

DELIVERING VALUE *with*

PROJECT MANAGEMENT

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Blue Ridge | Cumming | Dahlonega | Gainesville | Oconee



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ABOUT THIS BOOK

Juanita Woods and Scott Marshall teach project management to students at the University of North Georgia, USA. They recognized a need to create a zero-cost open-source project management textbook after project management professional standards were updated in 2021. Affordable Learning Georgia (ALG; <https://www.affordablelearninggeorgia.org/>) awarded the team a Textbook Transformation Grant in 2022 to support the development of the textbook and supporting materials.

The authors gratefully acknowledge the extensive help of their student assistant, Louisa Schlesiger, for her excellent work as a project assistant and developer of the instructor materials. They also appreciate the support of their students who patiently accepted the textbook in its early forms, and professional colleagues who provided the stories incorporated into the book.

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The textbook and associated materials were adapted from the following open-source materials:

- Christianson, J. S. (2017). *Project Management Fundamentals*. OERCommons.org, OER Commons. <https://www.oercommons.org/courseware/lesson/76030/overview-old>
- Daddey, F. and A. Watt (2019). *Project Management*. Nova Scotia Community College, Pressbooks. <https://pressbooks.nsc.ca/projectmanagement/>
- Russell, J., Pferdehirt, W. & Nelson, J. (2018). *Technical Project Management in Living and Geometric Order*, Third Edition. Madison, WI: University of Wisconsin. [https://biz.libretexts.org/Bookshelves/Management/Book%3A_Technical_Project_Management_in_Living_and_Geometric_Order_\(Russell_Pferdehirt_and_Nelson\)](https://biz.libretexts.org/Bookshelves/Management/Book%3A_Technical_Project_Management_in_Living_and_Geometric_Order_(Russell_Pferdehirt_and_Nelson))
- Morris, Shelley. (2021). *Project Management Fundamentals*. Toronto: Seneca College.

HOW THIS BOOK IS ORGANIZED

This textbook begins with a discussion of how projects support organizational strategy and how organizations use projects to deliver value. While the textbook introduces adaptive and predictive approaches to managing projects (see [Section 2.3.3](#)), it is structured to follow a predictive planning approach. This structure was chosen to support students in general management programs who may be working in operations, manufacturing, or similar environments where projects generally follow predictive approaches.

Following the foundational elements, we move into pre-project work, where we explore the processes for identifying, selecting, and chartering projects. Once

projects are chartered, project planning begins. Project planning includes the work of a project manager to engage project stakeholders and identify project outcomes. Once the project manager and stakeholders identify project outcomes, the project manager produces a project management plan that contains a schedule of the work, cost, and processes followed to produce the project outcomes.

Once planning is complete, the book focuses on activities performed by a project manager during the execution phase of project work. These chapters focus on the processes of managing and measuring project work, working with project teams, and monitoring and reporting project status. The textbook introduces project closure activities that ensure the projects deliver value to the organization and ultimately satisfy the organization’s strategy.

The textbook concludes with a brief discussion of careers and certifications available to students interested in pursuing a career in project management.

Throughout the chapters, the authors have included “**Deeper Dive**” activities that allow students to explore concepts in more detail through online articles, reports, or podcasts. “**Test Your Knowledge**” activities and examples are also included as checkpoints for students to ensure they understand the presented material.

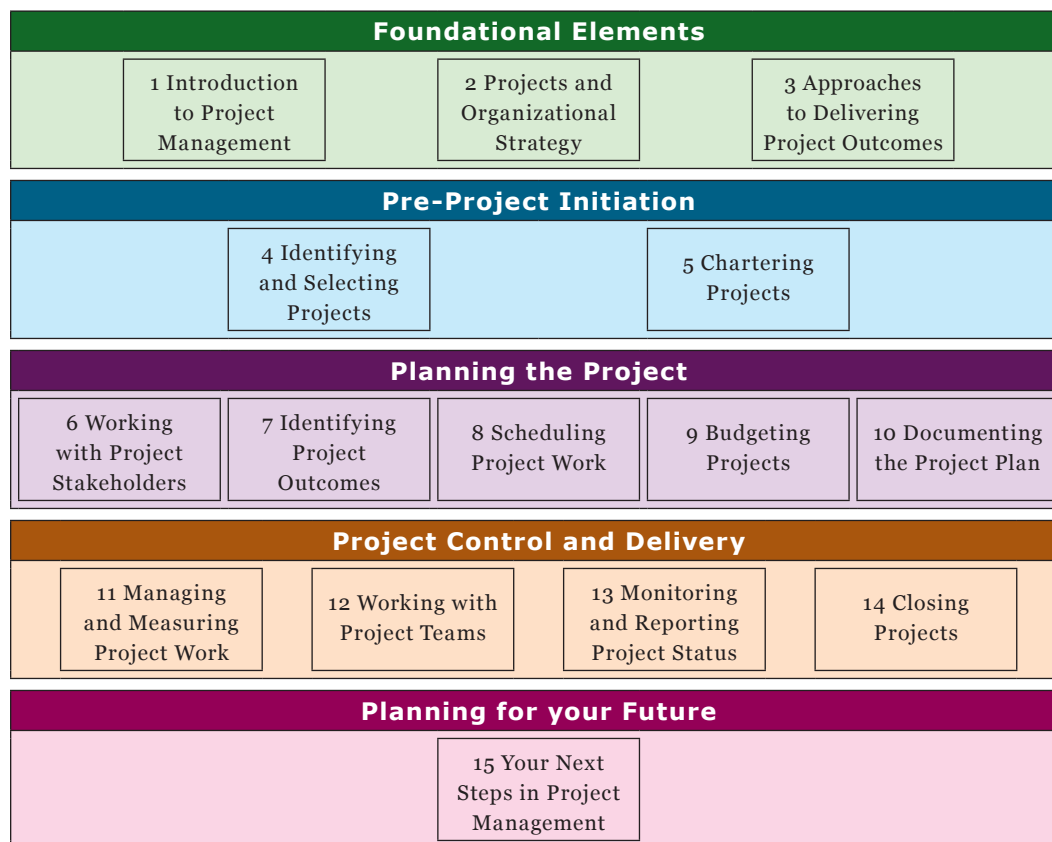


Figure 0.1: The Structure of this Textbook

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1

Introduction to Project Management

People have been undertaking projects since the earliest days of organized human activity. The hunting parties of prehistoric peoples could be considered projects. Large and complex undertakings such as the pyramids and the Great Wall of China were also projects. Today, project managers work in both the public and private sectors and in every industry and business size. Projects happen in small and large organizations around the world.

The skills used when managing projects are helpful for most careers and daily life. Strong planning skills, effective communication, and the ability to implement a project to deliver the product or service while monitoring for risks and managing the resources provide an edge toward career and professional success.

The starting point in learning how to manage projects appropriately is understanding what a project is and, just as importantly, what it is not. People use the term “project” frequently in daily conversations. Someone may tell their friend, “My main project for this weekend is to straighten out the garage.” Working on school and home projects, building pyramids, and fixing faucets all share certain features that make them projects.

In this chapter, you learn about projects, the discipline of project management, and the work of a project manager.

CHAPTER LEARNING OBJECTIVES

- Define projects and explain the characteristics and constraints of typical projects.
- Describe project management and its benefits.
- Identify factors that affect projects and explain how these factors influence either the success or failure of projects.
- Understand the relationship between project roles and organizations.
- Evaluate the significance of developing strategic, technical, and interpersonal skills for successful project management.

PM in Real Life: The Accidental Project Manager



Figure 1.1: Kimberly Wynn White, MSEE, CSM

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“I am what you might call an accidental project manager,” says Kimberly Wynn White. “I began my career as a semiconductor engineer and later transitioned to IT management in higher education.” After managing a team of IT infrastructure specialists and with several projects under her belt, Ms. White recalls her CIO approaching her to consider working as a full-time project manager.

“I have taken courses in project management and TQM (total quality management) but wasn’t sure this was the right move,” she said. “The CIO convinced me that I could make a bigger impact on the organization in the PM role, and I trusted his judgment and accepted the assignment. He was right, and I eventually became the director of a new PPMO¹.” While this was a lateral move, she was up for the challenge. Like many successful project managers, Ms. Wynn White worked on projects by default. However, the required attention to detail and her successes led her to seek out more education about the art and science of project management. Eventually, this led to an unexpected career path.

When asked what she likes best about working in project management, she points to two specific competencies: team-building and problem-solving.

“I look at each project as a problem to solve, resulting in delivering a successful outcome or solution to the stakeholders,” she said. “To be successful, you must build a collaborative and functioning team.” With that, she sees the role of the PM as often handling challenges. “I want my project teams to know I will listen, follow up, and remove identified roadblocks. They can rely on me being the messenger of good and not-so-good news to the sponsors who will advocate for all parties to solve the problems.”

Now, Ms. Wynn White leads and mentors a team of PMs who work on various technology initiatives at her university. “I love being able to provide ‘praise reports’ for individual and team contributors from start to finish and create a positive experience such that everyone will want to join another project I lead,” she declares. “Project management is a team sport, and I love being in the arena!”

1.1 WHAT IS A PROJECT?

1.1.1 Definition of a Project

Numerous project definitions exist, but all have the essential elements described below. For those looking for a formal definition of a **project**, the Project Management Institute (PMI) defines a project as a “temporary endeavor undertaken to create a unique product, service, or result.” The temporary nature of projects requires a definite beginning and end. The end is reached when the project’s objectives have been achieved, upon termination because its objectives will not or cannot be met, or when the need for the project no longer exists.

In popular culture, people use the term “project” in numerous ways, from describing everyday tasks (planting a garden, hanging a picture, running errands) to large-scale enterprises (building a house, constructing a new highway). However, when professional project managers talk about projects, they use a narrower definition.

Every book, organization, or standards body in the project management field agrees that a project demonstrates the following characteristics:

- is a temporary endeavor with a defined start and end,
- has a specific objective,
- has customers or stakeholders,
- has constraints such as time, cost, and scope,
- has measures for success, and
- includes some amount of uncertainty.

1.1.2 Project Versus Operations

A project has distinctive attributes distinguishing it from ongoing work or business operations. Projects are temporary and are not everyday business processes. This characteristic is important because a large part of the project effort is dedicated to ensuring that the project is completed at the appointed time. To do this, project schedules show when tasks should begin and end. Projects can last minutes, hours, days, weeks, months, or years.

People and organizations use projects to deliver a product, service, or result that hasn’t existed before. In this sense, a project is unique. Unique means that this is new; this has never been done before. Maybe it’s been done in a very similar fashion before but never precisely in this way. We consider updating existing applications, processes, or facilities unique because something new is being added to something already existing.



Figure 1.2: Building a house is a project.

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In contrast to projects, operations are ongoing and repetitive. Operational activities involve continuous work without a defined end date and with the same processes repeated to produce the same results. The purpose of operations is to keep the organization functioning, while the purpose of a project is to meet its goals and add value to the organization. Therefore, operations are ongoing, while projects are unique and temporary.

A project is completed when its goals and objectives are accomplished. These goals drive the project and all the planning and implementation efforts to achieve them. Sometimes projects end when it is determined that the goals and objectives cannot be accomplished or when the product or service of the project is no longer needed, and the project is canceled. We discuss completing projects in [Chapter 14](#).

1.1.3 Project Characteristics

To determine if you have a project, first, you need to identify its characteristics by answering a few questions ([Figure 1.3](#)).

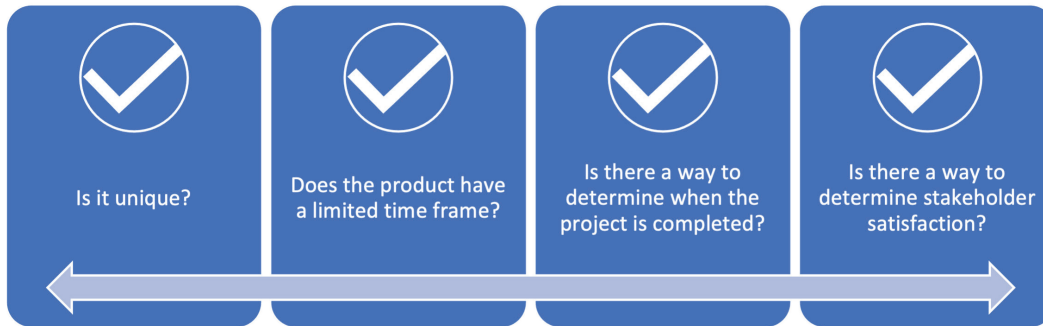


Figure 1.3: Questions to Distinguish Projects from Operations

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Second, you need to determine the project’s specific characteristics relating to the project outcomes, timing, and goals ([Figure 1.4](#)).

Project Characteristics	unique or modified outcome
	temporary with a defined beginning and ending date
	constraints limit the project
	include some amount of uncertainty
	completed when the project goals are achieved, or it's determined the project is no longer viable.

Figure 1.4: Summary of Project Characteristics

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Finally, a successful project meets or exceeds the expected project outcomes. **Project stakeholders** are individuals, groups, or organizations interested in a project and who may affect or be affected by the project processes or outcomes, so projects are considered successful when they satisfy the project stakeholders.

Test Your Knowledge

The county Sheriff approaches you with a fantastic idea. She wants to set up a kiosk in the local shopping mall as a community police station. The office will allow citizens to sign up for community services, volunteer work, or obtain information about available services and programs. The Sheriff believes that the exposure in the mall will increase awareness of the services provided by the police. She told you that county management has approved the project because it aligns with the agency’s strategic goals, and she’ll dedicate as many resources

as possible. The Sheriff wants the new kiosks in place in two malls by the end of the year. Finally, she has assigned you to head up this project.

Your first question should be, “Is it a project?” The question may seem elementary, but it’s easy to confuse projects with ongoing operations. Using the attributes and characteristics described above, let’s examine the assignment from the Sheriff to determine if it is a project.

- Is it unique?
 - Yes - the kiosks don’t exist in the malls. This is a new way of offering information to residents. While the service the agency is offering isn’t new, the way it is presenting its services is.
- Does the product have a limited time frame?
 - Yes - the start date of this project is today, and the end date is the end of next year. It is a temporary endeavor.
- Is there a way to determine when the project is completed?
 - Yes - the kiosks will be installed and the services will be offered from them. Once all the kiosks are installed and operating, the project will end.
- Is there a way to determine stakeholder satisfaction?
 - Yes - the expectations of the stakeholders will be documented in the form of requirements during the planning processes. These requirements will be compared to the finished product to determine if it meets the expectations of the stakeholder.

We have a project if the answer is “yes” to all these questions. Note that some activities are routine operations, which are different from projects.

1.1.4 Project Constraints

On any project, several project constraints compete for your attention, including scope, time, cost, quality, risk, and resources. You may have heard of the term “**triple**

constraint,” which traditionally consisted of only time, cost, and scope. However, we must also consider other project constraints, such as risk, resources, and quality. We often illustrate the triple constraint as a triangle to visualize the project work and see the relationship between the scope, time, cost, and quality ([Figure 1.5](#)).

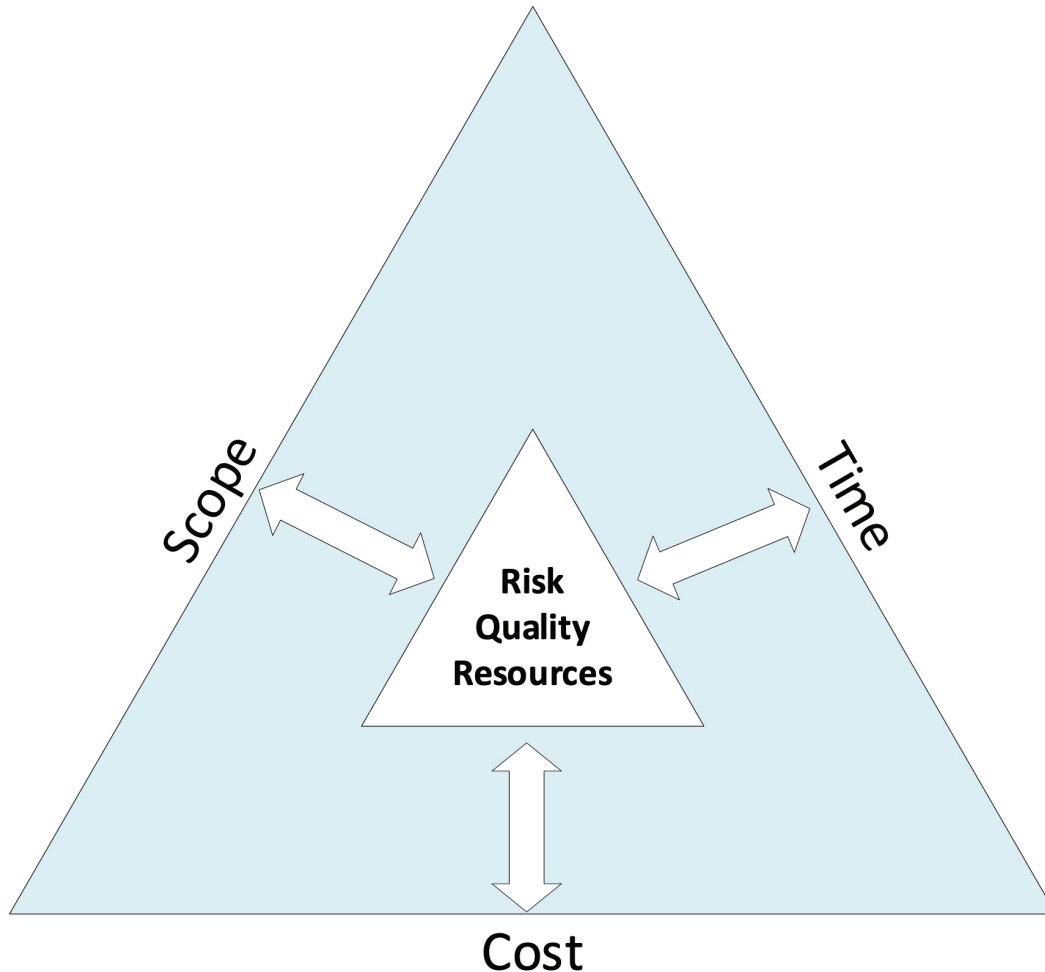


Figure 1.5: The Triple Constraint

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Each side of the triangle represents the “triple constraints,” wherein any changes to any side cause a change in the other two sides. The best projects perfectly balance the three constraints. Maintaining this balance is difficult because projects are prone to change. For example, if scope increases, then cost and time may increase disproportionately. Alternatively, if the amount of money you have for your project decreases, you may be able to do the same amount of work, but your time may increase.

Scope is what the project is trying to achieve. It entails all the work involved in delivering the project outcomes and the processes used to produce them. It is the reason and the purpose of the project.

Time refers to how long it will take to complete the project. Time is often the most frequent project oversight in developing projects. Projects are late when deadlines are missed, and deliverables are not completed as planned. Proper control of the schedule requires the careful identification of tasks to be performed and accurate estimations of their durations, the sequence in which they will be done, and how people and other resources are to be allocated. The project schedule should consider team member vacations and company holidays.

Cost is the budget approved for the project, including all necessary expenses needed to deliver the project. Within organizations, project managers must balance not running out of money with not under-spending. Many projects receive funds or grants with contract clauses taking a “use it or lose it” approach to project funds. Poorly executed budget plans can result in a last-minute rush to spend the allocated funds. For virtually all projects, the cost is a limiting constraint; few projects can go over budget without eventually requiring corrective action.

Quality combines the standards and criteria to which the project’s products must be delivered to perform effectively. The product must perform to provide the functionality expected, solve the identified problem, and deliver the benefit and value expected. It must also meet other performance requirements or service levels—such as availability, reliability, and maintainability—and have an acceptable finish and polish. Project quality is controlled through quality assurance (QA), which includes activities to regularly evaluate overall project performance to provide confidence that the project will satisfy the relevant quality standards.

Risk is defined by potential external or internal events that may negatively impact your project if they occur. Risks are evaluated by the probability that such an event occurs with some impact on the project. Suppose the probability of the occurrence and impact on the project is too high. In that case, you should identify the potential event as a risk and put a proactive plan in place to manage the risk.

Resources are required to carry out project tasks. They can be people, equipment, facilities, funding, or anything else capable of definition (usually other than labor) required to complete project activities.

Your project may have additional constraints that you must face, and as the project manager, you must balance the needs of these constraints against the needs of the stakeholders and your project goals. For instance, if your sponsor wants to add functionality to the original scope, then you will very likely need more money to finish the project; or, if they cut the budget, then you will have to reduce the quality of your scope; and, if you don’t get the appropriate resources to work on your project tasks, then you will have to extend your schedule because the resources you assigned to the task have taken much longer to finish the work.

Test Your Knowledge

How would you explain the triple constraint to your boss when she asks you to “produce high-quality work quickly and cheaply?”

1.2 WHAT IS PROJECT MANAGEMENT?

Now that we have explored the concept of projects, we can explore how projects are managed in organizations. First, we will look at a brief history of project management.

1.2.1 A Brief History of Project Management

While we can trace project management to the building of the Great Pyramids in Egypt, it was in the post-World War II industrial boom of the 1950s that project managers developed the tools and techniques used in modern project management. These tools were used to complete large industrial and military projects where the scope of work was well-defined.



Figure 1.6: Launch of Apollo 15 to the moon on July 26, 1971, by NASA.

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At that time, the process of managing projects became more formalized when international organizations began defining project management processes and activities. One organization, the Project Management Institute (PMI; www.pmi.org), was founded in 1969 to support the growing project management profession. Their initial goal was to establish an organization where members could share their experiences in project management and discuss issues. Today, PMI is a non-profit project management professional association and the most widely recognized organization promoting project management best practices. PMI was formed to serve the interests of the project management industry. The premise of PMI is that common tools and techniques of project management are widely applied to all industries, from software to the construction industry. PMI first began offering the Project Management Professional (PMP) certification exam in 1984. Since then, more than 1 million individuals worldwide have earned the PMP designation as of July 2020. Since 1984, PMI has added numerous other certifications to support the growing diversification of project management as a discipline.

Deeper Dive

For more information about the Project Management Institute and the certifications and training they provide, visit their website at <https://www.pmi.org/membership/student>.

You can set up a free membership, which will give you limited access to the learning materials and other resources, or purchase a discounted student membership to access all of PMI's learning materials and project management resources.

Student membership will give you access to a digital copy of the *Standard for Project Management and A Guide to the Project Management Body of Knowledge* (Seventh Edition).

To help keep project management terms and concepts clear and consistent, PMI introduced *A Guide to the Project Management Body of Knowledge (PMBOK Guide)* in 1987. The most current version, updated in 2021, is the seventh edition. More than one million copies of the PMBOK® Guide are currently in circulation. PMI is responsible for developing and promoting the PMBOK and administers professional certifications for project managers. If you want to get grounded in project management, PMI is the place to start, and if you want to make project management your profession, then you should consider earning a certification.

1.2.2 The Process of Project Management

You've determined that you have a project. What now? The notes you scribbled down on the back of the napkin at lunch are a start but not exactly good project management practice. Too often, organizations follow Nike's advice when managing projects: "just do it." An assignment is made, and the project team members jump directly into developing the product or service requested. Ultimately, the delivered product doesn't meet the customer's expectations. Unfortunately, many projects follow this poorly-constructed path, which is a primary contributor to many projects not meeting their original objectives, as defined by performance, schedule, and budget.

