CHAPTER 3

Project Management Processes for a Project

Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements. Project management is accomplished through processes, using project management knowledge, skills, tools, and techniques that receive inputs and generate outputs.

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

- Select appropriate processes within the Project Management Process Groups (also known as Process Groups) that are required to meet the project objectives
- Use a defined approach to adapt the product specifications and plans to meet project and product requirements
- Comply with requirements to meet stakeholder needs, wants and expectations
- Balance the competing demands of scope, time, cost, quality, resources, and risk to produce a quality product.

This standard documents information needed to initiate, plan, execute, monitor and control, and close a single project, and identifies those project management processes that have been recognized as good practice on most projects most of the time. These processes apply globally and across industry groups. Good practice means there is general agreement that the application of those project management processes has been shown to enhance the chances of success over a wide range of projects.

This does not mean that the knowledge, skills and processes described should always be applied uniformly on all projects. The project manager, in collaboration with the project team, is always responsible for determining what processes are appropriate, and the appropriate degree of rigor for each process, for any given project.

and their
that they must consider in

A process is a set of interrelated actions
achieve a pre-specified set of products, results, or services. The project proce
are performed by the project team, and generally fall into one of two ma
categories:

- The project management processes common to most projects most of the ti
are associated with each other by their performance for an integrated purpo
The purpose is to initiate, plan, execute, monitor and control, and close
project. These processes interact with each other in complex ways that cann
be completely explained in a document or with graphics. However,
example of the interactions among the Process Groups is shown in Figure 3-
The processes may also interact in relation to project scope, cost, schedul
etc., which are called Knowledge Areas, and are described in Chapters
through 12.
- Product-oriented processes specify and create the project's product. Produc
oriented processes are typically defined by the project life cycle (discussed i
Section 2.1) and vary by application area. Project management processes an
product-oriented processes overlap and interact throughout the project. Fo
example, the scope of the project cannot be defined in the absence of som
basic understanding of how to create the specified product.

Project management is an integrative undertaking. Project management integration requires each project and product process to be appropriately aligned and connected with the other processes to facilitate their coordination. These process interactions often require tradeoffs among project requirements and objectives. A large and complex project may have some processes that will have to be iterated several times to define and meet stakeholder requirements and reach agreement on the processes outcome. Failure to take action during one process will usually affect that process and other related processes. For example, a scope change will almost always affect project cost, but the scope change may or may not affect team morale or product quality. The specific performance tradeoffs will vary from project to project and organization to organization. Successful project management includes actively managing these interactions to successfully meet sponsor, customer and other stakeholder requirements.

This standard describes the nature of project management processes in terms of the integration between the processes, the interactions within them, and the purposes they serve. These processes are aggregated into five groups, defined as the Project Management Process Groups:

- Initiating Process Group
- Planning Process Group

3.1 Project Management Processes

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 here. Most experienced project management practitioners recognize there is more than one way to manage a project. The specifics for a project are defined as objectives that must be accomplished based on complexity, risk, size, time frame, project team's experience, access to resources, amount of historical information, the organization's project management maturity, and industry and application area. The required Process Groups and their constituent processes are guides to apply appropriate project management knowledge and skills during the project. In addition, the application of the project management processes to a project is iterative and many processes are repeated and revised during the project. The project manager and the project team are responsible for determining what processes from the Process Groups will be employed, by whom, and the degree of rigor that will be applied to the execution of those processes to achieve the desired project objective.

An underlying concept for the interaction among the project management processes is the plan-do-check-act cycle (as defined by Shewhart and modified by Deming, in the ASQ Handbook, pages 13–14, American Society for Quality, 1999). This cycle is linked by results – the result from one part of the cycle becomes the input to another. See Figure 3-1.

