Part 1

A Guide to the Project Management Body of Knowledge

(*PMBOK® GUIDE*)

The information contained in this part is not an American National Standard (ANS) and has not been processed in accordance with ANSI's requirements for an ANS. As such, the information in this part may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to an ANS standard.

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INTRODUCTION

1.1 OVERVIEW AND PURPOSE OF THIS GUIDE

Project management is not new. It has been in use for hundreds of years. Examples of project outcomes include:

- Pyramids of Giza,
- Olympic games,
- Great Wall of China,
- Taj Mahal,
- Publication of a children's book,
- Panama Canal,
- Development of commercial jet airplanes,
- Polio vaccine,
- Human beings landing on the moon,
- Commercial software applications,
- Portable devices to use the global positioning system (GPS), and
- Placement of the International Space Station into Earth's orbit.

The outcomes of these projects were the result of leaders and managers applying project management practices, principles, processes, tools, and techniques to their work. The managers of these projects used a set of key skills and applied knowledge to satisfy their customers and other people involved in and affected by the project. By the mid-20th century, project managers began the work of seeking recognition for project management as a profession. One aspect of this work involved obtaining agreement on the content of the body of knowledge (BOK) called project management. This BOK became known as the Project Management Body of Knowledge (PMBOK). The Project Management Institute (PMI) produced a baseline of charts and glossaries for the PMBOK. Project managers soon realized that no single book could contain the entire PMBOK. Therefore, PMI developed and published *A Guide to the Project Management Body of Knowledge (PMBOK® Guide).*

PMI defines the project management body of knowledge (PMBOK) as a term that describes the knowledge within the profession of project management. The project management body of knowledge includes proven traditional practices that are widely applied as well as innovative practices that are emerging in the profession.

The body of knowledge (BOK) includes both published and unpublished materials. This body of knowledge is constantly evolving. This *PMBOK® Guide* identifies a subset of the project management body of knowledge that is generally recognized as good practice.

- *Generally recognized* means the knowledge and practices described are applicable to most projects most of the time, and there is consensus about their value and usefulness.
- *Good practice* means there is general agreement that the application of the knowledge, skills, tools, and techniques to project management processes can enhance the chance of success over many projects in delivering the expected business values and results.

The project manager works with the project team and other stakeholders to determine and use the appropriate generally recognized good practices for each project. Determining the appropriate combination of processes, inputs, tools, techniques, outputs and life cycle phases to manage a project is referred to as "tailoring" the application of the knowledge described in this guide.

This *PMBOK® Guide* is different from a methodology. A methodology is a system of practices, techniques, procedures, and rules used by those who work in a discipline. This *PMBOK® Guide* is a foundation upon which organizations can build methodologies, policies, procedures, rules, tools and techniques, and life cycle phases needed to practice project management.

1.1.1 THE STANDARD FOR PROJECT MANAGEMENT

This guide is based on *The Standard for Project Management* [1]. A standard is a document established by an authority, custom, or general consent as a model or example. As an American National Standards Institute (ANSI) standard, *The Standard for Project Management* was developed using a process based on the concepts of consensus, openness, due process, and balance. *The Standard for Project Management* is a foundational reference for PMI's project management professional development programs and the practice of project management. Because project management needs to be tailored to fit the needs of the project, the standard and the guide are both based on *descriptive* practices, rather than *prescriptive* practices. Therefore, the standard identifies the processes that are considered good practices on most projects, most of the time. The standard also identifies the inputs and outputs that are usually associated with those processes. The standard does not require that any particular process or practice be performed. *The Standard for Project Management* is included as Part II of *A Guide to the Project Management Body of Knowledge (PMBOK® Guide).*

The *PMBOK® Guide* provides more detail about key concepts, emerging trends, considerations for tailoring the project management processes, and information on how tools and techniques are applied to projects. Project managers may use one or more methodologies to implement the project management processes outlined in the standard.

The scope of this guide is limited to the discipline of project management, rather than the full spectrum of portfolios, programs, and projects. Portfolios and programs will be addressed only to the degree they interact with projects. PMI publishes two other standards that address the management of portfolios and programs:

- *The Standard for Portfolio Management* [2], and
- *The Standard for Program Management* [3].

1.1.2 COMMON VOCABULARY

A common vocabulary is an essential element of a professional discipline. *The PMI Lexicon of Project Management Terms* [4] provides the foundational professional vocabulary that can be consistently used by organizations, portfolio, program, and project managers and other project stakeholders. The *Lexicon* will continue to evolve over time. The glossary to this guide includes the vocabulary in the *Lexicon* along with additional definitions. There may be other industry-specific terms used in projects that are defined by that industry's literature.

1.1.3 CODE OF ETHICS AND PROFESSIONAL CONDUCT

PMI publishes the *Code of Ethics and Professional Conduct* [5] to instill confidence in the project management profession and to help an individual in making wise decisions, particularly when faced with difficult situations where the individual may be asked to compromise his or her integrity or values. The values that the global project management community defined as most important were responsibility, respect, fairness, and honesty. The *Code of Ethics and Professional Conduct* affirms these four values as its foundation.

The *Code of Ethics and Professional Conduct* includes both aspirational standards and mandatory standards. The aspirational standards describe the conduct that practitioners, who are also PMI members, certification holders, or volunteers, strive to uphold. Although adherence to the aspirational standards is not easily measured, conduct in accordance with these is an expectation for those who consider themselves to be professionals—it is not optional. The mandatory standards establish firm requirements and, in some cases, limit or prohibit practitioner behavior. Practitioners who are also PMI members, certification holders, or volunteers and who do not conduct themselves in accordance with these standards will be subject to disciplinary procedures before PMI's Ethics Review Committee.

1.2 FOUNDATIONAL ELEMENTS

This section describes foundational elements necessary for working in and understanding the discipline of project management.

1.2.1 PROJECTS

A project is a temporary endeavor undertaken to create a unique product, service, or result.

- **Unique product, service, or result.** Projects are undertaken to fulfill objectives by producing deliverables. An objective is defined as an outcome toward which work is to be directed, a strategic position to be attained, a purpose to be achieved, a result to be obtained, a product to be produced, or a service to be performed. A deliverable is defined as any unique and verifiable product, result, or capability to perform a service that is required to be produced to complete a process, phase, or project. Deliverables may be tangible or intangible.

  Fulfillment of project objectives may produce one or more of the following deliverables:

  - A unique product that can be either a component of another item, an enhancement or correction to an item, or a new end item in itself (e.g., the correction of a defect in an end item);
  - A unique service or a capability to perform a service (e.g., a business function that supports production or distribution);
  - A unique result, such as an outcome or document (e.g., a research project that develops knowledge that can be used to determine whether a trend exists or a new process will benefit society); and
  - A unique combination of one or more products, services, or results (e.g., a software application, its associated documentation, and help desk services).

  Repetitive elements may be present in some project deliverables and activities. This repetition does not change the fundamental and unique characteristics of the project work. For example, office buildings can be constructed with the same or similar materials and by the same or different teams. However, each building project remains unique in key characteristics (e.g., location, design, environment, situation, people involved).

  Projects are undertaken at all organizational levels. A project can involve a single individual or a group. A project can involve a single organizational unit or multiple organizational units from multiple organizations.

Examples of projects include but are not limited to:

- Developing a new pharmaceutical compound for market,
- Expanding a tour guide service,
- Merging two organizations,
- Improving a business process within an organization,
- Acquiring and installing a new computer hardware system for use in an organization,
- Exploring for oil in a region,
- Modifying a computer software program used in an organization,
- Conducting research to develop a new manufacturing process, and
- Constructing a building.

◆ **Temporary endeavor.** The temporary nature of projects indicates that a project has a definite beginning and end. Temporary does not necessarily mean a project has a short duration. The end of the project is reached when one or more of the following is true:

- The project's objectives have been achieved;
- The objectives will not or cannot be met;
- Funding is exhausted or no longer available for allocation to the project;
- The need for the project no longer exists (e.g., the customer no longer wants the project completed, a change in strategy or priority ends the project, the organizational management provides direction to end the project);
- The human or physical resources are no longer available; or
- The project is terminated for legal cause or convenience.

