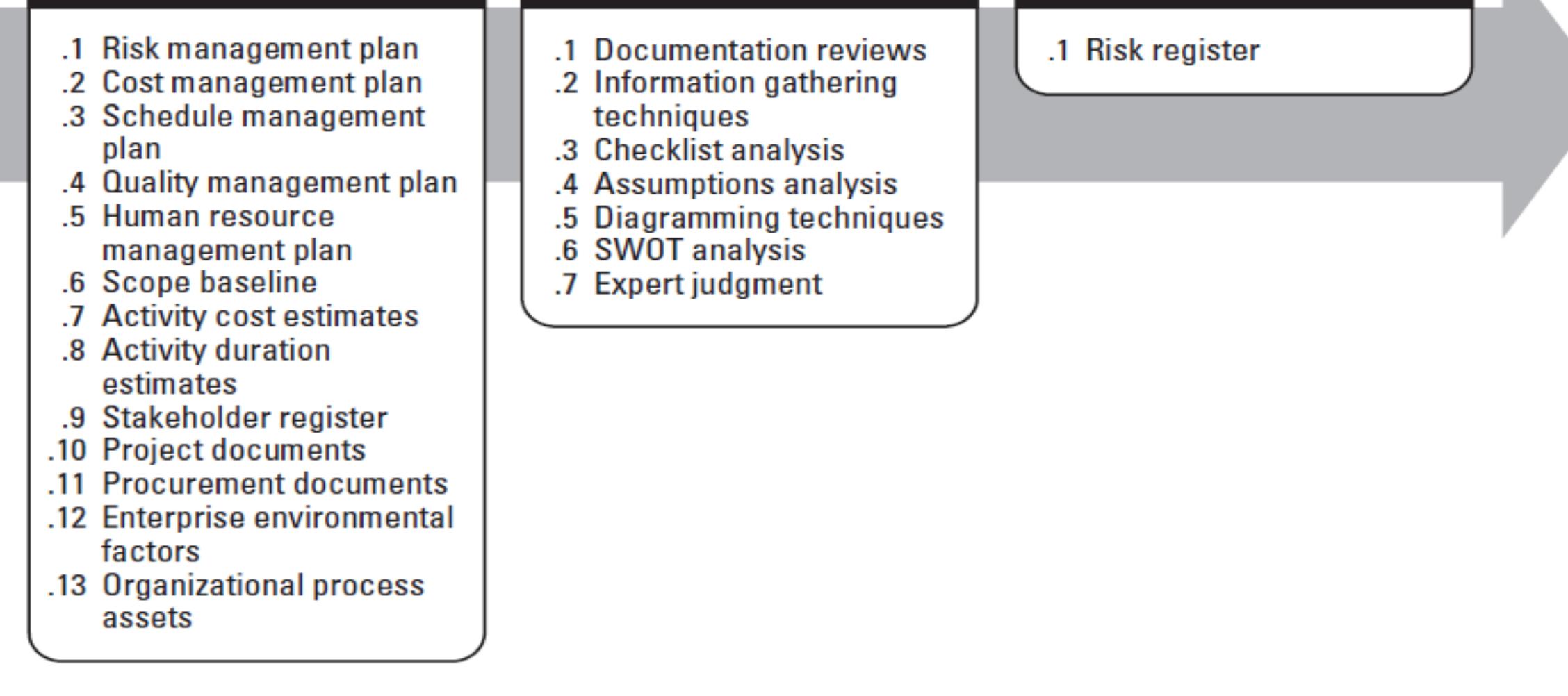
11.3 Identify Risk



Identify Risk

- Identify Risks is the process of determining which risks may affect the project and documenting their characteristics.
- The key benefit of this process is the documentation of existing risks and the knowledge and ability it provides to the project team to anticipate events.

Identify Risk



Identify Risk (Inputs)

1	Risk management plan	Described in Section 11. Key elements of the risk management plan that contribute to the Identify Risks process are the assignments of roles and responsibilities, provision for risk management activities in the budget and schedule, and categories of risk, which are sometimes expressed as a risk breakdown structure (Figure 11-4).
2	Cost management plan	Described in Section 7. The cost management plan provides processes and controls that can be used to help identify risks across the project.
3	Schedule management plan	Described in Section 6. The schedule management plan provides insight to project time/schedule objectives and expectations which may be impacted by risks (known and unknown).
4	Quality management plan	Described in Section 8. The quality management plan provides a baseline of quality measures and metrics for use in identifying risks.
5	Human resource management plan	Described in Section 9. The human resource management plan provides guidance on how project human resources should be defined, staffed, managed, and eventually released. It can also contain roles and responsibilities, project organization charts, and the staffing management plan, which form a key input to identify risk process.
6	Scope baseline	Described in Section 5. Project assumptions are found in the project scope statement. Uncertainty in project assumptions should be evaluated as potential causes of project risk.

Identify Risk (Inputs)

7	Activity cost estimates	Described in Section 7. Activity cost estimate reviews are useful in identifying risks as they provide quantitative assessment of the likely cost to complete scheduled activities and ideally are expressed as a range, with the width of the range indicating the degree(s) of risk. The review may result in projections indicating the estimate is either sufficient or insufficient to complete the activity (i.e., pose a risk to the project).
8	Activity duration estimates	Described in Section 6. Activity duration estimate reviews are useful in identifying risks related to the time allowances for the activities or project as a whole, again with the width of the range of such estimates indicating the relative degree(s) of risk.
9	Stakeholder register	Information about the stakeholders is useful for soliciting inputs to identify risks, as this will ensure that key stakeholders, especially the stakeholder, sponsor, and customer are interviewed or otherwise participate during the Identify Risks process.

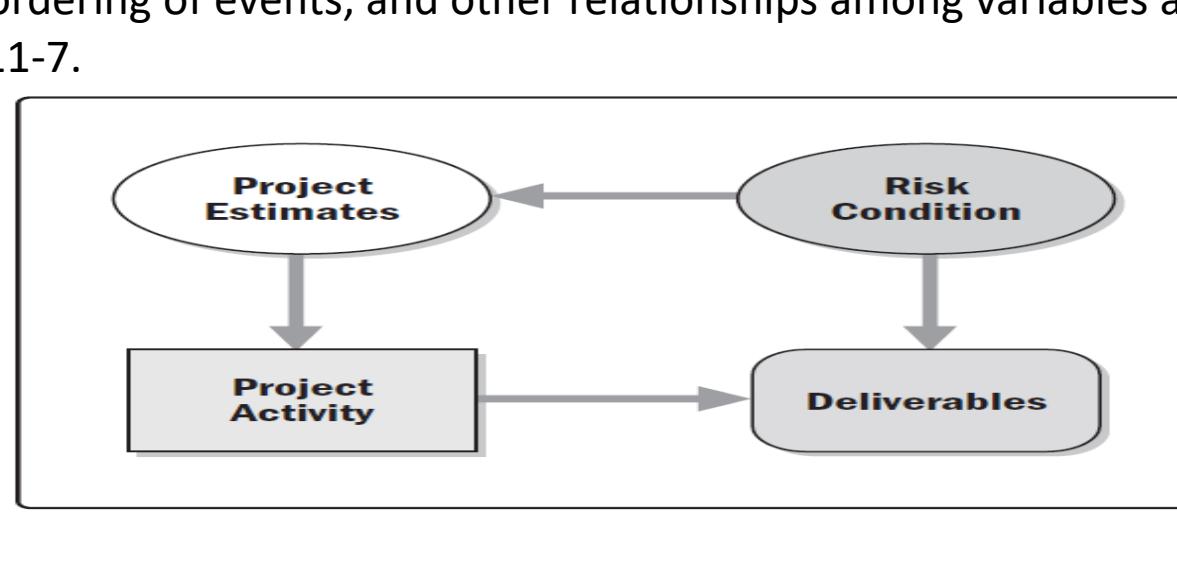
Identify Risk (Inputs)

10 Project Documents	<p>Project documents provide the project team with information about decisions that help better identify project risks.</p> <p>Project documents improve cross-team and stakeholder communications and include, but are not limited to:</p> <ul style="list-style-type: none"> • Project charter, • Project schedule, • Schedule network diagrams, • Issue log, • Quality checklist, and • Other information proven to be valuable in identifying risks.
11 Procurement documents	<p>Defined in Section 12. If the project requires external procurement of resources, procurement documents become a key input to the Identify Risks process.</p> <p>The complexity and the level of detail of the procurement documents should be consistent with the value of, and risks associated with, planned procurement.</p>
12 Enterprise environmental factors	Defined in Section 2
13 Organizational process assets	Defined in Section 2

Identify Risk (Tools and techniques)

1 Documentation reviews	<p>A structured review of the project documentation may be performed, including plans, assumptions, previous project files, agreements, and other information.</p> <p>The quality of the plans, as well as consistency between those plans and the project requirements and assumptions, may be indicators of risk in the project.</p>
2 Information gathering techniques	Brainstorming, Delphi technique, Interviewing, Root cause analysis
3 Checklist analysis	<p>Risk identification checklists are developed based on historical information and knowledge that has been accumulated from previous similar projects and from other sources of information.</p> <p>The lowest level of the RBS can also be used as a risk checklist.</p>
4 Assumptions analysis	<p>Every project and its plan is conceived and developed based on a set of hypotheses, scenarios, or assumptions.</p> <p>Assumptions analysis explores the validity of assumptions as they apply to the project. It identifies risks to the project from inaccuracy, instability, inconsistency, or incompleteness of assumptions.</p>

Identify Risk (Tools and techniques)

5 Diagramming techniques	<p>Risk diagramming techniques may include:</p> <ul style="list-style-type: none"> • Cause and effect diagrams. These are also known as Ishikawa or fishbone diagrams and are useful for identifying causes of risks. • System or process flow charts. These show how various elements of a system interrelate and the mechanism of causation. • Influence diagrams. These are graphical representations of situations showing causal influences, time ordering of events, and other relationships among variables and outcomes, as shown in Figure 11-7. 
6 SWOT analysis	SWOT analysis then identifies any opportunities for the project that arise from organizational strengths, and any threats arising from organizational weaknesses. The analysis also examines the degree to which organizational strengths offset threats, as well as identifying opportunities that may serve to overcome weaknesses.

Identify Risk (Tools and techniques)

7 Expert judgment	<p>Risks may be identified directly by experts with relevant experience with similar projects or business areas.</p> <p>Such experts should be identified by the project manager and invited to consider all aspects of the project and suggest possible risks based on their previous experience and areas of expertise. The experts' bias should be taken into account in this process.</p>
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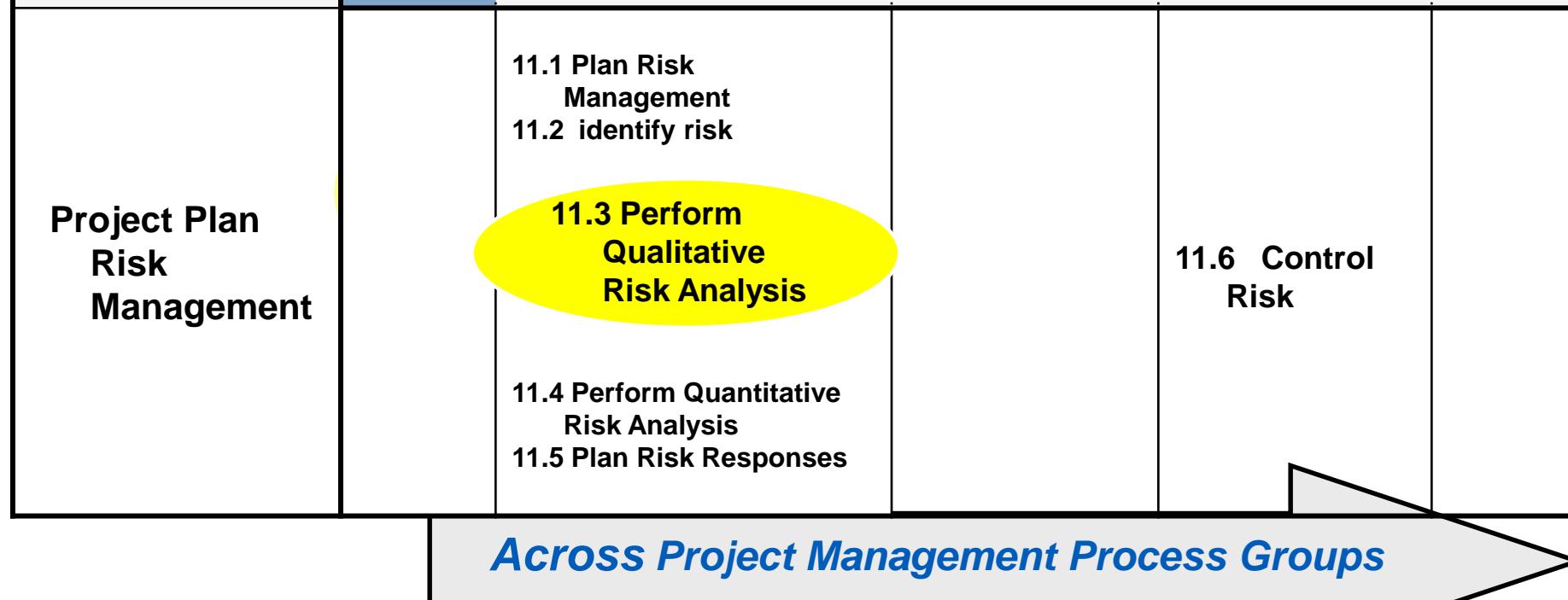
Identify Risk (Outputs)

1	Risk register	<p>The primary output from Identify Risks is the initial entry into the risk register. The risk register is a document in which the results of risk analysis and risk response planning are recorded.</p> <p>It contains the outcomes of the other risk management processes as they are conducted, resulting in an increase in the level and type of information contained in the risk register over time.</p> <p>The preparation of the risk register begins in the Identify Risks process with the following information, and then becomes available to other project management and risk management processes:</p> <ul style="list-style-type: none">• List of identified risks. The identified risks are described in as much detail as is reasonable. A structure for describing risks using risk statements may be applied, for example, EVENT may occur causing IMPACT, or if CAUSE exists, EVENT may occur leading to EFFECT. In addition to the list of identified risks, the root causes of those risks may become more evident. These are the fundamental conditions or events that may give rise to one or more identified risks. They should be recorded and used to support future risk identification for this and other projects.• List of potential responses. Potential responses to a risk may sometimes be identified during the Identify Risks process. These responses, if identified in this process, should be used as inputs to the Plan Risk Responses process.
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11.	Project Risk Management	3 hrs
11.1.	Reviewing Risks and Its Types	
11.2.	Risk Management Process	
11.3.	Planning Risk Management	
11.4.	Reviewing Risk Identification	
11.5.	Reviewing Risk Analysis	
11.6.	Quantitative and Qualitative Risk Assessment Processes	
11.7.	Risk Response Planning	
11.8.	Controlling Risk	

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11.7.	Risk Response Planning	
11.8.	Controlling Risk	