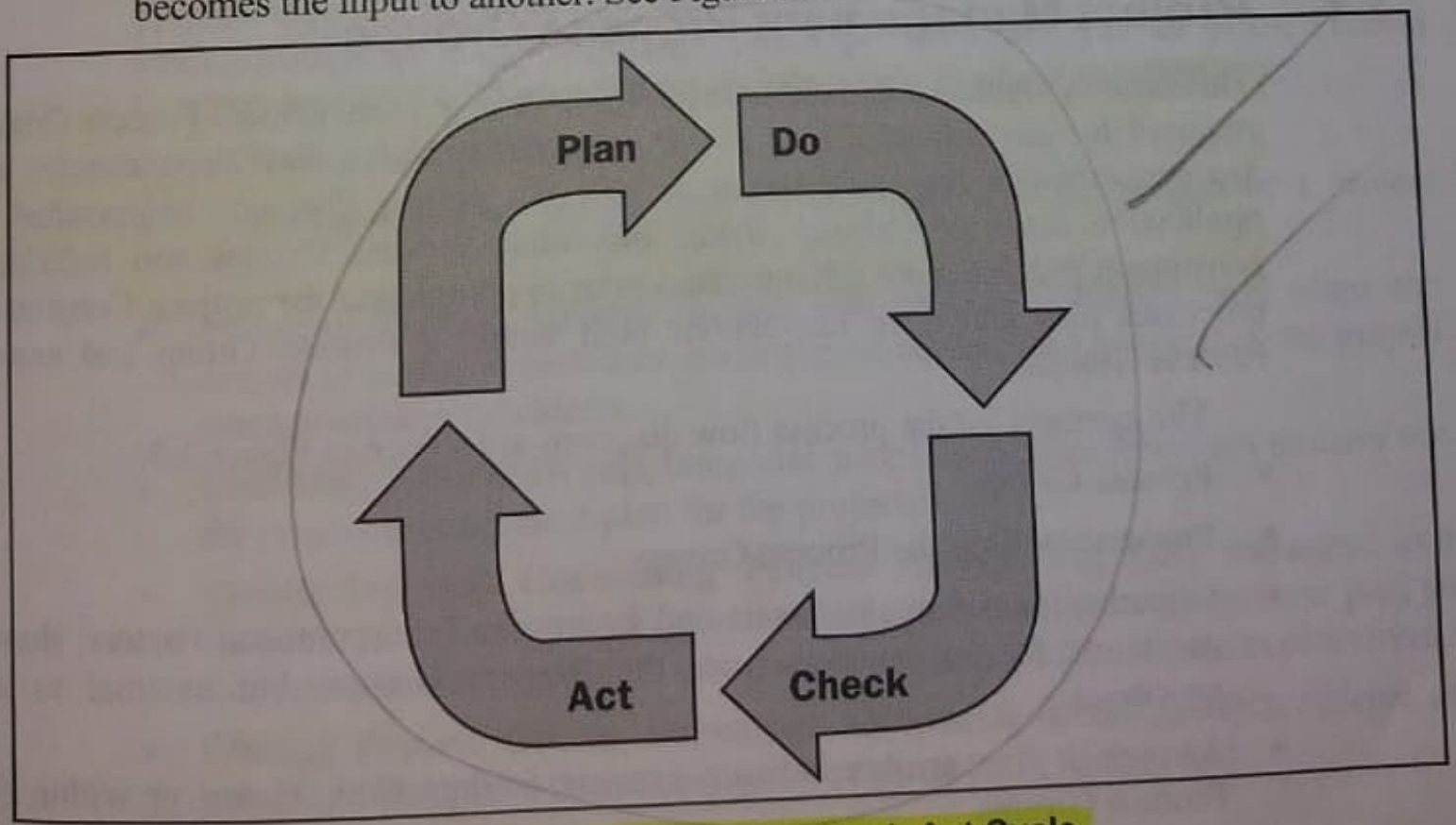


Figure 3-1. The Plan-Do-Check-Act Cycle

applied to the interrelat... Process Group corresponds to the "plan... The Executing Process Group corresponds to the "do" component and the Monitoring and Controlling Process Group corresponds to the "check and act" components. In addition, since management of a project is a finite effort, the Initiating Process Group starts these cycles and the Closing Process Group ends them. The integrative nature of project management requires the Monitoring and Controlling Process Group interaction with every aspect of the other Process Groups.

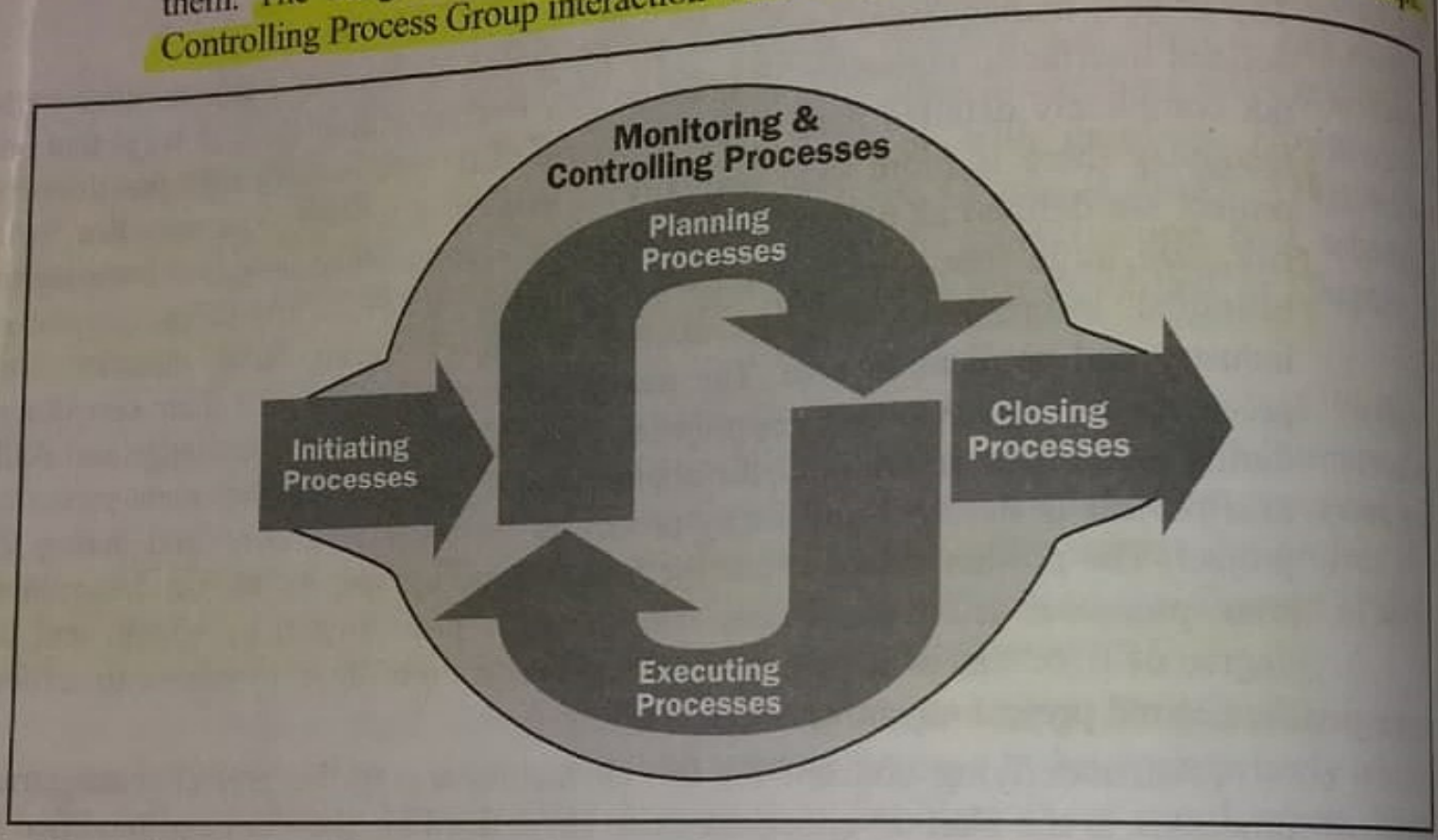


Figure 3-2. Project Management Process Groups Mapped to the Plan-Do-Check-Act Cycle

3.2 Project Management Process Groups

This section identifies and describes the five Project Management Process Groups required for any project. These five Process Groups have clear dependencies and are performed in the same sequence on each project. They are independent of application areas or industry focus. Individual Process Groups and individual constituent processes are often iterated prior to completing the project. Constituent processes also can have interactions both within a Process Group and among Process Groups.