Projects are temporary, but their deliverables may exist beyond the end of the project. Projects may produce deliverables of a social, economic, material, or environmental nature. For example, a project to build a national monument will create a deliverable expected to last for centuries.

- **Projects drive change.** Projects drive change in organizations. From a business perspective, a project is aimed at moving an organization from one state to another state in order to achieve a specific objective (see Figure 1-1). Before the project begins, the organization is commonly referred to as being in the current state. The desired result of the change driven by the project is described as the future state.

  For some projects, this may involve creating a transition state where multiple steps are made along a continuum to achieve the future state. The successful completion of a project results in the organization moving to the future state and achieving the specific objective. For more information on project management and change, see *Managing Change in Organizations: A Practice Guide* [6].

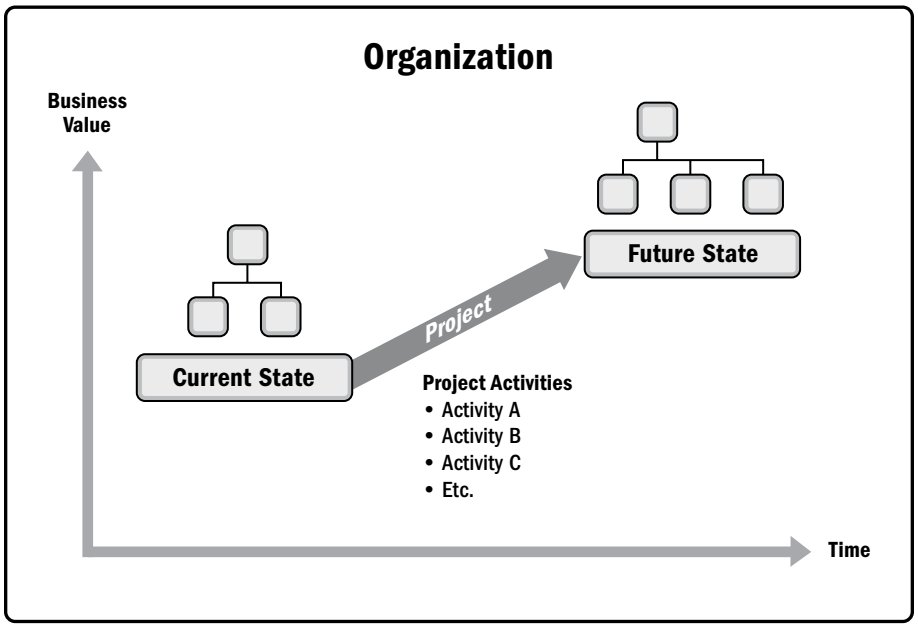

Figure 1-1. Organizational State Transition via a Project

- **Projects enable business value creation.** PMI defines business value as the net quantifiable benefit derived from a business endeavor. The benefit may be tangible, intangible, or both. In business analysis, business value is considered the return, in the form of elements such as time, money, goods, or intangibles in return for something exchanged (see *Business Analysis for Practitioners: A Practice Guide*, p. 185 [7]).

  Business value in projects refers to the benefit that the results of a specific project provide to its stakeholders. The benefit from projects may be tangible, intangible, or both.

  Examples of tangible elements include:

  - Monetary assets,
  - Stockholder equity,
  - Utility,
  - Fixtures,
  - Tools, and
  - Market share.

  Examples of intangible elements include:

  - Goodwill,
  - Brand recognition,
  - Public benefit,
  - Trademarks,
  - Strategic alignment, and
  - Reputation.

- **Project Initiation Context.** Organizational leaders initiate projects in response to factors acting upon their organizations. There are four fundamental categories for these factors, which illustrate the context of a project (see Figure 1-2):

  - Meet regulatory, legal, or social requirements;
  - Satisfy stakeholder requests or needs;
  - Implement or change business or technological strategies; and
  - Create, improve, or fix products, processes, or services.

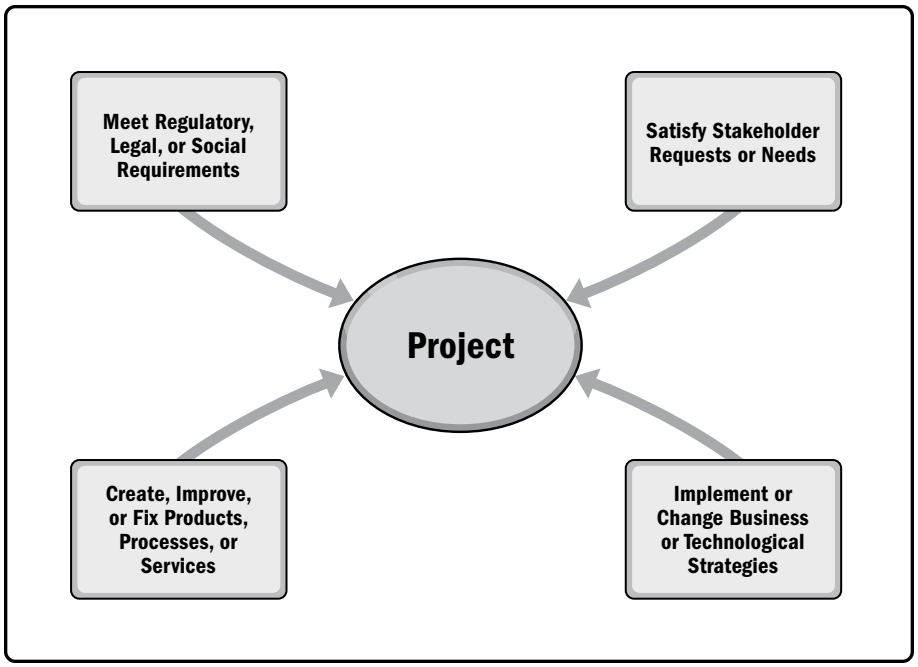

Figure 1-2. Project Initiation Context

These factors influence an organization's ongoing operations and business strategies. Leaders respond to these factors in order to keep the organization viable. Projects provide the means for organizations to successfully make the changes necessary to deal with these factors. These factors ultimately should link to the strategic objectives of the organization and the business value of each project.

Table 1-1 illustrates how example factors could align with one or more of the fundamental factor categories.

Table 1-1. Examples of Factors that Lead to the Creation of a Project

Specific Factor	Examples of Specific Factors	Meet Regulatory, Legal, or Social Requirements	Satisfy Stakeholder Requests or Needs	Create, Improve, or Fix Products, Processes, or Services	Implement or Change Business or Technological Strategies
New technology	An electronics firm authorizes a new project to develop a faster, cheaper, and smaller laptop based on advances in computer memory and electronics technology			X	X
Competitive forces	Lower pricing on products by a competitor results in the need to lower production costs to remain competitive				X
Material issues	A municipal bridge developed cracks in some support members resulting in a project to fix the problems	X		X	
Political changes	A newly elected official instigating project funding changes to a current project				X
Market demand	A car company authorizes a project to build more fuel-efficient cars in response to gasoline shortages		X	X	X
Economic changes	An economic downturn results in a change in the priorities for a current project				X
Customer request	An electric utility authorizes a project to build a substation to serve a new industrial park		X	X	
Stakeholder demands	A stakeholder requires that a new output be produced by the organization		X		
Legal requirement	A chemical manufacturer authorizes a project to establish guidelines for the proper handling of a new toxic material	X			
Business process improvements	An organization implements a project resulting from a Lean Six Sigma value stream mapping exercise			X	
Strategic opportunity or business need	A training company authorizes a project to create a new course to increase its revenues			X	X
Social need	A nongovernmental organization in a developing country authorizes a project to provide potable water systems, latrines, and sanitation education to communities suffering from high rates of infectious diseases		X		
Environmental considerations	A public company authorizes a project to create a new service for electric car sharing to reduce pollution			X	X

1.2.2 THE IMPORTANCE OF PROJECT MANAGEMENT

Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. Project management is accomplished through the appropriate application and integration of the project management processes identified for the project. Project management enables organizations to execute projects effectively and efficiently.