Test Your Knowledge

Sometimes, a lot of money and time is lost when companies or organizations follow the "just do it" approach to managing projects.

[The FYRE Festival](https://www.bbc.com/news/newsbeat-46904445) in 2017 was heavily promoted but failed miserably. You can read about the festival here. <https://www.bbc.com/news/newsbeat-46904445>

How might the organizers of the FYRE festival incorporate project management best practices into planning the event?

Applying solid project management practices is one way to help reduce project risks. Good project management skills do not eliminate problems, risks,

or surprises. However, the value of good project management is that you have standard processes in place to deal with all contingencies.

Project management is “the application of knowledge, skills, tools, and techniques applied to project activities to meet the project requirements.”² Project management is a process that includes planning, putting the project plan into action, and measuring progress and performance.

Managing a project includes identifying your project’s requirements and writing down what everyone needs from it. What are the objectives of your project? Keeping them on the right path is much easier when everyone understands the goal. Set goals that everyone agrees on to avoid team conflicts later. Understanding and addressing the needs of everyone affected by the project means the result of your project is far more likely to ensure a satisfactory project outcome.

Test Your Knowledge

Suppose you want to earn a project management certification, and you want your employer to pay for the certification. Write an email to your supervisor explaining how knowing project management fundamentals will help you in your job.

1.2.3 The Project Management Framework

The latest version of *The Standard for Project Management* by the Project Management Institute presents a model, or framework, of project management as a set of organizational processes and functions that deliver value to organizations through project work. A deeper discussion on how projects deliver organizational value will be discussed in [Chapter 2](#). For now, we offer a brief overview of this system for value delivery, the guiding principles to deliver value, and the performance domains associated with project work.

1.2.3.1 Delivering Value

The main goal of most for-profit organizations is to be profitable and deliver value to its shareholders, employees, and customers. Even not-for-profit organizations have value-driven objectives to satisfy the people they serve. Projects are one way that organizations deliver value through new or improved products, processes, or services. Project management is a deliberative approach to obtaining that value.

1.2.3.2 Guiding Principles

With project management as a system to deliver organizational value, the actions taken by project managers must align with the values of the organization and the values of society. PMI identifies 12 guiding principles by which project managers should demonstrate ethical and appropriate behaviors when managing projects ([Figure 1.7](#)). These principles will be discussed throughout this text as appropriate.



Figure 1.7: Project Management Principles

Source: Original Work

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1.2.3.3 Performance Domains

The 12 project management principles guide project manager behavior as they manage project work. The work performed by a project manager can be described by eight “performance domains” (Figure 1.8). The eight **performance domains** provide a comprehensive framework of interrelated activities for successfully delivering organizational value through projects.

Activities described in each performance domain may take place at any point during a project. The selection of activities is determined by the organizational context, the project, the project team, stakeholder needs, and other relevant factors.

INTRODUCTION TO PROJECT MANAGEMENT



Figure 1.8: Project Performance Domains

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Test Your Knowledge

Think of a non-work project that you are familiar with and describe it as a project.

1. What product, service, or result does this project deliver?
2. What is the time frame to complete this project?
3. How would this deliver value for the people who might use the results of this project?

1.3 PROJECT MANAGEMENT ROLES

Delegating responsibility and work to others is a critical project management skill. The responsibility for executing the project belongs to the project manager. Often other team members on the project will complete project work while reporting to a functional manager in the parent organization.

The following people typically play a critical role in a project's success: the project sponsor and upper management, the project manager, project team members, and subject matter experts, including business analysts. [Chapter 12](#) will provide more details on leading and developing project teams.



Figure 1.9: A Project Team Working Together

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1.3.1 Project Sponsor

In some organizations, an upper-level executive will be charged with, or volunteer to be, the **project's champion or sponsor**. This person acts as the liaison between the project team and upper management. They may provide the project manager with direction, information about how the project fits into the company's strategic goals, and assistance with getting the resources needed to complete the project. The best project sponsors are cheerleaders for the project, enthusiastically supporting the project and its team members.

Upper management support is essential because project managers are asked to use company resources to achieve organizational objectives. The organization's executives support the project by establishing the company's strategy, providing project funding and resources, and making project-related decisions. Suppose the top management team is not on board with the project outcomes. In that case, a project manager may have difficulty engaging project team members or using company resources to complete a project.

Deeper Dive

For an in-depth discussion of the importance of upper management project support, read the [article](#) by Syed Moize at ProjectManagement.com.

<https://www.projectmanagement.com/articles/306739/the-importance-of-executive-management-support>

1.3.2 Project Manager (PM)

The **project manager** is involved in a project throughout its life cycle. The PM develops the project plans, ensures they are executed with appropriate changes as needed, and turns over the project when it is complete. Being a project manager can be extremely rewarding but comes with its own set of challenges. A project manager may have responsibility for a project's success but often does not have full authority over the resources required to complete the project successfully. One reason having excellent interpersonal skills is vital for project managers is that they may have to negotiate for project resources from upper management or functional managers within the organization.

Being a great communicator and working well with various personalities are important skills for a project manager (skills that anyone can develop and improve). A project manager will use these skills with upper management, other stakeholders, and the project team. One of the primary responsibilities of a PM is motivating and building project teams. How a PM behaves in this role will depend on how they view the motivation of their team members.

1.3.3 Project Team

The **project team** works with the project manager to develop the project management plans, schedule the work of the project, acquire the needed resources, monitor project progress, and see the project through to its successful completion. Team members may be devoted solely to working on the management aspects of a project or may also be performing the project's work. How well the project team works together will determine the success or failure of a project.

The project team includes people dedicated to the project or borrowed on a part-time basis. They provide subject matter expertise to the project. **Subject matter experts** (SMEs) have specialized knowledge or skills about a particular function or product the project will use or create. Project managers must provide leadership, direction, and support to team members as they accomplish their tasks. Working closely with the team to solve problems can help you learn from the team and build rapport. Showing your support for the project team and each member will help you get their support and cooperation.

One key role on the project team is that of a **business analyst (BA)**. A business analyst helps ensure that the business needs are accurately and appropriately satisfied with the project outcomes. Business analysis is the process of identifying what is needed and recommending viable solutions to satisfy business needs. Activities include documenting requirements and validating that those requirements are satisfied by the project outcomes.

Deeper Dive

For an in-depth discussion of the business analysis function, read the practice guide developed by PMI. You must be registered as a member to access the digital version.

- [Business analysis for practitioners: A practice guide](https://www.pmi.org/pmbok-guide-standards/practice-guides/business-analysis). © 2015 by the Project Management Institute, available at <https://www.pmi.org/pmbok-guide-standards/practice-guides/business-analysis>

You can also read about the business analysis function here:

- “Business Analysis: Leading organizations to better outcomes (2017).” PMI White Paper. Available at <https://www.pmi.org/learning/library/business-analysis-11167>

Test Your Knowledge

Using the team roles identified in this section, create an organizational chart that shows an appropriate structure for project oversight and reporting.

1.4 THE PROJECT MANAGER

As a project manager, you should bring some areas of expertise to the project team to manage the project and competing constraints. These areas are technical knowledge, strategic business and management knowledge and skills, and leadership and interpersonal skills.

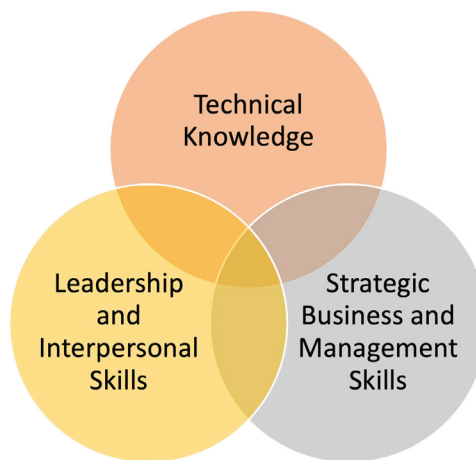


Figure 1.10: Areas of expertise that a project manager should bring to the project team

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Deeper Dive

PMI describes project manager competencies using the Talent Triangle®. [Read about PMI's Talent Triangle® here:](https://www.pmi.org/learning/training-development/talent-triangle)

<https://www.pmi.org/learning/training-development/talent-triangle>

1.4.1 Technical knowledge

Technical knowledge includes understanding standards, regulations, application areas, and best project management practices. **Standards** are guidelines or preferred approaches that are not necessarily required. In contrast, **regulations** are mandatory rules that must be followed, such as government-imposed requirements through laws. As a professional, you must follow all applicable laws and rules to your industry, organization, or project. Every industry has standards and regulations. Knowing what affects your project before you begin work will help the project unfold smoothly and allow for effective risk analysis. While knowledge of the industry type is important, you will have a project team supporting you in this endeavor.

Some projects require specific skills in particular **application areas**. Application areas contain common elements, characteristics, or technology. They can be defined by industry group (such as logistics, healthcare, technology) or department (Administration, Finance, Marketing, and Human Resources, for example). These application areas are usually concerned with disciplines, regulations, the project's specific needs, the customer/client, or the industry. For example, most government agencies have specific procurement rules that apply to their projects that wouldn't apply to the software industry. For them, today's fast-paced advances can leave them behind fairly quickly if they don't stay abreast of current trends.

Experience in the project application area may give the project manager some advantages in managing a project in a particular discipline. While it is helpful to call in experts who have the application area knowledge, a project manager can benefit from understanding the specific aspects of the project's application areas.

1.4.2 Strategic Business and Management Knowledge and Skills

Project management is more than just getting the work done. Inherent in the project management process are general management skills that allow the project manager to complete the project with some level of efficiency and control. In some respects, managing a project is similar to running a business: there are risks and rewards, finance and accounting activities, human resource issues, time management, stress management, and a purpose for the project to exist. Therefore, general management skills are needed in every project.

1.4.2.1 Understanding the Project Environment

The project environment, composed of many internal and external factors in your organization, can influence your project’s success. Internal organizational factors include structure, culture, people, and processes. External organizational factors include the external environment in which an organization operates ([Figure 1.11](#)).

Internal	External
<ul style="list-style-type: none"> • Organizational Culture • Physical Structure & Assets • People • Processes 	<ul style="list-style-type: none"> • PESTLE (political, economic, social, technological, legal, environmental) Factors • Competition and Market Factors

Figure 1.11: Important factors to consider within the project environment

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PMI distinguishes between enterprise environmental factors and organizational process assets to describe the many ways in which the project environment can influence project processes and outcomes ([Figure 1.12](#)). **External environmental factors** are those factors that are present inside and outside the organization, but are outside of the project team’s control or influence. **Organizational process assets** include processes and information unique to the organization, which the project team can utilize to understand the business environment in which the project operates.

External Environmental Factors	Organizational Process Assets
<ul style="list-style-type: none"> • Internal Organizational Environment • External Environment 	<ul style="list-style-type: none"> • Policies, procedures, processes • Organizational knowledge • Employee Knowledge

Figure 1.12: PMI Framework of Project Environment

Source: Original Work

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1.4.2.2 Internal Organizational Environment

Internal environmental factors include an organization’s processes, people, and assets, culture and structure, infrastructure, and physical assets available to a project team ([Figure 1.13](#)). Also known as **organizational process assets**, a project manager needs to be familiar with the resources that are available to effectively plan and manage projects.

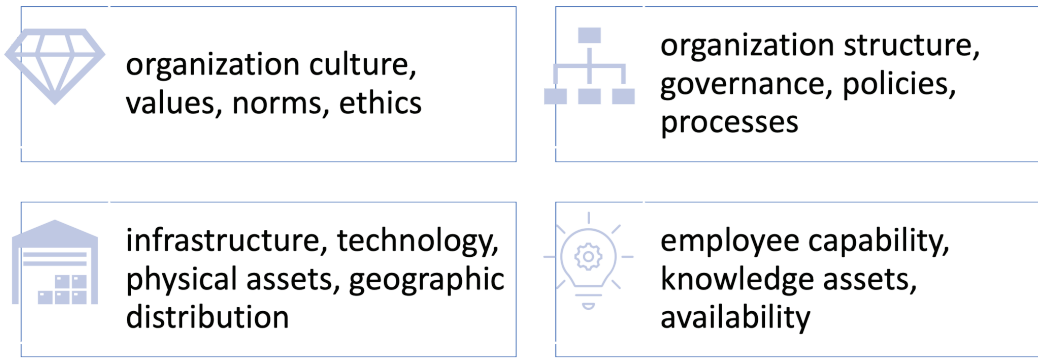


Figure 1.13: Internal Organizational Environmental Factors that may affect a project

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1.4.2.3 External Environment

External environmental factors can influence a project within an organization and include all factors that affect the organization’s success. One way to think about the external factors that may affect a project within an organization is to use the PESTLE acronym³ (Figure 1.14).



Figure 1.14: External Environmental Factors that may affect a project

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Political systems influence how businesses operate and directly affect the economy or industry in which a business operates. Social-cultural factors relate to how people interact with each other and the values and norms of behavior they hold. Technological factors include automation, computing, and innovations that can affect how a company competes in its market. Legal and ethical factors include laws that affect the business environment and the ethical frameworks that people and organizations uphold. Environmental and natural resources include the physical surrounding environment, the regional and global climate, and how these factors affect how an organization conducts its business.

Deeper Dive

To learn more about [PESTLE](http://www.pestleanalysis.com), visit www.pestleanalysis.com for articles that explain how to use PESTLE as a business analysis tool.

All the factors are important to consider, but the cultural and international factors are often misunderstood or ignored. How we deal with clients, customers, or project members from other countries or societies can be critical to the project's success. For example, colors have different meanings in different cultures. White, a sign of purity in North America (e.g., a bride's wedding dress) and thus a favored background color in North America, signifies death in Japan (e.g., a burial shroud).

Project managers in multicultural projects must appreciate the cultural dimensions and try to learn relevant customs, courtesies, and business protocols before taking responsibility for managing an international project. A project manager must consider these various cultural influences and how they may affect the project's completion, schedule, scope, and cost.

1.4.3 Power Skills for Project Managers

Project managers need strong interpersonal skills when managing and leading projects. This section will discuss additional interpersonal skills needed to effectively lead and develop high-performing project teams ([Figure 1.15](#)).

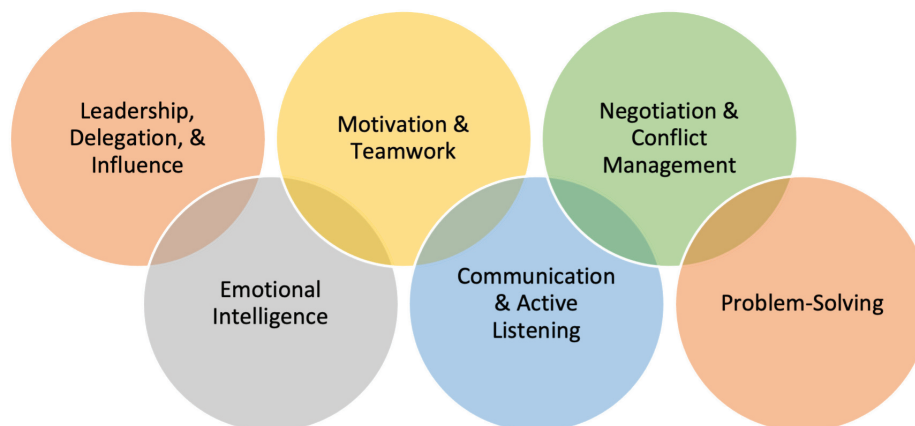


Figure 1.15: Interpersonal Skills Useful to A Project Manager

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1.4.3.1 Leadership

Leadership is the ability to motivate and inspire individuals to work toward expected results. Leaders inspire vision and rally people around common goals. As a leader, a good project manager can guide the team to see the vision and value of the project. In addition, the project manager can inspire the team to find a solution to overcome perceived obstacles to getting the work done. A more in-depth discussion of leading teams without authority will be presented in [Section 12.1](#).

1.4.3.2 Delegation

Delegating responsibility and work to others is another critical project leadership skill. The responsibility for executing the project belongs to the project

manager. Often, team members work on the project but report to a functional manager in the parent organization.

Delegation, or giving others the autonomy, accountability, and responsibility for how to do their assigned work, involves creating a project organizational structure with the work organized into manageable units. Delegation involves understanding the knowledge, skills, and abilities needed to manage that work and matching the team members with the right skills to do it. Good project managers are good delegators. They recognize that delegation is often more effective than exerting a great deal of control when working with competent staff engaged in the project.

For example, the procurement leader for a major project may also report to the organization's vice president for procurement. Although the procurement plan for the project must meet the organization's procurement policies, the procurement leader on the project will take day-to-day direction from the project manager.

The amount of direction given to the procurement leader or others on the team is the project manager's decision. Suppose the project manager delegates too little authority to others to make decisions and act. In that case, the consequent lack of a timely decision or lack of action will cause delays in the project. Delegating too much authority to others who do not have the knowledge, skills, or information will typically cause problems that result in delays or increased project costs. Finding the right balance is a critical project management skill.

1.4.3.3 Influence

Project management is about getting things done. Every organization has different policies, operations modes, and culture. Political alliances, differing motivations, conflicting interests, and power struggles exist. A project manager must understand the unspoken influences at work within an organization. **Influence** is the ability to get people to do things for you when you don't have the authority or other types of power to get them to do those things. A more in-depth discussion of leading teams without authority will be presented in [Section 12.2](#).

1.4.3.4 Emotional Intelligence

Emotions are mental and physiological responses to external environmental and internal stimuli. Leaders should understand and value emotions to appropriately respond to the client, project team, and project environment. **Emotional intelligence** includes the following:

- **Self-awareness:** recognizing your emotions and how they affect you and your interactions with others
- **Self-regulation:** managing emotional responses in your interactions with others
- **Empathy:** recognizing the emotions held by others

- **Relationship management:** managing emotions in relationships for more effective interactions

Emotions are essential to generating energy around a concept, building commitment to goals, and developing high-performing teams. Emotional intelligence is vital to the project manager's ability to build trust among the team members and stakeholders. It is necessary to establish credibility and open dialogue with project stakeholders. Emotional intelligence is critical for project managers, and the more complex a project, the more influential the project manager's emotional intelligence becomes to project success.

Deeper Dive

How emotionally intelligent are you? Learn more about the importance of emotional intelligence and assess yourself at the website below.

- Institute for Health and Human Potential. (n.d.) [What is emotional intelligence?](https://www.ihhp.com/meaning-of-emotional-intelligence/) Retrieved September 16, 2022, from <https://www.ihhp.com/meaning-of-emotional-intelligence/>

1.4.3.5 Motivation & Teamwork

Building motivation in your team helps everyone work more efficiently and produce better results. **Motivation** is an internal force that drives people to perform at their best. The project manager motivates the team toward completing project goals with passion and provides a profound reason to complete the work. The project manager uses various team-building techniques and exercises to motivate the team. **Team building** is getting a diverse group to work together most efficiently and effectively. This may involve management events and individual actions designed to improve team performance.

Recognition and rewards are an essential part of motivating teams and are formal ways of recognizing and promoting desirable behavior. These strategies are most effective when carried out by the management team and project manager. Consider individual preferences and cultural differences when using rewards and recognition. Some people don't like to be recognized in front of a group; others thrive on it.

1.4.3.6 Communication

Project managers spend the majority of their time communicating. Therefore they must be good communicators, promoting a clear, unambiguous exchange of information. As a project manager, you must keep many people well informed. It is essential that your project staff know what is expected of them: what they have to do, when they have to do it, and what budget, time constraints, and quality

specifications they are working toward. If project staff members do not know their tasks or how to accomplish them, the entire project will grind to a halt. If you do not know what the project team is (or is not) doing, you will be unable to monitor project progress. Finally, if you are uncertain of what the customer expects of you, the project will not get off the ground. Project communication can be summarized as knowing “who needs what information and when” and ensuring they have it.

1.4.3.7 Active Listening

One of the most useful communication skills a project manager has is the ability to listen actively. **Active listening** is placing oneself in the speaker’s position as much as possible, understanding the communication from the speaker’s point of view, observing body language and other environmental cues, and striving not just to hear but to understand. Active listening takes focus and practice to become effective. It enables a project manager to go beyond the basic information being shared and develop a complete contextual understanding of the information. Active listening techniques include:

- Listening intently to the client’s words and discerning their body language
- Nodding and expressing interest in the client without forming rebuttals
- Providing feedback and asking for clarity while repeating a summary of the information back to the client
- Expressing understanding and empathy for the client

Active Listening

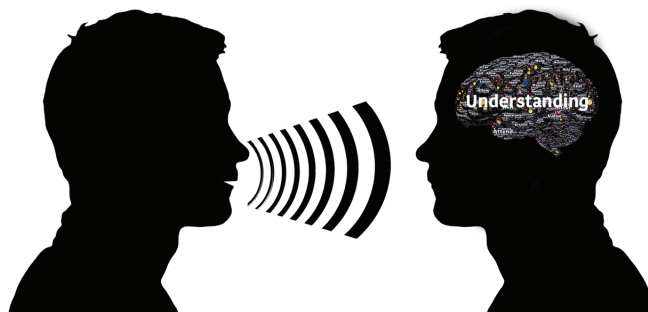


Figure 1.16: Active Listening Increases Understanding

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1.4.3.8 Negotiation and Conflict Management

Project managers must negotiate for the good of the project. In any project, the project manager, the project sponsor, and the project team will have to negotiate

with stakeholders, vendors, and customers to reach an agreement acceptable to all parties involved.

Negotiation is an active process where you try to get an agreement between the people involved in a disagreement. Negotiation is necessary when stakeholders disagree on what is to be included or not included in the project scope. A project manager will need to facilitate discussions between the competing stakeholders to determine the best decision for the project.

Conflict in a project is to be expected because of stress levels, lack of information during the early phases of the project, personal differences, role conflicts, and limited resources. Although good planning, communication, and team building can reduce conflict, issues will emerge. How the project manager deals with conflict results in either problems or an opportunity to build energy, creativity, and innovation. A more in-depth discussion of conflict management and negotiation will be discussed in [Section 11.5](#).

1.4.3.9 Problem-Solving

Problem-solving is the ability to understand the root of a problem, identify viable solutions, and then decide to implement the best solution. The starting point for problem-solving is defining the problem. Problem definition involves evaluating the cause and effect of the problem; this centers on root-cause analysis. If a project manager treats only the symptoms of a problem rather than its cause, then the symptoms will perpetuate and continue through the project life. Even worse, treating a symptom may result in a more significant problem. For example, increasing the ampere rating of a fuse in your car because the old one keeps blowing does not solve the problem of an electrical short that could result in a fire. The root-cause analysis looks beyond immediate symptoms to the cause of the symptoms, which then affords opportunities for solutions. Once a project manager identifies the root of a problem, they must take action to resolve it.

Solutions can be presented by vendors, the project team, the project manager, or various stakeholders. A viable solution focuses on more than just the problem; it looks at the cause and effect of the solution itself. In addition, a timely decision is needed or the window of opportunity may pass, and a new decision will be required to address the problem. As in most cases, the worst thing you can do is nothing.

All of these (and more) interpersonal skills will be used in all areas of project management. So start practicing now because it's guaranteed that you'll need these skills on your next project.