The symbols for the process flow diagrams are shown in Figure 3-3:

- Process Groups
- Processes within the Process Groups
- Organizational Process Assets and Enterprise Environmental Factors, shown as inputs to and outputs...

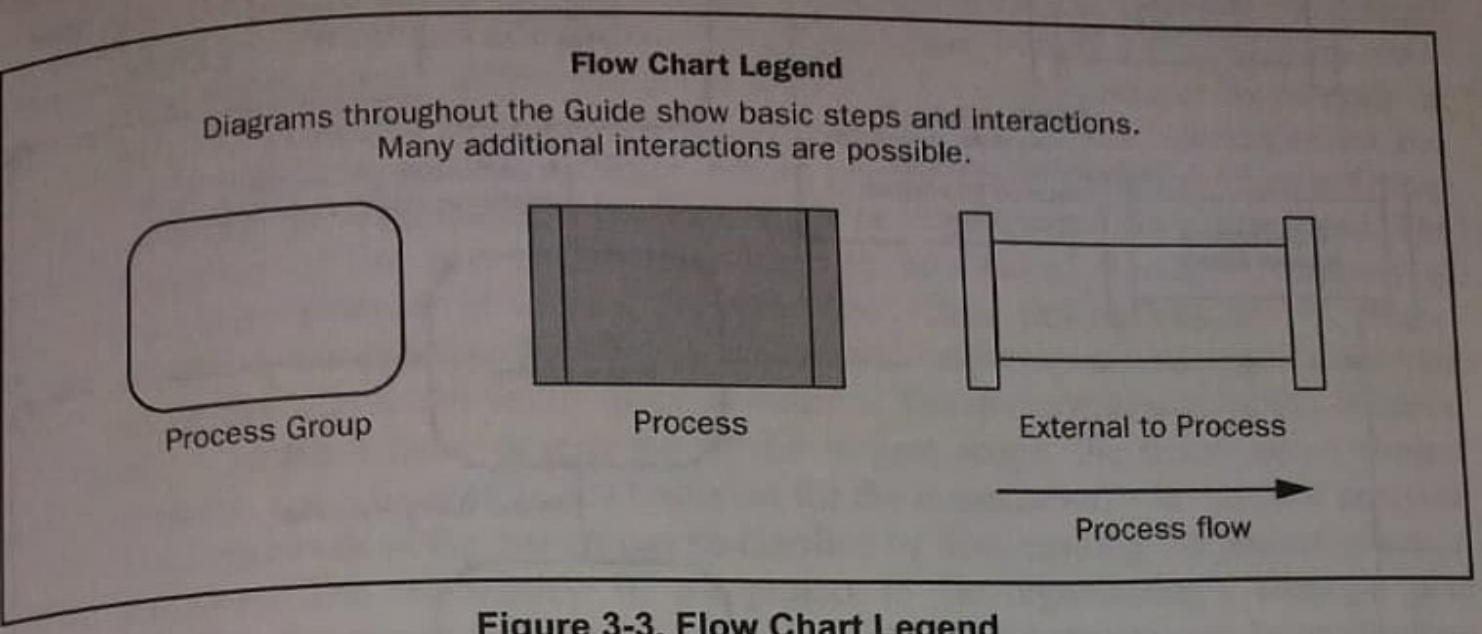
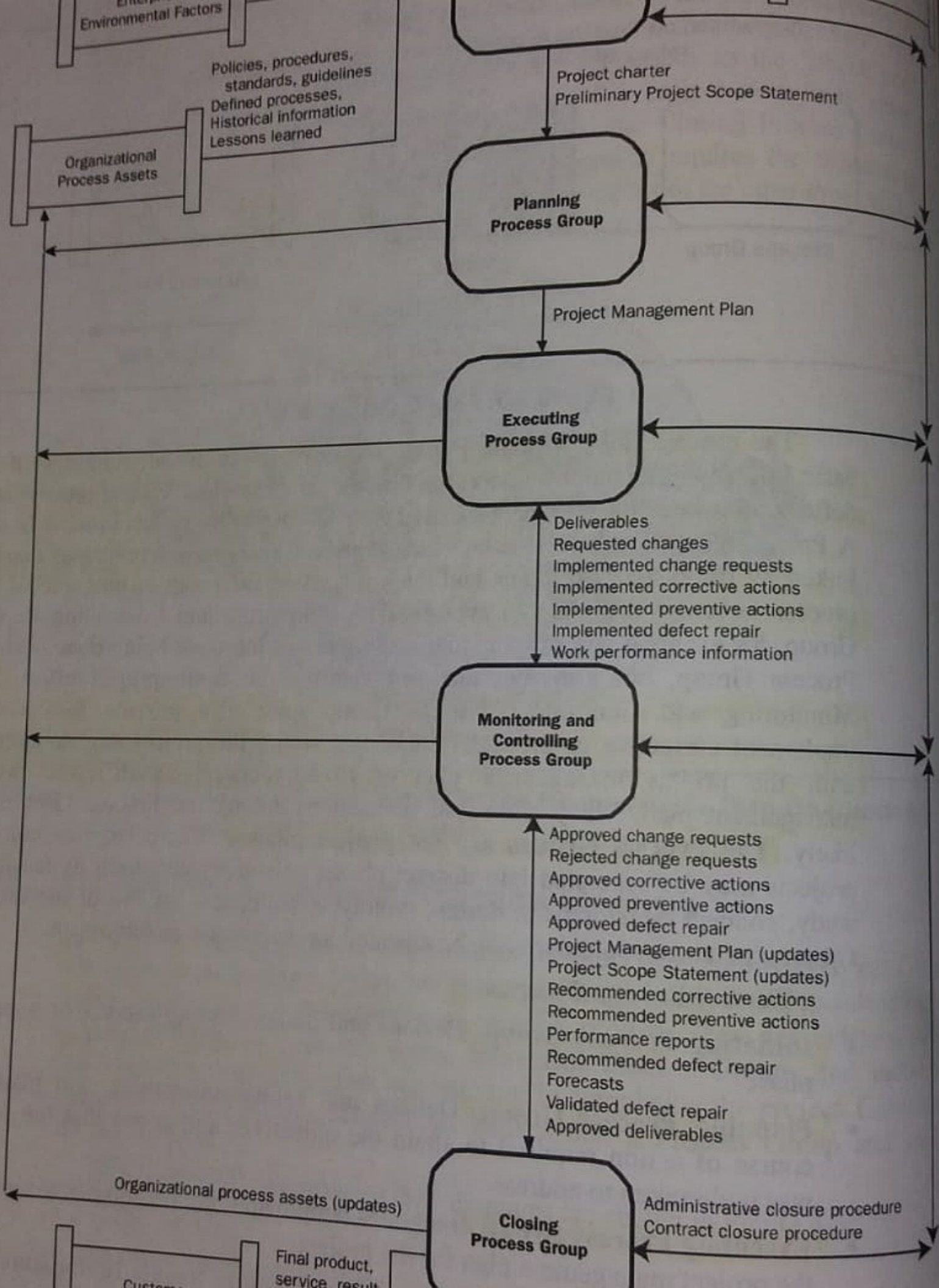


