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PROJECT MANAGEMENT PROCESSES

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.

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. As explained in Section 2, 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.

In order for a project to be successful, the project team should:

- Select appropriate processes required to meet the project objectives;
- Use a defined approach that can be adapted to meet requirements;
- Establish and maintain appropriate communication and engagement with stakeholders;
- Comply with requirements to meet stakeholder needs and expectations; and
- Balance the competing constraints of scope, schedule, budget, quality, resources, and risk to produce the specified product, service, or result.

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 (Sections 4 through 13).
- **Product-oriented processes.** These processes specify and create the project's product. Product-oriented processes are typically defined by the project life cycle (as discussed in Section 2.4) 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 only the project management processes. Although product-oriented processes are outside the scope of this document, they should not be ignored by the project manager and project team. Project management processes and product-oriented processes overlap and interact throughout the life of a project.

Project management processes apply globally and across industry groups. Good practice means there is general agreement that the application of project management processes has been shown to enhance the chances of success over a wide range of projects. Good practice does not mean that the knowledge, skills, and processes described should always be applied uniformly on all projects. For any given project, the project manager, in collaboration with the project team, is always responsible for determining which processes are appropriate, and the appropriate degree of rigor for each process.

Project managers and their teams should carefully address each process and its inputs and outputs and determine which are applicable to the project they are working on. The *PMBOK® Guide* may be used as a resource in managing a project while considering the overall approach and methodology to be followed for the project. This effort is known as tailoring.

Project management is an integrative undertaking that requires each project and product process to be appropriately aligned and connected with the other processes to facilitate coordination. Actions taken during one process typically affect that process and other related processes. For example, a scope change typically affects project cost, but it may not affect the communications management plan or level of risk. These process interactions often require tradeoffs among project requirements and objectives, and the specific performance tradeoffs will vary from project to project and organization to organization. Successful project management includes actively managing these interactions to meet sponsor, customer, and other stakeholder requirements. In some circumstances, a process or set of processes will need to be iterated several times in order to achieve the required outcome.

Projects exist within an organization and do not operate as a closed system. They require input data from the organization and beyond, and deliver capabilities back to the organization. The project processes may generate information to improve the management of future projects and organizational process assets.

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.

The remainder of this section provides information for project management of a single project organized as a network of interlinked processes, details the project management processes, and includes the following major sections:

3.1 Common Project Management Process Interactions

3.2 Project Management Process Groups

3.3 Initiating Process Group

3.4 Planning Process Group

3.5 Executing Process Group

3.6 Monitoring and Controlling Process Group

3.7 Closing Process Group

3.8 Project Information

3.9 Role of the Knowledge Areas

3.10 The Standard for Project Management of a Project

3.1 Common Project Management Process Interactions

The project management processes are presented as discrete elements with well-defined interfaces. However, in practice they overlap and interact in ways that are not completely detailed in this document. Most experienced project management practitioners recognize there is more than one way to manage a project. The required Process Groups and their processes are guides for applying appropriate project management knowledge and skills during the project. The application of the project management processes is iterative, and many processes are repeated during the project.

The integrative nature of project management requires the Monitoring and Controlling Process Group to interact with the other Process Groups, as shown in Figure 3-1. Monitoring and Controlling processes occur at the same time as processes contained within other Process Groups. Thus, the Monitoring and Controlling Process is pictured as a “background” Process Group for the other four Process Groups shown in Figure 3-1.

