English

for Graduate Students of Project Management

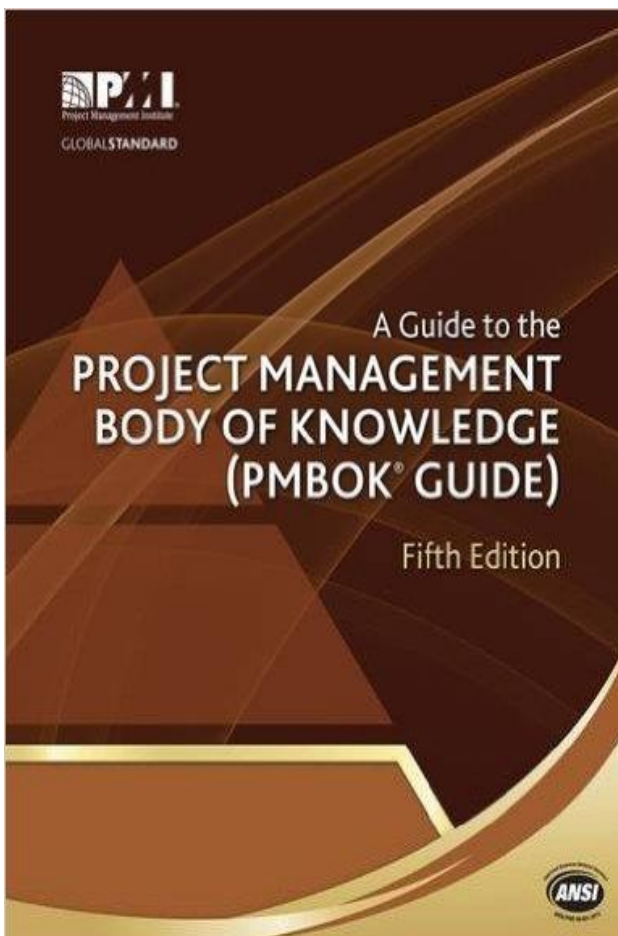**M. Ghanavi**

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1. Introduction to PMBOK

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The *PMBOK® Guide* contains the standard for managing most projects most of the time across many types of industries. The standard, included in Annex A1, describes the project management processes used to manage a project toward a more successful outcome.

This standard is unique to the project management field and has interrelationships to other project management disciplines such as program management and portfolio management.

Project management standards do not address all details of every topic. This standard is limited to individual projects and the project management processes that are generally recognized as good practice. Other standards may be consulted for additional information on the broader context in which projects are accomplished, such as:

- *The Standard for Program Management* addresses the management of programs,
- *The Standard for Portfolio Management* addresses the management of portfolios,
- *Organizational Project Management Maturity Model (OPM3®)* examines an enterprise's project management process capabilities.

Project Life cycle

A project life cycle is the series of phases that a project passes through from its initiation to its closure. The phases are generally sequential, and their names and numbers are determined by the management and control needs of the organization or organizations involved in the project, the nature of the project itself, and its area of application. The phases can be broken down by functional or partial objectives, intermediate results or deliverables, specific milestones within the overall scope of work, or financial availability. Phases are generally time bounded, with a start and ending or control point. A life cycle can be documented within a methodology. The project life cycle can be determined or shaped by the unique aspects of the organization, industry, or technology employed. While every project has a definite start and a definite end, the specific deliverables and activities that take place in between will vary widely with the project. The life cycle provides the basic framework for managing the project, regardless of the specific work involved.

Project life cycles can range along a continuum from predictive or plan-driven approaches at one end to adaptive or change-driven approaches at the other. In a predictive life cycle, the product and deliverables are defined at the beginning of the project and any changes to scope are carefully managed. In an adaptive life cycle, the product is developed over multiple iterations and detailed scope is defined for each iteration only as the iteration begins.