Figure 3-3. Flow Chart Legend

The process flow diagram, Figure 3-4, provides an overall summary of the basic flow and interactions among the Process Groups. An individual process may define and constrain how inputs are used to produce outputs for that Process Group. A Process Group includes the constituent project management processes that are linked by the respective inputs and outputs, that is, the result or outcome of one process becomes the input to another. The Monitoring and Controlling Process Group, for example, not only monitors and controls the work being done during a Process Group, but also monitors and controls the entire project effort. The Monitoring and Controlling Process Group must also provide feedback to implement corrective or preventive actions to bring the project into compliance with the project management plan or to appropriately modify the project management plan. Many additional interactions among the Process Groups are likely. **The Process Groups are not project phases.** Where large or complex projects may be separated into distinct phases or sub-projects such as feasibility study, concept development, design, prototype, build, test, etc. all of the Process Group processes would normally be repeated for each phase or subproject.

The five Process Groups are:

- **Initiating Process Group.** Defines and authorizes the project or a project phase.
- **Planning Process Group.** Defines and refines objectives, and plans the course of action required to attain the objectives and scope that the project was undertaken to address.
- **Executing Process Group.** Integrates people and other resources to carry out the project management plan for the project.
- **Monitoring and Controlling Process Group.** Regularly measures and monitors progress to identify variances from the project management plan so that corrective action can be taken when necessary to meet project objectives.


Environmental Factors
Policies, procedures, standards, guidelines
Defined processes,
Historical information
Lessons learned
Organizational Process Assets
Project charter
Preliminary Project Scope Statement
Planning Process Group
Project Management Plan
Executing Process Group
Deliverables
Requested changes
Implemented change requests
Implemented corrective actions
Implemented preventive actions
Implemented defect repair
Work performance information
Monitoring and Controlling Process Group
Approved change requests
Rejected change requests
Approved corrective actions
Approved preventive actions
Approved defect repair
Project Management Plan (updates)
Project Scope Statement (updates)
Recommended corrective actions
Recommended preventive actions
Performance reports
Recommended defect repair
Forecasts
Validated defect repair
Approved deliverables
Organizational process assets (updates)
Closing Process Group
Administrative closure procedure
Contract closure procedure
Final product,

3.2.1 Initiating Process Group

The Initiating Process Group consists of the processes that facilitate the formal authorization to start a new project or a project phase. Initiating processes are often done external to the project's scope of control by the organization or by program or portfolio processes (Figure 3-5), which may blur the project boundaries for the initial project inputs. For example, before beginning the Initiation Process Group activities, the organization's business needs or requirements are documented. The feasibility of the new undertaking may be established through a process of evaluating alternatives to pick the best one. Clear descriptions of the project objectives are developed, including the reasons why a specific project is the best alternative solution to satisfy the requirements. The documentation for this decision also contains a basic description of the project scope, the deliverables, project duration, and a forecast of the resources for the organization's investment analysis. The framework of the project can be clarified by documenting the project selection processes. The relationship of the project to the organization's strategic plan identifies the management responsibilities within the organization. In multi-phase projects, initiating processes are carried out during subsequent phases to validate the assumptions and decisions made during the original Develop Project Charter and Develop Preliminary Project Scope Statement processes.