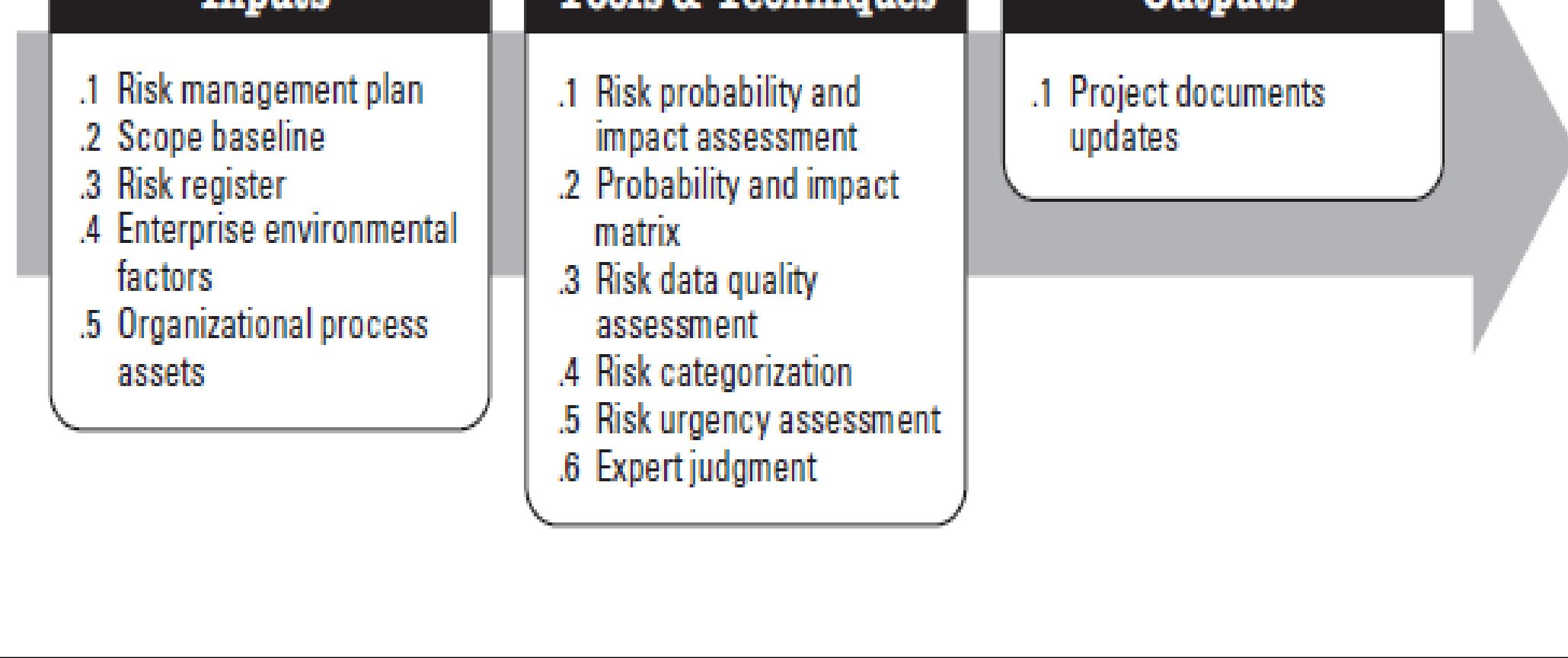
Perform Qualitative Risk Analysis



Perform Qualitative Risk Analysis

- Perform Qualitative Risk Analysis is the process of prioritizing risks for further analysis or action by assessing and combining their probability of occurrence and impact.
- The key benefit of this process is that it enables project managers to reduce the level of uncertainty and to focus on high-priority risks.

Perform Qualitative Risk Analysis



Perform Qualitative Risk Analysis (Inputs)

1	Risk management plan	Described in Section 11. Key elements of the risk management plan used in the Perform Qualitative Risk Analysis process include roles and responsibilities for conducting risk management, budgets, schedule activities for risk management, risk categories, definitions of probability and impact, the probability and impact matrix, and revised stakeholders' risk tolerances.
2	Scope baseline	Described in Section 5. Projects of a common or recurrent type tend to have more well-understood risks. Projects using state-of-the-art or first-of-its-kind technology, and highly complex projects, tend to have more uncertainty. This can be evaluated by examining the scope baseline.
3	Risk Register	Described in Section 11. The risk register contains the information that will be used to assess and prioritize risks.
4	Enterprise environmental factors	Described in Section 2
5	Organizational process assets	Described in Section 2

Perform Qualitative Risk Analysis (Tools and Techniques)

1	Risk probability and impact assessment	Risk probability assessment investigates the likelihood that each specific risk will occur. Risk impact assessment investigates the potential effect on a project objective such as schedule, cost, quality, or performance, including both negative effects for threats and positive effects for opportunities
2	Probability and impact matrix	Risks can be prioritized for further quantitative analysis and planning risk responses based on their risk rating. Ratings are assigned to risks based on their assessed probability and impact. Such a matrix specifies combinations of probability and impact that lead to rating the risks as low, moderate, or high priority.
3	Risk data quality assessment	Risk data quality assessment is a technique to evaluate the degree to which the data about risks is useful for risk management. It involves examining the degree to which the risk is understood and the accuracy, quality, reliability, and integrity of the data about the risk.
4	Risk categorization	Risks to the project can be categorized by sources of risk (e.g., using the RBS), the area of the project affected (e.g., using the WBS), or other useful categories (e.g., project phase) to determine the areas of the project most exposed to the effects of uncertainty. Risks can also be categorized by common root causes. This technique helps determine work packages, activities, project phases or even roles in the project, which can lead to the development of effective risk responses.

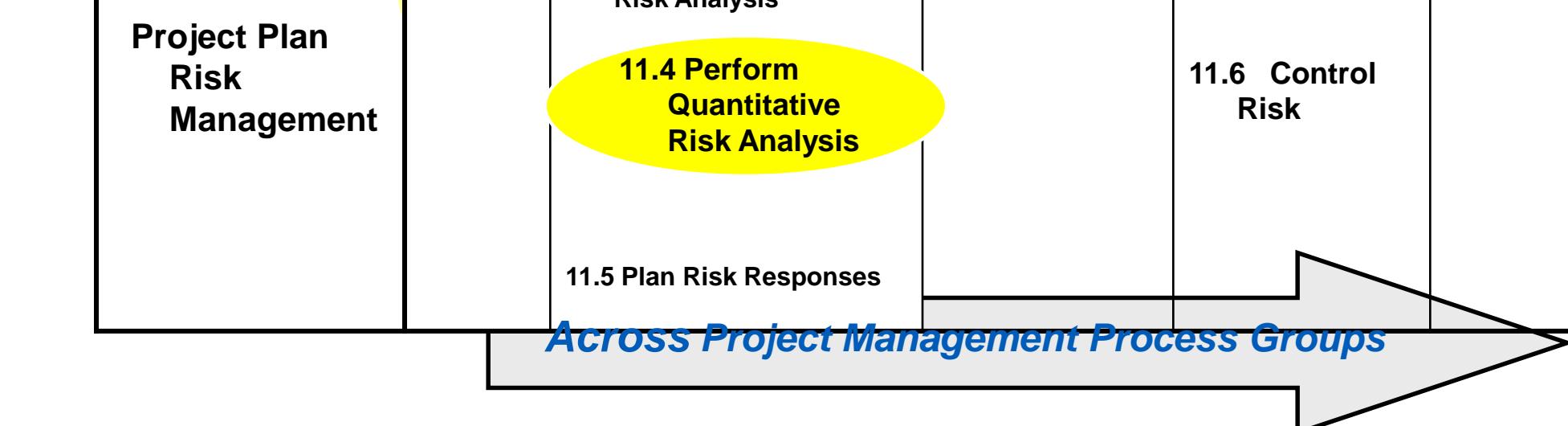
Perform Qualitative Risk Analysis (Tools and Techniques)

5	Risk urgency assessment	Risks requiring near-term responses may be considered more urgent to address. Indicators of priority may include probability of detecting the risk, time to affect a risk response, symptoms and warning signs, and the risk rating. In some qualitative analyses, the assessment of risk urgency is combined with the risk ranking that is determined from the probability and impact matrix to give a final risk severity rating.
6	Expert judgment	Expert judgment is required to assess the probability and impact of each risk to determine its location. Experts generally are those having experience with similar, recent projects. Gathering expert judgment is often accomplished with the use of risk facilitation workshops or interviews. The experts' bias should be taken into account in this process.

Perform Qualitative Risk Analysis (Outputs)

1	Project documents updates	Project documents that may be updated include, but are not limited to: <ul style="list-style-type: none"> • Risk register updates. <ul style="list-style-type: none"> • As new information becomes available through the qualitative risk assessment, the risk register is updated. • Updates to the risk register may include assessments of probability and impacts for each risk, risk ranking or scores, risk urgency information or risk categorization, and a watch list for low probability risks or risks requiring further analysis. • Assumptions log updates. <ul style="list-style-type: none"> • As new information becomes available through the qualitative risk assessment, assumptions could change. • The assumptions log needs to be revisited to accommodate this new information. Assumptions may be incorporated into the project scope statement or in a separate assumptions log.
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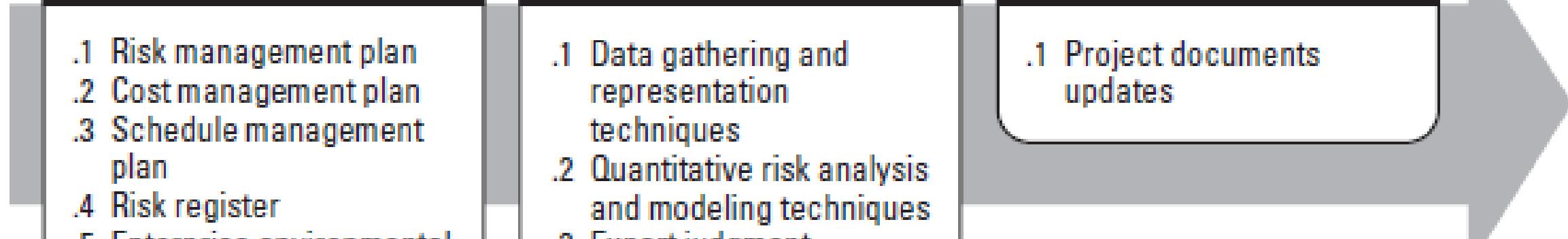
11.	Project Risk Management	3 hrs
11.1.	Reviewing Risks and Its Types	
11.2.	Risk Management Process	
11.3.	Planning Risk Management	
11.4.	Reviewing Risk Identification	
11.5.	Reviewing Risk Analysis	
11.6.	Quantitative and Qualitative Risk Assessment Processes	
11.7.	Risk Response Planning	
11.8.	Controlling Risk	



Perform Quantitative Risk Analysis

- Perform Quantitative Risk Analysis is the process of numerically analyzing the effect of identified risks on overall project objectives.
- The key benefit of this process is that it produces quantitative risk information to support decision making in order to reduce project uncertainty.

Perform Quantitative Risk Analysis



Perform Quantitative Risk Analysis (Inputs)

1	Risk management plan	Described in Section 11. The risk management plan provides guidelines, methods, and tools to be used in quantitative risk analysis.
2	Cost Management Plan	Described in Section 7. The cost management plan provides guidelines on establishing and managing risk reserves.
3	Schedule management plan	Described in Section 6. The schedule management plan provides guidelines on establishing and managing risk reserves.
4	Risk Register	Described in Section 11. The risk register is used as a reference point for performing quantitative risk analysis.
5	Enterprise environmental factors	Described in Section 2
6	Organizational process assets	Described in Section 2

Perform Quantitative Risk Analysis (Tools and Techniques)

1	Data gathering and representation techniques Interviewing. Interviewing techniques draw on experience and historical data to quantify the probability and impact of risks on project objectives. Probability distributions. Continuous probability distributions, which are used extensively in modeling and simulation, represent the uncertainty in values such as durations of schedule activities and costs of project components. Discrete distributions can be used to represent uncertain events, such as the outcome of a test or a possible scenario in a decision tree
2	Quantitative risk analysis and modeling techniques Sensitivity analysis. Sensitivity analysis helps to determine which risks have the most potential impact on the project. It helps to understand how the variations in project's objectives correlate with variations in different uncertainties. Conversely, it examines the extent to which the uncertainty of each project element affects the objective being studied when all other uncertain elements are held at their baseline values. One typical display of sensitivity analysis is the tornado diagram , which is useful for comparing relative importance and impact of variables that have a high degree of uncertainty to those that are more stable.

Perform Quantitative Risk Analysis (Tools and Techniques)

2	<p>Expected monetary value analysis.</p> <p>Expected monetary value (EMV) analysis is a statistical concept that calculates the average outcome when the future includes scenarios that may or may not happen (i.e., analysis under uncertainty).</p> <p>The EMV of opportunities are generally expressed as positive values, while those of threats are expressed as negative values.</p> <p>EMV requires a risk-neutral assumption— neither risk averse nor risk seeking. EMV for a project is calculated by multiplying the value of each possible outcome by its probability of occurrence and adding the products together.</p>
	<p>Modeling and simulation.</p> <p>A project simulation uses a model that translates the specified detailed uncertainties of the project into their potential impact on project objectives.</p> <p>Simulations are typically performed using the Monte Carlo technique.</p> <p>In a simulation, the project model is computed many times (iterated), with the input values (e.g., cost estimates or activity durations) chosen at random for each iteration from the probability distributions of these variables</p>

Perform Quantitative Risk Analysis (Tools and Techniques)

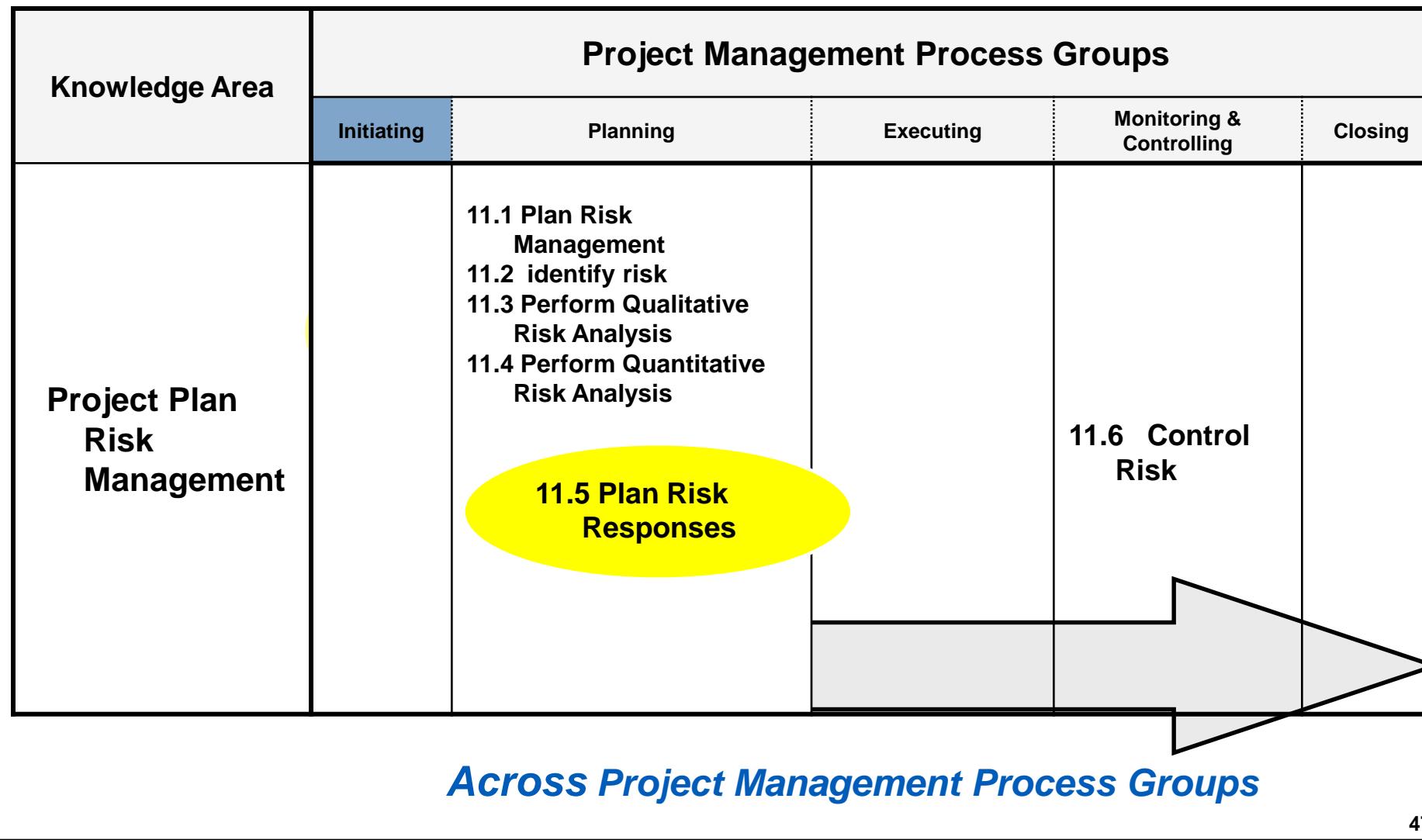
3	
	<ul style="list-style-type: none">Expert judgment (ideally using experts with relevant, recent experience) is required to identify potential cost and schedule impacts, to evaluate probability, and to define inputs such as probability distributions into the tools.Expert judgment also comes into play in the interpretation of the data. Experts should be able to identify the weaknesses of the tools as well as their strengths. Experts may determine when a specific tool may or may not be more appropriate given the organization's capabilities and culture.