3. Project Management Processes

Project Management Processes

A process is a set of interrelated actions and activities performed to create a pre-specified product, service, or result. Each process is characterized by its inputs, the tools and techniques that can be applied, and the resulting outputs. The project manager needs to consider organizational process assets and enterprise environmental factors. These should be taken into account for every process, even if they are not explicitly listed as inputs in the process specification. Organizational process assets provide guidelines and criteria for tailoring the organization's processes to the specific needs of the project. Enterprise environmental factors may constrain the project management options. Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. This application of knowledge requires the effective management of the project management processes.

The project processes are performed by the project team with stakeholder interaction and generally fall into one of two major categories:

- **Project management processes.** These processes ensure the effective flow of the project throughout its life cycle. These processes encompass the tools and techniques involved in applying the skills and capabilities described in the Knowledge Areas.

- **Product-oriented processes.** These processes specify and create the project's product. Product oriented processes are typically defined by the project life cycle and vary by application area as well as the phase of the product life cycle. The scope of the project cannot be defined without some basic understanding of how to create the specified product. For example, various construction

techniques and tools need to be considered when determining the overall complexity of the house to be built.

The *PMBOK® Guide* describes the nature of project management processes in terms of the integration between the processes, their interactions, and the purposes they serve. Project management processes are grouped into five categories known as Project Management Process Groups (or Process Groups):

- **Initiating Process Group.** Those processes performed to define a new project or a new phase of an existing project by obtaining authorization to start the project or phase.
- **Planning Process Group.** Those processes required to establish the scope of the project, refine the objectives, and define the course of action required to attain the objectives that the project was undertaken to achieve.
- **Executing Process Group.** Those processes performed to complete the work defined in the project management plan to satisfy the project specifications.
- **Monitoring and controlling Process Group.** Those processes required to track, review, and regulate the progress and performance of the project; identify any areas in which changes to the plan are required; and initiate the corresponding changes.
- **Closing Process Group.** Those processes performed to finalize all activities across all Process Groups to formally close the project or phase.

Role of the Knowledge Areas

The 47 project management processes identified in the *PMBOK® Guide* are further grouped into ten separate Knowledge Areas. A Knowledge Area represents a complete set of concepts, terms, and activities that make up a professional field, project management field, or area of specialization. These ten Knowledge Areas are

used on most projects most of the time. Project teams should utilize these ten Knowledge Areas and other Knowledge Areas, as appropriate, for their specific project. The Knowledge Areas are: Project Integration Management, Project Scope Management, Project Time Management, Project Quality Management, Project Human Resource Management, Project Communications Management, Project Risk Management, Project Procurement Management and Project Stakeholder Management. Each Knowledge Area within the *PMBOK® Guide* is contained in a separate section.

The *PMBOK® Guide* defines the important aspects of each Knowledge Area and how it integrates with the five Process Groups. As supporting elements, the Knowledge Areas provide a detailed description of the process inputs and outputs along with a descriptive explanation of tools and techniques most frequently used within the project management processes to produce each outcome. A data flow diagram is provided in each Knowledge Area. The data flow diagram is a summary level depiction of the process inputs and process outputs that flow down through all the processes within a specific Knowledge Area. Although the processes are presented here as discrete elements with well-defined interfaces, in practice they are iterative and can overlap and interact in ways not detailed here.