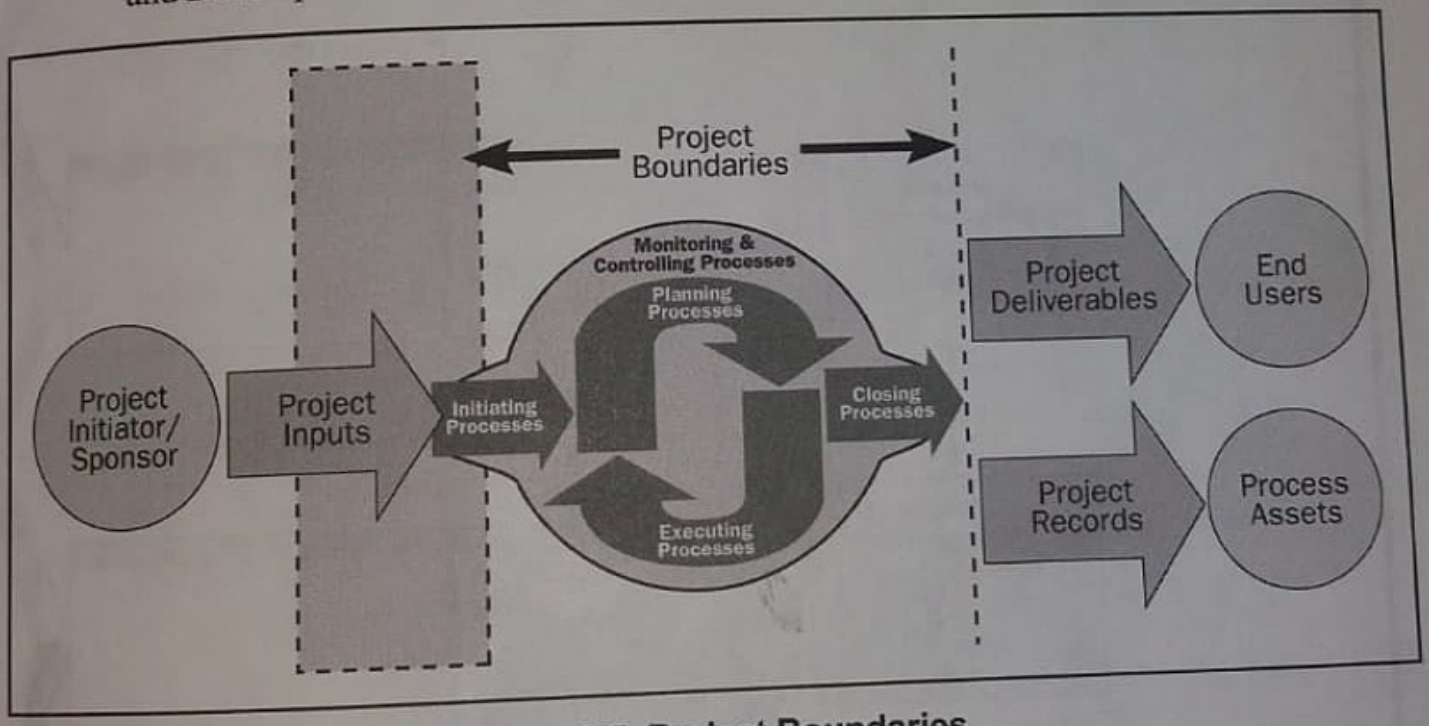


Figure 3-5. Project Boundaries

The initial scope description and the resources that the organization is willing to invest are further refined during the initiation process. If not already assigned, the project manager will be selected. Initial assumptions and constraints will also be documented. This information is captured in the Project Charter and, when it is approved, the project becomes officially authorized. Although the project management team may help write the Project Charter, approval and funding are handled external to the project boundaries.

The project management tea
processes and interactions to plan
organization. The Planning Process Group helps
sources with each having varying levels of completeness and confidence. The
planning processes develop the project management plan. These processes also
identify, define, and mature the project scope, project cost, and schedule the project
activities that occur within the project. As new project information is discovered,
additional dependencies, requirements, risks, opportunities, assumptions, and
constraints will be identified or resolved. The multi-dimensional nature of project
management causes repeated feedback loops for additional analysis. As more
project information or characteristics are gathered and understood, follow-on
actions may 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.

The frequency of iterating the planning processes is also affected. For
example, the project management plan, developed as an output of the Planning
Process Group, will have an emphasis on exploring all aspects of the scope,
technology, risks, and costs. Updates arising from approved changes during project
execution may significantly impact parts of the project management plan. Project
management plan updates provide greater precision with respect to schedule, costs,
and resource requirements to meet the defined project scope as a whole. Updates
can be limited to the activities and issues associated with the execution of a specific
phase. This progressive detailing of the project management plan is often called
"rolling wave planning," indicating that planning is an iterative and ongoing
process (see Figure 3-7).

While planning the project, the project team should involve all appropriate
stakeholders, depending upon their influence on the project and its outcomes. The
project team should use stakeholders in project planning since the stakeholders
have skills and knowledge that can be leveraged in developing the project
management plan and any subsidiary plans. The project team must create an
environment in which stakeholders can contribute appropriately.

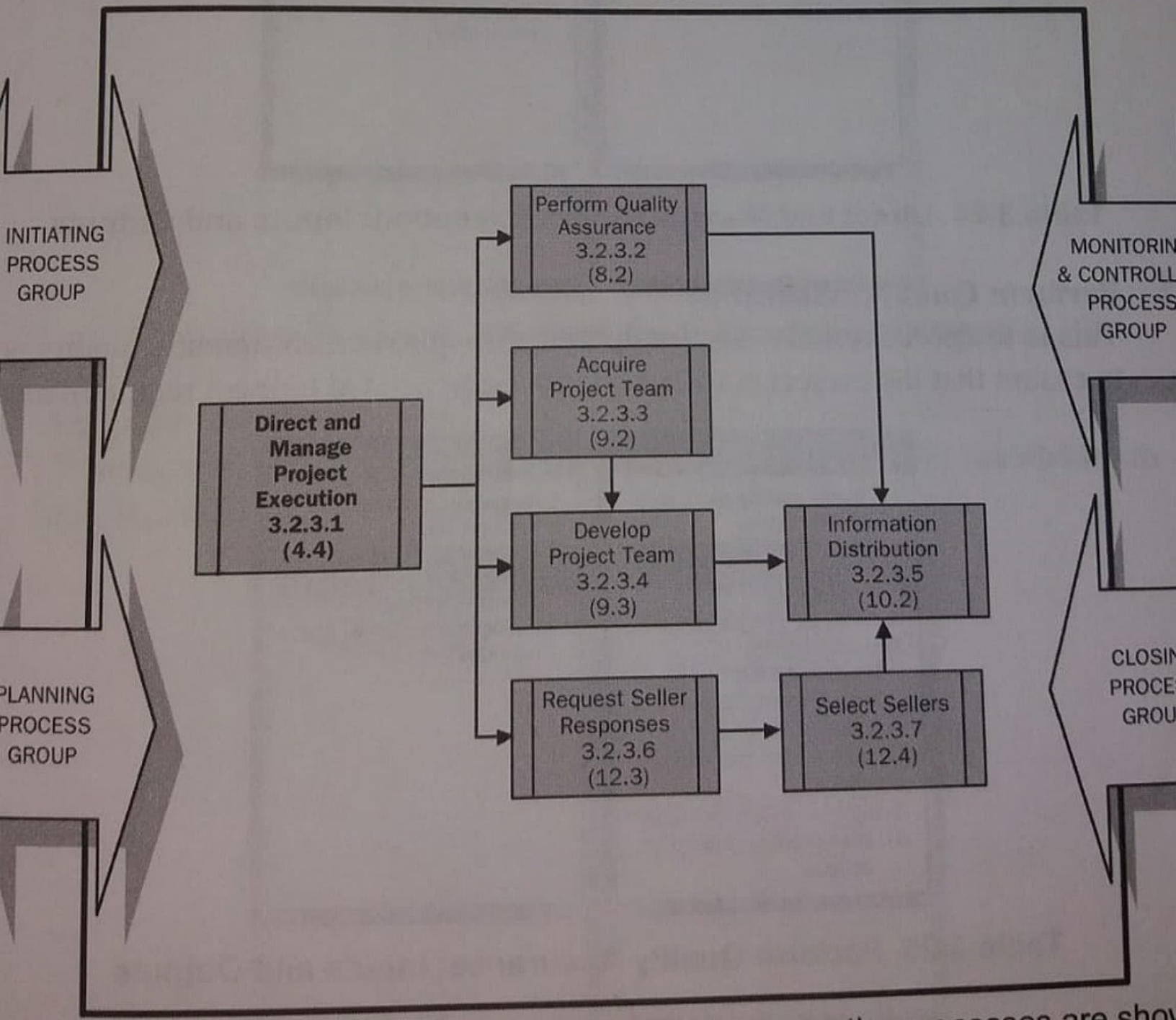
Since the feedback and refinement process cannot continue indefinitely,
procedures set by the organization identify when the planning effort ends. These
procedures will be affected by the nature of the project, the established project
boundaries, appropriate monitoring and controlling activities, as well as the
environment in which the project will be performed.