Deeper Dive

To learn more about your interpersonal skill strengths, check out the following websites:

- [Interpersonal Skills](https://www.skillsyouneed.com/interpersonal-skills.html). <https://www.skillsyouneed.com/interpersonal-skills.html>
- [Mind Tools](https://www.mindtools.com/). <https://www.mindtools.com/>

2

Projects and Organizational Strategy

As discussed in the prior chapter, organizations engage in projects to deliver value through new and improved products, services, or results. Project governance structures fit within the organization’s structure, and the type of organizational structure influences how projects are governed. This chapter will teach you about organizational structures and how projects fit within them. You will also explore the processes involved in identifying and selecting projects that satisfy organizational objectives.

CHAPTER LEARNING OBJECTIVES

- Understand the role of projects in delivering organizational value.
- Distinguish between the different organizational structures and understand how project work might fit within those structures.
- Explore the structures involved with project governance and oversight.

PM in Real Life: Competing Priorities



Figure 2.1: Military Communications

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For some, project management is as much about managing expectations as seeing new products and services delivered. For example, after commissioning as an officer in the U.S. military, Nicole G. found herself juggling multiple demands for projects and services in a rapidly changing environment.

“In the military, we were always in demand,” Nicole said, referring to her work in Signals, the branch associated with communications, computers, and networking ([Figure 2.1](#)). “The problem was many higher-ups knew what they wanted but didn’t always know what it would take to get there.” With limited resources, including personnel, she would have to clarify the desired end state with her commanders and superiors and decide where to focus her team’s efforts.

“We would have to break things down into different goals and try to understand which took precedence,” Nicole recalls. In this way, she helped create a simplified decision matrix to focus efforts based on the personnel and equipment she had. “They say, ‘when everything is a priority, then nothing is a priority,’” she stated.

This demand continued after she left the Army and started working for Amazon. “There were clear priorities and a vision for where we were going,” she said. “While we might start working on a single initiative or project, though, it would kind of grow from there if we saw some successes. As long as what we were doing was aligned with the goals set for us, we might see additional projects grow out of that into a full program.”

After several years, she moved on to another company focused on Artificial Intelligence. Still, her experiences of working to understand her stakeholders’ goals, priorities, and vision ensured she could reasonably deliver a series of successful projects and products that satisfied their needs. “If we didn’t align with the priorities, we could have spent so much of our time chasing lots of ideas but never really seeing them to completion,” Nicole concluded.

2.1 VALUE CREATION AND STRATEGIC ALIGNMENT

Creating value and aligning with organizational strategy requires project managers to understand an organization’s vision, mission, and strategy, as well as success factors that allow organizations to evaluate the effectiveness of project activities.

2.1.1 Vision, Mission, and Strategy

Organizations exist to fulfill a purpose. This purpose is expressed in an organization’s vision statement. The **vision statement** is an ideal that describes what leaders want an organization to accomplish. The **mission statement** is more specific, describing how the organization will fulfill its vision.

An organization’s **strategy** is the game plan for ensuring that the organization’s efforts are directed toward a common goal. It is an expression of its mission and overall culture. In a well-run company, every decision about a project supports the organization’s strategy ([Figure 2.2](#)). The strategy, in turn, defines the company’s

portfolio of projects and day-to-day operations. Projects and their budgets flow out of the organizational strategy.

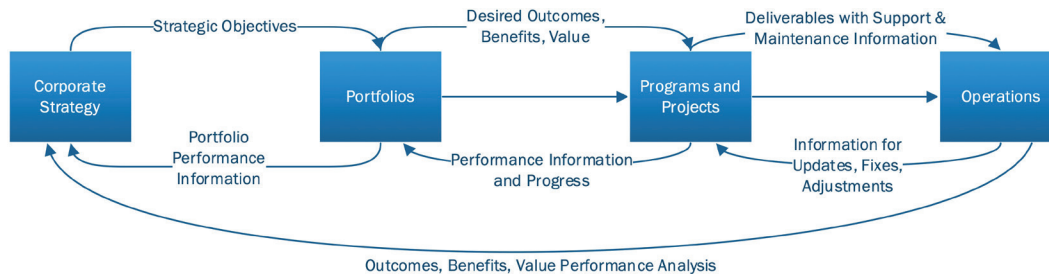


Figure 2.2: Information Flows Between Strategy and Operations

Source: Original Work

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Successful organizations are intentional about performing actions that fulfill their vision and mission. These organizations analyze their external and internal environments to understand the opportunities and threats present in the areas in which they operate. An organization must also analyze and work with its strengths and weaknesses. Organizational leaders use analysis to inform their decision-making. In particular, the organization must develop objectives to reach its desired strategic goals. These objectives are usually some sort of performance goal. Examples of performance goals include increasing market share for a product or service, improving profitability, and improving client satisfaction.

Without a clearly defined strategy, an organization cannot expect to navigate the complexities of its external environment. This is especially true if the strategy is motivated by the organization’s attempt to push its vision onto customers rather than pulling the customer’s definition of value into its daily operations.

Deeper Dive

To learn more about organizational strategy and the difference between planning and strategy, watch the following video by Roger Martin.

Martin, Roger. (2022) [A Plan Is Not a Strategy](https://www.youtube.com/watch?v=iuYlGRnC7J8&ab_channel=HarvardBusinessReview) - YouTube. Retrieved September 04, 2022, from https://www.youtube.com/watch?v=iuYlGRnC7J8&ab_channel=HarvardBusinessReview

Projects are one approach that organizations take to operationalize strategy. In the end, effectively executing a strategy means pursuing suitable projects. In other words, it’s a matter of aligning projects and initiatives with the company’s overall goals. For example, a company with a mission of providing meals to people experiencing food insecurity would be better served focusing on a project that develops a streamlined process to deliver food, instead of focusing on a project

that improves the executive’s office space. We will discuss the process of aligning projects with an organization’s strategy in [Chapter 4](#).

2.1.2 Success Factors

Project success depends on project management success, but these two types of success are distinct ([Figure 2.3](#)). **Project success** deals with the effects of a project’s outcomes or final product or service on stakeholders. **Project management success** focuses on the processes of a project, including successfully completing the project and delivering the agreed-upon scope within budget (cost), time (schedule), and quality requirements.

We can also consider **organizational success criteria**, which are success factors that connect with the organization’s strategy. An organization identifies its vision and mission, but organizational leaders must operationalize how the mission will be realized by identifying measurable strategic objectives. These strategic objectives can also be considered organizational success criteria, often used to identify and select projects (see [Section 4.4](#)).

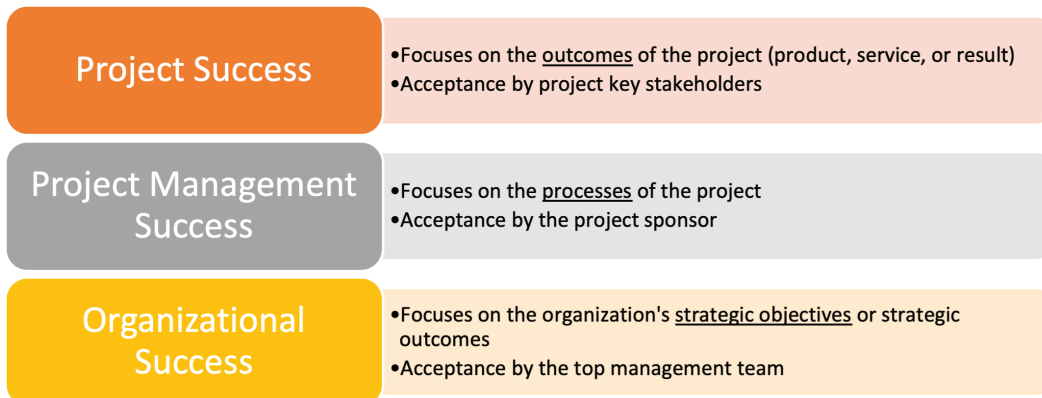


Figure 2.3: Types of Success Criteria

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Successful organizations need successful projects, and successful projects need successful project management. Effective project management requires good planning, a skilled project manager, good communication and information flows, value to stakeholders, engaged team members, and changing activities to accommodate the dynamic nature of projects.

A project may be successfully managed but not meet the client or customer’s expectations. Because the purpose of project work is to create value, success levels can be measured by stakeholders to determine added value upon completion.

Effective project management practices play a role in project success. However, many other factors outside the project manager’s direct control influence project management success. Therefore, even if the project management process is

successful, stakeholders may perceive the accomplished project as a failure. Factors that may cause project management to fail include⁴:

- Inadequate rationale, objectives, tasks, and goals
- Unqualified or inexperienced project manager
- Lack of support from top management
- Lack or misuse of project management techniques
- Inadequate or incorrect communications
- Inadequate project planning
- Lack of commitment to the project.

2.2 ORGANIZATIONAL STRUCTURES

As discussed previously, organizations rely on the strategic use of projects to ensure the organization's work aligns with its mission and strategy. To achieve this, leaders structure organizations to maximize the effectiveness and efficiency of operations to achieve organizational goals. An organization's structure directly influences how projects fit within the organization to help deliver the value desired by the organization.

2.2.1 Principles of Organizational Structures

Organizational structure refers to how various tasks are divided, resources are deployed, and how units or departments are coordinated. Organizations are structured around standard tasks, formal reporting relationships, and effective employee coordination across departments with the help of **authority**, **reliability**, **responsibility**, and **accountability**. These principles are fundamental to developing effective organizational structures and workflows based on their clear understanding by all employees.

The following principles help describe an organization's structure:

- **Authority** is the right to make decisions, issue orders, and allocate resources to achieve desired outcomes. This power is granted to individuals (possibly by position) so that they can make full decisions.
- **Reliability** is the degree to which a team member can be depended on to ensure the project's success with sound and consistent effort.
- **Responsibility** is an obligation incurred by individuals in their formal organizational roles to effectively perform assignments or work toward the organization's success with or without guidance or authorization.
- **Accountability** is the extent to which an individual or project team is answerable to stakeholders and provides visible evidence of action (accountability = authority + responsibility).

Authority and responsibility can be delegated to lower levels in the organization, whereas accountability usually rests with individuals. Yet many executives refuse to delegate and argue that an individual can have total accountability through responsibility alone.

An organizational structure outlines the various roles within an organization, who reports to whom, and how an organization will departmentalize its work. Traditional job groupings result in different organizational structures, impacting project management because of possible conflicts in authority, responsibility, and accountability.

An organization can be organized according to three broad structures: functional, matrix, and projectized. These structures represent a continuum (Figure 2.4), from structures where the project manager has very little authority (functional) to those where project managers have comprehensive power (projectized).

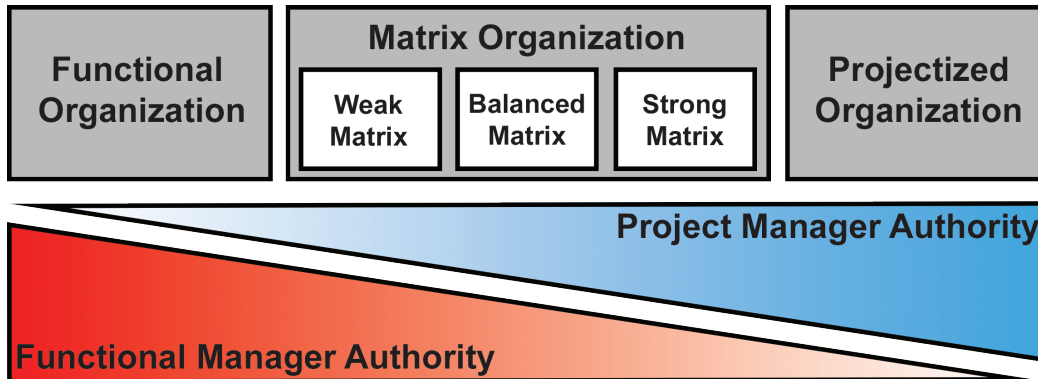


Figure 2.4: Managerial Authority by Organization Structure

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Many studies have considered the impact of organizational structure on project success, and it is not uncommon for corporations to change their organizational structures to increase relative success in executing projects on time and within budget. Structural change takes great effort and may take a long time to fully implement.

Instead of changing its structure, an organization may create a dedicated project team to carry out a critical project without reorganizing the entire enterprise. This way, they can get many of the same benefits of the projectized organization without reorganizing the enterprise. This approach is not without risk, as we'll explore in the discussion of dedicated project teams below.

Understanding organizational structures and how projects fit within them gives project managers insights into managing projects more effectively and efficiently.

A typical organization has several layers of management. Think of these layers as a pyramid like the one shown below (Figure 2.5). Top managers occupy the narrow space at the peak, employees occupy the broad base, and middle managers spread throughout the levels in between. As you move up the pyramid,

management positions get more demanding, but they carry more authority and responsibility (along with more power, prestige, and pay). Top managers spend most of their time planning and decision-making, while front-line managers focus on day-to-day operations. For obvious reasons, far more people are positioned at the pyramid's base than at the other two levels.

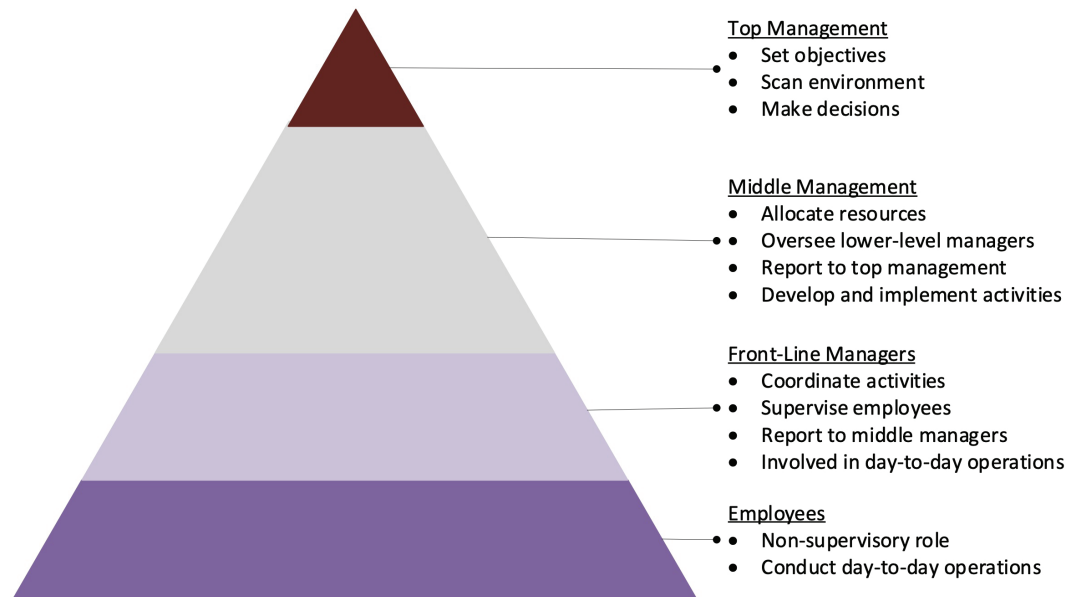


Figure 2.5: A Typical Functional Organization

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2.2.2 Functional Organizations

In **functional organizations**, the reporting structure is traditionally organized by function into various departments, with staff in each department reporting to a departmental manager or head. This allows for groupings of specialists within the organization to work together, share knowledge, and prioritize their work. Traditional functional departments might include:

- Human resources
- Accounting
- Procurement
- Marketing
- Sales
- Shipping

These functional units work independently, and the functional managers serve as conduits for communications and collaboration. This structure is very efficient and continuous process improvement can be conducted on all regular departmental operations. However, it is not optimal for project completion.

Projects often require work across disciplines. In a functional organization, with staff isolated inside their departmental “silos,” communication is directed through functional managers (Figure 2.6). These managers often have diverging priorities, making communications slow and error-prone in a functional organization.

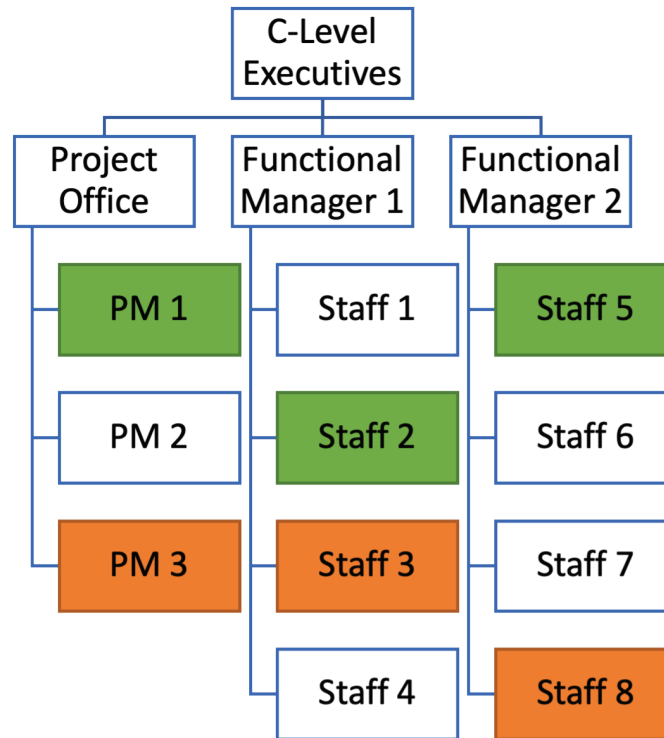


Figure 2.6: A Project Manager and Team in a Functional Organization

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The success of projects within a functional organization depends on functional and project managers working together and cooperating. While someone may be designated as the project manager for a particular project, that person may not have much authority. In this case, a functional organization may use the titles Project Coordinator, Project Scheduler, or Project Expediter to identify the people who manage projects. Regardless of title, those in charge of projects are often put in the role of simply trying to maintain a schedule of what is happening.

2.2.3 Projectized Organizations

Projectized organizations are at the opposite end of the organizational spectrum from functional organizations. These organizations focus their energy and resources on completing projects rather than managing ongoing operations. In a projectized organization, operations are minimal, and the project manager has full authority over resources and personnel decisions. Projectized organizations

may have organizational units called departments, and these groups either report directly to the project manager or provide support services to projects.

In the project-based structure, personnel are assigned to the project and report directly to the project manager (Figure 2.7). The project manager is responsible for the performance appraisal and career progression of all team members while on the project.

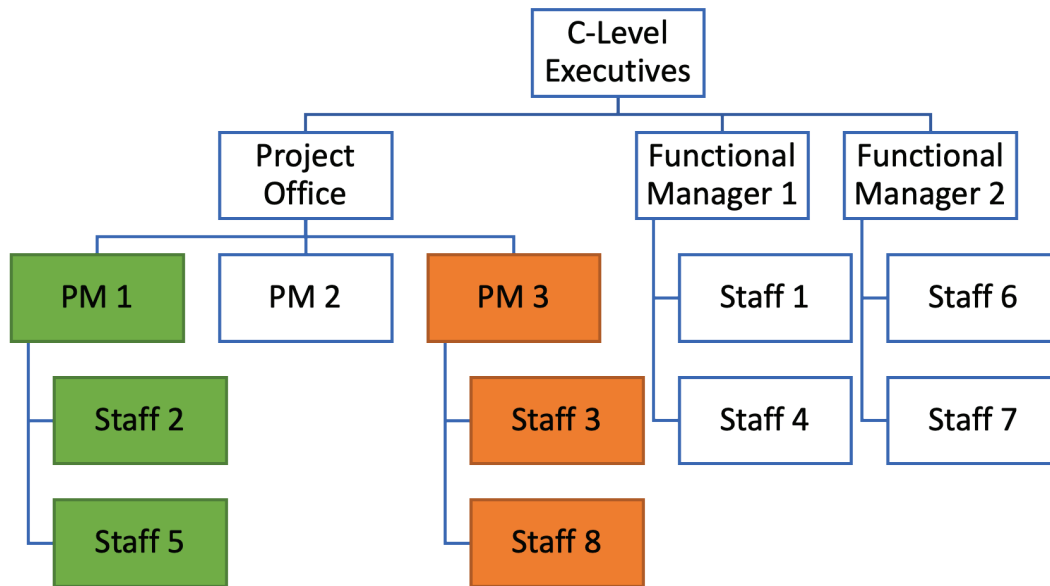


Figure 2.7: Project Teams in a Projectized Organization

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As you can imagine, employees in this environment can focus their loyalty on a project rather than their discipline. Not all people can succeed in such an organization, as they must adapt to different project managers’ leadership styles and organizational skills.

This structure is the most efficient organizational type for conducting projects, and it is used in organizations that bid on and undertake large projects, such as construction, industrial, and scientific projects that may last several years.

Examples of project-based organizations include construction companies, aeronautical manufacturers, and many software development companies. This type of organizational structure can put additional stress on employees as, once their project is over, they have no home to return to if they are not quickly selected for a subsequent project. However, this structure is generally considered ideal for project management since it significantly reduces the bureaucratic layers that a project manager must navigate.

2.2.4 Matrix Organizations

While it may work well in times of little change, a functional organization structure is limiting when a company’s success depends on adaptability. A **matrix organizational structure** attempts to combine the strengths a functional organization provides for operations management with the strengths a projectized organization provides for project management. In a matrix organization, the functional and project managers share authority and responsibility, which can lead to positive and negative outcomes ([Figure 2.8](#)).

Negative Outcomes	Positive Outcomes
<ul style="list-style-type: none"> • Employees may have two supervisors to whom they must report, breaking the solitary chain of command rule. • Employees must balance work between the project’s needs and their functional unit. • Supervisors may find it more challenging to achieve a consistent rate of progress since employees are often pulled in different directions. • Costs and communication channels can increase. 	<ul style="list-style-type: none"> • It significantly disrupts the communication silos of a functional organization, creating a more horizontal structure for teams and increasing the flow of information. • Allows people to concentrate on their specialty areas and bring those strengths to current projects.

Figure 2.8: Potential Outcomes of Matrix Organizations

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There are three basic types of matrix structures.

- **Weak Matrix:** The project manager has less control over resources and people than the functional managers. Project managers in a weak matrix may go by other titles, such as project coordinator or project scheduler.
- **Balanced Matrix:** In a balanced matrix, the project manager and functional manager share authority over resources and staff equally. This setup allows the organization to experience the best of both a projectized and functional organization simultaneously. However, this system presents many challenges:
 - Functional managers and project managers must work well together and maintain regular communications.
 - Staff will have two managers to whom they must report, breaking the chain of command concept and organizational structure.

- If functional and project managers have conflicting priorities, subordinates may be unable to meet expectations.
- **Strong Matrix:** In a strong matrix, the project manager has more direct control over resources and staffing while the functional manager will support the project staff in hiring, technical expertise, and professional development. Of all the matrix structures, the project manager has the most authority in this type while the functional manager has the least.

2.2.5 Dedicated Project Team

Many functional organizations find that they often need to carry out essential projects but do not want to change their entire organizational structure. Recognizing the advantages achieved by giving authority to a project manager, functional organizations often organize **dedicated project teams** where a project manager can have authority over the staff assigned to a particular project. The project manager and project team members are sometimes located in a designated office, away from the desks and duties they typically have within the functional organization. This can be a very effective way to complete projects. However, some challenges can arise, including:

- Temporary loss of staff from functional groups.
- Integration of project team members into the functional organization can be complex after the project is completed.
- An “us versus them” mentality, where people on the project team are deemed “better” than those working in functional departments. There have been numerous case studies of conflict arising from dedicated project teams.

A classic case of using a dedicated project team and the problems it can cause to the functional organization was when Steve Jobs picked the best and brightest engineers from Apple to work on the development of the Macintosh computer. The project was very successful, but there was a lot of tension between the project team and the functional organization.