Perform Quantitative Risk Analysis (outputs)

1	
	<p>Project documents are updated with information resulting from quantitative risk analysis. For example, risk register updates could include:</p> <ul style="list-style-type: none">Probabilistic analysis of the project. Estimates are made of potential project schedule and cost outcomes listing the possible completion dates and costs with their associated confidence levels. This output, often expressed as a cumulative frequency distribution, is used with stakeholder risk tolerances to permit quantification of the cost and time contingency reserves. Such contingency reserves are needed to bring the risk of overrunning stated project objectives to a level acceptable to the organization.Probability of achieving cost and time objectives. With the risks facing the project, the probability of achieving project objectives under the current plan can be estimated using quantitative risk analysis results.Prioritized list of quantified risks. This list includes those risks that pose the greatest threat or present the greatest opportunity to the project. These include the risks that may have the greatest effect on cost contingency and those that are most likely to influence the critical path. These risks may be evaluated, in some cases, through a tornado diagram generated as a result of the simulation analysis.Trends in quantitative risk analysis results. As the analysis is repeated, a trend may become apparent that leads to conclusions affecting risk responses. Organizational historical information on project schedule, cost, quality, and performance should reflect new insights gained through the Perform Quantitative Risk Analysis process. Such history may take the form of a quantitative risk analysis report.

11.	Project Risk Management	3 hrs
11.1.	Reviewing Risks and Its Types	
11.2.	Risk Management Process	
11.3.	Planning Risk Management	
11.4.	Reviewing Risk Identification	
11.5.	Reviewing Risk Analysis	
11.6.	Quantitative and Qualitative Risk Assessment Processes	
11.7.	Risk Response Planning	
11.8.	Controlling Risk	

Plan Risk Responses



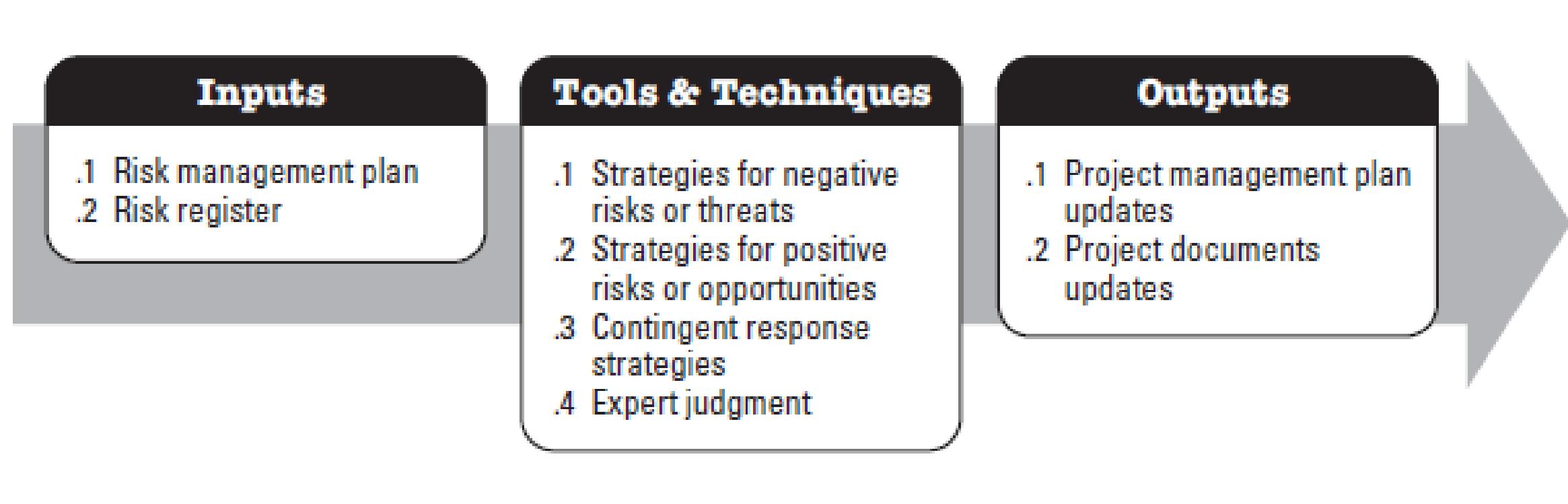
Across Project Management Process Groups

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Plan Risk Response

- Plan Risk Responses is the process of developing options and actions to enhance opportunities and to reduce threats to project objectives.
- The key benefit of this process is that it addresses the risks by their priority, inserting resources and activities into the budget, schedule and project management plan as needed.

Plan Risk Response



Plan Risk Response(Inputs)

1 Risk management plan	Important components of the risk management plan include roles and responsibilities, risk analysis definitions, timing for reviews (and for eliminating risks from review), and risk thresholds for low, moderate, and high risks. Risk thresholds help identify those risks for which specific responses are needed.
2 Risk Register	The risk register refers to identified risks, root causes of risks, lists of potential responses, risk owners, symptoms and warning signs, the relative rating or priority list of project risks, risks requiring responses in the near term, risks for additional analysis and response, trends in qualitative analysis results, and a watch list, which is a list of low priority risks within the risk register.

Plan Risk Response(Tools and techniques)

1	Strategies for negative risks or threats	<p>Three strategies, which typically deal with threats or risks that may have negative impacts on project objectives if they occur, are: <i>avoid</i>, <i>transfer</i>, and <i>mitigate</i></p> <p>Avoid. Risk avoidance is a risk response strategy whereby the project team acts to eliminate the threat or protect the project from its impact.</p> <p>Transfer. Risk transference is a risk response strategy whereby the project team shifts the impact of a threat to a third party, together with ownership of the response.</p> <p>Mitigate. Risk mitigation is a risk response strategy whereby the project team acts to reduce the probability of occurrence or impact of a risk.</p> <p>Accept. Risk acceptance is a risk response strategy whereby the project team decides to acknowledge the risk and not take any action unless the risk occurs.</p>
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2	Strategies for positive risks or opportunities	<p>The fourth strategy, <i>accept</i>, can be used for negative risks or threats as well as positive risks or opportunities</p> <p>Exploit. The exploit strategy may be selected for risks with positive impacts where the organization wishes to ensure that the opportunity is realized.</p> <p>Enhance. The enhance strategy is used to increase the probability and/or the positive impacts of an opportunity. Identifying and maximizing key drivers of these positive-impact risks may increase the probability of their occurrence.</p> <p>Share. Sharing a positive risk involves allocating some or all of the ownership of the opportunity to a third party who is best able to capture the opportunity for the benefit of the project.</p> <p>Accept. Accepting an opportunity is being willing to take advantage of the opportunity if it arises, but not actively pursuing it.</p>
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Plan Risk Response(Tools and techniques)

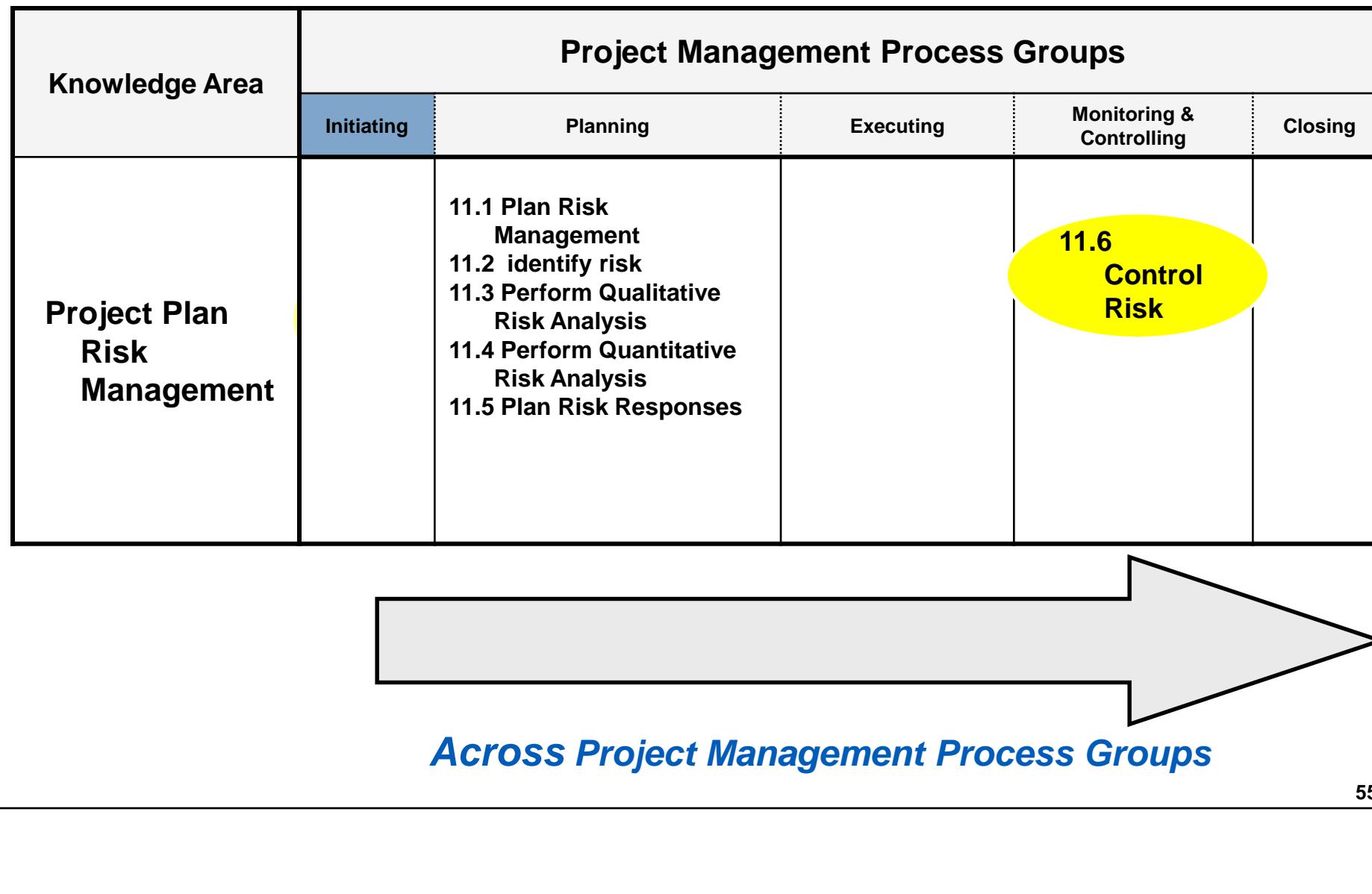
3	Contingent response strategies	Some responses are designed for use only if certain events occur. For some risks, it is appropriate for the project team to make a response plan that will only be executed under certain predefined conditions, if it is believed that there will be sufficient warning to implement the plan. Events that trigger the contingency response, such as missing intermediate milestones or gaining higher priority with a supplier, should be defined and tracked. Risk responses identified using this technique are often called contingency plans or fallback plans and include identified triggering events that set the plans in effect..
4	Expert judgment	Expert judgment is input from knowledgeable parties pertaining to the actions to be taken on a specific and defined risk. Expertise may be provided by any group or person with specialized education, knowledge, skill, experience, or training in establishing risk responses.

Plan Risk Response(Output)

1	Project management plan updates	<p>Schedule management plan., Cost management plan, Quality management plan. Procurement management plan. , Human resource management plan. Scope baseline. • Schedule baseline, Cost baseline</p>
2	Project documents updates	<p>In the Plan Risk Responses process, several project documents are updated as needed</p> <p>Risk owners and assigned responsibilities;</p> <ul style="list-style-type: none"> • Agreed-upon response strategies; • Specific actions to implement the chosen response strategy; • Trigger conditions, symptoms, and warning signs of a risk occurrence; • Budget and schedule activities required to implement the chosen responses; • Contingency plans and triggers that call for their execution; <p>Fallback plans for use as a reaction to a risk that has occurred and the primary response proves to be inadequate;</p> <ul style="list-style-type: none"> • Residual risks that are expected to remain after planned responses have been taken, as well as those that have been deliberately accepted; • Secondary risks that arise as a direct outcome of implementing a risk response; and • Contingency reserves that are calculated based on the quantitative risk analysis of the project and the organization's risk thresholds.