Effective project management helps individuals, groups, and public and private organizations to:

- Meet business objectives;
- Satisfy stakeholder expectations;
- Be more predictable;
- Increase chances of success;
- Deliver the right products at the right time;
- Resolve problems and issues;
- Respond to risks in a timely manner;
- Optimize the use of organizational resources;
- Identify, recover, or terminate failing projects;
- Manage constraints (e.g., scope, quality, schedule, costs, resources);
- Balance the influence of constraints on the project (e.g., increased scope may increase cost or schedule); and
- Manage change in a better manner.

Poorly managed projects or the absence of project management may result in:

- Missed deadlines,
- Cost overruns,
- Poor quality,
- Rework,
- Uncontrolled expansion of the project,
- Loss of reputation for the organization,
- Unsatisfied stakeholders, and
- Failure in achieving the objectives for which the project was undertaken.

Projects are a key way to create value and benefits in organizations. In today's business environment, organizational leaders need to be able to manage with tighter budgets, shorter timelines, scarcity of resources, and rapidly changing technology. The business environment is dynamic with an accelerating rate of change. To remain competitive in the world economy, companies are embracing project management to consistently deliver business value.

Effective and efficient project management should be considered a strategic competency within organizations. It enables organizations to:

- Tie project results to business goals,
- Compete more effectively in their markets,
- Sustain the organization, and
- Respond to the impact of business environment changes on projects by appropriately adjusting project management plans (see Section 4.2).

1.2.3 RELATIONSHIP OF PROJECT, PROGRAM, PORTFOLIO, AND OPERATIONS MANAGEMENT

1.2.3.1 OVERVIEW

Using project management processes, tools, and techniques puts in place a sound foundation for organizations to achieve their goals and objectives. A project may be managed in three separate scenarios: as a stand-alone project (outside of a portfolio or program), within a program, or within a portfolio. Project managers interact with portfolio and program managers when a project is within a program or portfolio. For example, multiple projects may be needed to accomplish a set of goals and objectives for an organization. In those situations, projects may be grouped together into a program. A program is defined as a group of related projects, subsidiary programs, and program activities managed in a coordinated manner to obtain benefits not available from managing them individually. Programs are not large projects. A very large project may be referred to as a megaproject. As a guideline, megaprojects cost US$1billion or more, affect 1 million or more people, and run for years.

Some organizations may employ the use of a project portfolio to effectively manage multiple programs and projects that are underway at any given time. A portfolio is defined as projects, programs, subsidiary portfolios, and operations managed as a group to achieve strategic objectives. Figure 1-3 illustrates an example of how portfolios, programs, projects, and operations are related in a specific situation.

Program management and portfolio management differ from project management in their life cycles, activities, objectives, focus, and benefits. However, portfolios, programs, projects, and operations often engage with the same stakeholders and may need to use the same resources (see Figure 1-3), which may result in a conflict in the organization. This type of a situation increases the need for coordination within the organization through the use of portfolio, program, and project management to achieve a workable balance in the organization.

Figure 1-3 illustrates a sample portfolio structure indicating relationships between the programs, projects, shared resources, and stakeholders. The portfolio components are grouped together in order to facilitate the effective governance and management of the work that helps to achieve organizational strategies and priorities. Organizational and portfolio planning impact the components by means of prioritization based on risk, funding, and other considerations. The portfolio view allows organizations to see how the strategic goals are reflected in the portfolio. This portfolio view also enables the implementation and coordination of appropriate portfolio, program, and project governance. This coordinated governance allows authorized allocation of human, financial, and physical resources based on expected performance and benefits.

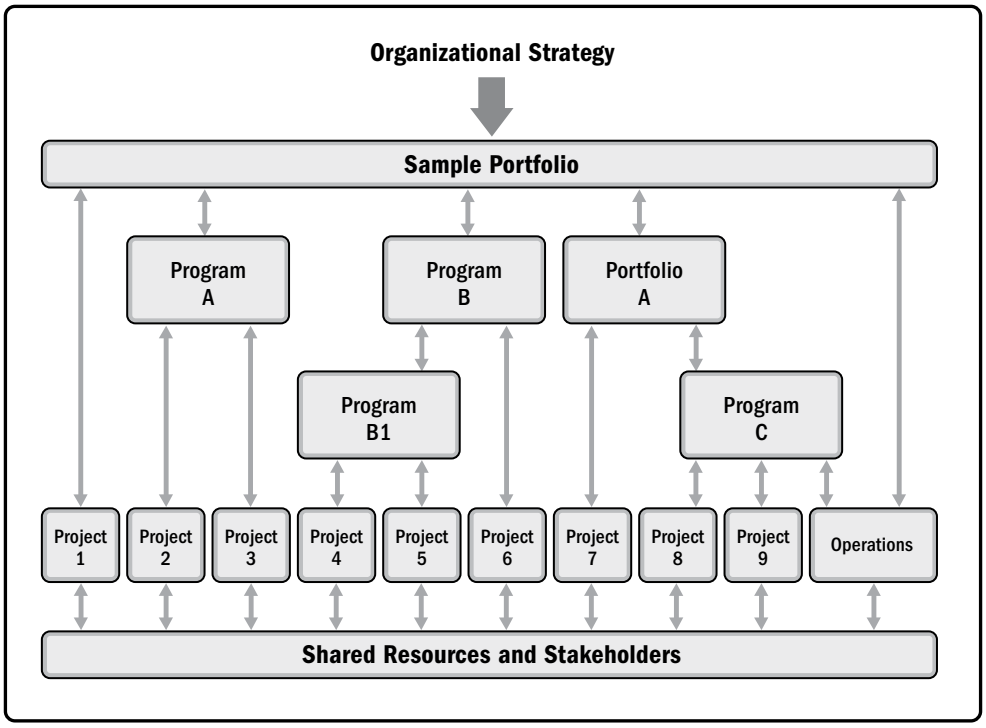

Figure 1-3. Portfolio, Programs, Projects, and Operations

Looking at project, program, and portfolio management from an organizational perspective:

- Program and project management focus on doing programs and projects the "right" way; and
- Portfolio management focuses on doing the "right" programs and projects.

Table 1-2 gives a comparative overview of portfolios, programs, and projects.

Table 1-2. Comparative Overview of Portfolios, Programs, and Projects

Organizational Project Management			
	Projects	**Programs**	**Portfolios**
Definition	A project is a temporary endeavor undertaken to create a unique product, service, or result.	A program is a group of related projects, subsidiary programs, and program activities that are managed in a coordinated manner to obtain benefits not available from managing them individually.	A portfolio is a collection of projects, programs, subsidiary portfolios, and operations managed as a group to achieve strategic objectives.
Scope	Projects have defined objectives. Scope is progressively elaborated throughout the project life cycle.	Programs have a scope that encompasses the scopes of its program components. Programs produce benefits to an organization by ensuring that the outputs and outcomes of program components are delivered in a coordinated and complementary manner.	Portfolios have an organizational scope that changes with the strategic objectives of the organization.
Change	Project managers expect change and implement processes to keep change managed and controlled.	Programs are managed in a manner that accepts and adapts to change as necessary to optimize the delivery of benefits as the program's components deliver outcomes and/or outputs.	Portfolio managers continuously monitor changes in the broader internal and external environments.
Planning	Project managers progressively elaborate high-level information into detailed plans throughout the project life cycle.	Programs are managed using high-level plans that track the interdependencies and progress of program components. Program plans are also used to guide planning at the component level.	Portfolio managers create and maintain necessary processes and communication relative to the aggregate portfolio.
Management	Project managers manage the project team to meet the project objectives.	Programs are managed by program managers who ensure that program benefits are delivered as expected, by coordinating the activities of a program's components.	Portfolio managers may manage or coordinate portfolio management staff, or program and project staff that may have reporting responsibilities into the aggregate portfolio.
Monitoring	Project managers monitor and control the work of producing the products, services, or results that the project was undertaken to produce.	Program managers monitor the progress of program components to ensure the overall goals, schedules, budget, and benefits of the program will be met.	Portfolio managers monitor strategic changes and aggregate resource allocation, performance results, and risk of the portfolio.
Success	Success is measured by product and project quality, timeliness, budget compliance, and degree of customer satisfaction.	A program's success is measured by the program's ability to deliver its intended benefits to an organization, and by the program's efficiency and effectiveness in delivering those benefits.	Success is measured in terms of the aggregate investment performance and benefit realization of the portfolio.