Other interactions among the processes within the Planning Process Group
are dependent on the nature of the project. For example, on some projects there will
be little or no identifiable risk until after most of the planning has been done. At
that time, the team might recognize that the cost and schedule targets are overly
aggressive, thus involving considerably
results of the

Table 3-23. Plan Contracting: Inputs and Outputs

2.3 Executing Process Group

The Executing Process Group consists of the processes used to complete the defined in the project management plan to accomplish the project's requirer The project team should determine which of the processes are required for the t specific project. This Process Group involves coordinating people and resourc well as integrating and performing the activities of the project in accordance w project management plan. This Process Group also addresses the scope defined project scope statement and implements approved changes (see Figure 3-8).



Note: Not all process interactions and data flow among the processes are shov

Figure 3-8. Executing Process Group

risks. Such variance
require an analysis. The results
approved, would modify the project
establishing a new baseline. The vast majority of the project's budget
expended in performing the Executing Process Group processes. The Exe
Process Group includes the following project management processes:

.1 Direct and Manage Project Execution

This is the process necessary for directing the various technical and organizat
interfaces that exist in the project to execute the work defined in the pro
management plan. The deliverables are produced as outputs from the proce
performed as defined in the project management plan. Information on
completion status of the deliverables and what work has been accomplished
collected as part of project execution and input to the performance repor
process.

Inputs	Outputs
.1 Project management plan .2 Approved corrective actions .3 Approved preventive actions .4 Approved change requests .5 Approved defect repair .6 Validated defect repair .7Administrative closure procedure	.1 Deliverables .2 Requested changes .3 Implemented change requests .4 Implemented corrective actions .5 Implemented preventive actions .6 Implemented defect repair .7 Work performance information

Table 3-24. Direct and Manage Project Execution: Inputs and Outputs

2 Perform Quality Assurance

This is the process necessary for applying the planned, systematic quality activit
to ensure that the project employs all processes needed to meet requirements.

Inputs	Outputs
.1 Quality management plan .2 Quality metrics .3 Process improvement plan .4 Work performance information .5 Approved change requests .6 Quality control measurements .7 Implemented change	.1 Requested changes .2 Recommended corrective actions .3 Organizational process assets (updates) .4 Project management plan (updates)

Monitoring and Controlling Process Group

The Monitoring and Controlling Process Group consists of those processe performed to observe project execution so that potential problems can be identifie in a timely manner and corrective action can be taken, when necessary, to contr the execution of the project. The project team should determine which of t processes are required for the team's specific project. The key benefit of t Process Group is that project performance is observed and measured regularly identify variances from the project management plan. The Monitoring Controlling Process Group also includes controlling changes and recommend preventive action in anticipation of possible problems. The Monitoring Controlling Processes Group includes, for example:

- Monitoring the ongoing project activities against the project manage plan and the project performance baseline
- Influencing the factors that could circumvent integrated change contr only approved changes are implemented.

This continuous monitoring provides the project team insight into the he the project and highlights any areas that require additional attention. The Mon and Controlling Process Group not only monitors and controls the work bein within a Process Group, but also monitors and controls the entire project ef multi-phase projects, the Monitoring and Controlling Process Group also p feedback between project phases, in order to implement corrective or pre actions to bring the project into compliance with the project management pla variances jeopardize the project objectives, appropriate project man processes within the Planning Process Group are revisited as part of the plan-do-check-act cycle. This review can result in recommended updat project management plan. For example, a missed activity finish date ca adjustments to the current staffing plan, reliance on overtime, or tradeoff budget and schedule objectives. Figure 3-9 indicates some of the process in that are essential to this Process Group.

3.2.5 Closing Process Group

The Closing Process Group includes the processes used to formally termin activities of a project or a project phase, hand off the completed product to oth close a cancelled project. This Process Group, when completed, verifies that defined processes are completed within all the Process Groups to close the pr or a project phase, as appropriate, and formally establishes that the proje project phase is finished. See Figure 3-10.