11.	Project Risk Management	3 hrs
11.1.	Reviewing Risks and Its Types	
11.2.	Risk Management Process	
11.3.	Planning Risk Management	
11.4.	Reviewing Risk Identification	
11.5.	Reviewing Risk Analysis	
11.6.	Quantitative and Qualitative Risk Assessment Processes	
11.7.	Risk Response Planning	
11.8.	Controlling Risk	

Control Risk

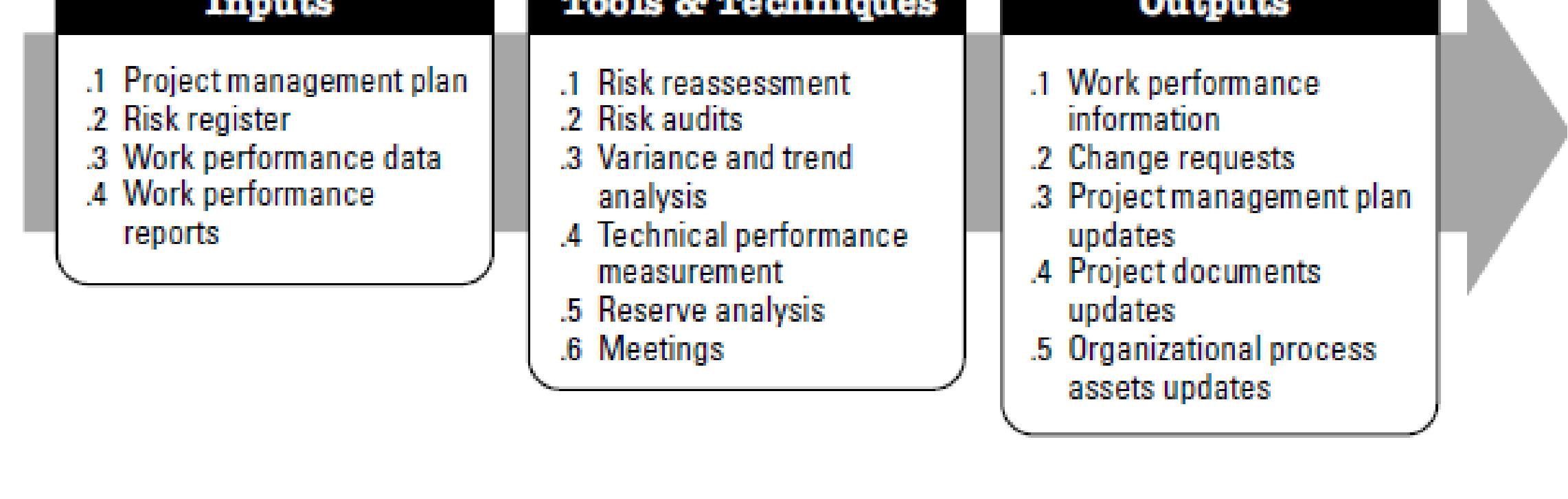


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Control Risk

- Control Risks is the process of implementing risk response plans, tracking identified risks, monitoring residual risks, identifying new risks, and evaluating risk process effectiveness throughout the project.
- The key benefit of this process is that it improves efficiency of the risk approach throughout the project life cycle to continuously optimize risk responses.

Control Risk



Control Risk (Inputs)

1	Project management plan	Described in Section 4. The project management plan, which includes the risk management plan, provides guidance for risk monitoring and controlling.
2	Risk register	The risk register has key inputs that include identified risks and risk owners, agreed-upon risk responses, control actions for assessing the effectiveness of response plans, risk responses, specific implementation actions, symptoms and warning signs of risk, residual and secondary risks, a watch list of low-priority risks, and the time and cost contingency reserves.
3	Work performance data	Described in Section 4. Work performance data related to various performance results possibly impacted by risks includes, but is not limited to: <ul style="list-style-type: none"> • Deliverable status, • Schedule progress, and • Costs incurred.
4	Work performance Reports	Described in Section 4. Work performance reports take information from performance measurements and analyze it to provide project work performance information including variance analysis, earned value data, and forecasting data.

Control Risk (Tools and techniques)

1	Risk reassessment	Control Risks often results in identification of new risks, reassessment of current risks, and the closing of risks that are outdated. Project risk reassessments should be regularly scheduled. The amount and detail of repetition that are appropriate depends on how the project progresses relative to its objectives..
2	Risk audits	Risk audits examine and document the effectiveness of risk responses in dealing with identified risks and their root causes, as well as the effectiveness of the risk management process.
3	Variance and trend analysis	Many control processes employ variance analysis to compare the planned results to the actual results. For the purposes of controlling risks, trends in the project's execution should be reviewed using performance information. Earned value analysis and other methods of project variance and trend analysis may be used for monitoring overall project performance.
4	Technical performance Measurement	Technical performance measurement compares technical accomplishments during project execution to the schedule of technical achievement.
5	Reserve analysis	Throughout execution of the project, some risks may occur with positive or negative impacts on budget or schedule contingency reserves.
6	Meetings	Project risk management should be an agenda item at periodic status meetings

Control Risk (Outputs)

1	Work performance information	Work performance information, as a Control Risks output, provides a mechanism to communicate and support project decision making.
2	Change requests	Implementing contingency plans or workarounds sometimes results in a change request. Change requests are prepared and submitted to the Perform Integrated Change Control process (Section 4.5). Change requests can include recommended corrective and preventive actions as well. <ul style="list-style-type: none"> • Recommended corrective actions. These are activities that realign the performance of the project work with the project management plan. They include contingency plans and workarounds. The latter are responses that were not initially planned, but are required to deal with emerging risks that were previously unidentified or accepted passively. • Recommended preventive actions. These are activities that ensure that future performance of the project work is aligned with the project management plan.
3	Project management plan updates	If the approved change requests have an effect on the risk management processes, the corresponding component documents of the project management plan are revised and reissued to reflect the approved changes. The elements of the project management plan that may be updated are the same as those in the Plan Risk Responses process.

Control Risk (Outputs)

4	Project documents updates	Project documents that may be updated as a result of the Control Risk process include, but are not limited to the risk register. Risk register updates may include: <ul style="list-style-type: none"> • Outcomes of risk reassessments, risk audits, and periodic risk reviews. These outcomes may include identification of new risks, updates to probability, impact, priority, response plans, ownership, and other elements of the risk register. Outcomes can also include closing risks that are no longer applicable and releasing their associated reserves. • Actual outcomes of the project's risks and of the risk responses. This information can help project managers to plan for risk throughout their organizations, as well as on future projects.
5	Organizational process assets updates	The risk management processes produce information that may be used for future projects, and should be captured in the organizational process assets

12.	Project Procurement Management	3 hrs
12.1.	Project Procurement Management Process	
12.2.	Plan Project Procurement Management	
12.3.	Conduct Procurement	
12.4.	Control Procurement	
12.5.	Close Procurement	
12.6.	Public Procurement Act in Nepal	

12 Project Procurement management

- Project Procurement Management includes the processes necessary to purchase or acquire products, services, or results needed from outside the project team.
- The organization can be either the buyer or seller of the products, services, or results of a project.
- Project Procurement Management includes the contract management and change control processes required to develop and administer contracts or purchase orders issued by authorized project team members.
- Project Procurement Management also includes controlling any contract issued by an outside organization (the buyer) that is acquiring deliverables from the project from the performing organization (the seller), and administering contractual obligations placed on the project team by the contract.

12.	Project Procurement Management	3 hrs
12.1.	Project Procurement Management Process	
12.2.	Plan Project Procurement Management	
12.3.	Conduct Procurement	
12.4.	Control Procurement	
12.5.	Close Procurement	
12.6.	Public Procurement Act in Nepal	

Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

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12.	Project Procurement Management	3 hrs
12.1.	Project Procurement Management Process	
12.2.	Plan Project Procurement Management	
12.3.	Conduct Procurement	
12.4.	Control Procurement	
12.5.	Close Procurement	
12.6.	Public Procurement Act in Nepal	

12 Plan Procurement Management

Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurement	12.3 Control Procurement	12.4 Close Procurement

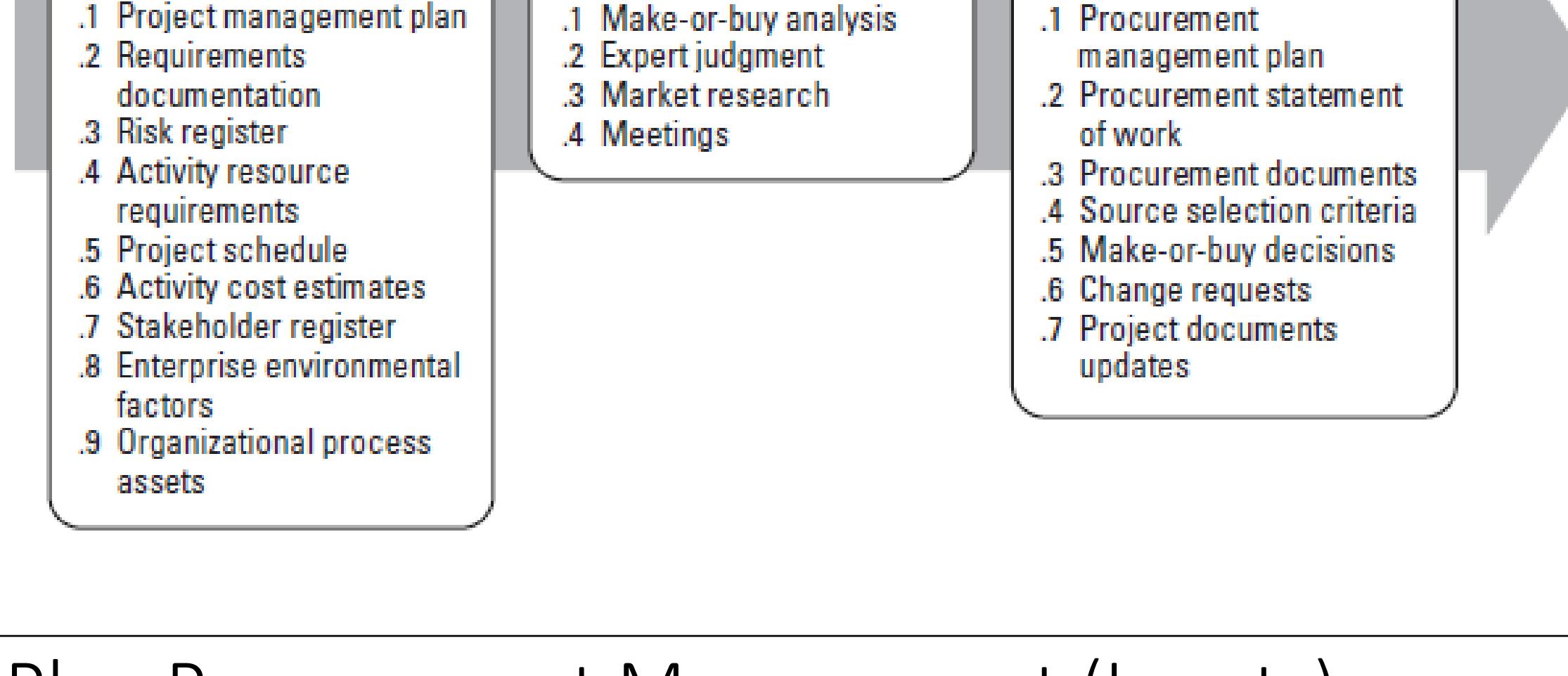
Across Project Management Process Groups

6

Plan Procurement Management

- Plan Procurement Management is the process of documenting project procurement decisions, specifying the approach, and identifying potential sellers.
- The key benefit of this process is that it determines whether to acquire outside support, and if so, what to acquire, how to acquire it, how much is needed, and when to acquire it.

Plan Procurement Management



Plan Procurement Management (Inputs)

1	Project management plan	Described in Section 4. The project management plan describes the need, justification, requirements, and current boundaries for the project.
2	Requirements documentation	Described in Section 5. Requirements documentation may include: <ul style="list-style-type: none">• Important information about project requirements that is considered during planning for procurements, and• Requirements with contractual and legal implications that may include health, safety, security, performance, environmental, insurance, intellectual property rights, equal employment opportunity, licenses, and permits—all of which are considered when planning for procurements
3	Risk register	Described in Section 11. The risk register provides the list of risks, along with the results of risk analysis and risk response planning.
4	Activity resource requirements	Described in Section 6. Activity resource requirements contain information on specific needs such as people, equipment, or location.
5	Project schedule	Described in Section 6. Project schedule contains information on required timelines or mandated deliverable dates.

Plan Procurement Management (Inputs)

6	Activity cost estimates	Described in Section 7. Cost estimates developed by the procuring activity are used to evaluate the reasonableness of the bids or proposals received from potential sellers.
7	Stakeholder register	The stakeholder register provides details on the project participants and their interests in the project.
8	Enterprise environmental factors	Described in Section 2;
9	Organizational Process Assets	Described in Section 2;

Plan Procurement Management (Tools and Techniques)

1	Make-or-buy analysis	A make-or-buy analysis is a general management technique used to determine whether particular work can best be accomplished by the project team or should be purchased from outside sources. Sometimes a capability may exist within the project organization, but may be committed to working on other projects, in which case, the project may need to source such effort from outside the organization in order to meet its schedule commitments. Budget constraints may influence make-or-buy decisions.
2	Expert judgment	Expert judgment is often used to assess the inputs to and outputs from this process. Expert purchasing judgment can also be used to develop or modify the criteria that will be used to evaluate seller proposals.
3	Market research	Market research includes examination of industry and specific vendor capabilities. Procurement teams may leverage information gained at conferences, online reviews and a variety of sources to identify market capabilities
4	Meetings	Research alone may not provide specific information to formulate a procurement strategy without additional information interchange meetings with potential bidders. By collaborating with potential bidders, the organization purchasing the material or service may benefit while the supplier can influence a mutually beneficial approach or product.

Plan Procurement Management (Outputs)

1	Procurement management plan	The procurement management plan is a component of the project management plan that describes how a project team will acquire goods and services from outside the performing organization. It describes how the procurement processes will be managed from developing procurement documents through contract closure.
2	Procurement statement of work	The statement of work (SOW) for each procurement is developed from the project scope baseline and defines only that portion of the project scope that is to be included within the related contract. The procurement SOW describes the procurement item in sufficient detail which can vary based on the nature of the item, the needs of the buyer, or the expected contract form. Information included in a SOW can include specifications, quantity desired, quality levels, performance data, period of performance, work location, and other requirements.
3	Procurement documents	Procurement documents are used to solicit proposals from prospective sellers. Terms such as bid, tender, or quotation are generally used when the seller selection decision will be based on price (as when buying commercial or standard items), while a term such as proposal is generally used when other considerations, such as technical capability or technical approach are paramount. Common terms are in use for different types of procurement documents and may include request for information (RFI), invitation for bid (IFB), request for proposal (RFP), request for quotation (RFQ), tender notice, invitation for negotiation, and invitation for seller's initial response. Specific procurement terminology used may vary by industry and location of the procurement.