1.2.3.2 PROGRAM MANAGEMENT

Program management is defined as the application of knowledge, skills, and principles to a program to achieve the program objectives and to obtain benefits and control not available by managing program components individually. A program component refers to projects and other programs within a program. Project management focuses on interdependencies within a project to determine the optimal approach for managing the project. Program management focuses on the interdependencies between projects and between projects and the program level to determine the optimal approach for managing them. Actions related to these program and project-level interdependencies may include:

- Aligning with the organizational or strategic direction that affects program and project goals and objectives;
- Allocating the program scope into program components;
- Managing interdependencies among the components of the program to best serve the program;
- Managing program risks that may impact multiple projects in the program;
- Resolving constraints and conflicts that affect multiple projects within the program;
- Resolving issues between component projects and the program level;
- Managing change requests within a shared governance framework;
- Allocating budgets across multiple projects within the program; and
- Assuring benefits realization from the program and component projects.

An example of a program is a new communications satellite system with projects for the design and construction of the satellite and the ground stations, the launch of the satellite, and the integration of the system.

For more information on program management, see *The Standard for Program Management* [3].

1.2.3.3 PORTFOLIO MANAGEMENT

A portfolio is defined as projects, programs, subsidiary portfolios, and operations managed as a group to achieve strategic objectives.

Portfolio management is defined as the centralized management of one or more portfolios to achieve strategic objectives. The programs or projects of the portfolio may not necessarily be interdependent or directly related.

The aim of portfolio management is to:

- Guide organizational investment decisions.
- Select the optimal mix of programs and projects to meet strategic objectives.
- Provide decision-making transparency.
- Prioritize team and physical resource allocation.
- Increase the likelihood of realizing the desired return on investment.
- Centralize the management of the aggregate risk profile of all components.

Portfolio management also confirms that the portfolio is consistent with and aligned with organizational strategies.

Maximizing the value of the portfolio requires careful examination of the components that comprise the portfolio. Components are prioritized so that those contributing the most to the organization's strategic objectives have the required financial, team, and physical resources.

For example, an infrastructure organization that has the strategic objective of maximizing the return on its investments may put together a portfolio that includes a mix of projects in oil and gas, power, water, roads, rail, and airports. From this mix, the organization may choose to manage related projects as one portfolio. All of the power projects may be grouped together as a power portfolio. Similarly, all of the water projects may be grouped together as a water portfolio. However, when the organization has projects in designing and constructing a power plant and then operates the power plant to generate energy, those related projects can be grouped in one program. Thus, the power program and similar water program become integral components of the portfolio of the infrastructure organization.

For more information on portfolio management, see *The Standard for Portfolio Management* [2].

1.2.3.4 OPERATIONS MANAGEMENT

Operations management is an area that is outside the scope of formal project management as described in this guide.

Operations management is concerned with the ongoing production of goods and/or services. It ensures that business operations continue efficiently by using the optimal resources needed to meet customer demands. It is concerned with managing processes that transform inputs (e.g., materials, components, energy, and labor) into outputs (e.g., products, goods, and/or services).

1.2.3.5 OPERATIONS AND PROJECT MANAGEMENT

Changes in business or organizational operations may be the focus of a project—especially when there are substantial changes to business operations as a result of a new product or service delivery. Ongoing operations are outside of the scope of a project; however, there are intersecting points where the two areas cross.

Projects can intersect with operations at various points during the product life cycle, such as;

- When developing a new product, upgrading a product, or expanding outputs;
- While improving operations or the product development process;
- At the end of the product life cycle; and
- At each closeout phase.

At each point, deliverables and knowledge are transferred between the project and operations for implementation of the delivered work. This implementation occurs through a transfer of project resources or knowledge to operations or through a transfer of operational resources to the project.

1.2.3.6 ORGANIZATIONAL PROJECT MANAGEMENT (OPM) AND STRATEGIES

Portfolios, programs, and projects are aligned with or driven by organizational strategies and differ in the way each contributes to the achievement of strategic goals:

- Portfolio management aligns portfolios with organizational strategies by selecting the right programs or projects, prioritizing the work, and providing the needed resources.
- Program management harmonizes its program components and controls interdependencies in order to realize specified benefits.
- Project management enables the achievement of organizational goals and objectives.

Within portfolios or programs, projects are a means of achieving organizational goals and objectives. This is often accomplished in the context of a strategic plan that is the primary factor guiding investments in projects. Alignment with the organization's strategic business goals can be achieved through the systematic management of portfolios, programs, and projects through the application of organizational project management (OPM). OPM is defined as a framework in which portfolio, program, and project management are integrated with organizational enablers in order to achieve strategic objectives.

The purpose of OPM is to ensure that the organization undertakes the right projects and allocates critical resources appropriately. OPM also helps to ensure that all levels in the organization understand the strategic vision, the initiatives that support the vision, the objectives, and the deliverables. Figure 1-4 shows the organizational environment where strategy, portfolio, programs, projects, and operations interact.

For more information on OPM, refer to *Implementing Organizational Project Management: A Practice Guide* [8].

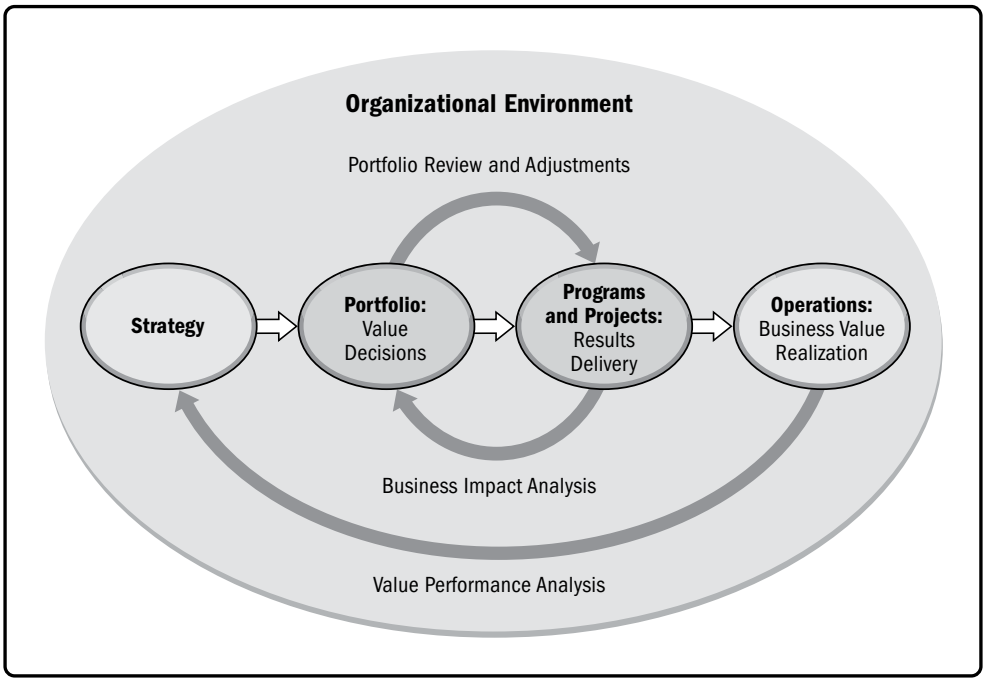

Figure 1-4. Organizational Project Management

1.2.4 COMPONENTS OF THE GUIDE

Projects comprise several key components that, when effectively managed, result in their successful completion. This guide identifies and explains these components. The various components interrelate to one another during the management of a project.