[Figure 2.9](#) summarizes the project manager’s authority and role across the different organizational structures discussed here. Additionally, the table highlights who has control of the project budget and project resource availability.

Organizational Structure					
	Functional	Weak Matrix	Balances Matrix	Strong Matrix	Projectized
Project Manager Authority	Minor or None	Low	Low to Moderate	Moderate to High	High or Absolute
Project Manager's Role	Part-Time	Part-Time	Full-Time	Full-Time	Full-Time
Budget Control	Functional Manager	Functional Manager	Shared	Project Manager	Project Manager
Project Resource Availability	Little or None	Low	Low to Moderate	Moderate to High	High

Figure 2.9: The Project Manager’s Role Across Organizational Structures

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2.3 PROJECT GOVERNANCE

2.3.1 Projects versus Programs versus Portfolios

Most organizations do not have the resources or time to complete all possible projects, even if all of those ideas might result in a successful outcome that would move the organization forward. As a result, organizations will typically keep a list of possible projects and review it periodically to see if it’s the right time to pursue a particular project.

Project Portfolio Management (PPM) is one approach organizational leaders use to align proposed projects with an organization’s strategic goals. **Portfolios** are the complete set of initiatives, including projects, programs, and operational activities, that a company enacts to achieve organizational strategies and objectives.

PROJECTS AND ORGANIZATIONAL STRATEGY

Project	Program	Portfolio
A temporary endeavor undertaken to create a unique product, service, or result	A set of coordinated projects, that usually share something in common, within portfolios	All initiatives, including projects, programs, and operational activities, that a company enacts to achieve organizational strategies and objectives
Project Management	Program Management	Project Portfolio Management
The application of knowledge, skills, tools, and techniques applied to project activities to meet the project requirements	The process of managing coordinated projects to reduce project conflict and efficiently utilize organizational resources	The alignment of proposed initiatives to an organization's strategic goals

Figure 2.10: Projects, Programs, And Portfolios

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Deeper Dive

To learn more about project portfolio management and the differences between projects, programs, and portfolios, watch this video by ProjectManagement.com

- Projectmanagement.com. (2014) [What is Portfolio Management vs. Project Management?](https://www.youtube.com/watch?v=9Tchp8LljXY&ab_channel=ProjectManager) - YouTube. Retrieved September 04, 2022, from https://www.youtube.com/watch?v=9Tchp8LljXY&ab_channel=ProjectManager

Within portfolios, a company may have several **programs**, which are sets of coordinated projects. Program management is the process of managing all these coordinated projects. Programs are established when a set of projects share something in common, such as resources, customers, or products and services. Programs allow organizations to use limited resources more efficiently and ensure similar projects do not conflict with one another. Program managers work with project managers on the various projects which make up the program to balance resources, risk, and scope.

The international Olympic Games is one example of a program. Hosting the Olympics is a program because many projects must fit together and be ready by a hard deadline, such as constructing stadiums and aquatic centers, creating marketing campaigns, installing new networks and power connections for media, etc. By coordinating all these projects, program managers can ensure that all is ready for the opening ceremonies.



Figure 2.11: Olympic Games May Be Managed as Programs

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2.3.2 Project Management Office

Organizations often have many project managers working on multiple projects, which may or may not be part of a coordinated program. A **Project Management Office** (or PMO) provides a central place for developing project management best practices, collecting lessons learned, supporting project managers, and assisting with Project Portfolio Management (PPM). Some PMOs will also support project managers by conducting analyses (for example, Monte Carlo risk analysis), such as assisting with time and cost estimates, for example. The PMO may be the home of all the project managers in an organization, or it may simply be a resource for all project managers who report to their line areas.

Typical objectives of a PMO are:

- Help ensure that projects are aligned with organizational objectives
- Provide templates and procedures for use by project managers
- Provide training and mentorship
- Provide unbiased facilitation for project meetings
- Stay abreast of the latest trends in project management
- Serve as a repository for project reports and lessons learned

The existence and role of PMOs tend to be somewhat fluid. If a PMO is created and increased success is not experienced in organizational projects, the PMO is at risk of being disbanded as a cost-saving measure. If an organization in which you are a project manager or a project team member has a PMO, try using available resources. If you are employed as a resource person in a PMO, remember that your role is not to get in the way and create red tape but to enable and enhance the success of project managers and project success.

2.3.3 Project Versus Product Management

Recently, the focus has shifted from project success criteria to the value achieved from products produced by projects.

Products are the outcomes of projects, and organizations measure product success in terms of business value over the product's life. This contrasts with project success, where the focus is on value delivery when the project ends.

Product management focuses on the "integration of people, data, processes, and business systems to create, maintain, and evolve a product or service throughout its life cycle."⁵ A product's life cycle includes all project stages, from the initial idea to the product's retirement.

Product management involves analyzing three trends in the market to determine how and what to do with a given product. These trends focus on the customer, the impact of technology, and changes to how products are purchased and supported.

In the past, organizations saw customers as merely end-users of their products or services. Today, organizations see customers as partners in designing, developing, and delivering products and services. Customer engagement and loyalty programs keep them involved in product improvement decisions throughout the product's life cycle.

Technology enhancements also influence how organizations manage products. As the world moves toward interconnected systems and societies, product features and functions must change to stay relevant and valuable to consumers.

Technology has also influenced how customers purchase and acquire new products and services. For example, transitioning from a pay-to-own to a subscription-based model has drastically changed how organizations deliver incremental improvements to existing products and how new products are designed for consumer use.

The focus on continuous value delivery and customer involvement has driven organizations to think of a product as part of an environment to be managed. Thinking this way, organizations tend to transition from temporary project teams that disband when the project is finished to stable teams that continue to support the evolution of the product or service. Incremental funding is made possible by the stability of the product environment, which improves financial projections and profit estimates.

Organizations often use programs and portfolios, discussed in the previous section, to manage product life cycles. [Figure 2.12](#) compares the duration, scope, change, success criteria, and funding sources of projects, programs, portfolios, and products.

PROJECTS AND ORGANIZATIONAL STRATEGY

Characteristic	Project	Program	Portfolio	Product
Duration	Short term, temporary	Longer term, but temporary	Long term, until organizational strategies and priorities change	Long term, until after the product is retired
Scope	Defined objectives are progressively elaborated	Aggregate benefits are realized through component projects	Includes all project and program work that supports organizational strategic activities	Customer value and benefits driven
Change	Change processes are part of the project management processes	Changes are evaluated across program to maximize value delivery	Changes to organizational strategy leads to changes in underlying projects and programs	Changes are evaluated to optimize value and benefit delivery to customers
Success	Project and project management success criteria	Realization of intended benefits and effectiveness of delivery	Strategic objectives are achieved	Ongoing viability of product and value delivery
Funding	Determined at the start of the project based on financial criteria and planned scope	Determined at the start of the program based on component projects and updated while the program is active	Continuous funding until the realization of strategic objectives	Continuous funding for ongoing development and value delivery assessment

Figure 2.12: Comparing Project, Programs, Portfolios, and Products⁶

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3

Approaches to Delivering Project Outcomes

Project management is not a one-size-fits-all approach that can be applied to organizations without considering their unique characteristics and the environment in which they operate. A good project manager learns when to modify, or tailor, project management methods, tools, techniques, and approaches to suit their organization's unique characteristics.

Organizational characteristics also influence the approach taken to manage projects. In this chapter, we will discuss the various development approaches and understand when each would be most beneficial for a given project. Further, we will explore project life cycles and how value can be delivered to an organization through project outcomes.

CHAPTER LEARNING OBJECTIVES

- Understand the process of tailoring the PMBOK® Guide and Standard to a specific project, considering project and organization attributes.
- Compare and contrast the various development approaches and understand when each would be most beneficial for a given project.
- Understand the relationship between the development approach and a project's life cycle.
- Explain the difference between a project life cycle and performance domains.
- Understand the project manager's role in ensuring value is delivered to the organization by the project outcomes.

PM in Real Life: Finding Value



Figure 3.1: Joseph Sisto, PMP, PMI-ACP

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“Overall, what we do comes back to delivering value for the customer,” Joseph Sisto said, “because that eventually drives revenue and sales.”

Mr. Sisto oversees project and program execution for a conglomerate of companies and has worked in project management for nearly 30 years. He is now with Driven Brands, which includes several companies and franchises related to automotive services, including car washes, collision repair services, and automotive glass replacement.

He has a staff of over 30 that manages and runs projects. At the same time, he oversees their general work and direction, ensuring that brands across the company can also profit as the benefits from one project are realized. One way of doing this is overseeing a project program based on a key outcome. For example, he had one program that involved automated scheduling for tire repairs, one that established convenient communication between customers and repair centers, and one that was a point-of-sale system for the repair center. Each of these projects affects the other projects. In addition, each is designed to be of value to make the customer’s repair experience more effortless, which, in turn, increases the convenience and sales of the repair center.

“Now you can make hair appointments over your phone,” he said. “We want you to be able to make car appointments with the same convenience rather than having to leave your car for a few days.”

One of the keys to realizing project benefit is knowing what the “solution vision or solution architecture” will be for the project’s outcome. The solution vision is how something should work and how that result will give value to customers. “This has to be done early,” he explained.

Once the outcomes are determined, he and his team can track progress towards outcomes through the project’s lifecycle. “This way, we know what the end should look like and ensure that we are measuring the value through to the end of the project.”

3.1 PROJECT MANAGEMENT IN MULTIPLE CONTEXTS

Every organization is different, with its own culture, leadership, measures of success, and business strategy. This variation requires project managers to **tailor**, or customize project management approaches and processes to work within the organization's unique environment or context.

As discussed in [Chapter 1](#), the guidebook we reference throughout this textbook, PMBOK® Guide (PMI, 2021)⁷, is a collection of performance domains, methods, models, and artifacts generally accepted as best practices within the project management discipline. The PMBOK® Guide provides the fundamentals and common vocabulary within the project management profession. In addition, it identifies “good practices” of project management to apply skills, models, methods, and artifacts to enhance the prospect of successfully delivering project outcomes.

However, the PMBOK® Guide does not describe every step you must take to manage a project. Each project team and organization must determine the processes and strategies appropriate to their specific business, industry, and type of project. PMI calls this “tailoring,” and it is necessary to tailor processes, documents, and engagement strategies to fit your organization, team, and project characteristics.

Tailoring project management approaches and processes require a conscious awareness of project management principles (see [Figure 1.7](#)) and business needs. Tailoring does not mean a project manager can pick and choose processes and approaches whimsically; rather the project manager must carefully choose appropriate methods and activities to ensure the project delivers a new product, service, or result valuable to the organization.

Tailoring processes include adding, modifying, removing, combining, or aligning activities to eliminate unnecessary steps that might otherwise reduce the effectiveness and efficiency of project management processes ([Figure 3.2](#)). For example, suppose it is organizational policy not to allocate funding to projects but rather include the cost of project work in operational expenses. In that case, a project manager does not have to perform cost estimation, planning, and budget control activities. Likewise, if additional safety requirements or regulations need to be satisfied, a project manager can adapt the project life cycle to ensure the project meets those requirements.

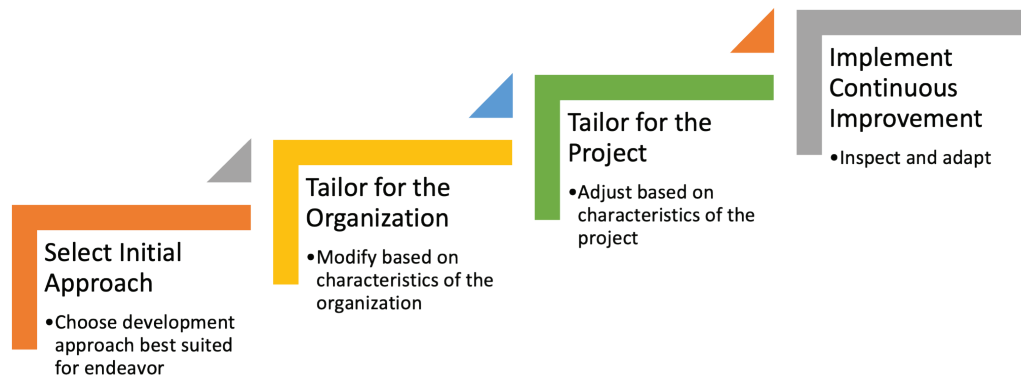


Figure 3.2: Tailoring Process

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3.2 DEVELOPMENT APPROACHES

3.2.1 Development Approaches

Every project has a certain rhythm, or cadence, that reflects when certain activities occur while the project progresses. Additionally, the outcomes of projects can be delivered at one time or in stages, depending on the goals of the project and the beneficiaries’ project outcome needs. The rhythm of a project can be reflected in its development approach, that is, how the project outcomes are produced, and the **life cycle**, which reflects how the project phases, or stages of work, are structured to deliver outcomes.

According to the PMBOK® Guide, a **development approach** is “a method used to create and evolve the product, service, or result during the project life cycle.”⁸ A continuum of approaches exists, ranging from predictive to adaptive. PMs use **predictive approaches** when there is significant uncertainty associated with project outcomes or processes. Defining the project requirements as comprehensively as possible before producing results will limit uncertainty levels before incurring a significant project cost.

On the other side of the spectrum, PMs use **adaptive approaches** when customers cannot fully describe requirements before project work begins. In adaptive approaches, numerous cycles of definition, creation, evaluation, and adjustment often occur throughout the project’s life. Adaptive approaches incur costs in a more balanced way during the project’s life, unlike predictive approaches, which incur most of the project costs during outcome production.

Between predictive and adaptive approaches lies the **hybrid approach** that balances the uncertainty-reduction of predictive approaches with the flexibility of adaptive approaches (Figure 3.3). In addition, hybrid approaches may deliver outcomes iteratively, incrementally, or both. **Iterative development** includes frequent feedback loops during each project phase, while **incremental development** provides outcomes with progressively more features and functionality.

APPROACHES TO DELIVERING PROJECT OUTCOMES

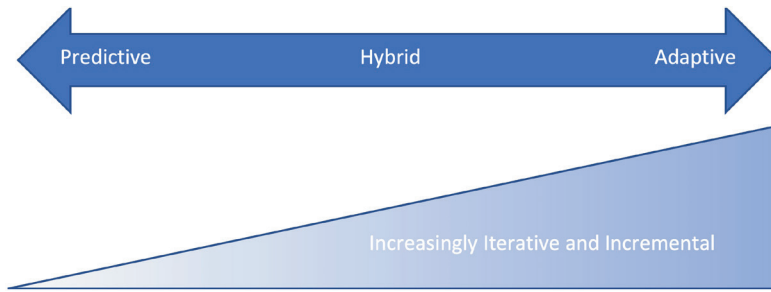


Figure 3.3: Development Approaches as a Continuum

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3.2.2 Choosing a Development Approach

Project managers must consider several things when choosing the development approach for a project. Sometimes, the type of project or the organization’s project management processes dictate the approach; often, however, the project manager has discretion in choosing a method. The project manager should consider the following factors when deciding which approach to use on a given project. These factors relate to project outcomes (product, service, or result), project processes, and the organization. When a project demonstrates a need for both adaptive and predictive approaches, the PM may need to consider hybrid approaches.

Factors relating to the product, service, or result include the degree of innovation, certainty of requirements, stability of the project’s scope, ease of incorporating changes, delivery options, amount and type of risks, and safety or regulatory requirements (Figure 3.4).

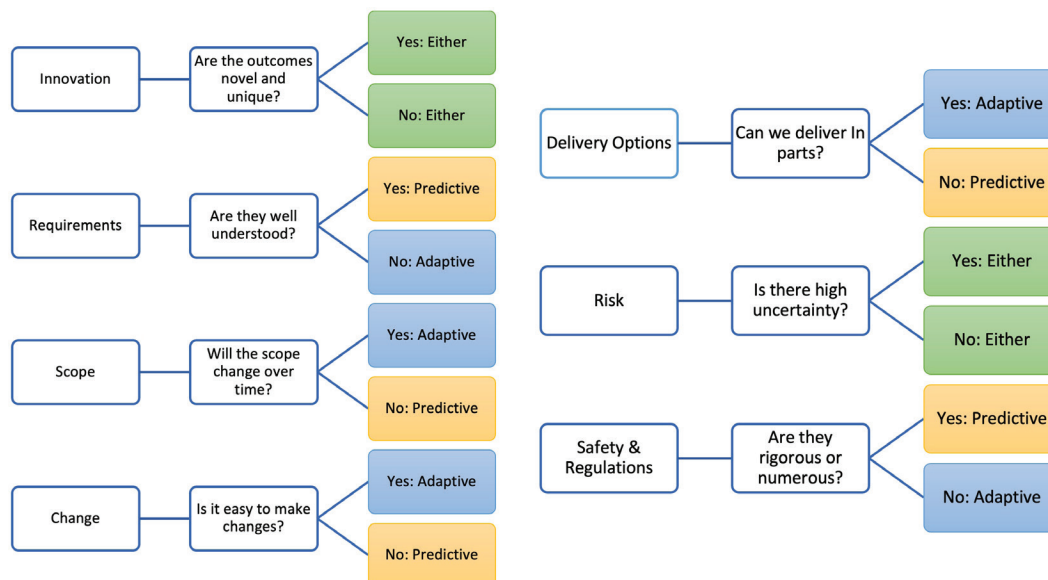


Figure 3.4: Product, Service, or Result Characteristics to Consider When Selecting an Approach

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APPROACHES TO DELIVERING PROJECT OUTCOMES

Factors relating to the project include stakeholder involvement, schedule constraints, and funding availability and timing ([Figure 3.5](#)).

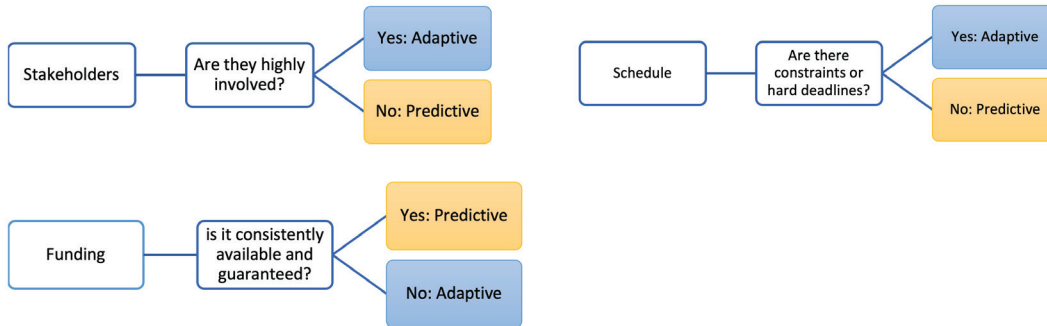


Figure 3.5: Factors Relating to Project Characteristics

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Factors relating to the organization include its structure, culture, capabilities, and the size and location of the project team ([Figure 3.6](#)). **Organizational culture** includes the practices, norms, and values that influence how the organization relates to its employees and how employees relate to one another. **Organizational capabilities** include the intangible assets an organization uses to achieve its strategic goals and include the combined skills, talent, knowledge, and mindset of organizational leaders and members.

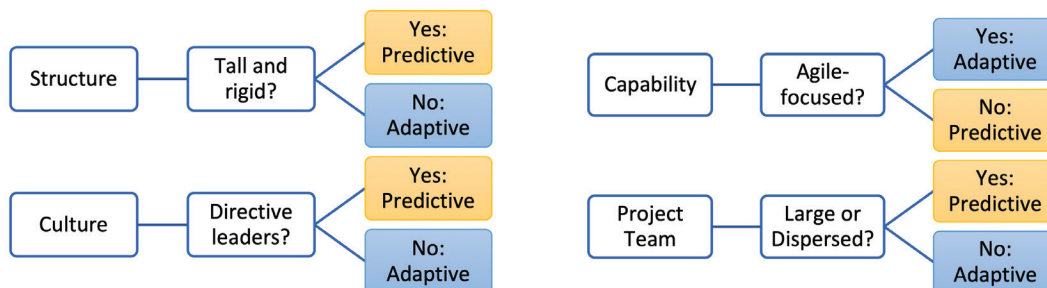


Figure 3.6: Factors Relating to Organizational Characteristics

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Deeper Dive

Do you want to know more about these organizational factors?

Read about organizational culture and how it affects organizational processes here.

- Hofstede Insights. (2022) [Organisational Culture - What you need to know](https://hi.hofstede-insights.com/organisational-culture). Retrieved Sep 09, 2022, from <https://hi.hofstede-insights.com/organisational-culture>

Read about organizational capabilities and how they develop here.

- Smallwood, Norm & Ulrich, David. (2004) [Capitalizing on Capabilities](https://hbr.org/2004/06/capitalizing-on-capabilities). Retrieved Sep 09, 2022, from <https://hbr.org/2004/06/capitalizing-on-capabilities>

Test Your Knowledge

Answer the following questions.

1. Describe an adaptive project based on product characteristics.
2. What type of project approach would you suggest for a project that had the following characteristics? Why did you select this approach?
 - a. project stakeholders are highly involved
 - b. the requirements are not well understood
 - c. there are several safety requirements that must be satisfied
 - d. the funding is guaranteed for the life of the project
 - e. the deadline for final delivery must be met
3. Describe an organization that is ideally suited to adaptive development approaches.

3.3 PROJECT LIFE CYCLES

3.3.1 Life Cycles and Phases

The project manager and project team have one shared goal: to carry out the project's work to meet its objectives. Every project has a cycle: a beginning, a middle period during which activities move the project toward completion, and an ending (either successful or unsuccessful).

A project's **life cycle** describes the structure and flow of project work that occurs as the project moves from start to finish. Different industries represent project life cycles in ways that make sense for their area of expertise. Regardless of the life cycle, each project phase includes several processes we use to manage the project. A **phase** represents a grouping of similar activities with a loosely defined beginning and end. In predictive approaches, phases are typically sequential, where the prior phase is complete before the next phase begins. With more adaptive approaches, phases may not have clear-cut end dates, and some activities in an early phase of

the project will continue into its later phases. Project managers often use **phase-gate reviews**, or checkpoints, to confirm that the work to be performed in the current phase has been completed successfully, indicating that the team can move forward to the next phase.

3.3.2 Process-Based Life Cycles

When projects follow a set of processes to move from project identification to delivery, project managers may find it appropriate to organize the project life cycle into stages that reflect groups of similar processes. Such a strategy will simplify project status discussions and provide a meaningful framework to follow.

The Project Management Institute (PMI) developed a life cycle containing five process groups that many industries and project types find useful (Figure 3.7).⁹ The process groups are structured so that the outputs of one phase are inputs to the next. The work described in the process group phases most often refers to project management activities that ensure project deliverables meet customer expectations.