Plan Procurement Management (Outputs)

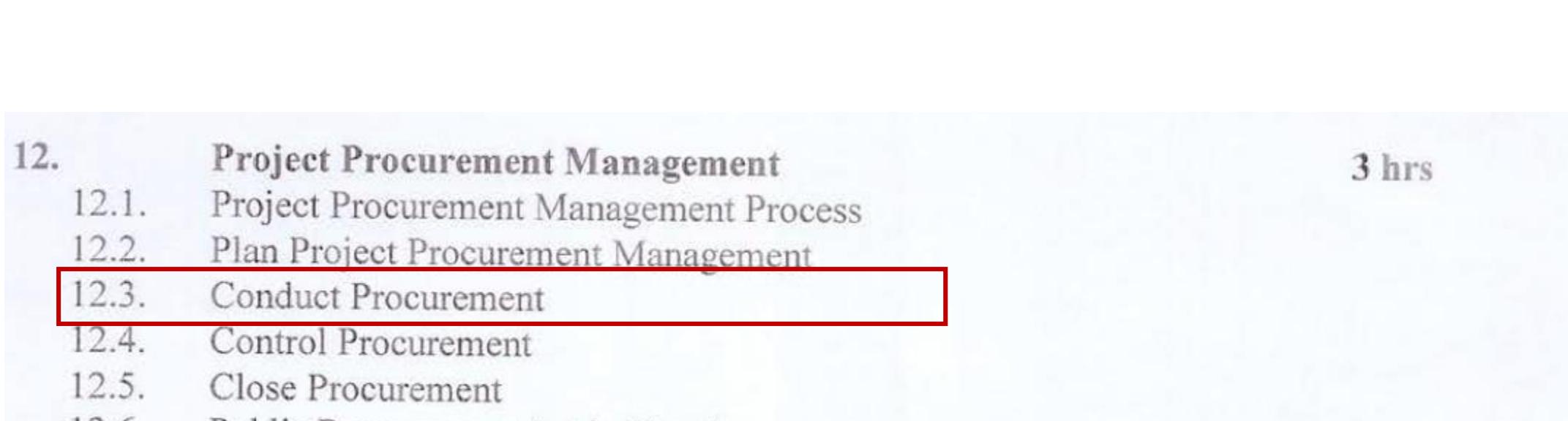
4	Source selection criteria	Source selection criteria are often included as a part of the procurement documents. Such criteria are developed and used to rate or score seller proposals, and can be objective or subjective. Selection criteria may be limited to only the purchase price if the procurement item is readily available from a number of acceptable sellers. Purchase price in this context includes both the cost of the item and all ancillary expenses such as delivery. Other selection criteria can be identified and documented to support an assessment for more complex products, services, or results. Some possible source selection criteria are: Understanding of need. How well does the seller's proposal address the procurement statement of work? <ul style="list-style-type: none">• Overall or life-cycle cost. Will the selected seller produce the lowest total cost of ownership (purchase cost plus operating cost)?• Technical capability. Does the seller have, or can the seller be reasonably expected to acquire, the technical skills and knowledge needed?• Risk. How much risk is embedded in the statement of work, how much risk will be assigned to the selected seller and how does the seller mitigate risk?• Management approach. Does the seller have, or can the seller be reasonably expected to develop, management processes and procedures to ensure a successful project?• Technical approach. Do the seller's proposed technical methodologies, techniques, solutions, and services meet the procurement documents requirements or are they likely to provide more or less than the expected results?
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Plan Procurement Management (Outputs)

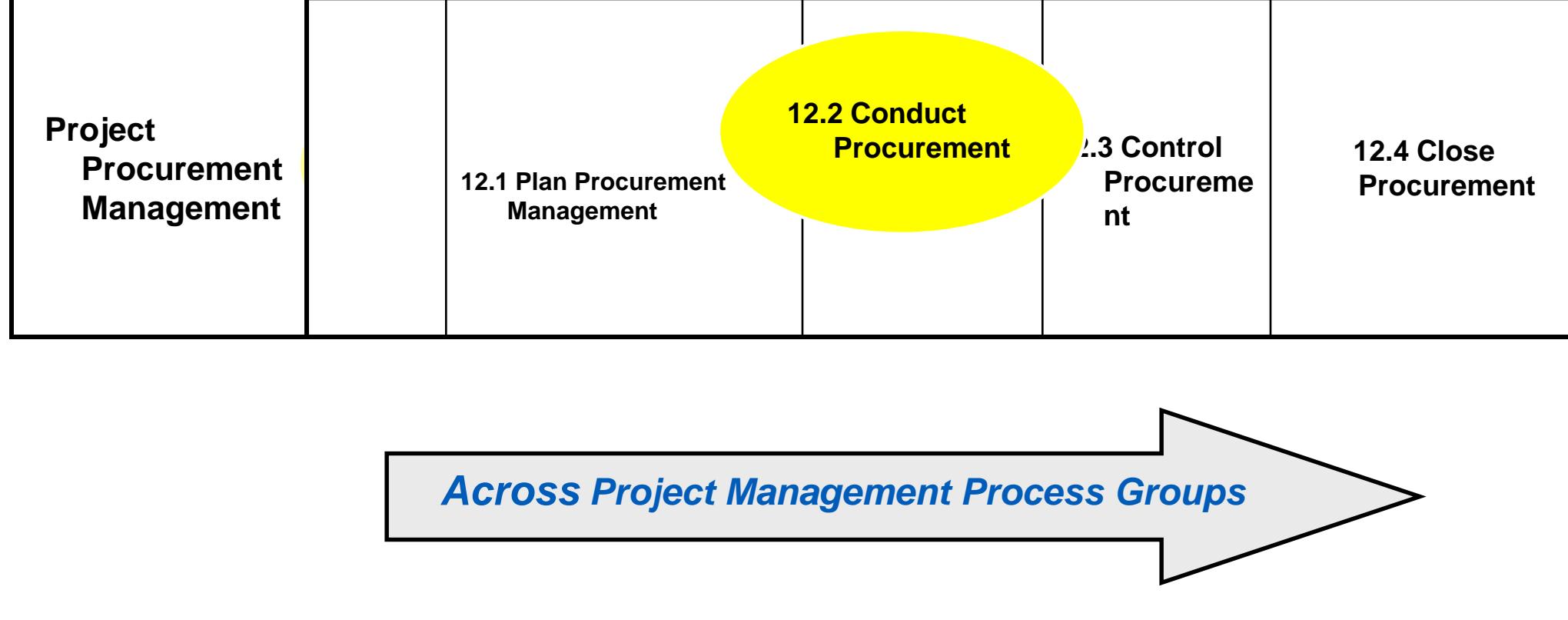
4	<ul style="list-style-type: none"> • Warranty. What does the seller propose to warrant for the final product, and through what time period? • Financial capacity. Does the seller have, or can the seller reasonably be expected to obtain, the necessary financial resources? • Production capacity and interest. Does the seller have the capacity and interest to meet potential future requirements? • Business size and type. Does the seller's enterprise meet a specific category of business such as small business (disadvantaged, specific programs, etc.) as defined by the organization or established by governmental agency and set forth as a condition of the agreement award? • Past performance of sellers. What has been the past experience with selected sellers? • References. Can the seller provide references from prior customers verifying the seller's work experience and compliance with contractual requirements? • Intellectual property rights. Does the seller assert intellectual property rights in the work processes or services they will use or in the products they will produce for the project? • Proprietary rights. Does the seller assert proprietary rights in the work processes or services they will use or in the products they will produce for the project?
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Plan Procurement Management (Outputs)

5	<p>A make-or-buy analysis results in a decision of whether particular work can best be accomplished by the project team or needs to be purchased from outside sources. If the decision is to make the item, then the procurement plan may define processes and agreements internal to the organization. A buy decision drives a similar process of reaching agreement with a supplier for the product or services.</p>
6	<p>decision that involves procuring goods, services, or resources typically requires a change request. Other decisions during procurement planning can also create the need for additional change requests. Change requests are processed for review and disposition through the Perform Integrated Change Control process (Section 4.5). Changes to the project management plan, its subsidiary plans, and other components may result in change requests that impact procurement actions. Change requests are processed for review and disposition through the Perform Integrated Change Control process (Section 4.5).</p>
7	<p>Project documents that may be updated include, but are not limited to:</p> <ul style="list-style-type: none"> • Requirements documentation, • Requirements traceability matrix, and • Risk register.



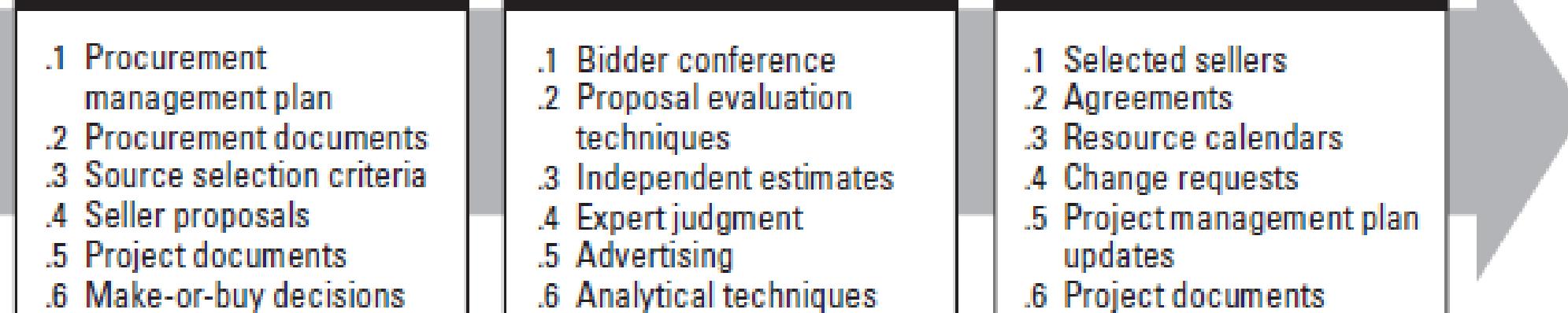
12 Conduct Procurement



Conduct Procurement

- Conduct Procurements is the process of obtaining seller responses, selecting a seller, and awarding a contract.
- The key benefit of this process is that it provides alignment of internal and external stakeholder expectations through established agreements.

Conduct Procurement



Conduct Procurement (Inputs)

1	Procurement management plan	Described in Section 4. The procurement management plan describes how the procurement processes will be managed from developing procurement documentation through contract closure.
2	Procurement documents	Described in Section 12. Procurement documents provide an audit trail for contracts and other agreements.
3	Source selection criteria	Described in Section 12. Source selection criteria can include information on the supplier's required capabilities, capacity, delivery dates, product cost, life-cycle cost, technical expertise, and the approach to the contract.
4	Seller proposals	Seller proposals, prepared in response to a procurement document package, form the basic information that will be used by an evaluation body to select one or more successful bidders (sellers).
5	Project documents	Described in Section 11. Project documents that are often considered include the risk-related contract decisions included within the risk register.

Conduct Procurement (Inputs)

6	Make-or-buy decisions	Described in Section 12. Organizations procuring goods or services analyze the need, identify resources, and then compare procurement strategies when deciding to buy. Organizations also evaluate the need of buying products versus making the items themselves
7	Procurement statement of work	Described in Section 12. The procurement statement of work provides suppliers with a clearly stated set of goals, requirements, and outcomes from which they can provide a quantifiable response. The statement of work is a critical component of the procurement process and can be modified as needed through this process until a final agreement is in place.
8	Organizational process assets	Described in Section 2. Elements of the organizational process assets that can influence the Conduct Procurements process

Conduct Procurement (Tools and Techniques)

1	Bidder conference	<p>Bidder conferences (sometimes called contractor conferences, vendor conferences, and pre-bid conferences) are meetings between the buyer and all prospective sellers prior to submittal of a bid or proposal.</p> <p>They are used to ensure that all prospective sellers have a clear and common understanding of the procurement requirements), and that no bidders receive preferential treatment.</p> <p>To be fair, buyers should take great care to ensure that all prospective sellers hear every question from any individual prospective seller and every answer from the buyer.</p> <p>Typically fairness is addressed by techniques such as collecting questions from bidders or arranging field visits in advance of the bidder conference.</p> <p>Responses to questions can be incorporated into the procurement documents as amendments.</p>
2	Proposal evaluation techniques	<p>On complex procurements, where source selection will be made based on seller responses to previously defined weighted criteria, a formal evaluation review process will be defined by the buyer's procurement policies. The evaluation committee will make their selection for approval by management prior to the award.</p>
3	Independent estimates	<p>For many procurement items, the procuring organization may elect to either prepare its own independent estimate, or have an estimate of costs prepared by an outside professional estimator, to serve as a benchmark on proposed responses. Significant differences in cost estimates can be an indication that the procurement statement of work was deficient, ambiguous, and/or that the prospective sellers either misunderstood or failed to respond fully to the procurement statement of work.</p>

Conduct Procurement (Tools and Techniques)

4	Expert judgment	<p>Expert judgment may be used in evaluating seller proposals.</p> <p>The evaluation of proposals may be accomplished by a multi-discipline review team with expertise in each of the areas covered by the procurement documents and proposed contract. This can include expertise from functional disciplines such as contracting, legal, finance, accounting, engineering, design, research, development, sales, and manufacturing.</p>
5	Advertising	<p>Existing lists of potential sellers often can be expanded by placing advertisements in general circulation publications such as selected newspapers or in specialty trade publications.</p> <p>Some organizations use online resources to communicate solicitations to the vendor community.</p> <p>Some government jurisdictions require public advertising of certain types of procurement items, and most government jurisdictions require public advertising or online posting of pending government contracts.</p>

Conduct Procurement (Tools and Techniques)

6	Analytical techniques	<p>Procurements involve defining a need in such a way that vendors can bring value through their offerings.</p> <p>To ensure that the need can be and is met, analytical techniques can help organizations identify the readiness of a vendor to provide the desired end state, determine the cost expected to support budgeting, and avoid cost overruns due to changes.</p> <p>By examining past performance information, teams may identify areas that may have more risk and that need to be monitored closely to ensure success of the project.</p>
7	Procurement negotiations	<p>Procurement negotiations clarify the structure, requirements, and other terms of the purchases so that mutual agreement can be reached prior to signing the contract.</p> <p>Final contract language reflects all agreements reached.</p> <p>Subjects covered should include responsibilities, authority to make changes, applicable terms and governing law, technical and business management approaches, proprietary rights, contract financing, technical solutions, overall schedule, payments, and price.</p> <p>Negotiations conclude with a contract document that can be executed by both buyer and seller.</p>

Conduct Procurement (Outputs)

1	Selected sellers	<p>The selected sellers are those who have been judged to be in a competitive range based upon the outcome of the proposal or bid evaluation, and who have negotiated a draft contract that will become the actual contract when an award is made.</p> <p>Final approval of all complex, high-value, high-risk procurements will generally require organizational senior management approval prior to award.</p>
2	Agreements	<p>A procurement agreement includes terms and conditions, and may incorporate other items that the buyer specifies regarding what the seller is to perform or provide.</p> <p>It is the project management team's responsibility to make certain that all agreements meet the specific needs of the project while adhering to organizational procurement policies.</p> <p>Depending upon the application area, an agreement can also be called an understanding, a contract, a subcontract, or a purchase order.</p>
3	Resource calendars	<p>The quantity and availability of contracted resources and those dates on which each specific resource or resource group can be active or idle are documented.</p>
4	Change requests	<p>Change requests to the project management plan, its subsidiary plans, and other components are processed for review and disposition through the Perform Integrated Change Control process (Section 4.5).</p>

Conduct Procurement (Outputs)

5	Project management plan updates	Elements of the project management plan that may be updated include, but are not limited to: <ul style="list-style-type: none">• Cost baseline,• Scope baseline,• Schedule baseline,• Communications management plan, and• Procurement management plan.
7	Project documents updates	Project documents that may be updated include, but are not limited to: <ul style="list-style-type: none">• Requirements documentation,• Requirements traceability documentation,• Risk register, and• Stakeholder register.