Knowledge Area Processes	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring & Controlling Process Group	Closing Process Group
4. Project Management Integration	Develop Project Charter 3.2.1.1 (4.1) Develop Preliminary Project Scope Statement 3.2.1.2 (4.2)	Develop Project Management Plan 3.2.2.1 (4.3)	Direct and Manage Project Execution 3.2.3.1 (4.4)	Monitor and Control Project Work 3.2.4.1 (4.5) Integrated Change Control 3.2.4.2 (4.6)	Close Project 3.2.5.1 (4.7)
5. Project Scope Management		Scope Planning 3.2.2.2 (5.1) Scope Definition 3.2.2.3 (5.2) Create WBS 3.2.2.4 (5.3)		Scope Verification 3.2.4.3 (5.4) Scope Control 3.2.4.4 (5.5)	
6. Project Time Management		Activity Definition 3.2.2.5 (6.1) Activity Sequencing 3.2.2.6 (6.2) Activity Resource Estimating 3.2.2.7 (6.3) Activity Duration Estimating 3.2.2.8 (6.4) Schedule Development 3.2.2.9 (6.5)		Schedule Control 3.2.4.5 (6.6)	
7. Project Cost Management		Cost Estimating 3.2.2.10 (7.1) Cost Budgeting 3.2.2.11 (7.2)		Cost Control 3.2.4.6 (7.3)	
8. Project Quality Management		Quality Planning 3.2.2.12 (8.1)	Perform Quality Assurance 3.2.3.2 (8.2)	Perform Quality Control 3.2.4.7 (8.3)	
9. Project Human Resource Management		Human Resource Planning 3.2.2.13 (9.1)	Acquire Project Team 3.2.3.3 (9.2) Develop Project Team 3.2.3.4 (9.3)	Manage Project Team 3.2.4.8 (9.4)	
10. Project Communications Management		Communications Planning 3.2.2.14 (10.1)	Information Distribution 3.2.3.5 (10.2)	Performance Reporting 3.2.4.9 (10.3) Manage Stakeholders 3.2.4.10 (10.4)	
11. Project Risk Management		Risk Management Planning 3.2.2.15 (11.1) Risk Identification 3.2.2.16 (11.2) Qualitative Risk Analysis 3.2.2.17 (11.3) Quantative Risk Analysis 3.2.2.18 (11.4) Risk Response Planning 3.2.2.19 (11.5)		Risk Monitoring and Control 3.2.4.11 (11.6)	
12. Project Procurement Management		Plan Purchases and Acquisitions 3.2.2.20 (12.1) Plan Contracting 3.2.2.21 (12.2)	Request Seller Responses 3.2.3.6 (12.3) Select Sellers 3.2.3.7 (12.4)	Contract Administration 3.2.4.12 (12.5)	Contract Closure 3.2.5.2 (12.6)

4. Project Integration Management

Project Integration Management

Project Integration Management includes the processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups. In the project management context, integration includes characteristics of unification, consolidation, communication, and integrative actions that are crucial to controlled project execution through completion, successfully managing stakeholder expectations, and meeting requirements. Project Integration Management includes making choices about resource allocation, making trade-offs among competing objectives and alternatives, and managing the interdependencies among the project management Knowledge Areas. The project management processes are usually presented as discrete processes with defined interfaces while, in practice, they overlap and interact in ways that cannot be completely detailed in the *PMBOK® Guide*.

An overview of the Project Integration Management processes is as follows:

1. **Develop Project Charter**—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 project activities.

2. **Develop Project Management Plan**—The process of defining, preparing, and coordinating all subsidiary plans and integrating them into a comprehensive project management plan. The project's integrated baselines and subsidiary plans may be included within the project management plan.

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

4. **Monitor and Control Project Work**—The process of tracking, reviewing, and reporting project progress against the performance objectives defined in the project management plan.

5. **Perform Integrated Change Control**—The process of reviewing all change requests; approving changes and managing changes to deliverables, organizational process assets, project documents, and the project management plan; and communicating their disposition.

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

The need for Project Integration Management is necessary in situations where individual processes interact. For example, a cost estimate needed for a contingency plan involves integrating the processes in the Project Cost, Time, and Risk Management Knowledge Areas. When additional risks associated with various staffing alternatives are identified, then one or more of those processes may be revisited. The project deliverables may also need integrating with ongoing operations of the performing organization, the requesting organization, and with the long-term strategic planning that takes future problems and opportunities into consideration. Project Integration Management also includes the activities needed to manage project documents to ensure consistency with the project management plan and product, service, or capability deliverables.