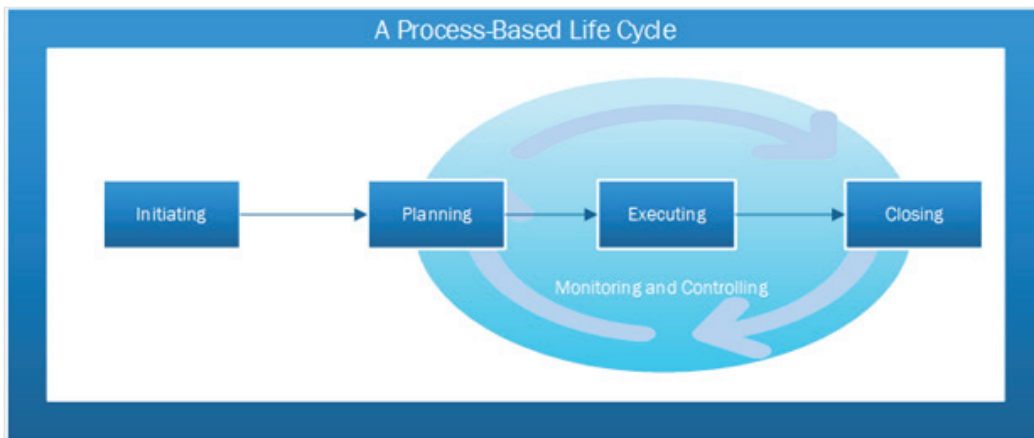


Figure 3.7: A Process-Based Life Cycle

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The five process groups in this process-based life cycle include:

- **Initiating** – the processes completed during project initiation to define the project, phase, or contract. Authorization to proceed to the next stage generally happens when the project is described in enough detail to be planned and elaborated in the next phase.
- **Planning** – processes that include elaborating the project scope, schedule, budget, and other aspects of the project, phase, or contract. Authorization to proceed to the next stage generally happens after a detailed plan has been documented and approved, including scope,

schedule, and budget baselines, and plans to manage resources, contracts, risk, stakeholders, and other project areas.

- **Executing** – processes that ensure the project team is producing the deliverables required by the project. These processes often happen in parallel to the monitoring and controlling processes.
- **Monitoring and Controlling** – processes that the project manager follows to ensure work is progressing as expected, changes are evaluated, and project performance is measured and reported. The plans documented during the planning stage are enacted here to keep the project “on track.”
- **Closing** – processes completed to wrap up a project, phase, or contract and deliver outcomes to the appropriate stakeholders. Activities included here allow for the formal handoff of project outcomes, releasing project resources, and closing procurements.

3.4 ALIGNING APPROACH, CADENCE, AND LIFE CYCLE

The development approach and delivery cadence influence how a project is structured. Below are four examples of life cycles that consider the approach and cadence of project work.

3.4.1 Predictive – Single Delivery

Projects using a predictive-single delivery life cycle generally produce a product, service, or result that can only be delivered all at once. The phases of this life cycle flow in a sequential pattern, with one phase ending before the next one can begin.

Examples of projects that would use a predictive-single delivery life cycle might be a new home, a small building, a wedding, or a similar one-time event ([Figure 3.8](#)). A wedding exemplifies a linear project focused on one outcome, the wedding day. The project would begin after the proposal is accepted and the couple hires an event coordinator. The event coordinator would start planning, making reservations, paying deposits, and ensuring the bride gets the wedding of her dreams. After planning, the wedding day arrives, and while the bride, groom, and guests are busy enjoying the hard labor of the wedding coordinator, the wedding coordinator makes sure the wedding and reception occur without issues. After the wedding (and honeymoon), it's time to close the project by paying the bills and moving on with life.

APPROACHES TO DELIVERING PROJECT OUTCOMES



Figure 3.8: Example Life Cycle for a Wedding Using a Predictive Approach

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3.4.2 Iterative – Multiple Deliveries

Projects that use an iterative approach to delivering multiple versions of a product, service, or result would use this life cycle. Each phase of the project will focus on enhancing the initial version of the outcome delivered. For example, a research paper project might follow this approach ([Figure 3.9](#)). Notice the incorporation of feedback from one iteration to the next.

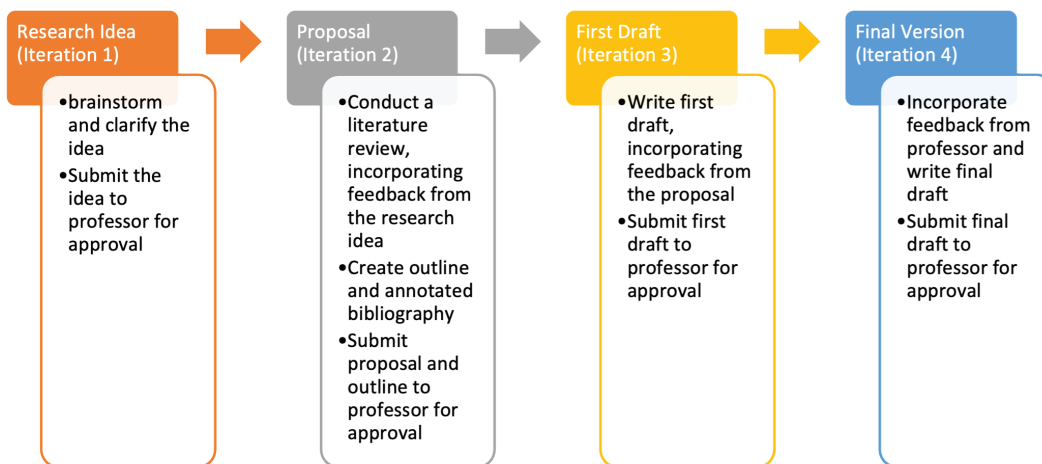


Figure 3.9: Research Paper as an Iterative Multiple Delivery Life Cycle

Source: Original Work

Attribution: Juanita Woods

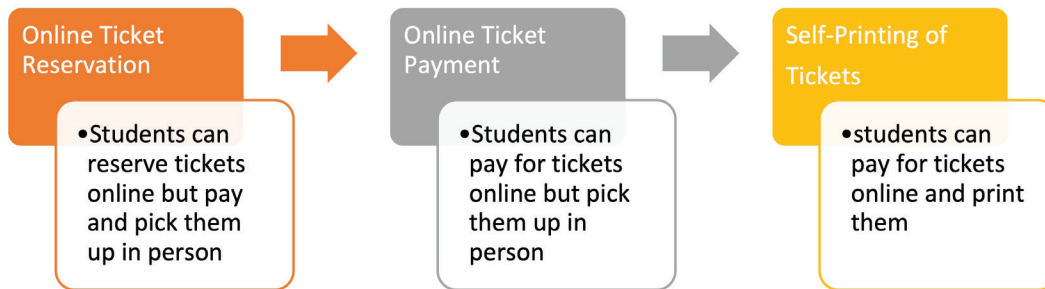
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3.4.3 Incremental – Multiple Deliveries

Instead of enhancing a single product, service, or result through multiple iterations, projects that use an incremental approach to delivery add new features and functions to a baseline product, service, or result in increments. Each increment has additional features and functions that were not present in the baseline, or first, version of the outcome.

For example, a small team of students might develop a reservation and ticketing system for Student Government Association (SGA) events ([Figure 3.10](#)). The first system version would include students' ability to reserve tickets online. After that, students would need to go to an office to pay for the tickets and pick

them up. While the SGA uses the system for events at the start of the semester, the development team works on the next increment, allowing students to pay for their tickets online, though they would still have to go to an office to pick them up. The development team continues their work while implementing this system for the end-of-year events. By the spring, the reservation system now allows self-printing tickets, even allowing students to gift tickets to other students.



Project Phases



Figure 3.10: An Incremental Project with Multiple Deliveries

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3.4.4 Adaptive – Periodic Deliveries

Adaptive life cycles incorporate feedback throughout the development of products, services, or results. **Agile** is a broad term for adaptive project management techniques. Rather than trying to develop all aspects of a project or software application and then present that result to the customer after a long development cycle (6 to 24 months), Agile techniques use short development cycles in which features of high value are developed first, and a working product/software is reviewed and tested at the end of the cycle (typically from 14 to 40 days).

This process allows the customer to verify that features are being developed as they want and allows them to suggest improvements. It also offers the customer the opportunity to release the product or software earlier than initially planned if the version presented at the end of a cycle is deemed good enough. This option is one of the many reasons Agile is favored for software development. With Agile, companies can bring products to market quickly and continuously improve them with subsequent updates.

In the previous example of the ticketing system, the team continued to develop it based on their initial plan and internal assessment of the project’s priorities. However, if they were to incorporate feedback from the students using the system at stages along the way and adjust the focus of their work accordingly, the team

would be using a more adaptive approach (Figure 3.11). For example, students may prioritize having a QR code on their phone to scan for admission over self-printing and gifting. In an adaptive project, this prioritization would drive the development team’s next steps.

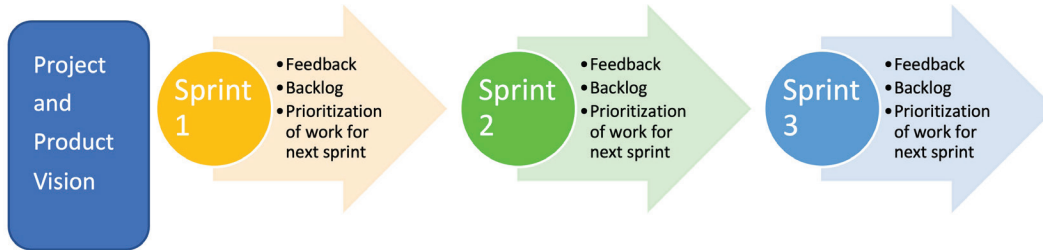


Figure 3.11: Adaptive Life Cycle

Source: Original Work

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For many years, traditional (predictive) and Agile (adaptive) project managers viewed each other with a certain amount of skepticism regarding the value of each other’s methods. However, in recent years project managers have seen the value of techniques used in both project management approaches. As a result, it is not unusual to see a building design using Agile techniques and software development projects conducting a traditional risk analysis. Project managers must choose the best approach and life cycle for the project to complete successfully.

Test Your Knowledge

Answer the following questions.

1. What are the differences between development approaches and project life cycles?
2. Design a project life cycle for a fundraising event for the local humane society and explain why you designed it this way.
3. What are the benefits of Agile, and when would you not want to use Agile approaches on a project?

3.5 DELIVERING VALUE THROUGHOUT THE PROJECT LIFE CYCLE

Throughout the project life cycle, a project manager should remember the value being delivered to the project recipient. Since projects are enacted to support strategic objectives, project managers must ensure that what is delivered meets the objectives. While value is technically delivered at the end of a predictive project, a

manager ensures that activities to build value into the outcomes happen during the appropriate stages ([Figure 3.12](#)).

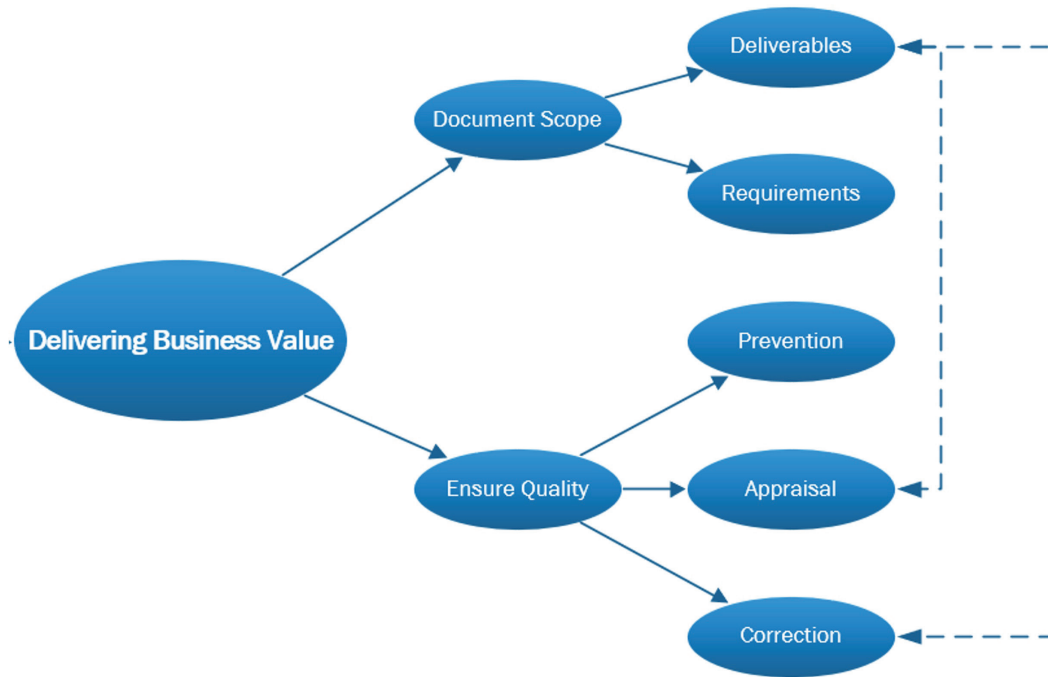


Figure 3.12: Processes in Delivering Value

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3.5.1 Aligning Project Scope to Project Value

A project charter may provide a high-level overview of how the project will deliver value, and is a good place for the project manager to start. Requirements and project deliverables should be described and documented considering why the project was started in the first place (see [Section 7.3](#)).

Once all deliverables have been produced, the project manager reviews acceptance criteria and technical performance expectations to ensure the deliverables are complete. Acceptance criteria (also known as completion criteria) are the criteria that must be met by the deliverable before it is accepted by the customer or recipient. **Acceptance criteria** are usually high-level statements of what the deliverable is expected to accomplish, do, or be before it is determined ready to use. For example, an acceptance criterion for a new website might be, “the website contains all functionality specified in the version 1 requirements document.”

Technical performance expectations refer to the parameters in which a deliverable is expected to behave or function. For example, a new website may be expected to be available continuously, with response speeds of less than 2 milliseconds on an internal corporate network. The project manager documents these parameters as part of the requirements definition, which may also be documented in the deliverable descriptions or high-level scope statements.

3.5.2 Deciding on the Definition of Done

The project manager should not wait until the end of the project to determine what everyone means by “done.” Instead, they should establish a definition of done early in the project while defining the scope and deliverables. A good **definition of done** generally includes a checklist of all criteria that must be met by a deliverable before it is considered ready for use. The checklist items often include the acceptance and technical performance criteria.

Because change happens throughout a project, a project manager needs to update the criteria of “done” whenever changes to the project scope occur.

3.5.3 Ensuring Project Value with Quality Processes

Quality relates to how usable and valuable the project outcomes are to the end users. Incorporating quality prevention, appraisal, and correction activities in the project schedule helps ensure that the project outcomes delivered provide value to the organization. Building quality into a project through prevention, appraisal, and correction activities will be discussed in detail in [Section 8.5](#).

4

Identifying and Selecting Projects

The preceding chapters provide foundational knowledge about projects, project management, and how project managers can design projects that deliver value to their organizations by ensuring the project outcomes align with organizational strategy.

But where do these projects come from? This chapter will discuss common approaches to identifying and selecting projects in organizations.

CHAPTER LEARNING OBJECTIVES

- Understand how to align projects with organizational strategy.
- Understand the three main types of projects.
- Evaluate the importance of considering costs when identifying and selecting projects.
- Describe approaches to selecting projects using both non-financial and financial methods.
- Understand the role a project manager plays in the project identification and selection process.

PM in Real Life: Finding Solutions that Fit



Figure 4.1: Christian Riis

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When consulting with clients, the project manager (PM) must learn to guide initial discussions to clarify the project’s intent. For Christian Riis, a software PM for a Norwegian firm, this often involves working with clients who already have a set idea of what they want and how to deliver it. But frequently, this is not the best path to success.

“They usually have a pretty defined situation,” he said, “and they have their thoughts about what our company is supposed to do. I let them explain everything; then I ask questions such as, ‘How well do you know your customers? What kind of research have you done before building this scope?’” Christian will try to guide them toward the idea that, in the world of business, especially business software, traditional project management methods are not always best.

“Have you tested it first?” he might ask. “Have you done a proof of concept or created a minimum viable product? In the initial discussions, I must understand what they think they want, and then if it is right, the process for getting there should be able to adapt to the world of business around them,” he said.

While Christian primarily works in adaptive and hybrid project management styles, he has foundations in the more predictive “waterfall” project management practices, including international certifications.

By tailoring several methodologies in developing a client’s project, he can do two things for a business:

1. Develop the project with frequent checks and adjustments along the way to make the best final product; and
2. Save the company money by implementing changes during development rather than after.

One of his messages to clients: “We can do that, but after this software has gone into production, changes will cost. A lot. It’s much easier to make those changes during development.”

Christian began his career as a software developer, but his leadership came to him to say, “You’re not going to be a great developer, maybe a [grade of] C+. Or you can be an A+ Project Manager.” It changed his career path and ensured his company took advantage of his best

skills and developed them further. Since then, he has worked with major clients, research facilities, and even two Scandinavian government agencies. He specializes in helping customers find the right fit for their projects.

“You have to lead them to the water, but then they have to drink it themselves.”

4.1 ALIGNING PROJECTS WITH STRATEGY

The problem facing most businesses and organizations is not uncovering possible projects but determining which projects to do given existing resources and time limitations, a process that ensures projects align with an organization’s strategy. An organization may be considering both internal and external projects for customers. Organizations may choose from numerous approaches for identifying and selecting projects, from qualitatively evaluating project goals to the financial and economic impact analysis of proposed projects. When identifying and selecting projects, project managers must understand several aspects of the project, including opportunity costs, sunk costs, ongoing maintenance costs, and other factors that can affect why a project might be selected.

Successful companies and organizations employ methodologies to choose the projects most likely to move the organization toward meeting its strategic goals. Some of these methods are simple, while others are more complex. The method(s) used should reflect the priorities and values of the organization. However, selection methods carry some uncertainty as many criteria involve subjective assessment, even in financial models.

The importance an organization places on a project directly influences the chances of the project’s success. For example, when conflicting demands for scarce resources arise, resources are usually given to the projects that the organization predicts will provide the most significant benefit.

Organizational leaders assess the importance of projects to the larger organization by investigating how a project supports the organization’s top priorities. The following four organizational documents can help confirm that a project’s identified needs and objectives are appropriate:

- Strategic plan (determines organizational strategy, vision, mission, and goals)
- Annual budget
- Capital appropriations plan
- Managers’ annual performance objectives (management by objectives).

One way that an organization can align its mission, vision, and values is through a balanced scorecard ([Figure 4.2](#)). Regardless of the method the organization chooses to communicate its strategy, it is vital to examine the organization’s relationship with outside clients/stakeholders and seek information from all possible sources.

IDENTIFYING AND SELECTING PROJECTS

Perspective	Objectives	Measures	Targets (2024)
<u>Stewardship</u> (Financial Strength into Perpetuity)	Increase smartphone sales	Number of smartphones sold	+1.5% of global shipments
	Offset advertising costs	Percent of users returning through direct channel after first purchase	5% of purchasers
	Increased margin on premium services	Increase the profit margin on premium data services	At least 3.2% margin
<u>Customers</u> (A uniquely satisfying experience)	Enhance customer shopping experience	Average session duration to purchase	Maintain the lead in online sales and increase gap between rivals
	Build brand loyalty	Number of returning users with a purchase	25%
<u>Process</u> (Efficient and effective Operations)	Develop a next-gen smartphone	Time to market with first product	Launch by January 2023
	Incorporate sustainability practices in manufacturing	Reduce waste from smart device production	Reduce by 10%
<u>People and Learning</u> (Be a great place to work)	Train sales team in new sales platform	Percentage of sales staff with certificate of completion	95%
	Improve employee benefits options	Add vision and dental services	70% election by EOY

Figure 4.2: An Example Corporate Strategy Balanced Scorecard

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4.2 TYPES OF PROJECTS

Organizations generally create three broad categories of projects: strategic projects, operational projects, and compliance projects.

Strategic projects involve creating something new and innovative. A new product, service, retail location, branch, division, or even a new factory might be a strategic project because it will allow an organization to gain a strategic advantage over its competitors.

Operational projects improve current operations. These projects may not produce radical improvements, but they will reduce costs, get work done more efficiently, or produce a higher-quality product. Often, external customers are unaware operational projects have taken place, though they may see some benefit in the company's efficiency at a future date.

Compliance Projects must be done to comply with industry or governmental regulations or standards. Often there is no choice about whether to implement a project to meet regulations, but there may be several options to consider, any of which would result in meeting compliance requirements.

Anyone in an organization may identify a project, but that does not mean the identified project will be selected. Project selection is a crucial step to ensure that projects undertaken by the organization align with the strategic, operational, or compliance targets. Project managers may not directly participate in project identification and selection, but they must understand how projects are identified and selected. Knowing the organizational processes to identify and select projects will allow the project manager to ensure that the projects undertaken align with the organization's goals.

4.3 COST OF PROJECTS

When evaluating potential projects, organizational leaders need to consider four main costs: project costs, opportunity costs, sunk costs, and the total cost of ownership.

Project Costs are those costs directly associated with the project, including:

- Direct costs, such as materials, labor, and equipment,
- Indirect costs, such as insurance and project manager labor, and
- Contingency funds and budgetary reserves.

These costs add up to the total estimated cost of our project. Details regarding how to calculate these costs are covered in [Chapter 9](#). Whenever a project is selected to move forward, others are rejected and may never be completed. We will never be able to reap the rewards of the projects we don't complete. The cost of NOT doing a project is considered the **opportunity cost**.

Test Your Knowledge

Opportunity Costs in Real Life

Here is an example to illustrate the concept of opportunity cost. Dave decided to spend four years of his life at a university to get a college education. His education costs \$12,000 annually, but he can make \$45,000 annually after he graduates. His other option was to enter the workforce and start earning \$20,000 per year. The income he gives up by not going directly into the workforce is the opportunity cost of his decision. Eventually, the investment in his education will pay off with a higher salary over the long term.

In this example, one should also consider the opportunity cost of NOT going to college (the opportunity

to make \$25,000 more per year after four years of college). For instance, with a college degree five years after graduation, Dave has a clear financial benefit from the experience despite losing four years of potential income.

Sunk costs are costs that have been put into a project and cannot be recovered. We talk about this type of cost here because sometimes projects may have costs incurred before the project is formally approved. Even though these costs have already happened, organizational leaders should not consider sunk costs when selecting projects.

Test Your Knowledge

An Example of Sunk Costs

ABC Corporation has spent \$20,000 on developing a new smartphone app. Unfortunately, several similar apps have been released since the project began. As a result, the potential profits of the app have been severely diminished. It will take another \$30,000 to complete the app. Some people on such a project will argue that the project should be completed since \$20,000 has already been spent. However, ABC Corporation cannot recover the original \$20,000, and investing another \$30,000 might be a waste of money and time.

Sunk costs are significant because people often make decisions based on data and emotions. Project managers want their projects to move forward and are generally optimistic about the future. As a result, their judgment can be clouded by what they want to happen. It may be difficult for them to step back and realize that a project should be canceled rather than investing more time and money into what will be neither beneficial nor profitable.

However, with a project that produces a physical product or deliverable, such as a building, not all costs are sunk forever. When a building has outlived the useful life for which it was designed, it can still have some value as an asset.

Test Your Knowledge

Sunk Costs and Physical Assets

ABC Corporation decides to build a new factory for 5 million dollars and calculates that it will have a useful life of 30 years before upgrading or replacing it. ABC Corporation will calculate the costs of building, financing, and operating the factory over 30 years, along with the revenue from the products produced, and then

decide if it is a worthwhile project to pursue. Then, at the end of 30 years, the factory will still have some value. For example, the factory can be resold to another business or torn down, and the metal can be sold for scrap. This value is called salvage value and will be added in the financial calculations for a project.

When our project involves the creation of a physical product, we need to consider the cost of operating or maintaining that product after the project is complete. For example, consider the construction of a new school with 20 classrooms. Each classroom will have a digital projector for use by the teacher. If the project team evaluates the projectors based on their initial cost and accepts the lowest bid that meets the technical specs, then over time, the school may suffer higher costs for operating and maintaining the projectors. The total initial cost of the projectors (or any item) and the cost to operate (e.g., electricity costs) and maintain them (e.g., cost to replace the lamps) is called **total cost of ownership**, or TCO.