12. Project Procurement Management 3 hrs

12.1. Project Procurement Management Process

12.2. Plan Project Procurement Management

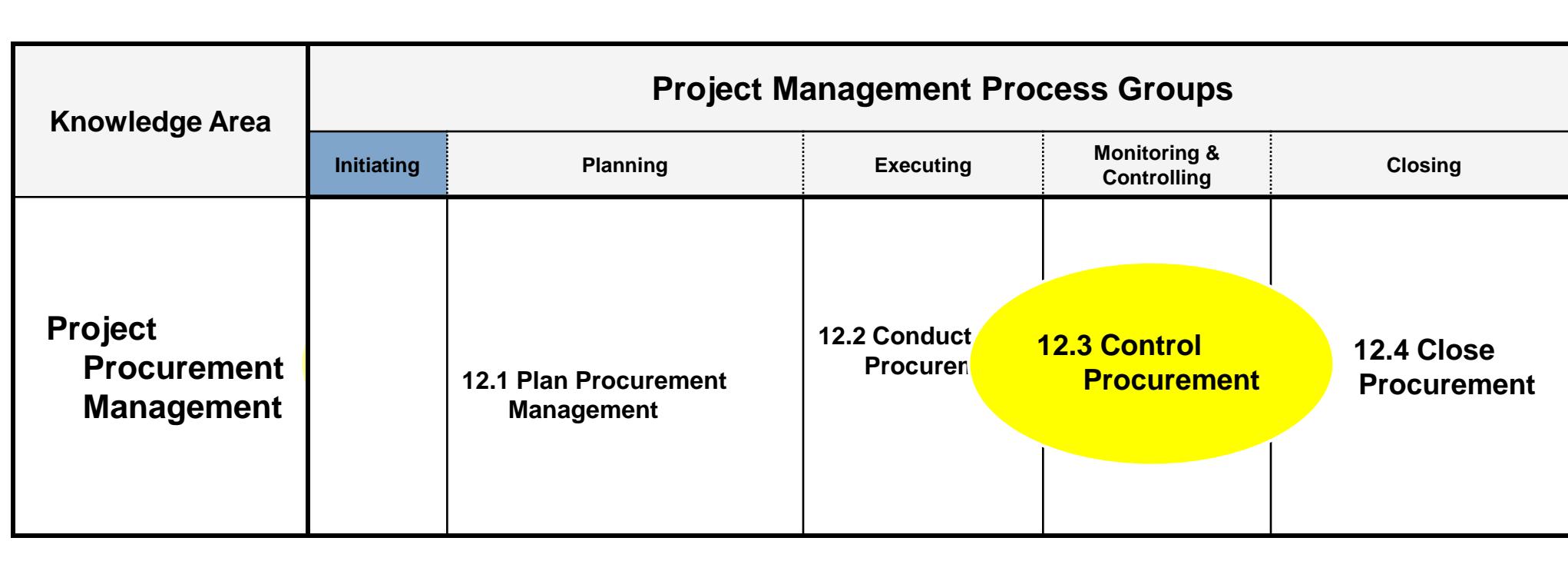
12.3. Conduct Procurement

12.4. Control Procurement

12.5. Close Procurement

12.6. Public Procurement Act in Nepal

12 Control Procurement



Across Project Management Process Groups

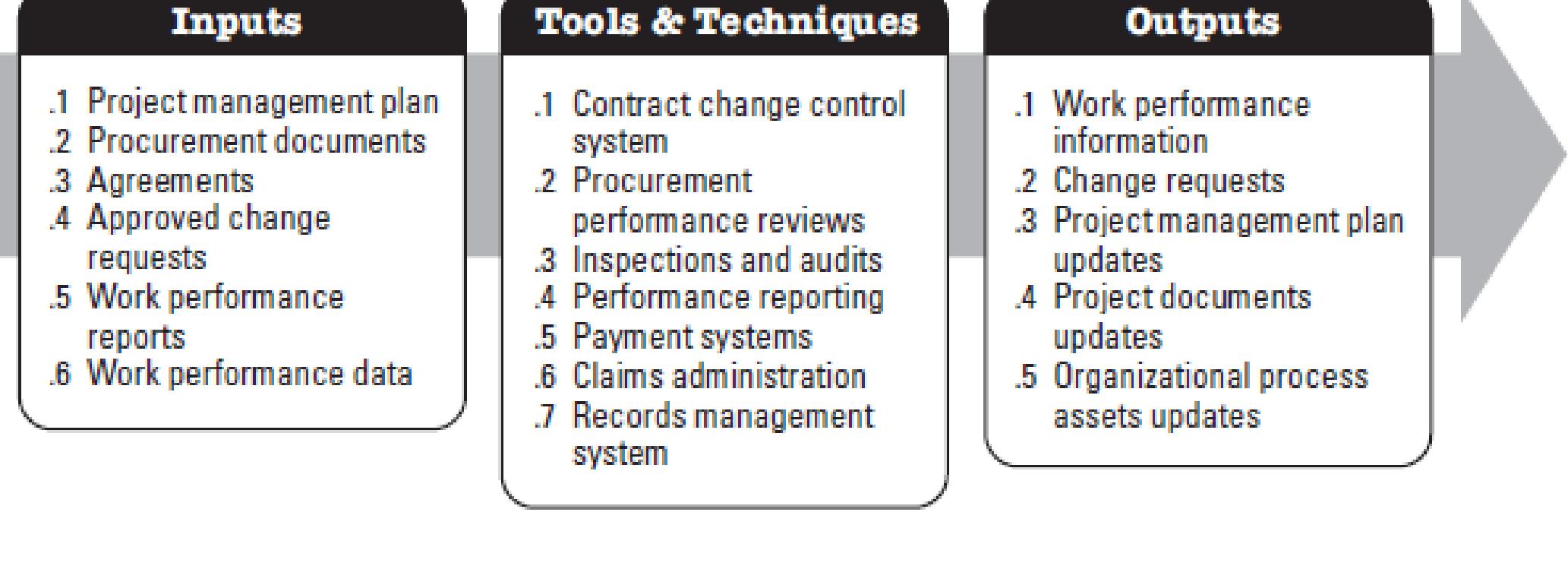
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Control Procurement

- Control Procurements is the process of managing procurement relationships, monitoring contract performance, and making changes and corrections to contracts as appropriate.
- The key benefit of this process is that it ensures that both the seller's and buyer's performance meets procurement requirements according to the terms of the legal agreement.

Control Procurement



Control Procurement (Inputs)

1	Project management plan	Described in Section 4. The project management plan describes how the procurement processes will be managed from developing procurement documentation through contract closure.
2	Procurement documents	Described in Section 12. Procurement documents contain complete supporting records for administration of the procurement processes; this includes procurement contract awards and the statement of work.
3	Agreements	Described in Section 12. Agreements are understandings between parties, including understanding of the duties of each party.
4	Approved change requests	Approved change requests can include modifications to the terms and conditions of the contract, including the procurement statement of work, pricing, and descriptions of the products, services, or results to be provided. All procurement-related changes are formally documented in writing and approved before being implemented through the Control Procurements process.
5	Work performance reports	Described in Section 4. Seller performance-related documentation includes: <ul style="list-style-type: none"> • Technical documentation. Seller-developed technical documentation and other deliverable information are provided in accordance with the terms of the contract. • Work performance information. The seller's performance reports indicate which deliverables have been completed and which have not.

Control Procurement (Inputs)

6	Work performance data	Described in Section 4. Work performance data includes (1) the extent to which quality standards are being satisfied, (2) the costs that have been incurred or committed, and (3) identification of the seller invoices that have been paid. All data are collected as part of project execution.
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Control Procurement (Tools and Techniques)

1	Contract change control system	A contract change control system defines the process by which the procurement can be modified. It includes the paperwork, tracking systems, dispute resolution procedures, and approval levels necessary for authorizing changes. The contract change control system is integrated with the integrated change control system.
2	Procurement performance reviews	procurement performance review is a structured review of the seller's progress to deliver project scope and quality, within cost and on schedule, as compared to the contract. It can include a review of seller-prepared documentation and buyer inspections, as well as quality audits conducted during seller's execution of the work. The objective of a performance review is to identify performance successes or failures, progress with respect to the procurement statement of work, and contract noncompliance, which allow the buyer to quantify the seller's demonstrated ability or inability to perform work. Such reviews may take place as a part of project status reviews, which would include key suppliers
3	Inspections and audits	Inspections and audits required by the buyer and supported by the seller, as specified in the procurement contract, can be conducted during execution of the project to verify compliance in the seller's work processes or deliverables. If authorized by contract, some inspection and audit teams can include buyer procurement personnel
4	Performance reporting	Work performance data and reports supplied by sellers are evaluated against the agreement requirements. Work performance information from this evaluation is then reported as appropriate. Performance reporting provides management with information about how effectively the seller is achieving the contractual objectives.

Control Procurement (Tools and Techniques)

5	Payment systems	Payments to the seller are typically processed by the accounts payable system of the buyer after certification of satisfactory work by an authorized person on the project team. All payments should be made and documented in strict accordance with the terms of the contract.
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Control Procurement (Tools and Techniques)

1	Claims administration	Contested changes and potential constructive changes are those requested changes where the buyer and seller cannot reach an agreement on compensation for the change or cannot agree that a change has occurred. These contested changes are variously called claims, disputes, or appeals. Claims are documented, processed, monitored, and managed throughout the contract life cycle, usually in accordance with the terms of the contract. If the parties themselves do not resolve a claim, it may have to be handled in accordance with alternative dispute resolution (ADR) typically following procedures established in the contract. Settlement of all claims and disputes through negotiation is the preferred method.
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2	Records management system	A records management system is used by the project manager to manage contract and procurement documentation and records. It consists of a specific set of processes, related control functions, and automation tools that are consolidated and combined as part of the project management information system (Section 4.). The system contains a retrievable archive of contract documents and correspondence.
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Control Procurement (Outputs)

1	Work performance information	Work performance information provides a basis for identification of current or potential problems to support later claims or new procurements. By reporting on the performance of a vendor, the organization increases knowledge of the performance of the procurement, which supports improved forecasting, risk management, and decision making. Performance reports also assist in the event there is a dispute with the vendor.
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2	Change requests	Change requests to the project management plan, its subsidiary plans, and other components, such as the cost baseline, schedule baseline, and procurement management plan, may result from the Control Procurements process. Change requests are processed for review and approval through the Perform Integrated Change Control process.
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3	Project management plan updates	Elements of the project management plan that may be updated include, but are not limited to: <ul style="list-style-type: none">• Procurement management plan. The procurement management plan is updated to reflect any approved change requests that affect procurement management, including impacts to costs or schedules.• Schedule baseline. If there are slippages that impact overall project performance, the schedule baseline may need to be updated to reflect the current expectations.• Cost baseline. If there are changes that impact overall project costs, the cost baseline may need to be updated to reflect the current expectations.
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4	Project documents updates	Project documents that may be updated include, but are not limited to, procurement documentation. Procurement documentation may include the procurement contract with all supporting schedules, requested unapproved contract changes, and approved change requests. Procurement documentation also includes any seller-developed technical documentation and other work performance information, such as deliverables, seller performance reports and warranties, financial documents including invoices and payment records, and the results of contract-related inspections.
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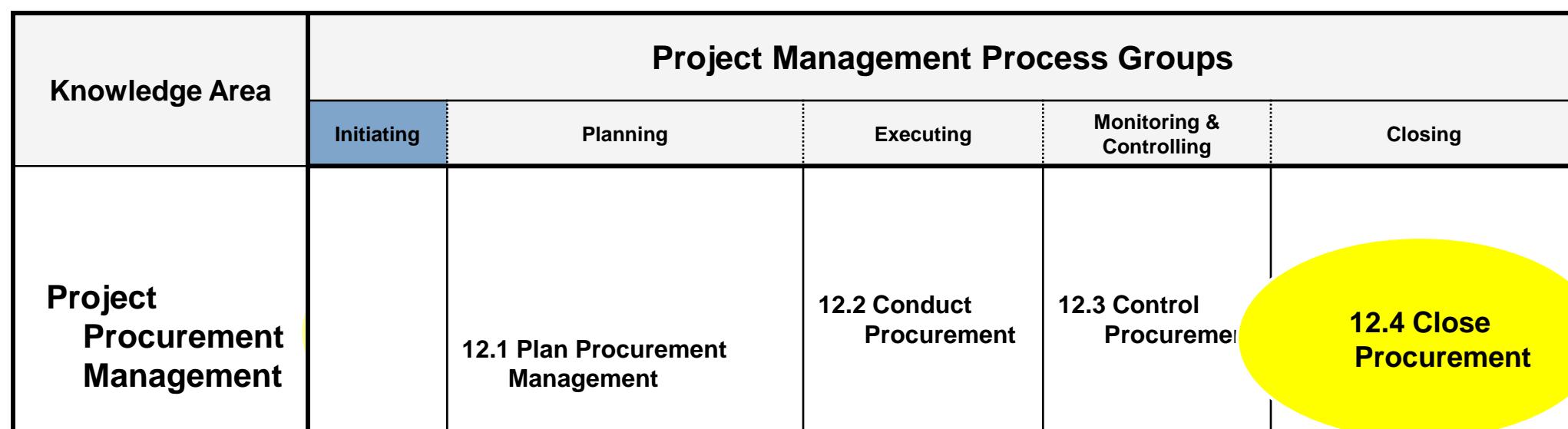
5	Organizational process assets updates	Elements of the organizational process assets that may be updated include, but are not limited to: Correspondence, Seller performance evaluation documentation, Payment schedules and requests
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6	Lessons learned	Lessons learned from the procurement process are documented and shared across the organization to improve future procurement decisions and outcomes.
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7	Procurement audit findings	Findings from the procurement audit are documented and used to identify areas for improvement in the procurement process.
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12.	Project Procurement Management	3 hrs
12.1.	Project Procurement Management Process	
12.2.	Plan Project Procurement Management	
12.3.	Conduct Procurement	
12.4.	Control Procurement	
12.5.	Close Procurement	
12.6.	Public Procurement Act in Nepal	

12 Close Procurement



Across Project Management Process Groups

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Close Procurement

- Close Procurements is the process of completing each procurement.
- The key benefit of this process is that it documents agreements and related documentation for future reference.



Close Procurement (Inputs)

1	Project management plan	Described in Section 4. The project management plan contains the procurement management plan, which provides the details and guidelines for closing out procurements.
2	Procurement documents	To close the contract, all procurement documentation is collected, indexed, and filed. Information on contract schedule, scope, quality, and cost performance along with all contract change documentation, payment records, and inspection results are cataloged. This information can be used for lessons learned information and as a basis for evaluating contractors for future contracts.

Close Procurement (Tools and Techniques)

1	Procurement audits	A procurement audit is a structured review of the procurement process originating from the Plan Procurement Management process through Control Procurements. The objective of a procurement audit is to identify successes and failures that warrant recognition in the preparation or administration of other procurement contracts on the project, or on other projects within the performing organization.
2	Procurement negotiations	In all procurement relationships, the final equitable settlement of all outstanding issues, claims, and disputes by negotiation is a primary goal. Whenever settlement cannot be achieved through direct negotiation, some form of alternative dispute resolution (ADR) including mediation or arbitration may be explored. When all else fails, litigation in the courts is the least desirable option.
3	Records management system	Described in Section 12. A records management system is used by the project manager to manage contract and procurement documentation and records. Contract documents and correspondence are archived through the records management system as part of the Close Procurements process.

Close Procurement (Outputs)

1	Closed procurements	The buyer, usually through its authorized procurement administrator, provides the seller with formal written notice that the contract has been completed. Requirements for formal procurement closure are usually defined in the terms and conditions of the contract and are included in the procurement management plan.
2	Organizational process assets updates	Elements of the organizational process assets that may be updated include, but are not limited to: <ul style="list-style-type: none">• Procurement file. A complete set of indexed contract documentation, including the closed contract, is prepared for inclusion with the final project files.• Deliverable acceptance. Documentation of formal acceptance of seller-provided deliverables may be required to be retained by the organization. The Close Procurement process ensures this documentation requirement is satisfied. Requirements for formal deliverable acceptance and how to address nonconforming deliverables are usually defined in the agreement.• Lessons learned documentation. Lessons learned, what has been experienced, and process improvement recommendations, should be developed for the project file to improve future procurements.