Most experienced project management practitioners know there is no single way to manage a project. They apply project management knowledge, skills, and required processes in a preferred order and with varying rigor to achieve the desired project performance. However, the determination that a particular process is not required does not mean that it should not be addressed. The project manager and project team

need to address every process and the project environment to determine the level of implementation for each process within the project. If a project has more than one phase, the level of rigor applied within each of the project phases should be appropriate for each phase. This determination is also addressed by the project manager and project team.

Project Scope Management

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

An overview of the Project Scope Management processes includes the following:

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

2. **Collect Requirements**—The process of determining, documenting, and managing stakeholder needs and requirements to meet project objectives.

3. **Define Scope**—The process of developing a detailed description of the project and product.

4. **Create WBS**—The process of subdividing project deliverables and project work into smaller, more manageable components.

5. **Validate Scope**—The process of formalizing acceptance of the completed project deliverables.

6. **Control Scope**—The process of monitoring the status of the project and product scope and managing changes to the scope baseline.

In the project context, the term scope can refer to:

- **Product scope.** The features and functions that characterize a product, service, or result; and/or

- **Project scope.** The work performed to deliver a product, service, or result with the specified features and functions. The term project scope is sometimes viewed as including product scope.

The processes used to manage project scope, as well as the supporting tools and techniques, can vary by project. The scope baseline for the project is the approved version of the project scope statement, work breakdown structure (WBS), and its associated WBS dictionary. A baseline can be changed only through formal change control procedures and is used as a basis for comparison while performing Validate Scope and Control Scope processes as well as other controlling processes.

Completion of the project scope is measured against the project management plan. Completion of the product scope is measured against the product requirements. The Project Scope Management processes need to be well integrated with the other Knowledge Area processes, so that the work of the project will result in delivery of the specified product scope.

6. Project Time Management

Project Time Management

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

An overview of the Project Time Management processes is as follows:

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

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

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

4. **Estimate Activity Resources**—The process of estimating the type and quantities of material, human resources, equipment, or supplies required to perform each activity.

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

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

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

Distinguishing the project schedule presentation (schedule) from the schedule data and calculations that produce the project schedule is practiced by referring to the scheduling tool populated with project data as the schedule model. A schedule model is a representation of the plan for executing the project's activities including

durations, dependencies, and other planning information, used to produce project schedules along with other scheduling artifacts.

On some projects, especially those of smaller scope, defining activities, sequencing activities, estimating activity resources, estimating activity durations, and developing the schedule model are so tightly linked that they are viewed as a single process that can be performed by a person over a relatively short period of time. These processes are presented here as distinct elements because the tools and techniques for each process are different.

The Project Time Management processes and their associated tools and techniques are documented in the schedule management plan. The schedule management plan is a subsidiary plan of, and integrated with, the project management plan through the Develop Project Management Plan process, The schedule management plan identifies a scheduling method and scheduling tool, and sets the format and establishes criteria for developing and controlling the project schedule. The selected scheduling method defines the framework and algorithms used in the scheduling tool to create the schedule model. Some of the better known scheduling methods include critical path method (CPM) and critical chain method (CCM). Project schedule development uses the outputs from the processes to define activities, sequence activities, estimate activity resources, and estimate activity durations in combination with the scheduling tool to produce the schedule model. The finalized and approved schedule is the baseline that will be used in the Control Schedule process. As the project activities are being performed, the majority of effort in the Project Time Management Knowledge Area will occur in the Control Schedule process to ensure completion of project work in a timely manner.

7. Project Cost Management

Project Cost Management

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. An overview of the following Project Cost Management processes is as follows:

1. **Plan Cost Management**—The process that establishes the policies, procedures, and documentation for planning, managing, expending, and controlling project costs.

2. **Estimate Costs**—The process of developing an approximation of the monetary resources needed to complete project activities.