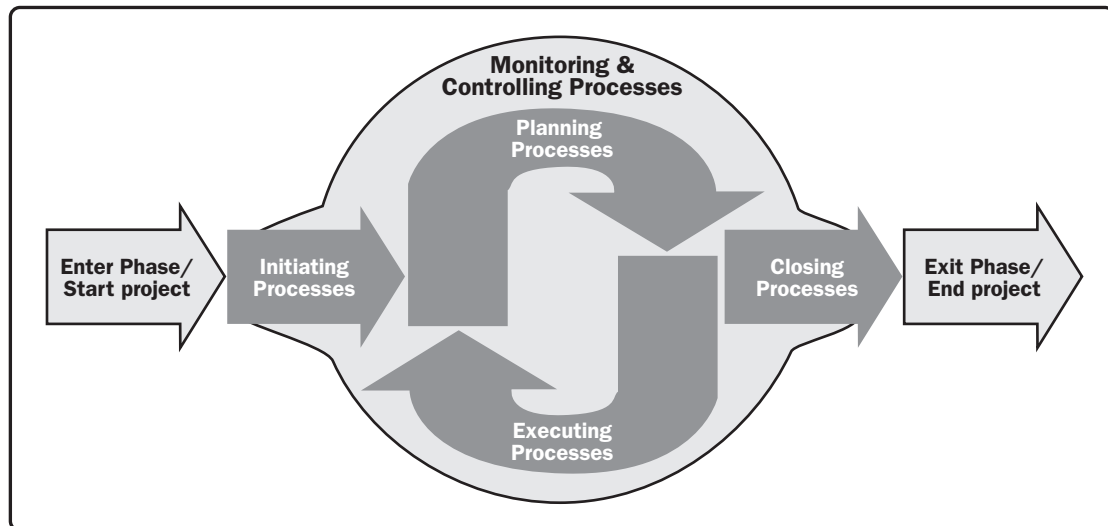


Figure 3-1. Project Management Process Groups

Project Management Process Groups are linked by the outputs which are produced. The Process Groups are seldom either discrete or one-time events; they are overlapping activities that occur throughout the project. The output of one process generally becomes an input to another process or is a deliverable of the project, subproject, or project phase. Deliverables at the subproject or project level may be called incremental deliverables. The Planning Process Group provides the Executing Process Group with the project management plan and project documents, and, as the project progresses, it often creates updates to the project management plan and the project documents. Figure 3-2 illustrates how the Process Groups interact and shows the level of overlap at various times. If the project is divided into phases, the Process Groups interact within each phase.

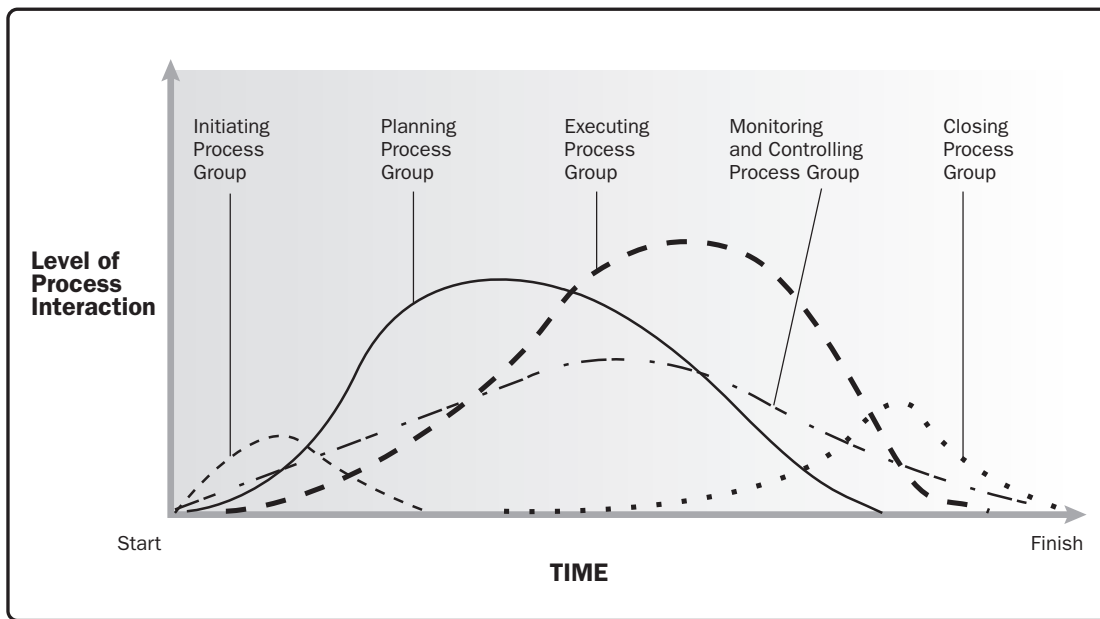


Figure 3-2. Process Groups Interact in a Phase or Project

An example of this interaction is the exit of a design phase, which requires sponsor acceptance of the design document. Once it is available, the design document provides the product description for the Planning and Executing Process Groups in one or more subsequent phases. When a project is divided into phases, the Process Groups are used, as appropriate, to effectively drive the project to completion in a controlled manner. In multiphase projects, processes are repeated within each phase until the criteria for phase completion have been satisfied. Additional information on project organization, life cycles, and project phases is provided in Section 2.