4.4 SELECTING PROJECTS

4.4.1 Evaluating Projects for Selection

Organizations select projects by comparing the costs and benefits of potential projects. Some of the selection methods are more subjective than others, but all try to use a standard set of criteria to determine which project is the best for an organization to pursue. The process an organization follows when selecting projects depends on several factors, including the type of organization or industry, the size of the organization, and the amount of risk an organization is willing to take.

Of course, companies are not limited to just one methodology when choosing a project. They can and typically do use a combination of selection criteria. The project selection process is a series of screens that filter many ideas, opportunities, and needs to a few approved projects. The organization selects a subset that warrants consideration from all available ideas, opportunities, and needs, given its alignment with the organization's strategy. As projects progress, they are subjected to a series of decisions based on various business and technical feasibility considerations.

Before exploring the various project selection methods, we should mention that projects are sometimes selected because of political or emotional considerations rather than purely objective comparisons. For example, a high-level executive may have an idea for a project and the power to make sure it moves forward, regardless of the soundness of the project or its imagined benefits. These projects are referred to as "sacred cows" because the project is being completed to meet the wishes of an executive or leader within the organization and cannot be canceled. This practice is simply a reality that many project managers face in their daily work. However, when taking a PMI exam, remember that PMI assumes organizations will always

follow a proper and rational approach to project management selection and that politics will not intrude into the decision-making process.

4.4.2 Qualitative or Non-Financial Scoring Methods

Qualitative Scoring Methods for project selection are non-financial assessments of project alignment with the organization’s strategy and allow for input from many people about the projects up for review. Qualitative scoring methods can take a variety of factors into account. These elements range from simple checklists (Figure 4.3) to complex weighted scoring systems. Scoring models might survey various experts and have them rate the project in terms of importance to the company or relative chance of success.

Evaluation Criteria - the project ...	Project A	Project B	Project C
Aligns with our values and mission statement	✓	✓	✓
Will not increase our carbon footprint	✓		
Improves product delivery time by 20%	✓	✓	
The cost to maintain over 10 years is not more than the initial cost			✓
Can be completed with in-house personnel and resources			✓
Design is aesthetically pleasing	✓	✓	
Total Points:	4	3	3

Figure 4.3: A Simple Checklist

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Checklists are simple to use and understand, although there are advantages and disadvantages to using a checklist for project selection (Figure 4.4). A set of **selection criteria** is generated and agreed upon by the major project stakeholders or sponsors. Those who study management might refer to these criteria as **Critical Success Factors** (CSF). These elements can be measurable indicators of success that tie to an organization’s strategy, for example, “the project is likely to attract 3,000 new customers to our store in the next 12 months,” or, “the project is likely to make a 30% return on investment.”

Advantages	Disadvantages
<ul style="list-style-type: none"> • Easy to understand and tally. • Multiple Criteria can be considered. • Can be used to quickly gather input from a wide range of stakeholders. • Easily changed to reflect management direction/policy. • Can be posted online to gather public input. 	<ul style="list-style-type: none"> • All criteria are treated equally and given the same weight. • Criteria that are “must-haves” are not separated from those that are “wants.” • Easy to add too many non-important criteria to the checklist. • Result of the checklist is a relative score, not a go or no-go decision.

Figure 4.4: Advantages and Disadvantages of a Checklist

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Each project is reviewed and scored against the success criteria in a simple checklist. Scoring can be done by a wide range of people inside and outside the organization, and good practice suggests soliciting input from a diverse group of subject matter experts. The project with the most boxes checked is the highest priority project.

Since decision-making models often consider numerous criteria when evaluating projects, tools such as the weighted scoring model are beneficial. Weighted scoring models introduce objectivity in what could otherwise be a very subjective decision-making process.

A **weighted scoring model**, therefore, allows decision-makers to structure the decision-making process by:

- Specifying and prioritizing needs by identifying decision-making criteria; then
- Evaluating, rating, and comparing different alternatives; and
- Selecting the best matching solution.

Creating a weighted scoring model starts with careful consideration of decision-making criteria. In the case of project selection, many organizations refer to their strategic plans or departmental goals to identify important factors that are often a mix of financial and non-financial criteria. Once the criteria have been selected, we give each criterion a weight value to indicate its relative importance. The more important the criterion, the higher its weight. Each potential project gets evaluated against the criteria and given a score.

A separate section containing these most important criteria can be put into a checklist to ensure that a project meets an organization’s “must have” criteria. If the project fails to meet one or more of these factors, then it will be rejected before it is evaluated by the weighted scoring model.

Weights can also be assigned to the critical success factors to reflect the relative value of some factors over others. For example, equal weight may be given to the

product design and to the cost of maintaining the facility. Alternatively, different weights may be given to different criteria to reflect the relative importance of each to the organization. It is only essential that the sum of all weights equal 100%. In [Figure 4.5](#), the weight column shows that the highest-weighted consideration for this set of projects is whether they are likely to make \$30,000 or more in revenue per year. The lowest weighted criterion is whether the project will positively affect the organization’s reputation in the press. This does NOT mean that good press is unimportant to the organization. In fact, all other criteria being equal, in this model, a project that generates good press would be chosen over one that does not.

Weighted scoring models have several advantages over simple checklists:

- Political games/sacred cows are exposed.
- Allows ranking of projects according to impact on key performance indicators for the company.

Criteria	Weight	Project A Score	Project A Value	Project B Score	Project B Value	Project C Score	Project C Value
Likely to produce spin-offs or other products	30	1	30	2	60	2	60
Likely to make \$30,000 or more in revenue per year	40	2	80	2	80	1	40
Doesn't require outside consultants	20	2	40	2	40	1	20
Likely to gain us good press	10	0	0	2	20	2	20
Total	100		150		200		140

Figure 4.5: Weighted Scoring Model with Critical Factors and Weighted Scoring

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4.4.3 Economic or Financial Scoring Methods

Economic scoring methods assess the project’s ability to help the bottom line by increasing profits or reducing costs. These models often look at the cash flow that a project will generate after it is completed. Economic scoring methods for project selection compare the costs and benefits of different projects. While these models generally are unbiased, they may still involve some subjective risk

as, in many cases, forecasts of sales, savings, or returns on investments are still estimates and not guarantees.

Economic scoring methods include:

- Payback period
- Time value of money
- Net present value
- Internal rate of return
- Benefit-cost ratio

The **payback period** is generally the most common method used in many organizations, especially government and non-profits. In it, one calculates the amount of time it will take to recover the project's costs through either increased revenue or reduced operating costs. For example, ABC Corporation of Arizona is considering a project to address rising energy prices through solar panels. The project is not meant to eliminate all external power needs, though. The estimate for the project is \$70,000. The accounting department estimates the company will save \$10,000 annually by enacting this project. Therefore, ABC Corporation should recover its initial investment within seven years at current rates. If rates increase, that payback period may be even shorter.

The **time value of money** considers that future dollars are worth less than current dollars. How much less depends on how well you can make your current dollars and predicted inflation rates work for you. **Net present value** is one way to account for the time value of money in project selection. NPV uses a discount rate that reflects the future decrease in the value of money each year.

Internal Rate of Return (IRR) is another measure that considers the future value of money, but rather than calculating a dollar amount, IRR is expressed as a percentage. This percentage represents the return a company will receive from an investment. When calculating IRR for a project, those with a negative IRR should be rejected, and those with a positive IRR should be considered. When choosing between two or more mutually exclusive projects using IRR, the project with the highest positive IRR should be selected.

Another technique is the **Benefit-Cost Ratio** (BCR) method. This method compares the benefits of doing a project to the costs associated with the project and factors in the time value of money. Benefit-cost ratios are often used on large public works projects. Quantifying benefits and costs can be lengthy and complicated, and companies will have their own ways of arriving at those numbers.

Calculating Payback, NPV, IRR, and BCR can require the consideration of many factors and is often done with assistance from accounting departments. The terms should be familiar to finance and accounting students. For project management purposes, the key is that financial models often do not consider company priorities and longer-term, non-financial goals.

Payback Period	Shows the time it will take to recover our investment in the project but doesn't account for the time value of money. With payback calculations, a lower number is better.
Net Present Value (NPV)	Accounts for the time value of money and is expressed as a dollar figure. Higher values are better.
Internal Rate of Return (IRR)	Accounts for the time value of money and is expressed as a percentage. Higher percentages are better. IRR doesn't express the magnitude (amount of dollars) of the project return.
Benefit-Cost Ratio (BCR)	Accounts for the time value of money and is expressed as a ratio. Higher numbers are better. Like IRR, BCR doesn't express the magnitude (amount of dollars) of the project return.

Figure 4.6: Summary of Economic Scoring Methods

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4.4.4 Constrained Optimization Methods

Constrained Optimization Methods of project selection are mathematically intensive means of analyzing a series of projects and are not easily generalized. In project management, these methods can include:

- Linear Programming
- Dynamic Programming
- Branch and Bound Algorithms
- Integer Programming

We might also refer to constrained optimization methods as mathematical approaches to project selection. These methods are beyond the scope of this text, but students preparing to take PMI exams should know that if they see any programming or algorithms used for project selection, a constrained optimization method is being used.

Deeper Dive

For more information about constrained optimization methods, visit the following website.

Google.com. (2022) [Constraint Optimization](https://developers.google.com/optimization/cp) | Google Developers. Retrieved September 03, 2022, from <https://developers.google.com/optimization/cp>

4.4.5 A Project Manager's Responsibility in Project Selection

It is vital that project and program leaders understand an organization's strategies and objectives. This knowledge allows them to ensure that the decisions made in their projects and programs align with the organization's strategic goals and they fulfill their project selection responsibilities. Project and program

leaders can assess the complexity of a change initiative. Generally, more complex initiatives are riskier and require a more extended implementation and business benefits realization period. Therefore, project selection decisions will weigh the benefits offered with the time frame required to realize these benefits. Projects that offer significant benefits that can be realized relatively quickly are more likely to be approved.

When participating in the project selection process, pay attention to the following red flags, which often signal a poorly conceived project:¹⁰

- Lack of strategic fit with the mission
- Lack of upper management support
- Unclear responsibility for project risks
- Risks outweigh potential benefits
- Unclear or unrealistic time frame, budget, or scope
- Unclear or unattainable project requirements or insuperable constraints
- Unclear responsibility for project outcomes

4.4.6 Practical Tips for Project Selection

An effective project manager should consider nine practical tips when selecting projects.

Tie every project to your organization's strategy. Make a conscious effort to connect your organization's strategy to every project you manage to help all stakeholders understand their greater purpose. For example, your organization might settle on pursuing government contracts. This move would involve learning everything about government contracts, which requires careful adherence to the details of a request for proposal (RFP) and then pursuing government contracts systematically. An organization taking this approach would have a greater chance of success than one that occasionally pursues government contracts without seriously attempting to learn the ins and outs of such work.

Identify the decision-makers in your organization. An effective project manager understands which people in an organization have the influence to make a project happen and addresses the interests and concerns of those decision-makers.

Understand your organization's project selection process. It's essential to understand how your organization decides which projects to take on, as it is critical to how you seek approval for your project and how you present it to decision-makers.

Learn all you can about your organization's project selection criteria. In many organizations, the criteria for project selection are not always clear. Seek opportunities to engage with colleagues and managers who can help you better understand how and by whom decisions about project selection and

continuation are made. This strategy can be a good information source if your organization has a Project Management Office (PMO).

Be ready to adapt to a change in strategy. Implementing an organizational strategy requires discipline and tradeoffs. Ideally, upper management monitors a strategy's effectiveness, just as a project manager monitors a project and makes changes when necessary. If external factors force your organization to change its strategy, you must be ready to adapt.

Accept that an approved project could be canceled at a later stage. A project might get a green light during the selection process, only to be terminated later by another decision maker who might be an officially designated exit champion or someone who isn't interested in the project. In either case, you need to be flexible and adaptable.

Be mindful of how your project connects with related projects. The interdependence of projects can affect an organization's portfolio strategy. One project may not have value except in conjunction with other projects. Keep in mind that executing all or none of a cluster of related projects or a program may be necessary.

Be mindful of the importance of having key personnel available. Often, the biggest constraint on projects is getting key personnel assigned and working.

Keep in mind the relationship between strategy and scope. When discussing altering the scope of a project, take some time to determine if the altered scope conflicts with your organization's strategy. If it does, then it's probably not a good idea. If your team and the sponsors agree to a change in scope, this must be documented and signed off on by all parties to ensure agreement.

5

Chartering Projects

Regardless of the approach you take to planning and managing a project, every project needs a clear starting point that is visible to all stakeholders connected with the project. This starting point has many names, depending on the industry and type of project, but for our purposes, we will use the term “project initiation.” **Project initiation** activities include establishing a high-level agreement for a project and developing a charter to ensure the project will address business needs. Typically, a **business analyst** will work with a project manager to ensure they hear all interested parties and meet the beneficiary organization’s needs.

At this point, we don’t know much about the project other than it met the organization’s selection criteria, and we were assigned as project manager. Often, a project manager’s first job is to describe the project at a high level so the organization can start assigning resources to the project’s subsequent phases.

Project definition begins with developing a “30,000-foot view” by interviewing the project sponsor, key stakeholders, and presenting what we know in a project charter. This chapter discusses the processes often followed in project definition, charter development, and communications planning.

CHAPTER LEARNING OBJECTIVES

- Understand the importance and process of chartering projects and demonstrate the ability to create a project charter.
- Understand the role of the business analyst to ensure business needs are met by project outcomes.
- Evaluate the importance of good communication in project management.
- Create a communication plan.

5.1 DEFINING THE PROJECT

After selecting a project (see [Section 4.4](#)), the project champion identifies the objective or need, which can be a business problem or opportunity. Before assigning a project manager to describe the project in more detail, an organization may complete a business case or feasibility study to ensure the proposed benefits outweigh the cost of doing the project.

An appropriate response to need is sometimes documented in a **business case** with recommended solution options. After a business case is documented, a **feasibility study** may be conducted to investigate whether the various options offered by the business case address the project objectives and determine a final recommended solution. Issues of feasibility (“can we do the project?”) and justification (“should we do the project?”) are addressed. Once the recommended solution is approved, a project is initiated to deliver the approved solution, and a project manager is appointed.

Chartering projects is often the first phase where the project manager becomes directly involved and begins to plan the project and work with the project team. Developing the **project charter** produces a document that outlines a project’s framework and primary goals, provides an initial identification of project stakeholders (see [Section 6.1](#)) and risks (see [Section 10.1.4](#)), and authorizes the project manager to acquire resources and move forward. The project’s outcomes and participating work groups are identified, and the team begins to take shape. Developing the charter produces a clear mandate for a successful project that everyone on the team understands and agrees to before proceeding to the next phases.

Deeper Dive

Learn more about the processes of writing business cases and feasibility studies.

- Bridges, Jennifer. (2022) [How to Write a Business Case](https://www.projectmanager.com/blog/how-to-write-a-business-case) (Template Included). Retrieved Sep 9, 2022, from <https://www.projectmanager.com/blog/how-to-write-a-business-case>
- Bridges, Jennifer. (2021) [What Is a Feasibility Study? How to Conduct One for Your Project](https://www.projectmanager.com/training/how-to-conduct-a-feasibility-study). Retrieved Sep 9, 2022, from <https://www.projectmanager.com/training/how-to-conduct-a-feasibility-study>

5.2 THE PROJECT CHARTER

The **project charter** provides essential information about a project and is used to gain authorization to start it. The charter document can be a single page or

many pages. Ideally, it will be short (less than 5 pages) and written in clear, concise language so that anyone who reads it, regardless of their technical background, will have a solid understanding of the project. Most project charters include a place at the end of the document for approval sign-off by sponsors or customers (i.e., those who are paying for the project).

The project manager uses the charter during the project's planning phases. The project charter informs the project manager about what skills will be required on the team and indicates the project's general scope of work. An approved project charter authorizes the manager to begin planning and acquiring resources.

Some organizations skip creating a project charter, viewing it as a document that wastes time to create and contains information that "everyone already knows." This approach can be a big mistake. The project manager and stakeholders can reference the charter if some of the project's goals are not met or if they are asked to do something outside the project's scope. A well-drafted project charter can prevent political interference in achieving project goals and reduce scope creep. In many organizations, the project charter may be the only formal document defining the project.

Key stakeholders contribute to the project charter to outline their shared vision (sometimes with the help of a project manager or PMO). Creating the charter prompts stakeholders to reevaluate assumptions about the project's purpose. Any differences in understanding about the project's goals can be resolved as quickly as possible in this stage.

5.2.1 Contents of a Project Charter

Many templates are available for project charters which vary in content and level of detail. For instance, the PMI-affiliated website ProjectManagement.com offers several project charter templates.

Deeper Dive

Explore the numerous formats of project charters at ProjectManagement.com.

- Go to www.projectmanagement.com.
- Sign in with a free account.
- Click the magnifying glass icon and search for "project charter."
- To filter the results to only show templates, click on the link next to Categories and unselect everything except "Deliverables" and "Tools."

At a minimum, good project charters will contain the following sections.

Project Information

This section includes identifying information about the project, including the project name, project manager, and sponsoring organization. Details in this section are typically defined by the organization's project management policies.

Project Purpose

This section should provide a broad overview of the project and answer the following questions:

- What is the purpose of the project?
- Where did the project originate? Have we conducted similar projects in the past?
- Who is the project manager, and what authority does the project manager have?

Business Case

The Business Case answers the following questions:

- Why was this project selected to move forward (project justification) over others?
- What selection criteria were used? (see [Section 4.4](#))
- What problems is this project solving, or what opportunities is it creating? What are the high-level requirements?

Project Goals

Listing project goals ensures that the stakeholders will not be disappointed when the project is completed. This section should answer the following questions:

- What are the broad goals of this project?
- How will we know if the project is a success (what are our metrics for success)?
- Are there industry standards we are trying to meet or benchmarks for performance that we want this project to attain?

Key Stakeholders

This section describes the key stakeholders and their interest in the project. This need not be an exhaustive list of stakeholders but should contain a list of people who are interested in the project and who will pay for or benefit from it.

Major Milestones

This section provides a summary of the major milestones for the project. A listing of any hard deadlines for the project should be included. **Milestones**, or

target dates, can relate to project work (when are major deliverables expected to be complete?), outside constraints that affect the project timeline (such as the date of an event like an election or the first day of classes), and invoicing and payment deadlines. The list includes proposed start and end dates, with milestones listed in ascending date order.

Keep in mind that milestones are single points in time with zero duration. They are not lists of tasks that take place over time. For example, “Painting the Hallways” and “Painting the Bedrooms” are not milestones. “Hallway painted” is a well-written milestone.

Project Budget

The project budget section should provide an estimate of cost and information about how it was determined. It answers the following questions:

- What is the initial budget for this project?
- How was that budget developed?
- Are the numbers used for budgeting rough estimates based on top-down estimation techniques, such as analogous or parametric estimating, or are they hard constraints?
- What contingency funds have been allocated?

Constraints

This section will list any constraints on our project or the final product. **Constraints** are limitations or boundary conditions on the project. This section answers the following questions:

- What technology, training, knowledge, or skills does the team need to deliver the project outcomes?
- Are there technological training requirements or other limitations on the project outcomes?
- Are there regulatory constraints that our product must meet to be successfully marketed in certain countries?
- Are there other limitations we need to consider regarding our scope of work?
- Can the work only be done during certain hours or on certain days?

Assumptions

Assumptions are information we assume to be true as we plan a project. Identifying assumptions early on will help the project manager mitigate risks later. This section answers the following questions:

- What assumptions are we making about this project or the environment we are operating in?

- If we use physical materials, are we assuming that prices will remain stable over the project’s lifetime?
- Are we assuming we will receive funding on time and key team members will not retire or find other positions?

Risks

This section will list the risks that can currently be identified. **Risks** are uncertain events that may negatively affect a project and will be discussed in more detail in [Section 10.1.4](#). The risk list will be expanded when we develop a formal risk management plan. For now, we need to consider the significant risks involved in this type of project. The list of assumptions will help inform risk analysis.

Project Authorization

This part of the document provides a place for project sponsors to approve the project charter. By signing the document, the sponsors are giving the project manager authorization to develop the planning documents and start the project. Obviously, the project manager will communicate regularly with those authorizing the project after this stage.

Test Your Knowledge

Answer the following questions.

1. What is the difference between an assumption and a constraint? Give one example of each.
2. Research the history of milestones. Why do we use them in projects?

5.2.2 Defining SMART Project Goals

In the early 1980s, George T. Doran introduced the SMART criteria for developing management goals and objectives.¹¹ SMART is an acronym for Specific, Measurable, Assignable, Realistic, and Time-related. The SMART criteria have been applied in many different areas of management, including project management. Let’s look at Doran’s criteria as they apply to project management.

Specific – A project needs to be specific about what it will accomplish. Unlike many organizational goals, the goal of a project should not be vague or nebulous. An organization may want to “make Gainesville, Georgia a great place to live,” but its projects need to focus on a specific goal, such as building a downtown farmers market. A project that is specific can be clearly communicated to all team members and stakeholders.

A specific project goal will answer the five ‘W’ questions:

1. What do we want to accomplish?
2. Why are we undertaking this project?

3. Who is involved in or will be affected by the project?
4. Where will this project be conducted?
5. Which constraints (scope, time, money, risk, etc.) have been placed on our project?

Measurable – How will project progress and success be measured? What will be the measurable difference once our project is completed successfully? These measures should be quantifiable.

Assignable (or Actionable) – Who will do the work? Can we identify people in the organization with the expertise to complete this work? Or can the expertise be hired from outside of the organization?

Realistic – Is it realistic that the organization can achieve this project, given its talents and resources? This is an essential consideration for businesses of all sizes. Yes, producing a new driverless car would be great, but is that realistic, given the organization’s available resources?

Time-related – when will the project be completed, and how long will it take? These criteria can be advantageous when defining a project. If the description for a project does not meet all these criteria, then it is time to go back to the drawing board and make sure that what is being described is a project rather than a program or strategic goal.

Test Your Knowledge

Using Doran’s SMART guidelines above, develop three goals for a project to create an app that can be used to communicate securely and privately with people around the globe.

5.3 ENSURING BUSINESS NEEDS ARE MET

As discussed in [Section 2.1](#), projects deliver value by supporting organizational strategies. To ensure projects (and programs and portfolios) are aligned with organizational strategy to meet business needs, innovative organizations ensure business analysis processes are part of the project identification, selection, and planning processes. **Business analysis** applies knowledge and processes to identify opportunities and problems, recommend solutions based on business needs, gather and communicate requirements for new projects and products, and evaluate the benefits achieved through project work.¹²

When done effectively, business analysis ensures business needs are met, risk and rework are reduced, product and service issues are minimized, and stakeholders are satisfied with the organization’s products and services. Business analysis begins with defining the problem or opportunity before projects are selected (see [Chapter 4](#)) and ends with measuring the intended benefits of the project, program, or portfolio initiatives.

Business analysts are individuals responsible for supporting the business analysis function in organizations. Business analysts work closely with project managers to ensure the project accurately reflects the beneficiaries needs. Business analysts participate in the project charter’s development by gathering high-level requirements from key stakeholders and ensuring the scope reflects the business needs the project will address, as it is understood at this early stage. Business analysts will also help the project manager plan after the charter is approved and serve as customer or organizational representatives to ensure outcomes meet their needs.