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

4. **Control Costs**—The process of monitoring the status of the project to update the project costs and managing changes to the cost baseline.

On some projects, especially those of smaller scope, cost estimating and cost budgeting are tightly linked and can be viewed as a single process that can be performed by a single person over a relatively short period of time. These are presented here as distinct processes because the tools and techniques for each are different. The ability to influence cost is greatest at the early stages of the project, making early scope definition critical.

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.

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

In many organizations, predicting and analyzing the prospective financial performance of the project's product is performed outside of the project. In others, such as a capital facilities project, Project Cost Management can include this work. When such predictions and analyses are included, Project Cost Management may address additional processes and numerous general financial management techniques such as return on investment, discounted cash flow, and investment payback analysis.

The cost management planning effort occurs early in project planning and sets the framework for each of the cost management processes so that performance of the processes will be efficient and coordinated.

8. Project Quality Management

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.

An overview of the Project Quality Management processes includes:

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

2. **Perform Quality Assurance**—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.

3. **Control Quality**—The process of monitoring and recording results of executing the quality activities to assess performance and recommend necessary changes.

Project Quality Management addresses the management of the project and the deliverables of the project. It applies to all projects, regardless of the nature of their deliverables. Quality measures and techniques are specific to the type of deliverables being produced by the project. For example, the project quality management of software deliverables may use different approaches and measures from those used when building a nuclear power plant. In either case, failure to meet the quality

requirements can have serious, negative consequences for any or all of the project's stakeholders. For example:

- Meeting customer requirements by overworking the project team may result in decreased profits and increased project risks, employee attrition, errors, or rework.

- Meeting project schedule objectives by rushing planned quality inspections may result in undetected errors, decreased profits, and increased post-implementation risks.

The project management team should determine the appropriate levels of accuracy and precision for use in the quality management plan. *Precision* is a measure of exactness. *Accuracy* is an assessment of correctness. For example, if the measured value of an item is very close to the true value of the characteristic being measured, the measurement is more accurate.

The basic approach to project quality management is intended to be compatible with International Organization for Standardization (ISO) quality standards. Every project should have a quality management plan. Project teams should follow the quality management plan and should have data to demonstrate compliance with the plan.

In the context of achieving ISO compatibility, modern quality management approaches seek to minimize variation and to deliver results that meet defined requirements. These approaches recognize the importance of:

- **Customer satisfaction.** Understanding, evaluating, defining, and managing requirements so that customer expectations are met. This requires a combination of conformance to requirements (to ensure the project produces what it was created to produce) and fitness for use (the product or service needs to satisfy the real needs).

- **Prevention over inspection.** Quality should be planned, designed, and built into—not inspected into the project's management or the project's deliverables. The cost of preventing mistakes is generally much less than the cost of correcting mistakes when they are found by inspection or during usage.

- **Continuous improvement.** The PDCA (plan-do-check-act) cycle is the basis for quality improvement as defined by Shewhart and modified by Deming. In addition, quality improvement initiatives such as Total Quality Management (TQM), Six Sigma, and Lean Six Sigma could improve the quality of the project's management as well as the quality of the project's product.

- **Management responsibility.** Success requires the participation of all members of the project team. Nevertheless, management retains, within itsresponsibility for quality, a related responsibility to provide suitable resources at adequate capacities.

- **Cost of quality (COQ).** Cost of quality refers to the total cost of the conformance work and the nonconformance work that should be done as a compensatory effort because, on the first attempt to perform that work, the potential exists that some portion of the required work effort may be done or has been done incorrectly. The costs for quality work may be incurred throughout the deliverable's life cycle. Post-project quality costs may be incurred because of product returns, warranty claims, and recall campaigns. Therefore, because of the temporary nature of projects and the potential benefits that may be derived from reducing the post-project cost of quality, sponsoring organizations may choose to invest in product quality improvement. These investments generally are made in the areas of conformance work that act to prevent defects or act to mitigate the costs of defects by inspecting out nonconforming units.