3.2 Project Management Process Groups

The following sections identify and describe the five Project Management Process Groups required for any project. These five Process Groups have clear dependencies and are typically performed in each project and highly interact with one another. These five Process Groups are independent of application areas or industry focus. Individual Process Groups and individual processes are often iterated prior to completing the project and can have interactions within a Process Group and among Process Groups. The nature of these interactions varies from project to project and may or may not be performed in a particular order.

The process flow diagram, Figure 3-3, provides an overall summary of the basic flow and interactions among Process Groups and specific stakeholders. The project management processes are linked by specific inputs and outputs where the result or outcome of one process becomes the input to another process but not necessarily in the same Process Group. **The Process Groups are not project life cycle phases.** In fact, it is possible that all Process Groups could be conducted within a phase. As projects are separated into distinct phases or subcomponents, such as concept development feasibility study, design, prototype, build, or test, etc., all of the Process Groups would normally be repeated for each phase or subcomponent along the lines explained previously and illustrated in Figure 3-2.

The project management processes are shown in the Process Group in which most of the related activities takes place. For example, a process that normally takes place in the planning phase is put into the Planning Process Group. When this process is updated by an Executing Process Group process or activity, it is not considered a new process within the Executing Process Group but is still a Planning Process Group process or activity. The iterative nature of project management means that processes from any group may be reused throughout the project life cycle. For example, in response to a risk event, executing a risk response may trigger further analysis, which leads to another iteration of the Identify Risks process and the associated Perform Quantitative Risk Analysis and Perform Quantitative Risk Analysis processes to evaluate the impact.