The key components are described briefly in Table 1-3. These components are more fully explained in the sections that follow the table.

Table 1-3. Description of *PMBOK® Guide* Key Components

PMBOK® Guide Key Component	Brief Description
Project life cycle (Section 1.2.4.1)	The series of phases that a project passes through from its start to its completion.
Project phase (Section 1.2.4.2)	A collection of logically related project activities that culminates in the completion of one or more deliverables.
Phase gate (Section 1.2.4.3)	A review at the end of a phase in which a decision is made to continue to the next phase, to continue with modification, or to end a program or project.
Project management processes (Section 1.2.4.4)	A systematic series of activities directed toward causing an end result where one or more inputs will be acted upon to create one or more outputs.
Project Management Process Group (Section 1.2.4.5)	A logical grouping of project management inputs, tools and techniques, and outputs. The Project Management Process Groups include Initiating, Planning, Executing, Monitoring and Controlling, and Closing. Project Management Process Groups are not project phases.
Project Management Knowledge Area (Section 1.2.4.6)	An identified area of project management defined by its knowledge requirements and described in terms of its component processes, practices, inputs, outputs, tools, and techniques.

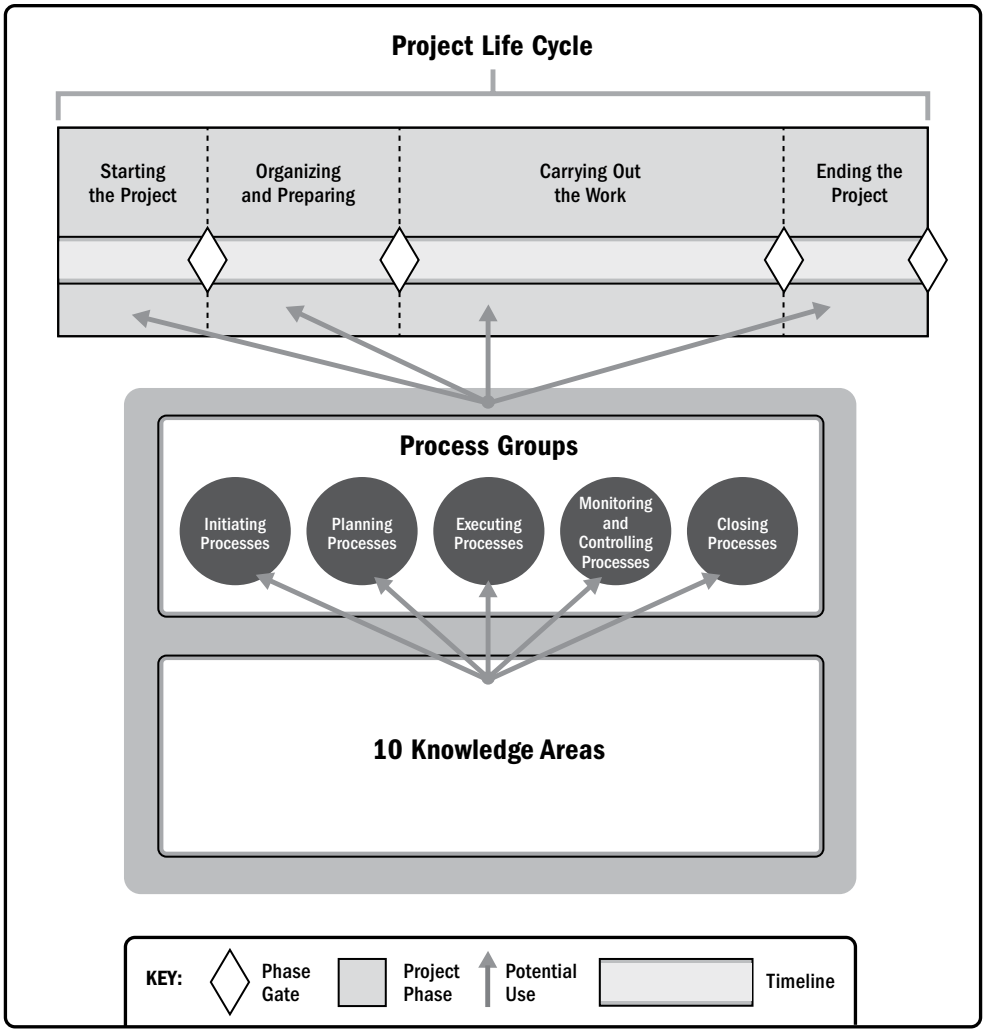

Figure 1-5. Interrelationship of *PMBOK® Guide* Key Components in Projects

1.2.4.1 PROJECT AND DEVELOPMENT LIFE CYCLES

A project life cycle is the series of phases that a project passes through from its start to its completion. It provides the basic framework for managing the project. This basic framework applies regardless of the specific project work involved. The phases may be sequential, iterative, or overlapping. All projects can be mapped to the generic life cycle shown in Figure 1-5.

Project life cycles can be predictive or adaptive. Within a project life cycle, there are generally one or more phases that are associated with the development of the product, service, or result. These are called a development life cycle. Development life cycles can be predictive, iterative, incremental, adaptive, or a hybrid model:

- In a predictive life cycle, the project scope, time, and cost are determined in the early phases of the life cycle. Any changes to the scope are carefully managed. Predictive life cycles may also be referred to as waterfall life cycles.
- In an iterative life cycle, the project scope is generally determined early in the project life cycle, but time and cost estimates are routinely modified as the project team's understanding of the product increases. Iterations develop the product through a series of repeated cycles, while increments successively add to the functionality of the product.
- In an incremental life cycle, the deliverable is produced through a series of iterations that successively add functionality within a predetermined time frame. The deliverable contains the necessary and sufficient capability to be considered complete only after the final iteration.
- Adaptive life cycles are agile, iterative, or incremental. The detailed scope is defined and approved before the start of an iteration. Adaptive life cycles are also referred to as agile or change-driven life cycles. See Appendix X3.
- A hybrid life cycle is a combination of a predictive and an adaptive life cycle. Those elements of the project that are well known or have fixed requirements follow a predictive development life cycle, and those elements that are still evolving follow an adaptive development life cycle.

It is up to the project management team to determine the best life cycle for each project. The project life cycle needs to be flexible enough to deal with the variety of factors included in the project. Life cycle flexibility may be accomplished by:

- Identifying the process or processes needed to be performed in each phase,
- Performing the process or processes identified in the appropriate phase,
- Adjusting the various attributes of a phase (e.g., name, duration, exit criteria, and entrance criteria).

Project life cycles are independent of product life cycles, which may be produced by a project. A product life cycle is the series of phases that represent the evolution of a product, from concept through delivery, growth, maturity, and to retirement.

1.2.4.2 PROJECT PHASE

A project phase is a collection of logically related project activities that culminates in the completion of one or more deliverables. The phases in a life cycle can be described by a variety of attributes. Attributes may be measurable and unique to a specific phase. Attributes may include but are not limited to:

- Name (e.g., Phase A, Phase B, Phase 1, Phase 2, proposal phase),
- Number (e.g., three phases in the project, five phases in the project),
- Duration (e.g., 1 week, 1 month, 1 quarter),
- Resource requirements (e.g., people, buildings, equipment),
- Entrance criteria for a project to move into that phase (e.g., specified approvals documented, specified documents completed), and
- Exit criteria for a project to complete a phase (e.g., documented approvals, completed documents, completed deliverables).