9. Project Human Resource Management

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.

An overview of the Project Human Resource Management processes is as follows:

1. **Plan Human Resource Management**—The process of identifying and documenting project roles, responsibilities, required skills, reporting relationships, and creating a staffing management plan.

2. **Acquire Project Team**—The process of confirming human resource availability and obtaining the team necessary to complete project activities.

3. **Develop Project Team**—The process of improving competencies, team member interaction, and overall team environment to enhance project performance.

4. **Manage Project Team**—The process of tracking team member performance, providing feedback, resolving issues, and managing changes to optimize project performance.

As a result of these interactions additional planning may be required throughout the project. For example:

- As additional team members are added to the team, their experience levels, or lack thereof, could decrease or increase project risk, creating the need for additional risk planning.

- When activity durations are estimated, budgeted, scoped, or planned prior to identifying all project team members and their competency levels, the activity durations may change.

The project management team is a subset of the project team and is responsible for the project management and leadership activities such as initiating, planning, executing, monitoring, controlling, and closing the various project phases. This group can also be referred to as the core, executive, or leadership team. For smaller projects, the project management responsibilities may be shared by the entire team or administered solely by the project manager. The project sponsor works with the project management team, typically assisting with matters such as project funding, clarifying scope, monitoring progress, and influencing stakeholders in both the requesting and performing organization for the project benefit.

Managing and leading the project team includes, but is not limited to:

- **Influencing the project team.** The project manager needs to be aware of and influence, when possible, human resource factors that may impact the project. These factors includes team environment, geographical locations of team members, communications among stakeholders, internal and external politics, cultural issues, organizational uniqueness, and others factors that may alter project performance.

- **Professional and ethical behavior.** The project management team should be aware of, subscribe to, and ensure that all team members follow professional and ethical behavior.

Project Communications 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. Project managers spend most of their time communicating with team members and other project stakeholders, whether they are internal (at all organizational levels) or external to the organization. Effective communication creates a bridge between diverse stakeholders who may have different cultural and organizational backgrounds, different levels of expertise, and different perspectives and interests, which impact or have an influence upon the project execution or outcome.

An overview of the Project Communications Management processes is as follows:

1. **Plan Communications Management**—The process of developing an appropriate approach and plan for project communications based on stakeholder's information needs and requirements, and available organizational assets.

2. **Manage Communications**—The process of creating, collecting, distributing, storing, retrieving and the ultimate disposition of project information in accordance with the communications management plan.

3. **Control Communications**—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 communication activities involved in these processes may often have many potential dimensions that need to be considered, including, but not limited to:

- Internal (within the project) and external (customer, vendors, other projects, organizations, the public);

- Formal (reports, minutes, briefings) and informal (emails, memos, ad-hoc discussions);

- Vertical (up and down the organization) and horizontal (with peers);

- Official (newsletters, annual report) and unofficial (off the record communications);

- Written and oral, and verbal (voice inflections) and nonverbal (body language).

Most communication skills are common for both general management and project management, such as, but not limited to:

- Listening actively and effectively;

- Questioning and probing ideas and situations to ensure better understanding;

- Educating to increase team's knowledge so that they can be more effective;

- Fact-finding to identify or confirm information;

- Setting and managing expectations;

- Persuading a person, a team, or an organization to perform an action;

- Motivating to provide encouragement or reassurance;

- Coaching to improve performance and achieve desired results;

- Negotiating to achieve mutually acceptable agreements between parties;

- Resolving conflict to prevent disruptive impacts; and

- Summarizing, recapping, and identifying the next steps.

11.Project Risk Management

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.

An overview of the Project Risk Management processes is as follows:

1. **Plan Risk Management**—The process of defining how to conduct risk management activities for a project.

2. **Identify Risks**—The process of determining which risks may affect the project and documenting their characteristics.