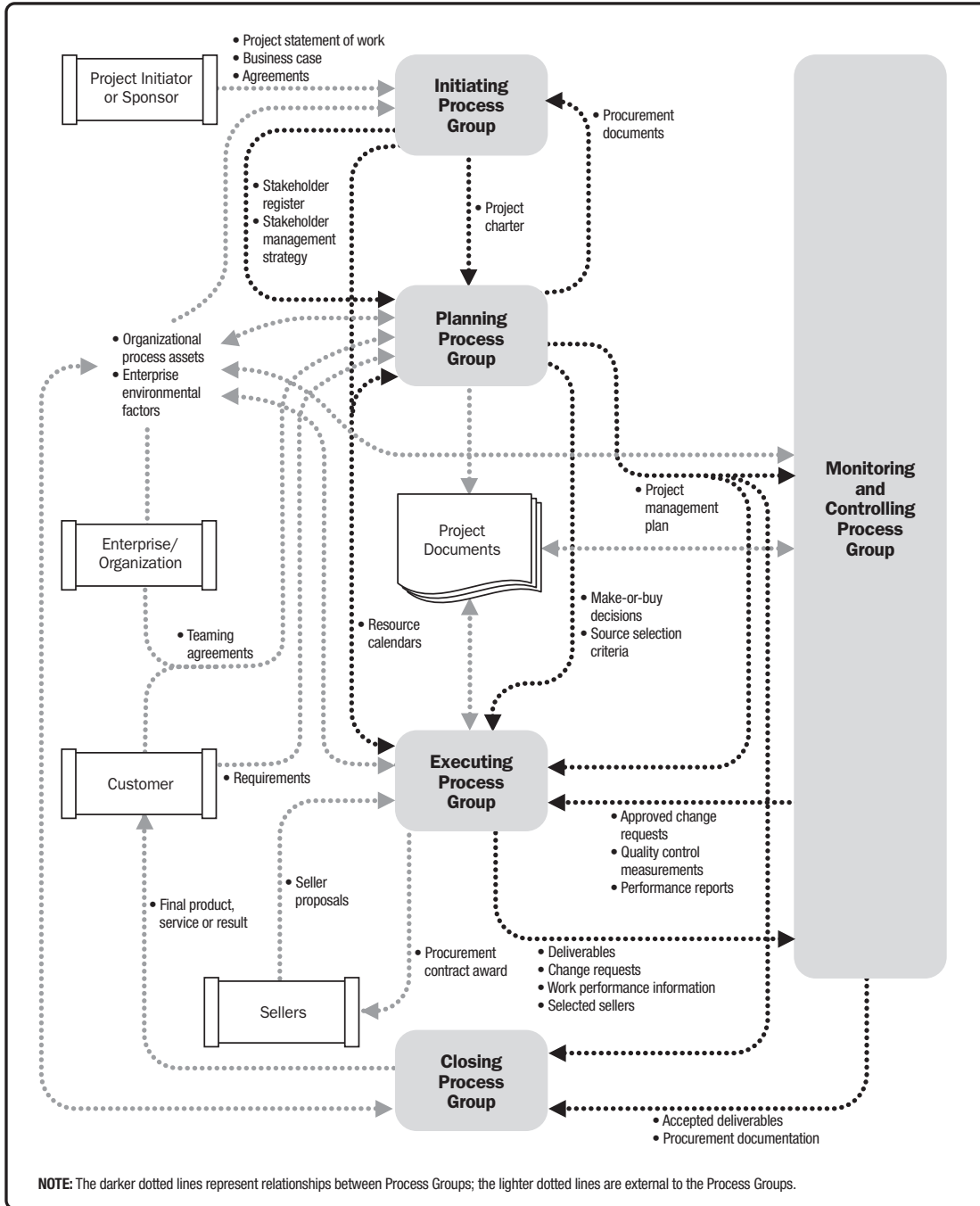


Figure 3-3. Project Management Process Interactions

3.3 Initiating Process Group

The Initiating Process Group consists of 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. Within the Initiating processes, the initial scope is defined and initial financial resources are committed. Internal and external stakeholders who will interact and influence the overall outcome of the project are identified. If not already assigned, the project manager will be selected. This information is captured in the project charter and stakeholder register. When the project charter is approved, the project becomes officially authorized. Although the project management team may help write the project charter, this standard assumes that business case assessment, approval, and funding are handled externally to the project boundaries (Figure 3-4). A project boundary is defined as the point in time that a project or project phase is authorized to its completion. The key purpose of this Process Group is to align the stakeholders' expectations with the project's purpose, give them visibility about the scope and objectives, show how their participation in the project and its associated phases can ensure that their expectations are achieved. These processes help set the vision of the project—what is needed to be accomplished.

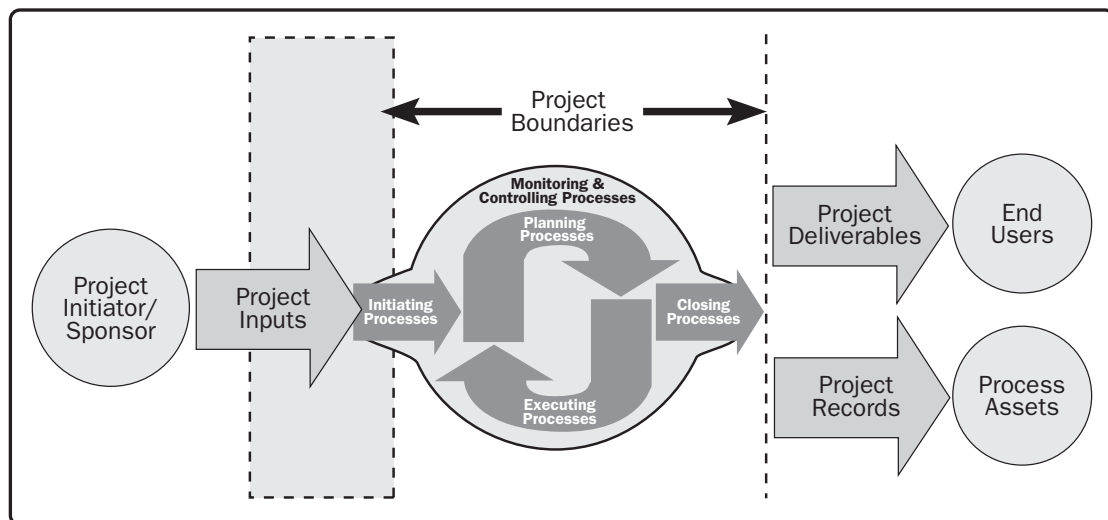


Figure 3-4. Project Boundaries

Large complex projects should be divided into separate phases. In such projects, the Initiating processes are carried out during subsequent phases to validate the decisions made during the original Develop Project Charter and Identify Stakeholders processes. Performing the Initiating processes at the start of each phase helps to keep the project focused on the business need that the project was undertaken to address. The success criteria are verified, and the influence, drivers and objectives of the project stakeholders are reviewed. A decision is then made as to whether the project should be continued, delayed, or discontinued.