Projects may be separated into distinct phases or subcomponents. These phases or subcomponents are generally given names that indicate the type of work done in that phase. Examples of phase names include but are not limited to:

- Concept development,
- Feasibility study,
- Customer requirements,
- Solution development,
- Design,
- Prototype,
- Build,
- Test,
- Transition,
- Commissioning,
- Milestone review, and
- Lessons learned.

The project phases may be established based on various factors including, but not limited to:

- Management needs;
- Nature of the project;
- Unique characteristics of the organization, industry, or technology;
- Project elements including, but not limited to, technology, engineering, business, process, or legal; and
- Decision points (e.g., funding, project go/no-go, and milestone review).

Using multiple phases may provide better insight to managing the project. It also provides an opportunity to assess the project performance and take necessary corrective or preventive actions in subsequent phases. A key component used with project phases is the phase review (see Section 1.2.4.3).

1.2.4.3 PHASE GATE

A phase gate, is held at the end of a phase. The project's performance and progress are compared to project and business documents including but not limited to:

- Project business case (see Section 1.2.6.1),
- Project charter (see Section 4.1),
- Project management plan (see Section 4.2), and
- Benefits management plan (see Section 1.2.6.2).

A decision (e.g., go/no-go decision) is made as a result of this comparison to:

- Continue to the next phase,
- Continue to the next phase with modification,
- End the project,
- Remain in the phase, or
- Repeat the phase or elements of it.

Depending on the organization, industry, or type of work, phase gates may be referred to by other terms such as, phase review, stage gate, kill point, and phase entrance or phase exit. Organizations may use these reviews to examine other pertinent items which are beyond the scope of this guide, such as product-related documents or models.

1.2.4.4 PROJECT MANAGEMENT PROCESSES

The project life cycle is managed by executing a series of project management activities known as project management processes. Every project management process produces one or more outputs from one or more inputs by using appropriate project management tools and techniques. The output can be a deliverable or an outcome. Outcomes are an end result of a process. Project management processes apply globally across industries.

Project management processes are logically linked by the outputs they produce. Processes may contain overlapping activities that occur throughout the project. The output of one process generally results in either:

- An input to another process, or
- A deliverable of the project or project phase.

Figure 1-6 shows an example of how inputs, tools and techniques, and outputs relate to each other within a process, and with other processes.

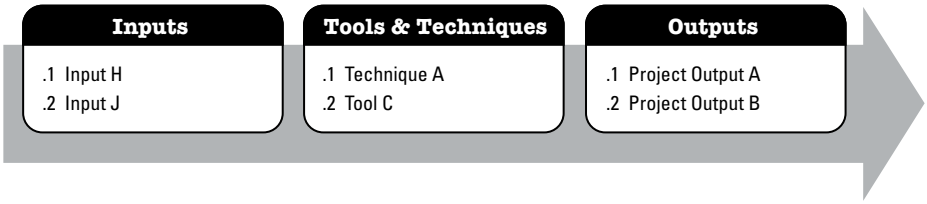

Figure 1-6. Example Process: Inputs, Tools & Techniques, and Outputs

The number of process iterations and interactions between processes varies based on the needs of the project. Processes generally fall into one of three categories:

- **Processes used once or at predefined points in the project.** The processes *Develop Project Charter and Close Project or Phase* are examples.
- **Processes that are performed periodically as needed.** The process *Acquire Resources* is performed as resources are needed. The process *Conduct Procurements* is performed prior to needing the procured item.
- **Processes that are performed continuously throughout the project.** The process *Define Activities* may occur throughout the project life cycle, especially if the project uses rolling wave planning or an adaptive development approach. Many of the monitoring and control processes are ongoing from the start of the project, until it is closed out.

Project management is accomplished through the appropriate application and integration of logically grouped project management processes. While there are different ways of grouping processes, the *PMBOK® Guide* groups processes into five categories called Process Groups.

1.2.4.5 PROJECT MANAGEMENT PROCESS GROUPS

A Project Management Process Group is a logical grouping of project management processes to achieve specific project objectives. Process Groups are independent of project phases. Project management processes are grouped into the following five Project Management 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 requirements.
- **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 formally complete or close the project, phase, or contract.

Process flow diagrams are used throughout this guide. The project management processes are linked by specific inputs and outputs where the result or outcome of one process may become the input to another process that is not necessarily in the same Process Group. Note that Process Groups are not the same as project phases (see Section 1.2.4.2).

1.2.4.6 PROJECT MANAGEMENT KNOWLEDGE AREAS

In addition to Process Groups, processes are also categorized by Knowledge Areas. A Knowledge Area is an identified area of project management defined by its knowledge requirements and described in terms of its component processes, practices, inputs, outputs, tools, and techniques.

Although the Knowledge Areas are interrelated, they are defined separately from the project management perspective. The ten Knowledge Areas identified in this guide are used in most projects most of the time. The ten Knowledge Areas described in this guide are:

- **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.
- **Project Scope Management.** Includes the processes required to ensure the project includes all the work required, and only the work required, to complete the project successfully.

- **Project Schedule Management.** Includes the processes required to manage the timely completion of the project.
- **Project Cost Management.** Includes the processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs so the project can be completed within the approved budget.
- **Project Quality Management.** Includes the processes for incorporating the organization's quality policy regarding planning, managing, and controlling project and product quality requirements, in order to meet stakeholders' expectations.
- **Project Resource Management.** Includes the processes to identify, acquire, and manage the resources needed for the successful completion of the project.
- **Project Communications Management.** Includes the processes required to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and ultimate disposition of project information.
- **Project Risk Management.** Includes the processes of conducting risk management planning, identification, analysis, response planning, response implementation, and monitoring risk on a project.
- **Project Procurement Management.** Includes the processes necessary to purchase or acquire products, services, or results needed from outside the project team.
- **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.

The needs of a specific project may require one or more additional Knowledge Areas, for example, construction may require financial management or safety and health management. Table 1-4 maps the Project Management Process Groups and Knowledge Areas. Sections 4 through 13 provide more detail about each Knowledge Area. This table is an overview of the basic processes described in Sections 4 through 13.

Table 1-4. 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 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 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 Schedule Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule		6.6 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 Manage Quality	8.3 Control Quality	
9. Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor 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 Implement Risk Responses	11.7 Monitor Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	

1.2.4.7 PROJECT MANAGEMENT DATA AND INFORMATION

Throughout the life cycle of a project, a significant amount of data is collected, analyzed, and transformed. Project data are collected as a result of various processes and are shared within the project team. The collected data are analyzed in context, aggregated, and transformed to become project information during various processes. Information is communicated verbally or stored and distributed in various formats as reports. See Section 4.3 for more detail on this topic.

Project data are regularly collected and analyzed throughout the project life cycle. The following definitions identify key terminology regarding project data and information:

- **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. Project data are usually recorded in a Project Management Information System (PMIS) (see Section 4.3.2.2) and in project documents.
- **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 forecast estimates to complete.
- **Work performance reports.** The physical or electronic representation of work performance information compiled in project documents, which is intended to generate decisions or raise issues, actions, or awareness. Examples include status reports, memos, justifications, information notes, electronic dashboards, recommendations, and updates.

Figure 1-7 shows the flow of project information across the various processes used in managing the project.