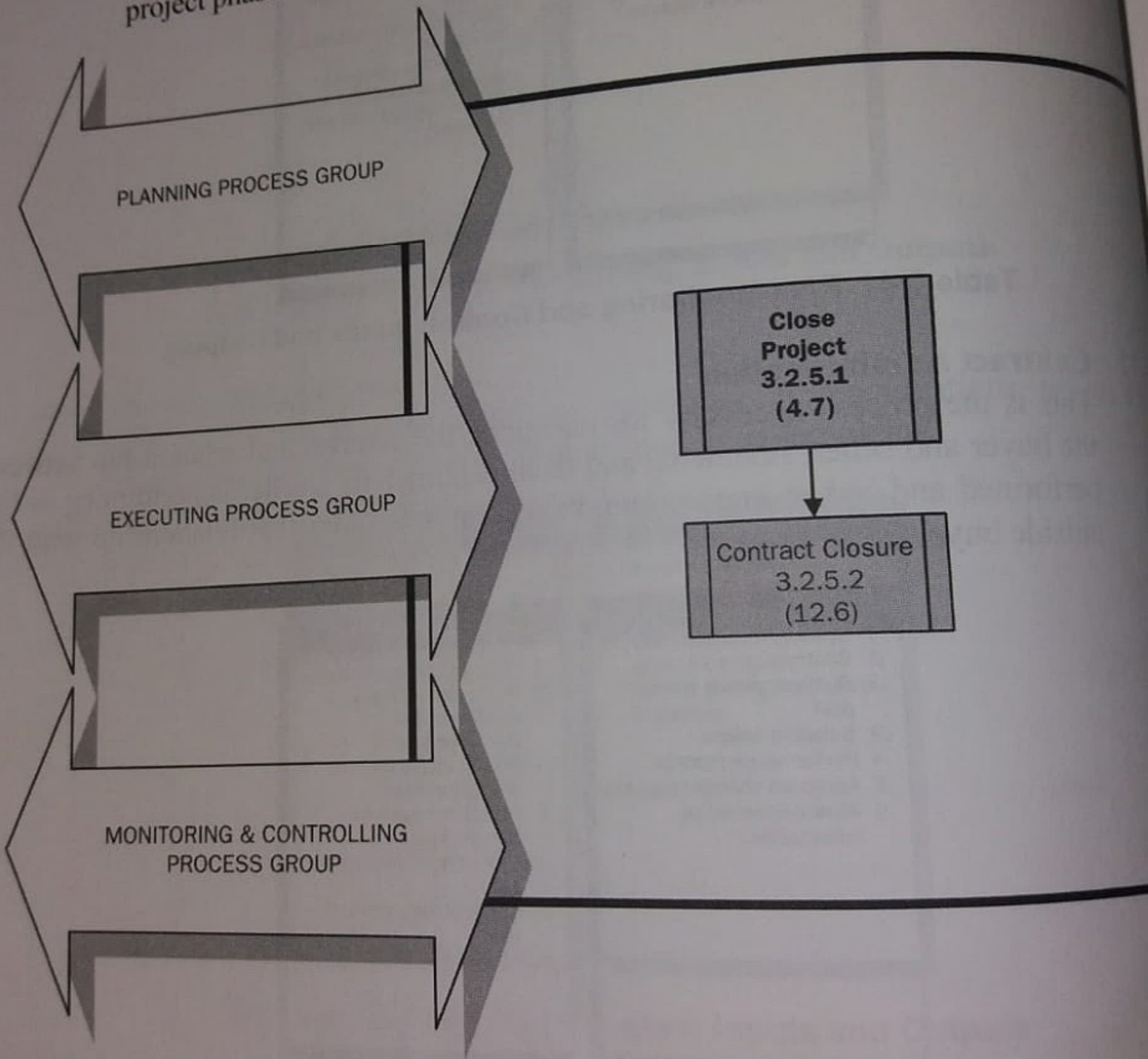


Figure 3-10. Closing Process Group

cess Interactions

t Management Process Groups are linked by the objectives t
of one process generally becomes an input to another
able of the project. The Planning Process Group provid
s Group a documented project management plan and projec
en updates the project management plan as the project prog
ocess Groups are seldom either discrete or one-time
ping activities that occur at varying levels of intensity thro
3-11 illustrates how the Process Groups interact and the
g times within a project. If the project is divided into p
interact within a project phase and also may cross the proje