Involving the sponsors, customers, and other stakeholders during initiation creates a shared understanding of success criteria, reduces the overhead of involvement, and generally improves deliverable acceptance, customer satisfaction, and other stakeholder satisfaction.

Initiating processes may be performed at the organizational, program, or portfolio level and therefore, would be outside of the project's level of control. For example, prior to commencing a project, the need for high-level requirements may be documented as part of a larger organizational initiative. A process of evaluating alternatives may be utilized to determine the feasibility of the new undertaking. Clear descriptions of the project objectives may be developed, including the reasons why a specific project is the best alternative to satisfy the requirements. The documentation for this decision may also contain the initial project scope statement, deliverables, project duration, and a forecast of the resources for the organization's investment analysis. As part of the Initiating processes, the project manager is given the authority to apply organizational resources to the subsequent project activities.

3.4 Planning Process Group

The Planning Process Group consists of those processes performed to establish the total scope of the effort, define and refine the objectives, and develop the course of action required to attain those objectives. The Planning processes develop the project management plan and the project documents that will be used to carry out the project. The complex nature of project management may require the use of repeated feedback loops for additional analysis. As more project information or characteristics are gathered and understood, additional planning will likely be required. Significant changes occurring throughout the project life cycle trigger a need to revisit one or more of the planning processes and possibly some of the initiating processes. This progressive detailing of the project management plan is called progressive elaboration, indicating that planning and documentation are iterative and ongoing activities. The key benefit of this Process Group is to delineate the strategy and tactics as well as the course of action or path to successfully complete the project or phase. When the Planning Process Group is well managed, it is much easier to get stakeholder buy-in and engagement. These processes express how this will be done, setting the route to the desired objective.

The project management plan and project documents developed as outputs from the Planning Process Group will explore all aspects of the scope, time, cost, quality, communications, human resources, risks, procurements, and stakeholder engagement.

Updates arising from approved changes during the project (generally during Monitoring and Controlling processes and specifically during the Direct and Manage Project Work Process) may significantly impact parts of the project management plan and the project documents. Updates to these documents provide greater precision with respect to schedule, costs, and resource requirements to meet the defined project scope.

The project team seeks input and encourages involvement from all stakeholders when planning the project and developing the project management plan and project documents. While the act of collecting feedback and refining the documents cannot continue indefinitely, procedures set by the organization dictate when the initial planning ends. These procedures will be affected by the nature of the project, the established project boundaries, appropriate monitoring and controlling activities, as well as the environment in which the project will be performed.

Other interactions among the processes within the Planning Process Group are dependent upon the nature of the project. For example, for some projects there will be little or no identifiable risks until after a significant amount of planning has been done. At that time, the team might recognize that the cost and schedule targets are overly aggressive, thus involving considerably more risk than previously understood. The results of the iterations are documented as updates to the project management plan or to various project documents.

3.5 Executing Process Group

The Executing Process Group consists of those processes performed to complete the work defined in the project management plan to satisfy the project specifications. This Process Group 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.

During project execution, results may require planning updates and rebaselining. This may include changes to expected activity durations, changes in resource productivity and availability, and unanticipated risks. Such variances may affect the project management plan or project documents and may require detailed analysis and development of appropriate project management responses. The results of the analysis can trigger change requests that, if approved, may modify the project management plan or other project documents and possibly require establishing new baselines. A large portion of the project's budget will be expended in performing the Executing Process Group processes.

3.6 Monitoring and Controlling Process Group

The Monitoring and Controlling Process Group 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; and initiate the corresponding changes. The key benefit of this Process Group is that project performance is measured and analyzed at regular intervals, appropriate events, or exception conditions to identify variances from the project management plan. The Monitoring and Controlling Process Group also involves:

- Controlling changes and recommending corrective or preventive action in anticipation of possible problems,
- Monitoring the ongoing project activities against the project management plan and the project performance measurement baseline, and
- Influencing the factors that could circumvent integrated change control or configuration management so only approved changes are implemented.