3. **Perform Qualitative Risk Analysis**—The process of prioritizing risks for further analysis or action by assessing and combining their probability of occurrence and impact.

4. **Perform Quantitative Risk Analysis**—The process of numerically analyzing the effect of identified risks on overall project objectives.

5. **Plan Risk Responses**—The process of developing options and actions to enhance opportunities and to reduce threats to project objectives.

6. **Control Risks**—The process of implementing risk response plans, tracking identified risks, monitoring residual risks, identifying new risks, and evaluating risk process effectiveness throughout the project.

Project risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives such as scope, schedule, cost, and quality. A risk may have one or more causes and, if it occurs, it may have one or more impacts. A cause may be a given or potential requirement, assumption, constraint, or

condition that creates the possibility of negative or positive outcomes. For example, causes could include the requirement of an environmental permit to do work, or having limited personnel assigned to design the project. The risk is that the permitting agency may take longer than planned to issue a permit; or, in the case of an opportunity, additional development personnel may become available who can participate in design, and they can be assigned to the project. If either of these uncertain events occurs, there may be an impact on the project, scope, cost, schedule, quality, or performance. Risk conditions may include aspects of the project's or organization's environment that contribute to project risk, such as immature project management practices, lack of integrated management systems, concurrent multiple projects, or dependency on external participants who are outside the project's direct control.

Project risk has its origins in the uncertainty present in all projects. Known risks are those that have been identified and analyzed, making it possible to plan responses for those risks. Known risks that cannot be managed proactively, should be assigned a contingency reserve. Unknown risks cannot be managed proactively and therefore may be assigned a management reserve. A negative project risk that has occurred is considered an issue.

Individual project risks are different from overall project risk. Overall project risk represents the effect of uncertainty on the project as a whole. It is more than the sum of the individual risks within a project, since it includes all sources of project uncertainty. It represents the exposure of stakeholders to the implications of variations in project outcome, both positive and negative.

Organizations perceive risk as the effect of uncertainty on projects and organizational objectives. Organizations and stakeholders are willing to accept varying degrees of

risk depending on their risk attitude. The risk attitudes of both the organization and the stakeholders may be influenced by a number of factors, which are broadly classified into three themes:

- *Risk appetite*, which is the degree of uncertainty an entity is willing to take on in anticipation of a reward.

- *Risk tolerance*, which is the degree, amount, or volume of risk that an organization or individual will withstand.

- *Risk threshold*, which refers to measures along the level of uncertainty or the level of impact at which a stakeholder may have a specific interest. Below that risk threshold, the organization will accept the risk. Above that risk threshold, the organization will not tolerate the risk.

For example, an organization's risk attitude may include its appetite for uncertainty, its threshold for risk levels that are unacceptable, or its risk tolerance at which point the organization may select a different risk response.

Positive and negative risks are commonly referred to as opportunities and threats. The project may be accepted if the risks are within tolerances and are in balance with the rewards that may be gained by taking the risks. Positive risks that offer opportunities within the limits of risk tolerances may be pursued in order to generate enhanced value. For example, adopting an aggressive resource optimization technique is a risk taken in anticipation of a reward for using fewer resources.

Individuals and groups adopt attitudes toward risk that influence the way they respond. These risk attitudes are driven by perception, tolerances, and other biases, which should be made explicit wherever possible. A consistent approach to risk should be developed for each project, and communication about risk and its handling should

be open and honest. Risk responses reflect an organization's perceived balance between risk taking and risk avoidance.

To be successful, an organization should be committed to address risk management proactively and consistently throughout the project. A conscious choice should be made at all levels of the organization to actively identify and pursue effective risk management during the life of the project. Project risk could exist at the moment a project is initiated. Moving forward on a project without a proactive focus on risk management is likely to lead to more problems arising from unmanaged threats.

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.