Deeper Dive

To learn more about business analysis, visit PMI.org.

Visit <https://www.pmi.org/learning/featured-topics/business-analysis> for articles about [business analysis in various organizations](#).

One article that may be of interest is by Rick Cusolito, who talks about the working relationship between project managers and business analysts.

- Cusolito, R. (2008). [Symbiosis: project managers and business analysts living together](#). Paper presented at PMI® Global Congress 2008—North America, Denver, CO. Newtown Square, PA: Project Management Institute. <https://www.pmi.org/learning/library/project-managers-business-analysts-requirements-6971>

5.4 PROJECT COMMUNICATIONS

5.4.1 The Importance of Communication

Successfully completing a project requires teamwork and effective communication among team members. If those team members work in the same building, they can arrange regular meetings, stop by each other’s workspace to get a quick answer, or even discuss a project informally at other office functions. On the other hand, many projects in today’s environment involve team members not located in the same building or city, making in-person meetings difficult. Teams that use electronic communication methods without face-to-face meetings are called **virtual teams**.

Communications management is about keeping everybody informed. **Communications planning** involves defining the types of information you will deliver, who will receive it, the format for communicating it, and the timing of its release and distribution. Much of a project manager’s time is spent on

communication, so it is essential to ensure everybody gets the right message at the right time.

All projects require sound communication plans, but not all projects will have the same types of communication or the same methods for distributing information. For example, will data be distributed via mail or email, is there a shared website, or are face-to-face meetings required? The communication management plan documents how the project team will meet the stakeholders' communication needs. This plan also includes the types of data the team will communicate, who will initiate communication, and who will receive it; the methods used to communicate; communication timing and frequency; the method for updating the plan as the project progresses, including the escalation process; and a glossary of standard terms.

The first step in defining your communication plan is figuring out what information your stakeholders need from the project to make good decisions. Your project will produce much information, and you do not want to overwhelm your stakeholders. Your job is to figure out what they feel is valuable. Communicating valuable information does not mean you always present a positive picture. Communications to stakeholders may consist of either good or bad news. You do not want to bury stakeholders in too much information; instead, you want to give them enough so that they can be informed and make appropriate decisions.

The information you will typically communicate includes project status, scope statements and updates, baseline information, risks, action items, performance measures, project acceptance, and so on. The stakeholders' information requirements need to be determined early in the planning phase of the project management life cycle so that while you and your team develop planning documents, you already know who should receive copies of them and how they should be delivered.

Finally, consider project duration and environment. Will the technology you choose work throughout the project's life, or will it be upgraded, updated, or discontinued? And how does the team function? Are they located together or spread out across several campuses or locations? The project team should document the answers to these questions in the communication plan. All projects require a sound communication plan, but not all projects will have the same types of communication or the same methods for distributing the information. The communication plan documents the types of information the stakeholders need to know, when the information should be distributed, and how the information will be delivered.

5.4.2 Communication Media

Communication media, or the way project information is shared, can take many forms, such as formal reports, conversations, emails, meetings, online dashboards, and collaboration platforms. You should consider timing and technology before choosing the methods you will use to communicate information.

The first factor is the timing of information exchanges. Daily communication may be too much; monthly is likely not enough. One update per week is appropriate for most projects. Hold project meetings as required, but don't let too much time pass between meetings. Be sure to answer stakeholders' questions and emails promptly. Regular communication is always appreciated – and may even soften the blow when you have bad news to share.

Second, do you need to procure new technology or systems, or are there systems already in place that will work? The available technologies should figure into your plan to notify everyone of project status and issues. Staff experience with technology is another factor. Are the team members and stakeholders experienced using this technology, or will you need to train them?

Consider how stakeholders wish to obtain information. The PM may consider “*push*” versus “*pull*” techniques for information. Some stakeholders prefer the PM to **push**, or send, information to them regularly, such as an email with a project status report. Others may prefer to **pull** the information conveniently by going to an online project dashboard that displays updated progress reports and metrics.

Deeper Dive

Project Dashboards share information visually and in real-time. There are many online tools available to develop project dashboards. The article below describes different types of dashboards and shares best practices for creating dashboards that are useful to your team.

- Calzon, B. (2021). [How To Create a Project Management Dashboard – Examples & Templates](https://www.datapine.com/blog/project-management-dashboards-examples-and-templates/). Retrieved September 29, 2022, from <https://www.datapine.com/blog/project-management-dashboards-examples-and-templates/>

5.4.2.1 Synchronous Communications

If all parties involved in communication are participating in the exchange simultaneously, the communication is **synchronous**, such as when making a telephone call or holding a video conference. Other examples of synchronous communications include:

- In-person meetings: Gathering of team members at the same location
- Virtual meetings: includes sharing audio, video, and documents between participants who are not at the same location
- Instant messaging: Exchanging text or voice messages using electronic devices

- Online collaboration platforms: a shared repository for project information, including options for communications and messaging.

Modern communication technologies make it possible to assemble project teams from anywhere worldwide. Most people work during daylight hours, making synchronous meetings difficult if the participants are in different time zones. However, they can be advantageous in some circumstances; for example, if something must be done by the start of business in Boston tomorrow, team members in Asia can work on the problem during their regular work hours while team members in North America get some sleep.

Deeper Dive

Online collaboration platforms have increased in recent years. Conduct an online search for “online collaboration platform” and identify two widely used platforms to manage project information and communications.

5.4.2.2 Asynchronous Communications

Getting a team to meet at one time can be challenging, especially if they are spread out across time zones. However, many communication types do not require everyone to be present simultaneously. This type of communication is **asynchronous**. Several choices of asynchronous communications exist, including physical mail and package delivery, fax, email, and online collaboration technologies.

Email is widely used to coordinate projects and to communicate between team members. Information can be sent to a list of team members. Messages can be saved to document the process in case of a misunderstanding or miscommunication. Files can be attached and distributed. However, email can also be used too much, overwhelming stakeholders. Project managers should balance emails with other means of communication like collaboration portals or project dashboards to reduce information overwhelm.

The ability to collaborate with people anytime and anywhere has increased over the last 15 years thanks to technological advances. These tools allow project teams to communicate quickly, share information, and plan and coordinate work. All they require is a computer and a connection to the internet. A good collaboration tool will be easy to use and not interfere with work, which is delivering the product, service, or result the project was assigned to deliver. Collaboration technology may also improve team development for teams who do not work together in one physical location.

Deeper Dive

Many tools are available to collaborate with your project team. How do you decide which collaboration software to use? Linda Rosencrance has a few ideas that might help you get started.

- Rosencrance, Linda. (2022) [How to choose the right project collaboration software](https://www.computerworld.com/article/3647528/how-to-choose-the-right-project-collaboration-software.html) | Computerworld. Retrieved September 29, 2022, from <https://www.computerworld.com/article/3647528/how-to-choose-the-right-project-collaboration-software.html>

5.4.3 Culture and Communication

When working with internal and external customers on a project, project managers must pay close attention to relationships, context, history, and corporate culture. **Corporate culture** refers to the beliefs, attitudes, and values that organizational members share and the behaviors consistent with them. Corporate culture sets one organization apart from another and dictates how members of the organization will see you, interact with you, and sometimes judge you. Often, projects have a specific culture, work norms, and social conventions.

Some aspects of corporate culture are easily observed; others are more difficult to discern. You can easily observe the office environment and how people dress and speak. In one company, individuals work separately in closed offices; in another, teams may work in a shared environment. The more subtle components of corporate culture, such as the values and overarching business philosophy, may not be readily apparent but are reflected in member behaviors, symbols, and conventions.

Project managers must be aware of cultural norms around communications and incorporate them into their project communications plans. For example, in some cultures, communication must follow a specific hierarchy, with each layer only communicating with those immediately above or below. In other, more egalitarian cultures, a project team member might be expected to communicate directly and casually with the CEO.

5.4.4 Communication Planning

Once the corporate culture has been identified, members should try to adapt to the frequency, formality, and type of communication customary in that culture. This adaptation will strongly affect project members' productivity and satisfaction internally and externally. Consider the following:

- Which **stakeholders** will be involved in decision-making? Will your project decisions and documentation have to go through several layers to get approval? If so, what criteria and values may affect acceptance in

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the organization? For example, is being on schedule the most important consideration? Is cost or quality more important?

- What **type of communication** among and between stakeholders is preferred? Do they want lengthy documents? Or is “short and sweet” the typical standard?
- What **communication medium** is preferred? What kind of medium is usually chosen for this type of situation? Check to see what others have done. Ask others in the organization.
- What **vocabulary and format** are used? What colors and designs are used (e.g., at Hewlett-Packard, all rectangles have curved corners)?

A **communications plan** is a document that lists all communications a project manager will deliver to manage a project ([Figure 5.1](#)). The information in the communication plan provides details about the timing (frequency), communication type, method of communication, audience, and content of each information exchange.

Communication Type (What)	Method (How)	Frequency (When)	Goal and Content	Owner	Audience
Project status report	Email	Weekly	Review project status and discuss potential issues or delays	Project manager	Project team + project sponsor
Team standup	Meeting	Daily	Discuss what each team member did yesterday, what they'll do today, and any blockers	Project manager	Project team
Project review	Meeting	At milestones	Present project deliverables, gather feedback, and discuss next steps	Project manager	Project team + project sponsor
Post-mortem meeting	Meeting	At end of the project	Assess what did and did not work and discuss actionable takeaways. (Sometimes referred to as “lessons learned” or an “after-action review.”)	Project manager	Project team
Task progress updates	Activity List	Daily	Share daily progress made on project tasks	Project manager	Project team

Figure 5.1: A Sample Communications Plan

Source: Original Work

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5.4.5 Managing Team Meetings

Team meetings are an important method of communicating project information and are conducted differently depending on the meeting’s purpose, the leadership style appropriate for it, and team members’ personality types.

Deeper Dive

Planning and managing effective and efficient meetings is both a science and an art. Without a clear agenda or processes to be followed during the meeting, team members may often feel frustrated at the wasted time and effort some meetings produce. The following article shares best practices for running effective project meetings.

- Brownlee, D. (2008). [The secrets to running project status meetings that work!](https://www.pmi.org/learning/library/secrets-running-project-status-meetings-7009) Paper presented at PMI® Global Congress 2008—North America, Denver, CO. Newtown Square, PA: Project Management Institute. Retrieved 9/29/2022 from <https://www.pmi.org/learning/library/secrets-running-project-status-meetings-7009>

5.4.5.1 Action Item Meetings

Action item meetings are short meetings to develop a shared understanding of what the short-term priorities are for the project, individual roles, and expectations for specific activities. This type of meeting is for sharing, not problem-solving. Any problems that emerge from the discussion are assigned to a person, and another meeting is established to address the issue. Action item meetings focus on short-term activities, such as tasks that usually last less than a week. The action item meeting is fact-based and information oriented. This meeting has little dialogue except to ask clarifying questions. A problem-solving meeting or workgroup is arranged to deal with any problem or issue if a discussion is needed or a disagreement is not quickly resolved. On smaller topics, solutions meeting might occur immediately after the action item meeting and only include those interested in the discussion’s outcome.

The project manager keeps the successful action item meeting short and focuses on only those items of information needed for the short-term project objectives. The project manager will restate the common understanding of what activities are priorities and who will be responsible for the activities. Often these meetings can include a review of safety or security procedures when these issues are relevant to the project. The leadership approach to action item meetings focuses on data, actions, and commitments. Although the project manager may observe stresses

between team members or other issues, they do not resolve them in this meeting. These are fact-based meetings. If issues arise between people, the project manager will develop other opportunities to address these issues in another forum.

5.4.5.2 Management Meetings

Management meetings are longer in duration and focused on planning. They are oriented toward developing plans, tracking the progress of existing plans, and adjusting plans in response to new information. These meetings include discussions on generating a common understanding of the existing plan's progress. This discussion is based on quantitative information on schedule progress and other data, but the discussion is qualitative in evaluating the data to develop a complete understanding. The project manager solicits everyone's experience and opinions, and when a disagreement about the data's meaning arises, encourages a deeper discussion to strengthen understanding. Through this discussion, a mutual sense of the project's status should emerge, and the project manager invites conversation, encourages people to offer their thoughts, and ensures that disagreements are positive discussions about interpreting the information. Disagreements should not become personal. Management meetings also focus on developing mid-term goals.

Project goals may be evaluated monthly or quarterly for larger, more complex projects. For smaller or less complex projects, weekly goals will provide the focus. The project manager focuses the discussion on broad priorities for the next period and includes all the functional leaders in the discussion. The goals that emerge from the discussion should represent a consensus on priorities for the next term.

For example, during a project's early phases, the team is focused on developing a conceptual understanding of the project. A major milestone on complex projects is typically the completion of the conceptual plan. The project manager would lead a discussion on what needs to be accomplished to meet the milestone and ask what potential barriers exist and what key resources are needed. From that discussion, the team develops a few key goals that integrate their various functions and focus them on priorities.

Management meetings combine information sharing with analysis, creativity, and innovation. The project manager allows and encourages conversation in developing and evaluating goals but focuses the discussion on both goals and obstacles. Management meetings provide an opportunity to discover obstacles to goal achievement. The project team reallocates resources or develops alternative methods for accomplishing the goals. As the team discusses goal progress, the project manager explores potential obstacles and encourages exposing potential problems in achieving goals. The project manager focuses the team on finding solutions and avoids searching for blame.

The project manager also uses a facilitative leadership approach, encouraging the management team to contribute their ideas. Then the PM builds consensus on what goals will bring the appropriate focus. The project manager focuses on developing these goals, tracking progress, identifying barriers, and adjusting efforts

to accomplish current goals. Although there are typically meetings for scheduling and procurement and other meetings where goals are established and problems solved, the management meeting and goal development process create alignment among leadership on items critical to project success.

5.4.5.3 Leadership Meetings

Leadership meetings are held less frequently and are longer in duration. These meetings are used by the project manager to reflect on the project, explore its more significant issues, and back away from daily problem-solving. The project manager will create a safe environment for sharing thoughts and evaluations of less data-oriented issues. Leadership meetings creatively focus on the people issues of the project: the relationships with clients, vendors, and project teams. Team members who favor feeling, perceiving, and intuition may contribute valuable insights at this type of meeting. The team might also share perceptions by upper management and the community in which the project is being executed. Where the time frame for action item meetings is in weeks and management meetings is in months, the time frame for leadership meetings is longer and considers the entire project's length and impact.

5.4.5.4 Key Meeting Management Skills

Skilled project managers know what type of meeting is needed and how to develop an environment to support each meeting type. Action item meetings focus on information sharing with little discussion. These meetings require efficient communication of plans, progress, and other information team members need to plan and execute daily work. Management meetings focus on developing and progressing goals. Leadership meetings are more reflective and focus on the project's mission and culture. In addition to these three types of meetings, project managers may lead other types of meetings, depending on the need.

Specific problem-solving, vendor evaluation, and scheduling meetings are examples of other project meetings. Understanding what types of meetings are needed on the project and creating the proper focus for each type is a critical project management skill.

The project manager's meeting management skills include creating the right atmosphere for team discussion. The manager creates an action item meeting for discussions based on data and facts. The conversation focuses on sharing information and clarification. The conversation for leadership meetings are different, where discussion is more open-ended and focuses on creativity and innovation. Because each type of meeting requires a different atmosphere and focus, mixing the purposes of a meeting will make it difficult for the project manager to develop and maintain the appropriate conversation for each stage.

6

Working with Project Stakeholders

Many individuals and groups may interact with projects in organizations. These individuals and groups may be affected by or have an impact on the project. A successful project manager will identify these individuals early, including those who can positively or negatively influence the project. In each case, the manager needs to identify what these groups want or need and their influence over the project. Based on this information, the team can identify project communication needs and develop a communication plan to be used during all project phases.

CHAPTER LEARNING OBJECTIVES

- Understand the importance of stakeholder identification and management.
- Identify and assess the needs of various stakeholders involved in a typical project.
- Discuss why the sponsor is the key ingredient to successful project completion.
- Develop and apply tools for managing stakeholders effectively.
- Understand how a Stakeholder Register and Stakeholder Matrix are used.

6.1 IDENTIFYING PROJECT STAKEHOLDERS

A project is successful when it achieves its objectives and meets or exceeds the stakeholders' expectations. But who are the stakeholders? **Project stakeholders** are individuals, groups, or organizations interested in a project and may affect or be affected by the project processes or outcomes ([Figure 6.1](#)). Stakeholders are those who care about or are vested in your project. They are actively involved with the project's work or have something to gain or lose because of it.

Stakeholder Map for the Traffic Citation System

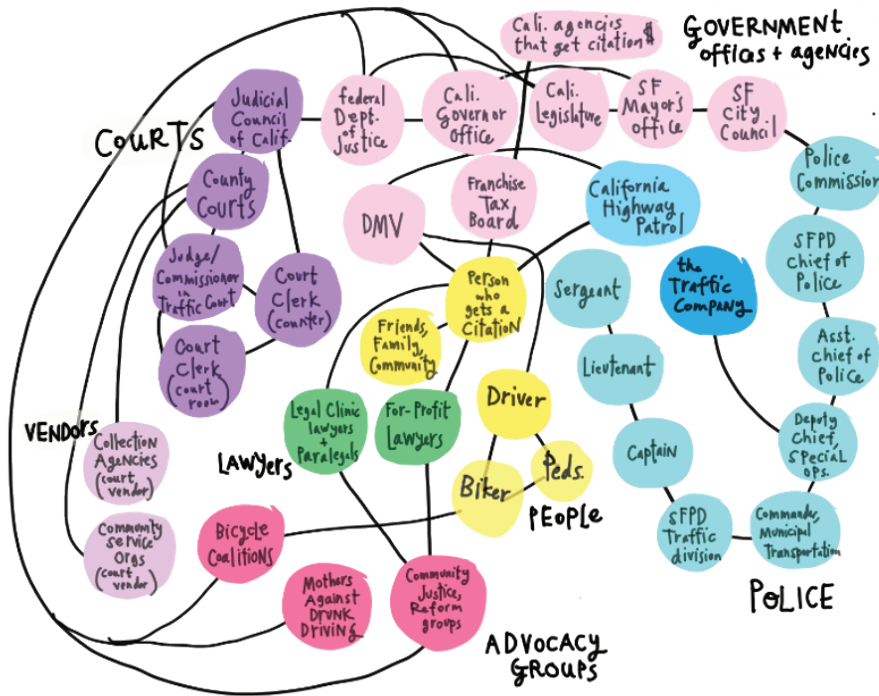


Figure 6.1: Project Stakeholders are Numerous

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For example, when you manage a traffic citation project (Figure 6.1), advocacy groups may be positively affected stakeholders. However, you may negatively affect the court system with an increase in traffic citations. Additionally, local law enforcement may be affected by different policies and procedures developed, and community members may be affected by changing policies.

Knowing the key stakeholders ensures a successful project. Key stakeholders' attitudes about your project or its outcomes can make or break the project success. Even if all the deliverables are met and the objectives are satisfied, if your key stakeholders aren't happy, it doesn't matter if the project outcomes are satisfactory.

Once you know the project stakeholders, you can create a stakeholder management plan. A **stakeholder management plan** is a guide that tells the project manager how to identify, analyze, and engage project stakeholders (Figure 6.2).

WORKING WITH PROJECT STAKEHOLDERS

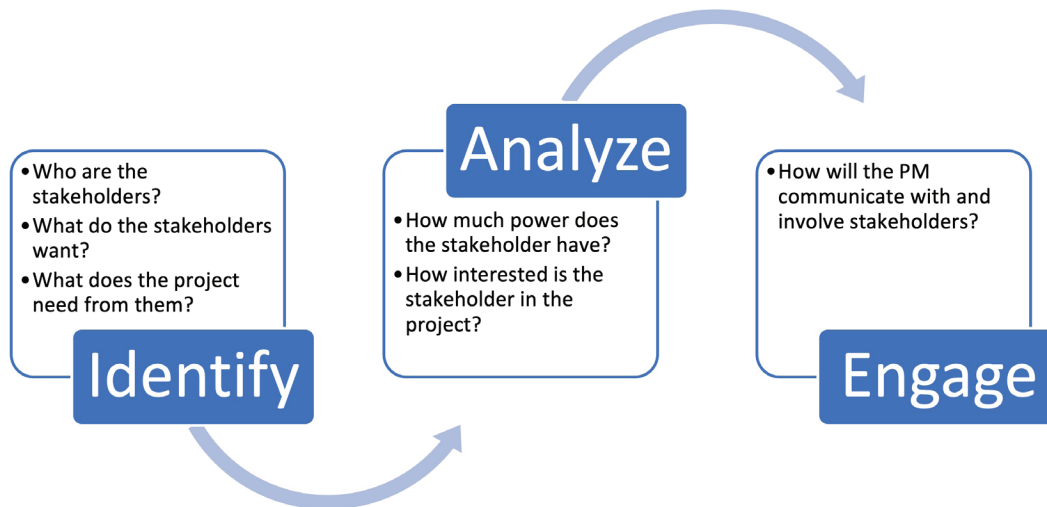


Figure 6.2: Stakeholder Management Key Processes

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A **stakeholder register** is used to identify and track interactions between the project and each stakeholder. This register must be updated regularly, as new stakeholders can arise at any time, and a particular stakeholder's needs and interest levels may change throughout the project. We will discuss how to create a stakeholder register below.

The **project sponsor** (see [Section 1.3.1](#)), generally organization executive with authority to assign resources and enforce decisions regarding the project, is a key stakeholder. Customers, subcontractors, suppliers, and sometimes even government agencies are stakeholders. The project manager, team members (see [Section 1.3.3](#)), and managers from other organization departments are also stakeholders. It's necessary to identify all stakeholders in your project upfront. Leaving out crucial stakeholders or their department's function and not discovering the error until well into the project could be detrimental.

The number of stakeholders project managers must deal with ensures they will have a complex job guiding their project through the life cycle. Problems with any of these members could derail the project. Project managers must deal with people external to the organization along with the internal environment, which is undoubtedly more complex than what a manager faces in an internal environment. For example, suppliers who are late in delivering crucial parts may negatively impact the project schedule. To compound the problem, project managers generally have little or no direct control over any of these individuals.

Let's look at the different types of stakeholders and their relationships with the project manager ([Figure 6.3](#)).

Project Stakeholders	
Internal Stakeholders <ul style="list-style-type: none"> •Project Sponsor •Top Management •Your Manager •Peers •Resource Managers •Internal Customers •The Project Team 	External Stakeholders <ul style="list-style-type: none"> •External Customers •Government and Regulatory Bodies •Contractors •Suppliers and Vendors

Figure 6.3: Types of Project Stakeholders

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6.1.1 Top Management

Top management may include the company's president, vice presidents, directors, division managers, the corporate operating committee, and others. These people direct the organization's strategy and development. On the plus side, you will likely have top management support with a project that aligns with the company's goals and values. Having top management support means it will be easier to recruit the best staff to carry out the project and acquire needed material and resources; also, visibility can enhance a project manager's professional standing in the company. On the minus side, failure can be dramatic and visible to all, and if the project is large and expensive (most are), the cost of failure will be more substantial than for a smaller, less visible project. Some suggestions for dealing with top management are:

- Understand what is important to them and what their preferred communication methods are. Do not waste time with unnecessary or inappropriate communications. For example, one executive might prefer to be called if a key event or milestone is about to be reached, while another may never want to speak via telephone.
- Develop in-depth plans and major milestones that must be approved by top management during the planning and design phases of the project.
- Ask top management associated with your project for their information reporting needs and frequency.
- Develop a status reporting methodology to include distribution on a predictable schedule.
- Keep them informed of project risks and potential impacts.