This continuous monitoring provides the project team insight into the health of the project and identifies any areas requiring additional attention. The Monitoring and Controlling Process Group not only monitors and controls the work being done within a Process Group, but also monitors and controls the entire project effort. In multiphase projects, the Monitoring and Controlling Process Group coordinates project phases in order to implement corrective or preventive actions to bring the project into compliance with the project management plan. This review can result in recommended and approved updates to the project management plan. For example, a missed activity finish date may require adjustments and trade-offs between budget and schedule objectives. In order to reduce or control overhead, management-by-exception procedures and other techniques can be appropriately considered.

3.7 Closing Process Group

The Closing Process Group consists of those processes performed to conclude all activities across all Project Management Process Groups to formally complete the project, phase, or contractual obligations. This Process Group, when completed, verifies that the defined processes are completed within all of the Process Groups to close the project or a project phase, as appropriate, and formally establishes that the project or project phase is complete.

This Process Group also formally establishes the premature closure of the project. Prematurely closed projects may include, for example: aborted projects, cancelled projects, and projects having a critical situation. In specific cases, when some contracts cannot be formally closed (e.g. claims, termination clauses, etc.) or some activities are to be transferred to other organizational units, specific hand-over procedures may be arranged and finalized.

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,
- Archive all relevant project documents in the project management information system (PMIS) to be used as historical data,
- Close out all procurement activities ensuring termination of all relevant agreements, and
- Perform team members' assessments and release project resources.

3.8 Project Information

Throughout the life cycle of the project, a significant amount of data and information is collected, analyzed, transformed, and distributed in various formats to project team members and other stakeholders. Project data are collected as a result of various Executing processes and are shared within the project team. The collected data are analyzed in context, and aggregated and transformed to become project information during various Controlling processes. The information may then be communicated verbally or stored and distributed as reports in various formats.

The project data are continuously collected and analyzed during the dynamic context of the project execution. As a result, the terms data and information are often used interchangeably in practice. The indiscriminate use of these terms can lead to confusion and misunderstandings by the various project stakeholders. The following guidelines help minimize miscommunication and help the project team use appropriate terminology:

- **Work performance data.** The raw observations and measurements identified during activities performed to carry out the project work. Examples include reported percent of work physically completed, quality and technical performance measures, start and finish dates of schedule activities, number of change requests, number of defects, actual costs, actual durations, etc.
- **Work performance information.** The performance data collected from various controlling processes, analyzed in context and integrated based on relationships across areas. Examples of performance information are status of deliverables, implementation status for change requests, and forecasted estimates to complete.
- **Work performance reports.** The physical or electronic representation of work performance information compiled in project documents, intended to generate decisions or raise issues, actions, or awareness. Examples include status reports, memos, justifications, information notes, electronic dashboards, recommendations, and updates.

Figure 3-5 illustrates the flow of project information across the various processes used to manage the project.