12.	Project Procurement Management	3 hrs
12.1.	Project Procurement Management Process	
12.2.	Plan Project Procurement Management	
12.3.	Conduct Procurement	
12.4.	Control Procurement	
12.5.	Close Procurement	
12.6.	Public Procurement Act in Nepal	

13.	Project Stakeholders Management
13.1.	Project Stakeholders Management Process
13.2.	Identify Stakeholder
13.3.	Plan Stakeholder Management

13.4. Manage Stakeholder Engagement

13.5. Control Stakeholder Management

Project Stakeholder Management

- Project Stakeholder Management includes the processes required to identify the people, groups, or organizations that could impact or be impacted by the project, to analyze stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution.
- Stakeholder management also focuses on continuous communication with stakeholders to understand their needs and expectations, addressing issues as they occur, managing conflicting interests and fostering appropriate stakeholder engagement in project decisions and activities.
- Stakeholder satisfaction should be managed as a key project objective.

13. Project Stakeholders Management	
13.1. Project Stakeholders Management Process	
13.2. Identify Stakeholder	
13.3. Plan Stakeholder Management	
13.4. Manage Stakeholder Engagement	
13.5. Control Stakeholder Management	

Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

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13. Project Stakeholders Management	
13.1. Project Stakeholders Management Process	
13.2. Identify Stakeholder	
13.3. Plan Stakeholder Management	
13.4. Manage Stakeholder Engagement	
13.5. Control Stakeholder Management	

Identify Stakeholders

Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Stakeholder Management	13.1 Identify Stakeholder	13.2 Plan Stakeholder Management	13.3 Manage Stake Holder Engagement	13.4 Control Stakeholder Engagement	

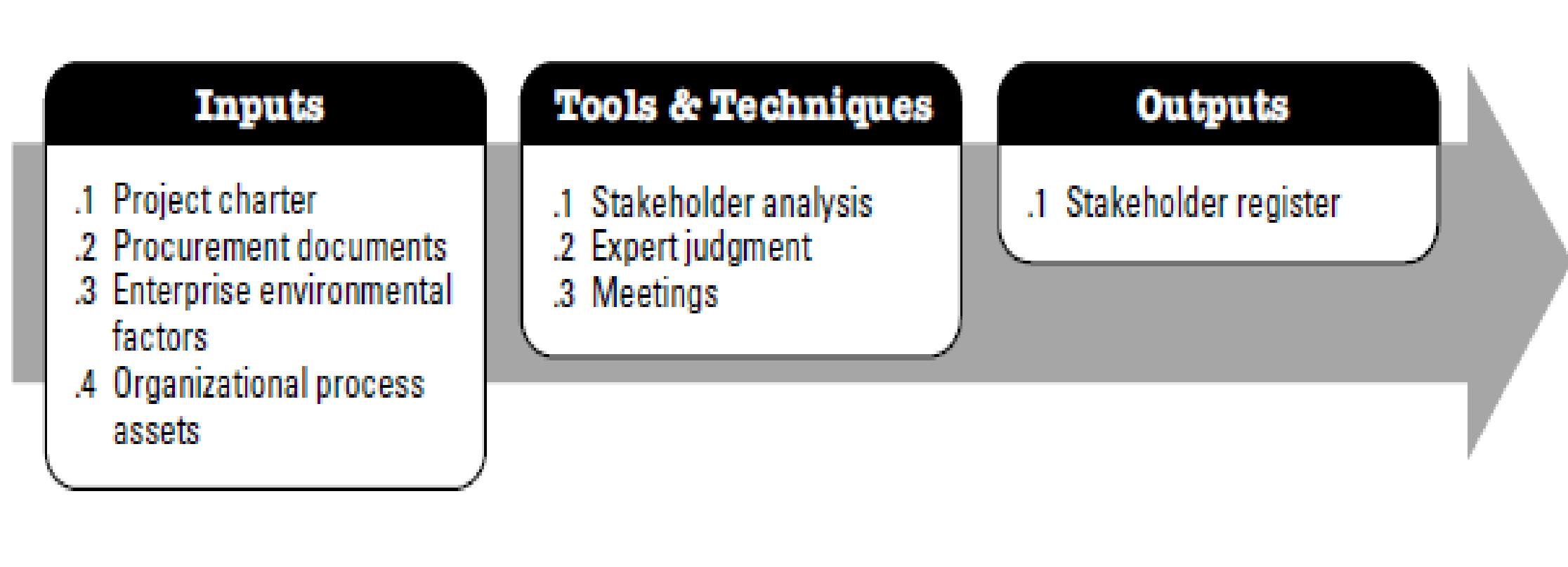
Across Project Management Process Groups

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Identify Stakeholders

- Identify Stakeholders is the process of identifying the people, groups, or organizations that could impact or be impacted by a decision, activity, or outcome of the project, analyzing and documenting relevant information regarding their interests, involvement, interdependencies, influence, and potential impact on project success.
- The key benefit of this process is that it allows the project manager to identify the appropriate focus for each stakeholder or group of stakeholders.

Identify Stakeholders



Identify Stakeholders (Inputs)

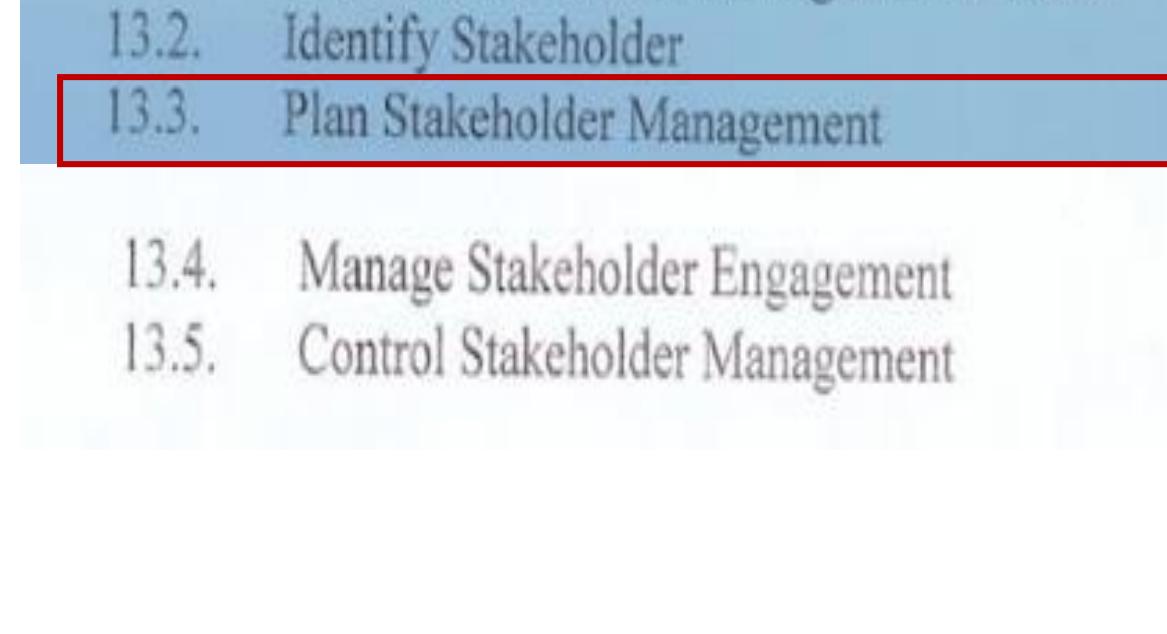
1	Project charter	Described in Section 4. The project charter can provide information about internal and external parties related with the project and affected by the result or the execution of the project, such as project sponsor(s), customers, team members, groups and departments participating in the project, and other people or organizations affected by the project.
2	Procurement documents	Described in Section 12. If a project is the result of a procurement activity or is based on an established contract, the parties in that contract are key project stakeholders. Other relevant parties, such as suppliers, should also be considered as part of the project stakeholder list.
3	Enterprise environmental factors	Described in Section 2
4	Organizational process assets	Described in Section 2

Identify Stakeholders (Tools and Techniques)

1	Stakeholder analysis	<p>Stakeholder analysis is a technique of systematically gathering and analyzing quantitative and qualitative information to determine whose interests should be taken into account throughout the project.</p> <p>It identifies the interests, expectations, and influence of the stakeholders and relates them to the purpose of the project.</p> <p>It also helps to identify stakeholder relationships (with the project and with other stakeholders) that can be leveraged to build coalitions and potential partnerships to enhance the project's chance of success, along with stakeholder relationships that need to be influenced differently at different stages of the project or phase.</p>
2	Expert judgment	<p>To ensure comprehensive identification and listing of stakeholders, judgment and expertise should be sought from groups or individuals with specialized training or subject matter expertise, such as:</p> <ul style="list-style-type: none"> • Senior management; • Other units within the organization; • Identified key stakeholders;
3	Meetings	<p>Profile analysis meetings are project meetings designed to develop an understanding of major project stakeholders, and they can be used to exchange and analyze information about roles, interests, knowledge, and the overall position of each stakeholder facing the project.</p>

Identify Stakeholders (Outputs)

1	Stakeholder register	<p>The main output of the Identify Stakeholders process is the stakeholder register. This contains all details related to the identified stakeholders including, but not limited to:</p> <ul style="list-style-type: none"> • Identification information. Name, organizational position, location, role in the project, contact information; • Assessment information. Major requirements, main expectations, potential influence in the project, phase in the life cycle with the most interest; and • Stakeholder classification. Internal/external, supporter/neutral/resistor, etc.
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Plan Stakeholder Management

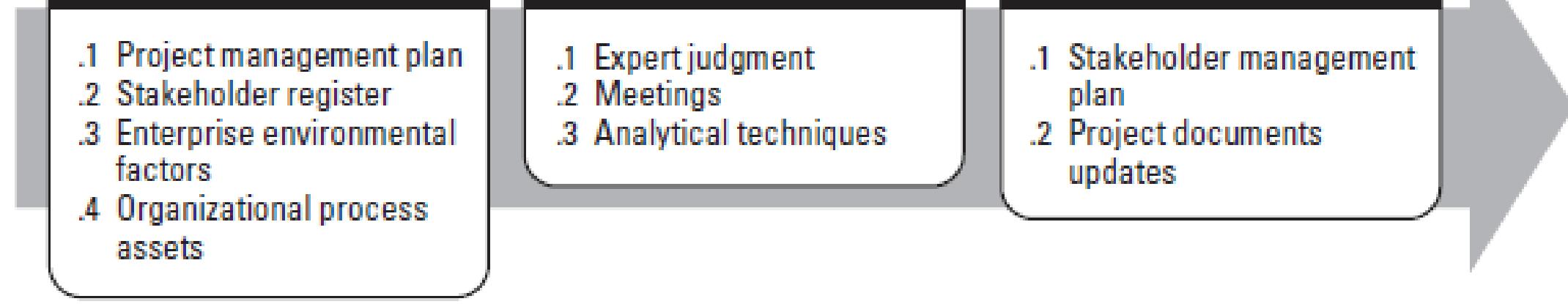
Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Stakeholder Management	13.1 Identify Stakeholder	13.2 Plan Stakeholder Management	13.3 Manage Stake Holder Engagement	13.4 Control Stakeholder Engagement	

Across Project Management Process Groups

Plan Stakeholder Management

- Plan Stakeholder Management is the process of developing appropriate management strategies to effectively engage stakeholders throughout the project life cycle, based on the analysis of their needs, interests, and potential impact on project success.
- The key benefit of this process is that it provides a clear, actionable plan to interact with project stakeholders to support the project's interests.

Plan Stakeholder Management



Plan Stakeholder Management (Inputs)

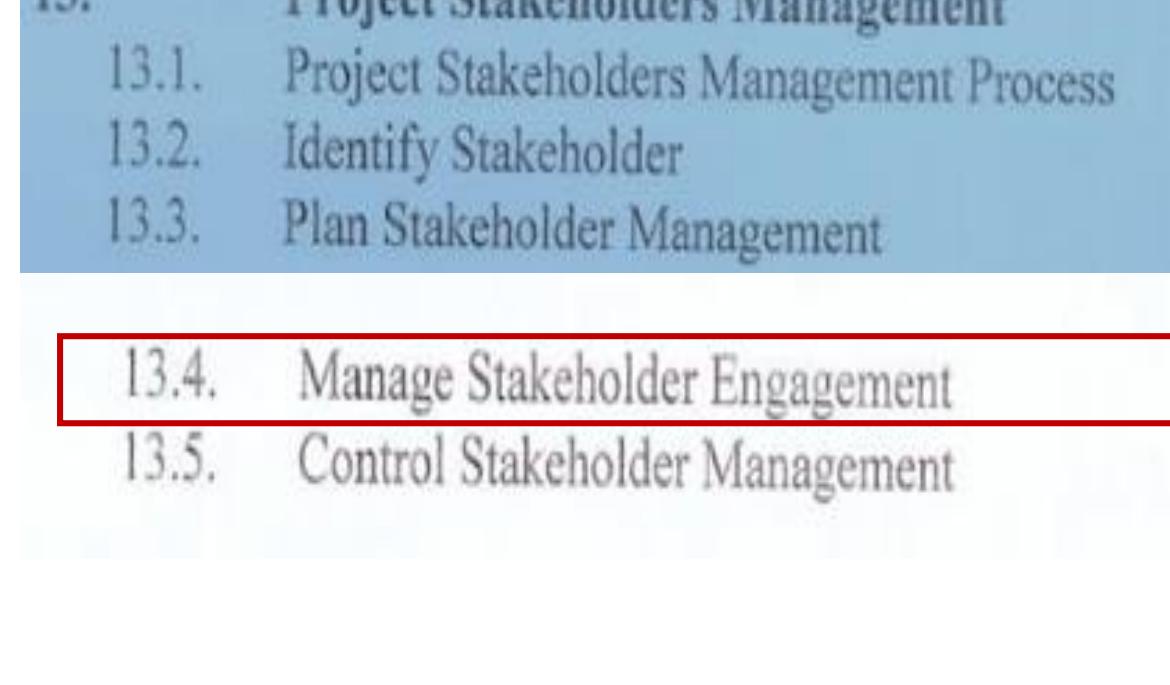
1	Project management plan	Described in Section 4.
2	Stakeholder register	Described in Section 13. The stakeholder register provides the information needed to plan appropriate ways to engage project stakeholders.
3	Enterprise environmental factors	Described in Section 2
4	Organizational process assets	Described in Section 2

Plan Stakeholder Management (Tools and Techniques)