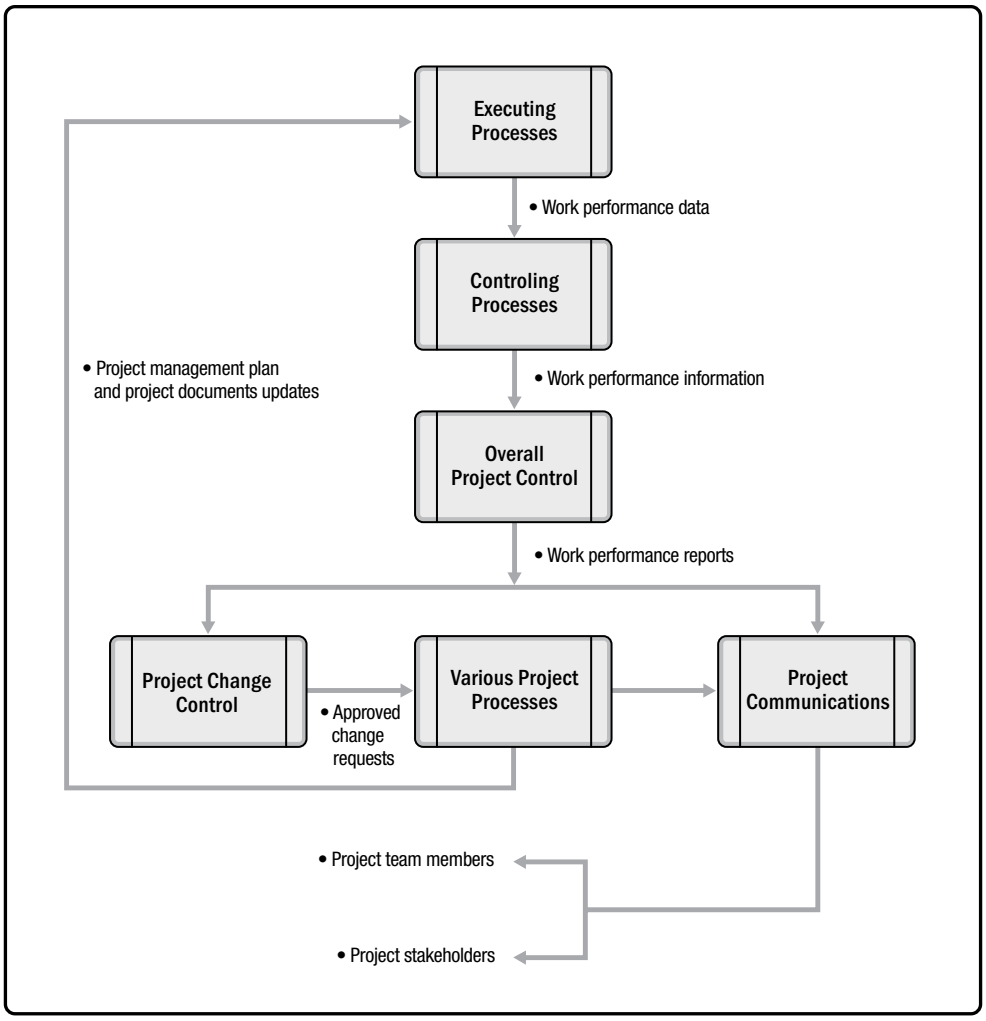

Figure 1-7. Project Data, Information, and Report Flow

1.2.5 TAILORING

Usually, project managers apply a project management methodology to their work. A methodology is a system of practices, techniques, procedures, and rules used by those who work in a discipline. This definition makes it clear that this guide itself is not a methodology.

This guide and *The Standard for Project Management* [1] are recommended references for tailoring, because these standard documents identify the subset of the project management body of knowledge that is generally recognized as good practice. "Good practice" does not mean that the knowledge described should always be applied uniformly to all projects. Specific methodology recommendations are outside the scope of this guide.

Project management methodologies may be:

- Developed by experts within the organization,
- Purchased from vendors,
- Obtained from professional associations, or
- Acquired from government agencies.

The appropriate project management processes, inputs, tools, techniques, outputs, and life cycle phases should be selected to manage a project. This selection activity is known as tailoring project management to the project. The project manager collaborates with the project team, sponsor, organizational management, or some combination thereof, in the tailoring. In some cases, the organization may require specific project management methodologies be used.

Tailoring is necessary because each project is unique; not every process, tool, technique, input, or output identified in the *PMBOK® Guide* is required on every project. Tailoring should address the competing constraints of scope, schedule, cost, resources, quality, and risk. The importance of each constraint is different for each project, and the project manager tailors the approach for managing these constraints based on the project environment, organizational culture, stakeholder needs, and other variables.

In tailoring project management, the project manager should also consider the varying levels of governance that may be required and within which the project will operate, as well as considering the culture of the organization. In addition, consideration of whether the customer of the project is internal or external to the organization may affect project management tailoring decisions.

Sound project management methodologies take into account the unique nature of projects and allow tailoring, to some extent, by the project manager. However, the tailoring that is included in the methodology may still require additional tailoring for a given project.

1.2.6 PROJECT MANAGEMENT BUSINESS DOCUMENTS

The project manager needs to ensure that the project management approach captures the intent of business documents. These documents are defined in Table 1-5. These two documents are interdependent and iteratively developed and maintained throughout the life cycle of the project.

Table 1-5. Project Business Documents

Project Business Documents	Definition
Project business case	A documented economic feasibility study used to establish the validity of the benefits of a selected component lacking sufficient definition and that is used as a basis for the authorization of further project management activities.
Project benefits management plan	The documented explanation defining the processes for creating, maximizing, and sustaining the benefits provided by a project.

The project sponsor is generally accountable for the development and maintenance of the project business case document. The project manager is responsible for providing recommendations and oversight to keep the project business case, project management plan, project charter, and project benefits management plan success measures in alignment with one another and with the goals and objectives of the organization.

Project managers should appropriately tailor the noted project management documents for their projects. In some organizations, the business case and benefits management plan are maintained at the program level. Project managers should work with the appropriate program managers to ensure the project management documents are aligned with the program documents. Figure 1-8 illustrates the interrelationship of these critical project management business documents and the needs assessment. Figure 1-8 shows an approximation of the life cycle of these various documents against the project life cycle.

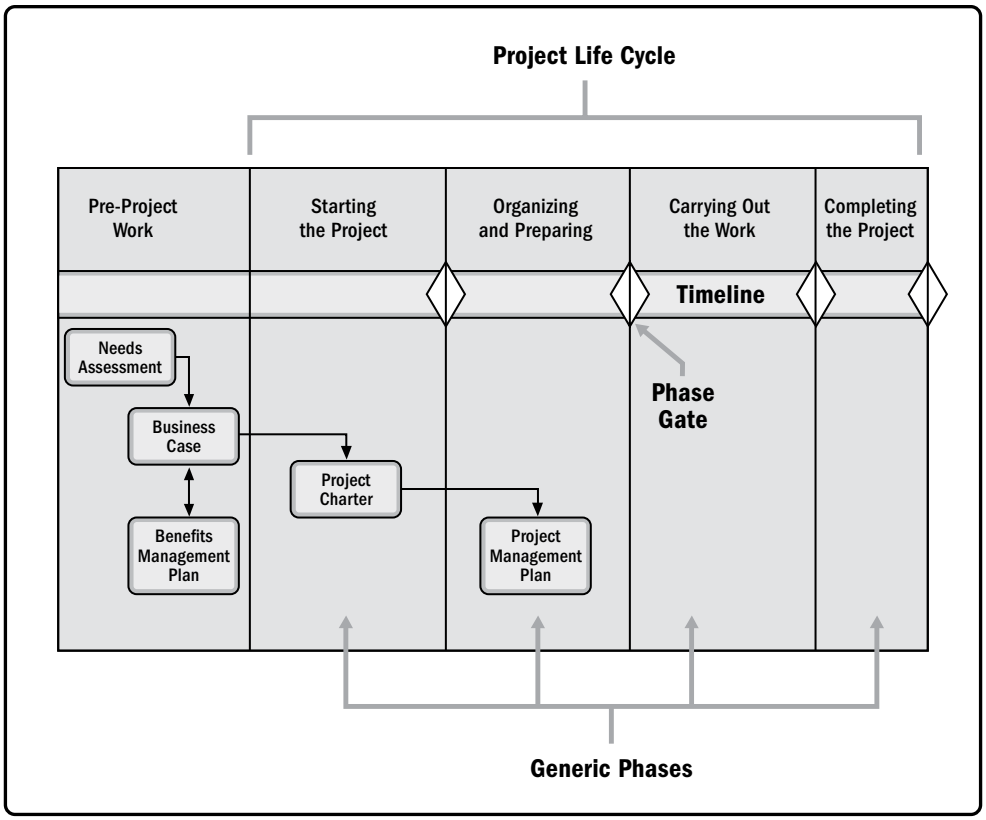

Figure 1-8. Interrelationship of Needs Assessment and Critical Business/Project Documents

1.2.6.1 PROJECT BUSINESS CASE

The project business case is a documented economic feasibility study used to establish the validity of the benefits of a selected component lacking sufficient definition and that is used as a basis for the authorization of further project management activities. The business case lists the objectives and reasons for project initiation. It helps measure the project success at the end of the project against the project objectives. The business case is a project business document that is used throughout the project life cycle. The business case may be used before the project initiation and may result in a go/no-go decision for the project.