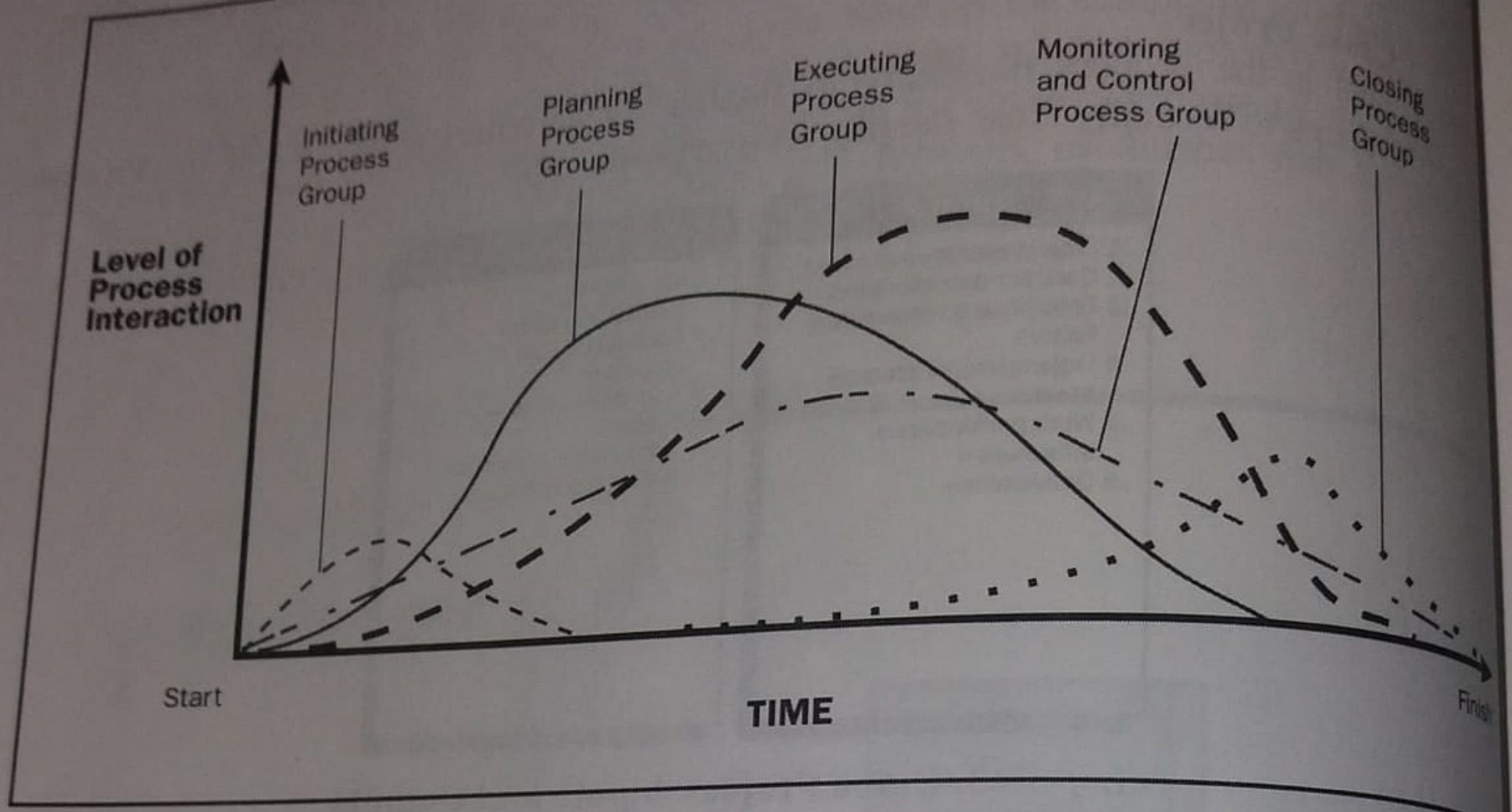


Figure 3-11. Process Groups Interact in a Project

Among the Process Groups and their processes, the process outputs are related and have an impact on the other Process Groups. For example, closing a design phase requires customer acceptance of the design document. Then, the design document defines the product description for the ensuing Executing Process Group. When a project is divided into phases, the Process Groups are normally repeated within each phase throughout the project's life to effectively drive the project to completion. The Process Groups

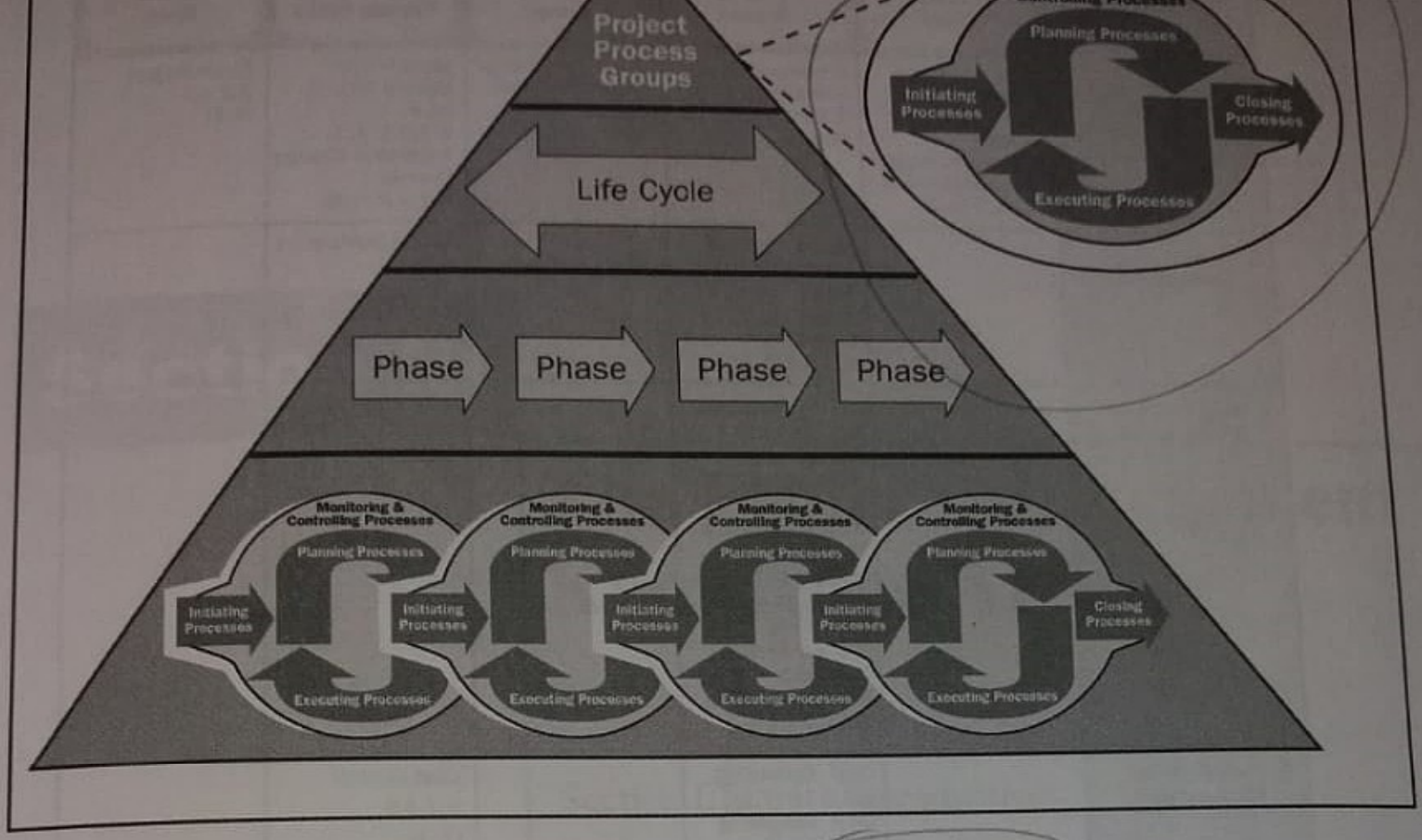


Figure 3-12. Project Management Process Group Triangle

However, just as not all of the processes will be needed on all projects, not all of the interactions will apply to all projects or project phases. For example:

- Projects that are dependent upon unique resources (e.g., commercial software development and biopharmaceuticals) can define roles and responsibilities prior to scope definition, since what can be done is dependent on who is available to do it.
- Some process inputs are predefined as constraints. For example, management can specify a target completion date rather than allowing that date to be determined by the planning process. An imposed completion date will often require scheduling backward from that date and can increase project risk, add cost, and compromise quality, or, in extreme cases, require a significant change in scope.

3.4 Project Management Process Mapping

Table 3-45 reflects the mapping of the 44 project management processes into the five Project Management Process Groups and the nine Project Management Knowledge Areas. Each of the required project management processes is shown in the Process Group in which **most** of the activity takes place. For instance, when a process that normally takes place during planning is revisited or updated during execution, it is still the same process that was performed in the planning process