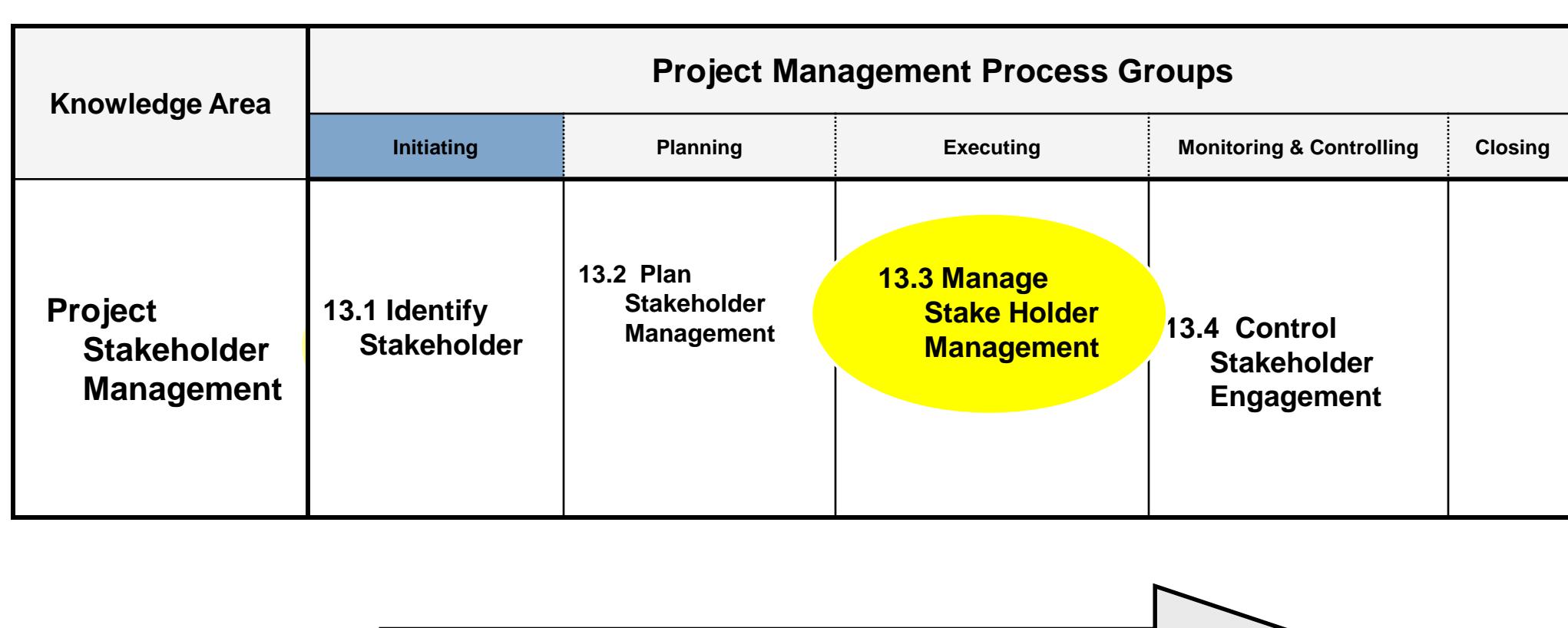
1	Expert judgment	Based on the project objectives, the project manager should apply expert judgment to decide upon the level of engagement required at each stage of the project from each stakeholder. For example, at the beginning of a project, it may be necessary for senior stakeholders to be highly engaged in order to clear away any obstacles to success. Once these have been successfully removed, it may be sufficient for senior stakeholders to change their level of engagement from leading to supportive, and other stakeholders, such as end users, may become more important..
2	Meetings	Meetings should be held with experts and the project team to define the required engagement levels of all stakeholders. This information can be used to prepare the stakeholder management plan.
3	Analytical techniques	The current engagement level of all stakeholders needs to be compared to the planned engagement levels required for successful project completion. Stakeholder engagement throughout the life cycle of the project is critical to project success.

Plan Stakeholder Management(Outputs)

1	Stakeholder management plan	The stakeholder management plan is a component of the project management plan (Section 4.) and identifies the management strategies required to effectively engage stakeholders. The stakeholder management plan can be formal or informal, highly detailed or broadly framed, based on the needs of the project.
2	Project documents updates	Project documents that may be updated include, but are not limited to: • Project schedule, and • Stakeholder register.



Manage Stakeholder Engagement

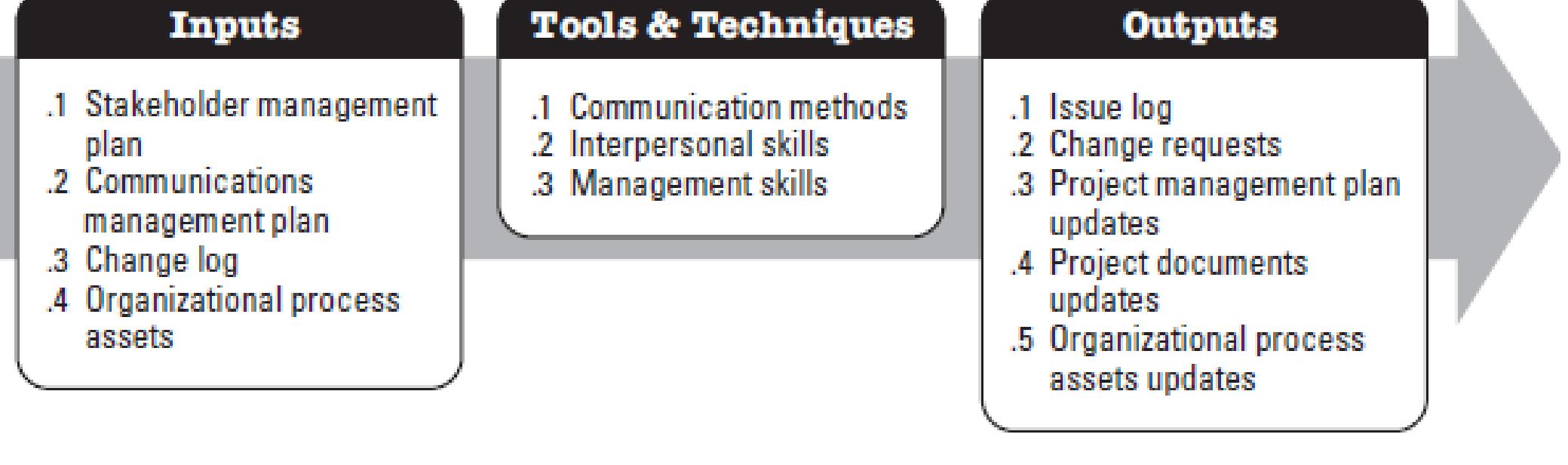


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Manage Stakeholder Engagement

- Manage Stakeholder Engagement is the process of communicating and working with stakeholders to meet their needs/expectations, address issues as they occur, and foster appropriate stakeholder engagement in project activities throughout the project life cycle.
- The key benefit of this process is that it allows the project manager to increase support and minimize resistance from stakeholders, significantly increasing the chances to achieve project success.

Manage Stakeholder Management



Manage Stakeholder Engagement(Inputs)

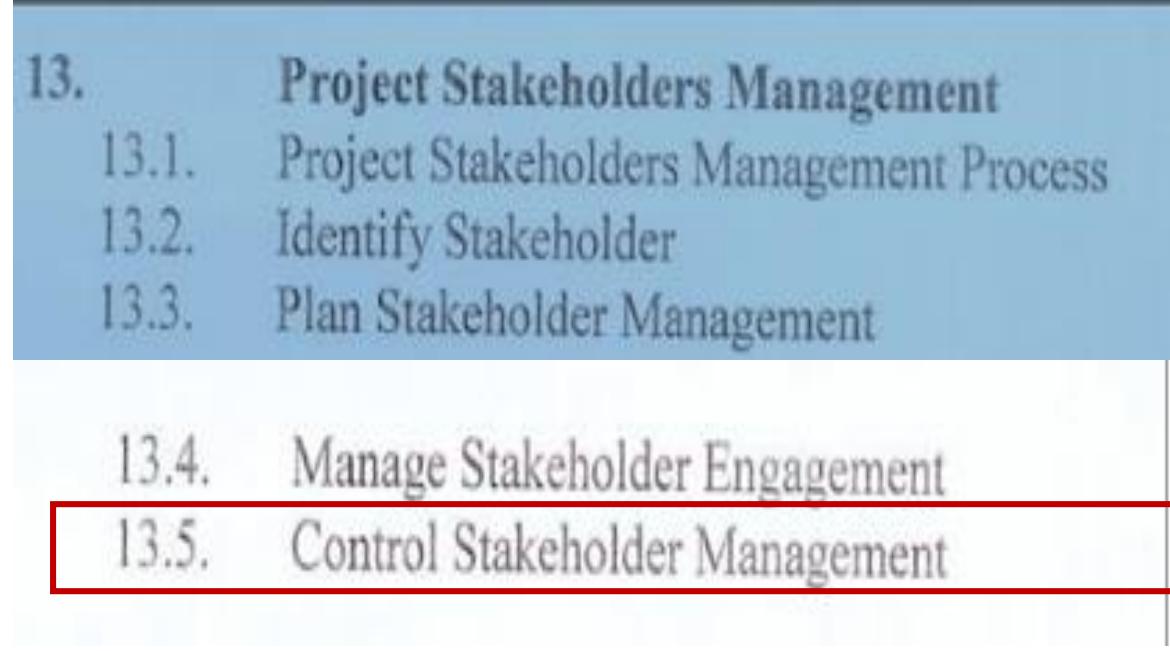
1 Stakeholder management plan	Described in Section 13. The stakeholder management plan provides guidance on how the various stakeholders can be best involved in the project. The stakeholder management plan describes the methods and technologies used for stakeholder communication.
2 Communications management plan	Described in Section 10. The communications management plan provides guidance and information on managing stakeholder expectations
3 Change log	Described in Section 4. A change log is used to document changes that occur during a project. These changes—and their impact on the project in terms of time, cost, and risk—are communicated to the appropriate stakeholders.
4 Organizational process assets	Described in Section 2

Manage Stakeholder Engagement(tools and Techniques)

1 Communication methods	Described in Section 10. The methods of communication identified for each stakeholder in the communications management plan are utilized during stakeholder engagement management. Based on the stakeholders' communication requirements, the project manager decides how, when, and which of these communication methods are to be used in the project.
2 Interpersonal skills	The project manager applies interpersonal skills to manage stakeholders' expectations. For example: <ul style="list-style-type: none">• Building trust,• Resolving conflict,• Active listening, and• Overcoming resistance to change.
3 Management skills	The project manager applies management skills to coordinate and harmonize the group toward accomplishing the project objectives. For example: <ul style="list-style-type: none">• Facilitate consensus toward project objectives,• Influence people to support the project,• Negotiate agreements to satisfy the project needs, and• Modify organizational behavior to accept the project outcomes.

Manage Stakeholder Engagement(tools and Techniques)

1 Issue log	Managing stakeholder engagement may result in the development of an issue log. This log is updated as new issues are identified and current issues are resolved.
2 Change requests	Managing stakeholder engagement may result in a change request to the product or the project. It may also include corrective or preventive actions to the project itself or to the interaction with the impacted stakeholders, as appropriate.
3 Project management plan updates	Elements of the project management plan that may be updated include, but are not limited to, the stakeholder management plan. This plan is updated when new or changed stakeholders requirements are identified. For example, some communications may no longer be necessary, an ineffective communication method may be replaced by another method, or a new communication requirement may be identified. It is also updated as a result of addressing concerns and resolving issues. For example, it may be determined that a stakeholder has additional informational needs.
4 Project documents Updates	Project documents that may be updated include, but are not limited to, the stakeholder register. This is updated as information on stakeholders change, when new stakeholders are identified, or if registered stakeholders are no longer involved in or impacted by the project, or other updates for specific stakeholders are required.
5 Organizational process assets updates	The organizational process assets that may be updated include, but are not limited to: Stakeholder notifications, Project reports, Project Presentation, Project Records, Feedback from stakeholders, Lessons learned documentation



Control Stakeholder Engagement

Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Management	13.1 Identify Stakeholder	13.2 Plan Stakeholder Management	13.3 Manage Stake Holder Management	13.4 Control Stakeholder Engagement	

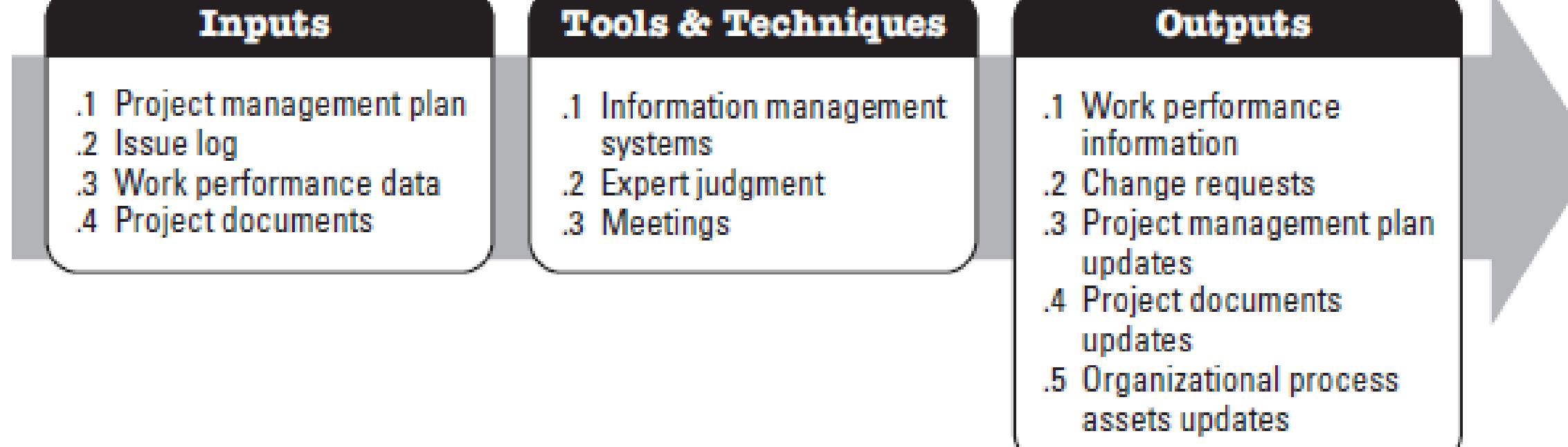
Across Project Management Process Groups

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Control Stakeholder Engagement

- Control Stakeholder Engagement is the process of monitoring overall project stakeholder relationships and adjusting strategies and plans for engaging stakeholders.
- The key benefit of this process is that it will maintain or increase the efficiency and effectiveness of stakeholder engagement activities as the project evolves and its environment changes.

Control Stakeholder Engagement



Control Stakeholder Engagement (Inputs)

1	Project management plan	Described in Section 4. The project management plan is used to develop the stakeholder management plan, as described in Section 13.
2	Issue log	Described in Section 13. The issue log is updated as new issues are identified and current issues are resolved.
3	Work performance data	Described in Section 4. The work performance data are the primary observations and measurements identified during activities being performed to carry out the project work.
4	Project documents	Multiple project documents originating from initiation, planning, execution, or control processes may be used as supporting inputs for controlling stakeholder engagement.

Control Stakeholder Engagement (Tools and Techniques)

1	Information management systems	An information management system provides a standard tool for the project manager to capture, store, and distribute information to stakeholders about the project cost, schedule progress, and performance. It also allows the project manager to consolidate reports from several systems and facilitate report distribution to the project stakeholders.
2	Expert judgment	To ensure comprehensive identification and listing of new stakeholders, reassessment of current stakeholders can be performed.
3	Meetings	Status review meetings are used to exchange and analyze information about stakeholder engagement.

Control Stakeholder Engagement (Outputs)

1	Work performance information	The work performance information is the performance data collected from various controlling processes, analyzed in context, and integrated based on relationships across areas. Thus work performance data have been transformed into work performance information. Data per se are not used in the decision-making process, because the meaning may be misinterpreted. Information, however, is correlated and contextualized and provides a sound foundation for project decisions.
2	Change requests	Analysis of project performance and interactions with stakeholders often generates change requests.
3	Project management plan updates	As stakeholders engage with the project the overall effectiveness of the stakeholder management strategy can be evaluated.
4	Project documents updates	Project documents that may be updated include, but are not limited to: <ul style="list-style-type: none">• Stakeholder register. This is updated as information on stakeholders change, when new stakeholders are identified, or if registered stakeholders are no longer involved in or impacted by the project, or other updates for specific stakeholders are required.• Issue log. This is updated as new issues are identified and current issues are resolved.
5	Organizational process assets updates	The organizational process assets, which may be updated include, but are not limited to: Stakeholder notifications, Project Updates, Project report, Project presentations, Feedback from stakeholders, Lessons learned documentation