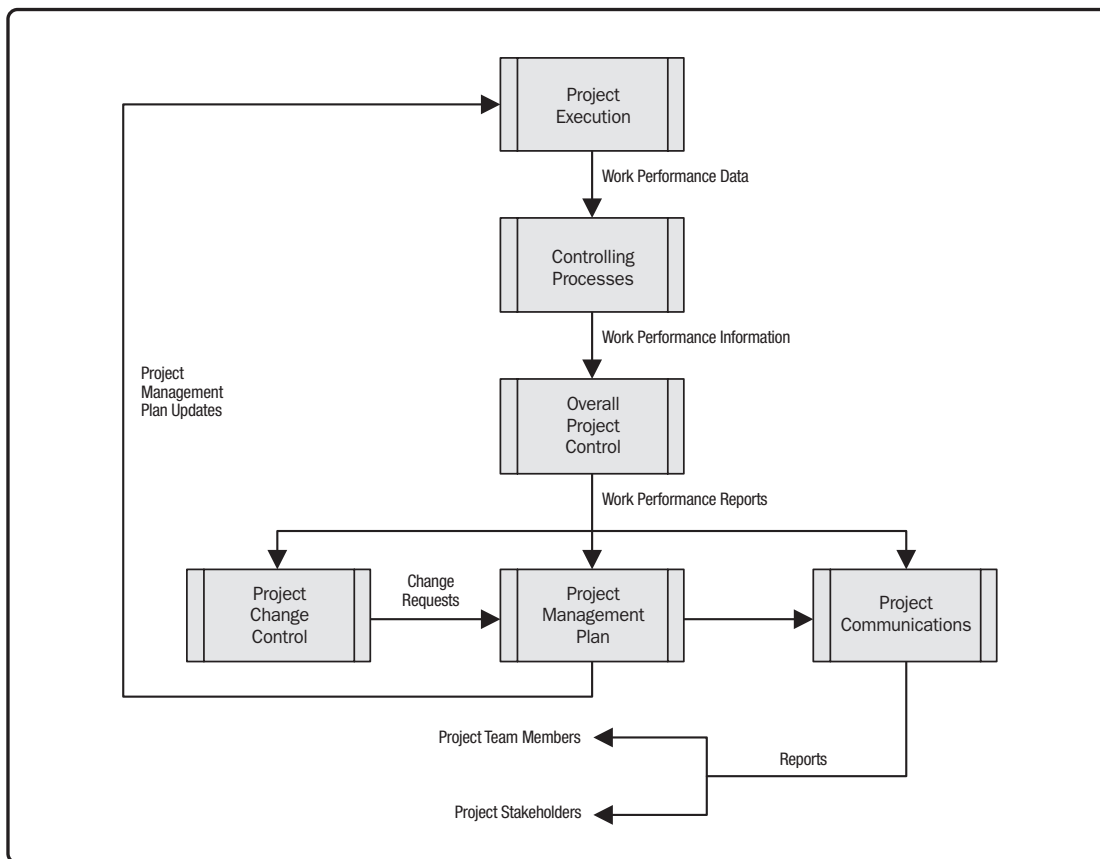


Figure 3-5. Project Data, Information and Report Flow

3.9 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 (Sections 4 through 8). 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 (see Figure 3-6 for data flow diagram legend). 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.

Table 3-1 reflects the mapping of the 47 project management processes within the 5 Project Management Process Groups and the 10 Knowledge Areas.

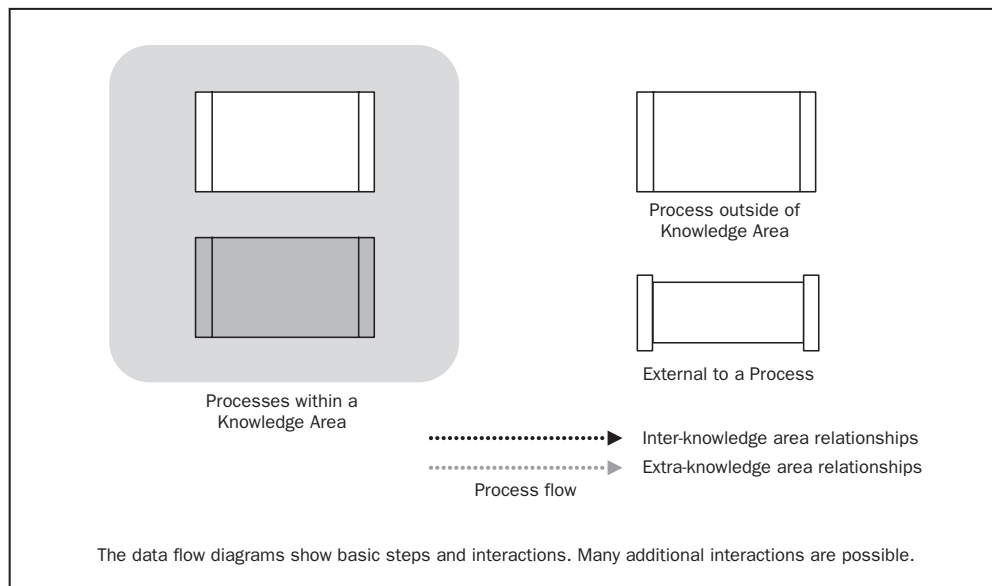


Figure 3-6. Data Flow Diagram Legend

Table 3-1. Project Management Process Group and Knowledge Area Mapping

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. 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
5. 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	
6. 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	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8. Project Quality Management		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
9. 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		
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
11. 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	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	