An overview of the Project Procurement Management processes includes the following:

1. **Plan Procurement Management**—The process of documenting project procurement decisions, specifying the approach, and identifying potential sellers.
2. **Conduct Procurements**—The process of obtaining seller responses, selecting a seller, and awarding a contract.
3. **Control Procurements**—The process of managing procurement relationships, monitoring contract performance, and making changes and corrections as appropriate.
4. **Close Procurements**—The process of completing each project procurement.

The Project Procurement Management processes involve agreements, including contracts, which are legal documents between a buyer and a seller. A contract represents a mutually binding agreement that obligates the seller to provide

something of value (e.g., specified products, services, or results) and obligates the buyer to provide monetary or other valuable compensation. An agreement can be simple or complex, and may reflect the simplicity or complexity of the deliverables or required effort.

A procurement contract includes terms and conditions, and may incorporate other items that the buyer specifies as to what the seller is to perform or provide. It is the project management team's responsibility to make certain that all procurements meet the specific needs of the project while adhering to organizational procurement policies. Depending upon the application area, a contract can also be called an agreement, an understanding, a subcontract, or a purchase order. Most organizations document policies and procedures specifically defining the procurement rules and specifying who has authority to sign and administer such agreements on behalf of the organization.

Although all project documents may be subject to some form of review and approval, the legally binding nature of a contract or agreement usually means it will be subjected to a more extensive approval process. In all cases, the primary focus of the review and approval process is to ensure that the contract language describes the products, services, or results that will satisfy the identified project need.

The project management team may seek support in early phases from specialists in contracting, purchasing, law, and technical disciplines. Such involvement can be mandated by an organization's policies. The various activities involved in the Project Procurement Management processes form the life cycle of an agreement. By actively managing the agreement life cycle and carefully wording the terms and conditions of a procurement, some identifiable project risks may be shared or transferred to a seller.

Entering into an agreement for products or services is one method of allocating the responsibility for managing or sharing potential risks.

A complex project may involve managing multiple contracts or subcontracts simultaneously or in sequence. In such cases, each contract life cycle may end during any phase of the project life cycle. Project Procurement Management is discussed within the perspective of the buyer-seller relationship. The buyer-seller relationship may exist at many levels on any one project, and between organizations internal to and external to the acquiring organization.

Depending on the application area, the seller may be identified as a contractor, subcontractor, vendor, service provider, or supplier. Depending on the buyer's position in the project acquisition cycle, the buyer may be called a client, customer, prime contractor, contractor, acquiring organization, service requestor, or purchaser. The seller can be viewed during the contract life cycle first as a bidder, then as the selected source, and then as the contracted supplier or vendor.

The seller will typically manage the work as a project if the acquisition is not just for shelf material, goods, or common products. In such cases:

- The buyer becomes the customer, and is thus a key project stakeholder for the seller.
- The seller's project management team is concerned with all the processes of project management, not only with those of this Knowledge Area.
- Terms and conditions of the contract become key inputs to many of the seller's management processes.

The contract can actually contain the inputs (e.g., major deliverables, key milestones, cost objectives), or it can limit the project team's options (e.g., buyer approval of staffing decisions is often required on design projects.

13.Project 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.

An overview of the Project Stakeholder Management processes includes the following:

1. **Identify Stakeholders**—The process of identifying the people, groups, or organizations that could impact or be impacted by a decision, activity, or outcome of the project; and analyzing and documenting relevant information regarding their interests, involvement, interdependencies, influence, and potential impact on project success.

2. **Plan Stakeholder Management**—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.

3. **Manage Stakeholder Engagement**—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.

4. **Control Stakeholder Engagement**—The process of monitoring overall project stakeholder relationships and adjusting strategies and plans for engaging stakeholders.

Every project will have stakeholders who are impacted by or can impact the project in a positive or negative way. While some stakeholders may have a limited ability to influence the project, others may have significant influence on the project and its expected outcomes. The ability of the project manager to correctly identify and manage these stakeholders in an appropriate manner can mean the difference between success and failure.