A needs assessment often precedes the business case. The needs assessment involves understanding business goals and objectives, issues, and opportunities and recommending proposals to address them. The results of the needs assessment may be summarized in the business case document.

The process of defining the business need, analyzing the situation, making recommendations, and defining evaluation criteria is applicable to any organization's projects. A business case may include but is not limited to documenting the following:

- Business needs:
  - Determination of what is prompting the need for action;
  - Situational statement documenting the business problem or opportunity to be addressed including the value to be delivered to the organization;
  - Identification of stakeholders affected; and
  - Identification of the scope.
- Analysis of the situation:
  - Identification of organizational strategies, goals, and objectives;
  - Identification of root cause(s) of the problem or main contributors of an opportunity;
  - Gap analysis of capabilities needed for the project versus existing capabilities of the organization;
  - Identification of known risks;
  - Identification of critical success factors;
  - Identification of decision criteria by which the various courses of action may be assessed;

    Examples of criteria categories used for analysis of a situation are:

    - *Required.* This is a criterion that is "required" to be fulfilled to address the problem or opportunity.
    - *Desired.* This is a criterion that is "desired" to be fulfilled to address the problem or opportunity.
    - *Optional.* This is a criterion that is not essential. Fulfillment of this criterion may become a differentiator between alternative courses of action.
  - Identification of a set of options to be considered for addressing the business problem or opportunity. Options are alternative courses of action that may be taken by the organization. Options may also be described as business scenarios. For example, a business case could present the following three options:
    - *Do nothing.* This is also referred to as the "business as usual" option. Selection of this option results in the project not being authorized.
    - *Do the minimum work possible to address the problem or opportunity.* The minimum may be established by identifying the set of documented criteria that are key in addressing the problem or opportunity.
    - *Do more than the minimum work possible to address the problem or opportunity.* This option meets the minimum set of criteria and some or all of the other documented criteria. There may be more than one of these options documented in the business case.

- Recommendation:
  - A statement of the recommended option to pursue in the project;
  - Items to include in the statement may include but are not limited to:
    - Analysis results for the potential option;
    - Constraints, assumptions, risks, and dependencies for the potential options; and
    - Success measures (see Section 1.2.6.4).
  - An implementation approach that may include but is not limited to:
    - Milestones,
    - Dependencies, and
    - Roles and responsibilities.
- Evaluation:
  - Statement describing the plan for measuring benefits the project will deliver. This should include any ongoing operational aspects of the recommended option beyond initial implementation.

The business case document provides the basis to measure success and progress throughout the project life cycle by comparing the results with the objectives and the identified success criteria. See *Business Analysis for Practitioners: A Practice Guide* [7].

1.2.6.2 PROJECT BENEFITS MANAGEMENT PLAN

The project benefits management plan is the document that describes how and when the benefits of the project will be delivered, and describes the mechanisms that should be in place to measure those benefits. A project benefit is defined as an outcome of actions, behaviors, products, services, or results that provide value to the sponsoring organization as well as to the project's intended beneficiaries. Development of the benefits management plan begins early in the project life cycle with the definition of the target benefits to be realized. The benefits management plan describes key elements of the benefits and may include but is not limited to documenting the following:

- **Target benefits** (e.g., the expected tangible and intangible value to be gained by the implementation of the project; financial value is expressed as net present value);
- **Strategic alignment** (e.g., how well the project benefits align to the business strategies of the organization);
- **Timeframe for realizing benefits** (e.g., benefits by phase, short-term, long-term, and ongoing);
- **Benefits owner** (e.g., the accountable person to monitor, record, and report realized benefits throughout the timeframe established in the plan);
- **Metrics** (e.g., the measures to be used to show benefits realized, direct measures, and indirect measures);
- **Assumptions** (e.g., factors expected to be in place or to be in evidence); and
- **Risks** (e.g., risks for realization of benefits).

Developing the benefits management plan makes use of the data and information documented in the business case and needs assessment. For example, the cost-benefit analyses recorded in the documents illustrate the estimate of costs compared to the value of the benefits realized by the project. The benefits management plan and the project management plan include a description of how the business value resulting from the project becomes part of the organization's ongoing operations, including the metrics to be used. The metrics provide verification of the business value and validation of the project's success.

Development and maintenance of the project benefits management plan is an iterative activity. This document complements the business case, project charter, and project management plan. The project manager works with the sponsor to ensure that the project charter, project management plan, and the benefits management plan remain in alignment throughout the life cycle of the project. See *Business Analysis for Practitioners: A Practice Guide* [7], *The Standard for Program Management* [3], and *The Standard for Portfolio Management* [2].

1.2.6.3 PROJECT CHARTER AND PROJECT MANAGEMENT PLAN

The project charter is defined as a document issued by the project sponsor that formally authorizes the existence of a project and provides the project manager with the authority to apply organizational resources to project activities.

The project management plan is defined as the document that describes how the project will be executed, monitored, and controlled.

See Section 4 on Project Integration Management for more information on the project charter and the project management plan.

1.2.6.4 PROJECT SUCCESS MEASURES

One of the most common challenges in project management is determining whether or not a project is successful.

Traditionally, the project management metrics of time, cost, scope, and quality have been the most important factors in defining the success of a project. More recently, practitioners and scholars have determined that project success should also be measured with consideration toward achievement of the project objectives.

Project stakeholders may have different ideas as to what the successful completion of a project will look like and which factors are the most important. It is critical to clearly document the project objectives and to select objectives that are measurable. Three questions that the key stakeholders and the project manager should answer are:

- What does success look like for this project?
- How will success be measured?
- What factors may impact success?

The answer to these questions should be documented and agreed upon by the key stakeholders and the project manager.

Project success may include additional criteria linked to the organizational strategy and to the delivery of business results. These project objectives may include but are not limited to:

- Completing the project benefits management plan;
- Meeting the agreed-upon financial measures documented in the business case. These financial measures may include but are not limited to:
  - Net present value (NPV),
  - Return on investment (ROI),
  - Internal rate of return (IRR),
  - Payback period (PBP), and
  - Benefit-cost ratio (BCR).

- Meeting business case nonfinancial objectives;
- Completing movement of an organization from its current state to the desired future state;
- Fulfilling contract terms and conditions;
- Meeting organizational strategy, goals, and objectives;
- Achieving stakeholder satisfaction;
- Acceptable customer/end-user adoption;
- Integration of deliverables into the organization's operating environment;
- Achieving agreed-upon quality of delivery;
- Meeting governance criteria; and
- Achieving other agreed-upon success measures or criteria (e.g., process throughput).

The project team needs to be able to assess the project situation, balance the demands, and maintain proactive communication with stakeholders in order to deliver a successful project.

When the business alignment for a project is constant, the chance for project success greatly increases because the project remains aligned with the strategic direction of the organization.

It is possible for a project to be successful from a scope/schedule/budget viewpoint, and to be unsuccessful from a business viewpoint. This can occur when there is a change in the business needs or the market environment before the project is completed.