6.1.2 Your Manager

Typically, the boss decides assignments and who will work with the project manager on projects. Keeping your manager informed will help ensure you get the resources needed to complete your project. If things go wrong, having an understanding and supportive boss advocating for you is helpful. By supporting your manager, you will find that your manager will support you more often.

- Find out exactly how your performance will be measured. When unclear about directions, ask for clarification.
- Develop a reporting schedule and methodology that is acceptable to your boss.
- Communicate frequently in the manner your boss prefers.

6.1.3 Peers

Peers are at the same level in the organization as you and may or may not be on the project team. These people may also have a personal stake in your project's product, service, or result. However, they have neither leadership responsibilities nor accountability for the success or failure of your project. Your relationship with peers can be helped or hindered by how you work with them. Your peers may be working on projects that compete with yours, but there are ways to maintain positive working relationships. To ensure you have cooperation and support from your peers:

- Get the support of your project sponsor or top management to empower you as the project manager with whatever necessary authority is needed for success. The sponsor should express the project's importance to the organization and her expectations for all team members to work towards the success goal.
- If you notice a dysfunctional behavior, such as bad-mouthing the project, discuss it with your peer to determine if there are any underlying issues. This can also indicate that you are aware of the undermining behavior.

6.1.4 Resource Managers

Because project managers are in the position of borrowing resources, **resource managers** control the resources a project manager needs to complete a project. So, a project manager's relationships with resource managers are significant. If the relationship is good, project managers may be able to consistently acquire the best staff and equipment for their projects. If relationships aren't good, project managers may have difficulty obtaining good people or equipment needed for the project.

6.1.5 Internal Customers

Internal customers are individuals within the organization who are clients for projects that meet the needs of internal demands. The customer can accept or reject your work. Early in the relationship, the project manager must negotiate, clarify, and document project specifications and deliverables. After the project begins, the project manager must stay attuned to the customer's concerns and issues and keep them informed. Common stumbling blocks when dealing with internal customers include:

- A lack of clarity about precisely what the customer wants
- A lack of requirement documentation
- A lack of knowledge regarding the customer's department or division and their operating characteristics
- Unrealistic deadlines, budgets, or specifications requested by the customer
- Customer hesitancy to sign off on the project or accept responsibility for decisions
- Changes in project scope

To meet the needs of the customer, client, or owner, be sure to do the following:

- Learn the client's departmental terminology, culture, and business.
- Clarify all project requirements and specifications in a written agreement.
- Specify a change in procedure.
- Establish the project manager as the central point of communication for the project.

6.1.6 External Customers

External customers are the customers outside an organization. In the case of Ford Motor Company, for example, the external customers would be the buyers of automobiles. Also, if you manage a project at your company for Ford Motor Company, they will be your external customer.

6.1.7 Government

Project managers in certain heavily regulated environments (e.g., pharmaceutical, banking, or military industries) will have to deal with government regulators and departments. These can include all or some levels of government, from municipal, provincial, and federal to international.

6.1.8 External Partners

Sometimes organizations do not have in-house expertise or resources, so work is turned over to contractors or subcontractors. **Contractors** are team members who are not employees of the project's organization. These can be construction management supervisors, network consultants, electricians, carpenters, architects, lawyers, or other experts. Managing contractors or suppliers requires the same skills as managing full-time project team members. The same problems can arise with contractors or subcontractors, such as work quality, cost overruns, and schedule slippage.

Many projects depend on goods provided by outside suppliers. For example, construction projects will acquire lumber, nails, bricks, and mortar from outside suppliers. If the supplied goods are delivered late, in short supply, of poor quality, or if the price exceeds what was quoted initially, the project will suffer. Managing contractor and supplier relationships can consume most of the project manager's time, depending on the project's complexity. This task is not purely intuitive; it involves a sophisticated skill set that includes managing conflicts, negotiating, and other interpersonal skills, often while having few practical levels of recourse to address issues. If a contractor came about through a lengthy bid process, or is one of the only businesses in the region doing that work, firing the contractor may not be a viable option to address individual problems or issues. The PM may find that doing so would derail the project. Therefore, the PM needs to use their skills to resolve issues.

6.1.9 The Project Team

The project team is an essential stakeholder with a great deal of influence. Logically, the project team would want the project to succeed, but we must realize that the team might be composed of individuals with different and competing goals for what they want to see out of the project. Therefore, the project manager must understand the characteristics of effective teams to help their team be more effective (see [Chapter 12](#)).

6.2 MANAGING PROJECT STAKEHOLDERS

Achieving a project's objectives takes a focused, well-organized project manager who can engage with a committed team and gain the support of all stakeholders. Building strong, trusting relationships with interested parties from the start can be the difference between project success and failure.

Often there is more than one major stakeholder in a project. An increased number of stakeholders adds stress and influences the project's complexity level. The business or emotional investment of a stakeholder, and the stakeholder's ability to influence project outcomes or execution, will also influence project complexity. In addition to the number of stakeholders and their level of investment, the degree to which the project stakeholders agree or disagree affects project complexity.

6.2.1 Analyzing Project Stakeholders

After taking time to identify the stakeholders, the project manager's next step is to begin building solid relationships by actively engaging them in the project. The critical activities performed during stakeholder analysis include the following.

Stakeholder analysis, which assesses a project's key participants and how the project will affect their problems and needs, is an important step. During stakeholder analysis, the project manager identifies individual characteristics and interests and discovers what motivates and provokes project stakeholders. Defining roles and levels of participation helps reduce the chance of conflicts of interest among stakeholders.

A lack of stakeholder support can negatively affect a project. Whether stakeholders initially support your project or not, you should secure their support if they are essential to your project. Importance in the organization does not necessarily mean they are important to your project, however. Just because they think they are essential does not mean they are. Even if they don't think they need to be involved, they may have to be. The typical suspects are your manager, the manager's manager, customers, any subject matter expert (SME) you need, and the board reviewing and approving your project.

Note that in some situations, there are people who think they are stakeholders. From your perspective, they may not be, but be careful how you handle them. They could be influential with those who have the power to impact your project. Do not dismiss them out of hand.

The more influential a stakeholder is, the more a project manager will need to engage them. Consider the question, "What's in it for them?" when approaching stakeholders. Knowing what each stakeholder needs or wants will enable the project manager to gauge their level of support. And remember to balance support against influence. Is it more important to have strong support from a stakeholder with little influence or lukewarm support from one with a high level of influence?

A project manager needs to determine what power the identified stakeholders have and their intentions toward your project. Do they have the power to have an impact on your project? Do they support or oppose you? What strategies can you use with them? The project manager also needs to evaluate any relationships between stakeholders. Can you improve your project's chances by working with those who support you to boost the views of less enthusiastic people?

Finally, stipulate expectations for meetings. Ask for clarification when needed to be sure requests are thoroughly understood. Define "success." Each stakeholder may have a different idea of what project success looks like. Discovering this difference at the end of the project is a formula for failure. Gather definitions up front and include them in the objectives to ensure all stakeholders support the outcomes.

Now that you have this information, you can conduct a **stakeholder analysis** to help define your strategies to improve their support. Because of the sensitive nature of this information, this document should be kept confidential by the project manager to avoid offending anyone. The stakeholder analysis should

be used as a mechanism for you to understand your stakeholders and develop plans to engage and manage them during the project. A stakeholder register lets you document the results of the stakeholder analysis and includes the following information (Figure 6.4).

Stakeholder Name and Role	Identify key information and other relevant facts (e.g., contact information and availability for project)
Power (Low – Med – High)	How important are they to the project?
Interest (Low – Med – High)	What do they want to know about the project?
Project Needs	What do you want or need from them?
Stakeholder Needs	What do they want or need from you or the project?
Potential Blockers	How could stakeholders block your effort?
Engagement Strategy	What is your strategy for enhancing stakeholder support? See section 6.4.2 for ideas.

Figure 6.4: Stakeholder Register Contents

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If you want to share information about project stakeholders with your team, consider creating a second version of the **stakeholder register**, which removes comments about their power, interests, or needs that might be detrimental to share with the team. A stakeholder register will help your project team understand the timing and methods of communicating with stakeholders during the project but keeps confidential information from being public.

6.2.2 Engaging Project Stakeholders

To help identify possible strategies for enhancing stakeholder support, you might consider using their levels of power and interest to determine an optimal engagement strategy. A power-interest grid can help with this effort; where stakeholders fit in the grid will help you determine how to engage and manage each one and the amount of attention to give each member.

		Importance of Project to Stakeholder (Interest)					
		None or Unknown	Little	Some	Moderate	Significant	High
Stakeholder Influence (Power)	High	<u>Influential</u> Keep satisfied			<u>Important</u> Collaborate and involve		
	Significant						
	Moderate						
	Some	<u>Aware</u> Monitor			<u>Interested</u> Keep informed		
	Little						
	None or Unknown						

Figure 6.5: Possible Engagement Strategies based on Power and Interest¹³

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General strategies for managing stakeholders depend on where they are placed on the grid, as follows:

- **Important Stakeholders:** Stakeholders with a moderate to high degree of influence and interest in the project require the project team to work closely with them and involve them in project planning.
- **Influential Stakeholders:** Stakeholders with high influence but little interest. These stakeholders need to be kept satisfied and informed about the project, so they are not surprised if there are changes or delays. These stakeholders can be a source of risk to the project.
- **Interested Stakeholders:** These stakeholders have a high degree of interest in the project, but less influence or power to affect the project. These stakeholders need to be kept informed of the project’s progress.
- **Aware Stakeholders:** Stakeholders in this box do not require much interaction from our project team. These stakeholders should be monitored in case their level of interest or influence changes but are generally the lowest priority for the team.

Learning to relate to stakeholders is the foundation of building strong stakeholder relationships. But as in any relationship, there are subtleties that successful project managers understand—such as learning the differences between and relating well to different stakeholder personalities.

By conducting a stakeholder analysis, project managers can gather enough information to build strong relationships—regardless of their differences. For example, the needs and wants of a marketing director will differ from those of a chief information officer. Therefore, the project manager’s engagement with each will also need to differ. Stakeholders with financial concerns will need to know the potential return of the project’s outcomes. Others will support projects if there

is sound evidence of their value in improving operations, boosting market share, increasing production, or meeting other company objectives.

Keep each stakeholder's expectations and needs in mind throughout each conversation, report, or email, no matter how casual or formal the communication may be. Remember that the company's interests are more important than any individual's—yours or stakeholders'. When forced to choose between them, put the company's needs first. No matter what their needs or wants are, all stakeholders will respect a project manager who:

- Is always honest, even when telling them something they don't want to hear,
- Takes ownership of the project,
- Is predictable and reliable,
- Stands by his or her decisions, and
- Takes accountability for mistakes.

Once you understand your engagement strategies, you can decide how and when to communicate with your stakeholders. A crucial part of your stakeholder management efforts is consistent, valuable communication. Using the information from your stakeholder analysis, you should develop a communications plan that secures your stakeholders' support. A communication plan (see [Section 5.4.4](#)) documents what information stakeholders want from you about the project, how often the information is needed, and in what format to present the information. Knowing how influential and interested each stakeholder is in the project will help you decide how, when, and what to communicate.

Deeper Dive

To learn more about stakeholder analysis, watch the following video, [“What is a Stakeholder Analysis? — Leading Successful Projects.”](#)

Available at <https://youtu.be/PXC092Iag3g> (Accessed 10/24/2022)

7

Identifying Project Outcomes

Project planning is at the heart of a project life cycle and tells everyone involved where you're going and how you will get there. During project planning, the project plans are documented, deliverables and requirements are defined, and the schedule is created. Planning involves documenting processes to help guide your team through the project's implementation and closure phases. The plans created during this phase will help you manage time, cost, quality, changes, risk, and related issues. They will also help you supervise staff and external suppliers to ensure that you deliver the project on time and within budget.

Project planning is often the most challenging phase for a project manager, as you need to make an educated guess about the staff, resources, and equipment needed to complete your project. You may also need to plan your communications and procurement activities and contract any third-party suppliers. The purpose of the project planning phase is to:

- Establish business requirements,
- Establish cost, schedule, list of deliverables, and delivery dates,
- Establish resource plans,
- Create plans to manage stakeholders, schedules, cost, quality, change, risk, and related issues during project production phases, and
- Obtain management approval and proceed to the next phase.

Project planning is one of the most important activities for which a project manager is responsible. Without proper planning, projects often fail to achieve their intended goals. Project planning activities refine objectives, which were gathered during project charter development. Activities include steps necessary to meet those objectives by identifying the tasks and resources required to complete the project.

Now that these objectives have been recognized, they must be clearly articulated, detailing in-depth scrutiny of each recognized objective. With such scrutiny, our understanding of the objective may change. Often, trying to describe

something precisely gives us a better understanding of what we are looking at. This articulation serves as the basis for requirement development. This means that after an objective has been clearly articulated, we can describe it in concrete (measurable) terms and identify what we must do to achieve it. Obviously, if we do a poor job articulating the objective our requirements will be misdirected, and the resulting project will not represent the actual need.

We will discuss project planning processes and considerations in the following chapters. We will also examine several typical project documents developed during the planning process and explore ways to improve the project plans before beginning to work on producing outcomes. This chapter will explore the processes associated with defining and describing project outcomes.

CHAPTER LEARNING OBJECTIVES

- Demonstrate awareness of the importance and purpose of project planning and identify the fundamental processes and activities required in the planning phase.
- Demonstrate skills in defining and describing project scope and deliverables.
- Understand the various types of project requirements and give an example of each.
- Create a responsibility assignment matrix for project deliverables.

7.1 AN OVERVIEW OF PROJECT PLANNING

7.1.1 The Planning Process

The planning process is an integral part of project management, but depending on the development approach, you may not know everything about a project before you begin. When we discussed development approaches in [Chapter 3](#), we discovered that the approach taken depends on the level of uncertainty in project outcomes or the level of uncertainty in project requirements.

In predictive development approaches, where there is high uncertainty in project outcomes, the team must know what work needs to be done before work begins. In more adaptive approaches, planning the work in advance is less critical because the requirements are not fully known before the project begins. However, for either approach, it is possible to plan ahead.

Regardless of approach, the project manager gathers initial project facts from the project charter. In addition, background information on the stakeholder's workplace, existing business model and rules, etc., assist in creating the vision of the final product, service, or result and the project scope.

The scope planning process is the first thing you do to manage your scope. **Project scope planning** includes defining all the work needed to successfully

IDENTIFYING PROJECT OUTCOMES

meet project objectives. Scope planning is a critical step because you need to have as clear a picture as possible of all work that needs to happen on your project, and as the project progresses, you need to keep that scope up to date and written down in the scope management plan.

Although the project scope is the primary document for identifying project deliverables, the work breakdown structure (WBS; [Section 7.2.2](#)) incorporates all project deliverables and reflects any documents or information that clarify the project deliverable. The project manager uses the WBS to develop a project schedule. The project schedule lists the activities needed to accomplish the work identified in the WBS. The more detailed the WBS, the more activities are identified to accomplish the work.

Once the team develops the WBS, the project manager will assign responsibility for each deliverable to key team members and begin scheduling project work based on what is required to produce each deliverable. At this time, cost and duration estimates can be identified, and project schedules and budget baselines can be established. Project planning ends when everyone clearly understands what, how, and when project outcomes will be produced and delivered during the next phase of the project ([Figure 7.1](#)).

Project Planning Areas		
Scope <ul style="list-style-type: none">• Project Scope & Deliverables• Requirements• Responsibilities	Schedule <ul style="list-style-type: none">• Activities• Resources• Relationships	Budget <ul style="list-style-type: none">• Activity-Related Costs• Other Project Costs• Reserves

Figure 7.1: Overview of Project Planning

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7.1.2 Tailoring Guidelines

Tailoring project management processes, tools, and techniques used during planning allows the project manager to consider the unique characteristics of the project environment as discussed in [Section 3.1](#). Tailoring during the planning process does not mean you do not identify project scope, work, costs, and risks. Tailoring does mean that you adapt the processes to fit your project and the organization. A small project, for example, may not need multiple rounds of requirement documentation. Adaptive projects identify a broad scope at the beginning and then progressively elaborate on deliverables and requirements as each stage progresses.

7.2 IDENTIFYING PROJECT SCOPE

7.2.1 Project Scope and Deliverables

Project scope defines the characteristics of a project's outcomes and includes work done within its boundaries. The project scope is documented to clearly communicate what work will be accomplished by the end of the project—the deliverables. The project scope specifies what will, and in some cases what will not, be done. The documented scope is the basis for agreement by all stakeholders.

Scope statements may take many forms depending on the type of project being implemented and the nature of the organization. The scope statement details project deliverables and describes primary objectives. The objectives should include measurable success criteria for the project.

A **scope statement** broadly captures project outcomes, for example, the “development of a software-based system to capture and track orders for software.” A scope statement should also include the list of people using the product and the desired features. A baseline scope statement should contain the following information:

- Project name and identifier
- Link to project charter
- Project owner, sponsors, and stakeholders
- Project goals and objectives (what is “in scope”)
- High-level project requirements
- Project deliverables
- Exclusions (what is “out of scope”)
- Assumptions and constraints relating to project scope

A clear project scope statement is also critical to managing change. Since the project scope reflects what work will be accomplished, any changes in expectations that are not captured and documented create confusion and failure to meet requirements. If a sponsor and team member discuss a potential change to a specification and agree to it but do not propose it to the rest of the project team or the PM, it is likely not being documented. Without tracking and verifying these changes, it sets up the project team for failure.

Test Your Knowledge

While working on a website design project, the sponsor and one of the team members talked about changing the links at the bottom of all pages for contacting the company. The original plan was to have a form that a customer could fill out to send a question or request to a generic email account that would be monitored. The

customer would enter an email address voluntarily. The sponsor decides that she would rather have direct email links that a customer would have to access from their email account, thus verifying email address legitimacy. The team member changed the design but did not document or get approval for the change in scope and requirements. Later in the project, other team members see the link, assume someone made a design error, and re-enable the form. On review, the sponsor is upset that her expectations were not met and because she was assured of a change that was later ignored.

Deeper Dive

Identifying and controlling project scope on personal projects is important, too. Read one PM's story here.

- Jordan, A. (2022) [The Scourge of Great Auntie Mildred \(or, How to Manage Scope on a Personal Project\)](https://www.projectmanagement.com/articles/812570/The-Scourge-of-Great-Auntie-Mildred--or--How-to-Manage-Scope-on-a-Personal-Project-). Retrieved October 13, 2022, from <https://www.projectmanagement.com/articles/812570/The-Scourge-of-Great-Auntie-Mildred--or--How-to-Manage-Scope-on-a-Personal-Project->

One of the most common challenges project managers face is the incremental expansion of project scope by sponsors or customers. This trend is labeled “scope creep.” **Scope creep** occurs when the project sponsor or customers add deliverables without going through a formal review process. When scope creep happens, deliverables grow in number, feature, functionality, or type without a corresponding adjustment to the schedule, budget, and use of resources. Scope creep threatens the success of a project because the small increases in scope require additional resources that were not budgeted.

Due to project managers and team members wanting to please sponsors and key stakeholders, increasing project scope is common. However, changes and expansion of project scope should be documented and agreed upon. Adjustments should also be made to the project budget and schedule to account for these changes. The project manager considers the effects of the change on project constraints, discussed earlier (see [Section 1.1.4](#)). Scope creep occurs when these changes are not recognized or not managed.

In addition to scope creep, the expansion of scope can come from within the project team. **Gold Plating** occurs when project team members add additional features, services, or products to the project scope without prior approval. These features may or may not be appreciated by the sponsor. As these features are

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outside the agreed-upon scope of the project, they can significantly impact the project schedule and budget.

A project manager's ability to identify potential changes is often related to the quality of scope documents. Events do occur requiring the project's scope to change. Changes in the marketplace, for example, may require changes in product design or product delivery timing. Changes in the client's management team or financial health may also result in changes to project scope.

Changes in project schedule, budget, or product quality will influence the project plan. Generally, the later in the project the change occurs, the greater its impact on costs. The project manager is responsible for establishing a change management system. The system should capture changes to the project scope and ensure that these changes are authorized by the appropriate management level in the client's organization. The project manager also analyzes the cost and schedule impact of these changes and adjusts the project plan to reflect the changes authorized by the client. Changes to the scope can cause costs to increase or decrease.

No single template works for all projects. Some projects require a detailed scope of work, and some have a short summary document. The more complex the project, the more detail is needed for success. The scope's quality is measured by the project manager and stakeholders' abilities to develop and maintain a shared understanding of what products or services the project will deliver. Well-written project scope statements should address the following:

- A clear description of the scope of work to be performed,
- Acceptance criteria for project deliverables,
- List or map of project deliverables,
- Scope exclusions (what is out-of-scope),
- Constraints to project scope, and
- Assumptions held when identifying project scope.

An experienced project manager can draw on past experiences with similar projects to forecast the work that can realistically be completed, given time and cost constraints. Communication and negotiation skills are a "must-have" as well. Project managers must prepare stakeholders for the impacts of choices made about project work. More deliverables add complexity to a project by requiring more staff, time, or money. Adding project scope may also have an impact on project quality. Some aspects of the project may be unfeasible—stakeholders need to know this to adjust their vision or prepare for future challenges.

Determining what should (and should not) be included in a project is a team effort and can be accomplished using one or more of the following techniques:

- Interviews
- Focus groups
- Facilitated groups such as JAD (joint application development)

- Group creativity techniques such as brainstorming, nominal groups, Delphi, mind map, or affinity diagnostics
- Prototyping/wireframing
- Observation
- Questions and surveys
- Group decision-making techniques, such as unanimity, majority, plurality, or dictatorship

7.2.2 Documenting Deliverables

You already have a head start on refining the project's objectives in quantifiable terms, but now you need to plan further and write down all the intermediate and final deliverables that you and your team will produce throughout the project. One of the project manager's primary functions is to accurately document project deliverables and manage the project so that they are finished or "delivered" according to the agreed-on criteria.

Deliverables include everything you and your team produce for the project (i.e., anything that your project will deliver). The deliverables for your project include all the products or services that you and your team are producing for the client, customer, or sponsor. They include every intermediate component that will be made along the way, including any project management documents you develop. **Product deliverables** are tangible outcomes, measurable results, or specific items that must be produced to consider either the project or the project phase completed. **Project deliverables** are the things you produce as you plan and manage the project, including schedules, budgets, tracking lists, and reports. Deliverables, like objectives, must be specific and verifiable. All deliverables must be described in sufficient detail to differentiate them from related deliverables. For example:

- A twin-engine plane versus a single-engine plane
- A red marker versus a green marker
- A daily report versus a weekly report

Now that we have well-defined deliverables and requirements, breaking down the project's work via a **work breakdown structure** (WBS) begins. The WBS defines the project's scope and divides the work into components that can be scheduled, estimated, and easily monitored and controlled. The idea behind the WBS is simple: you subdivide a complicated deliverable into smaller deliverables until you reach a product, service, or result that cannot be further subdivided ([Figure 7.2](#)). This process is called "**decomposition**."

IDENTIFYING PROJECT OUTCOMES

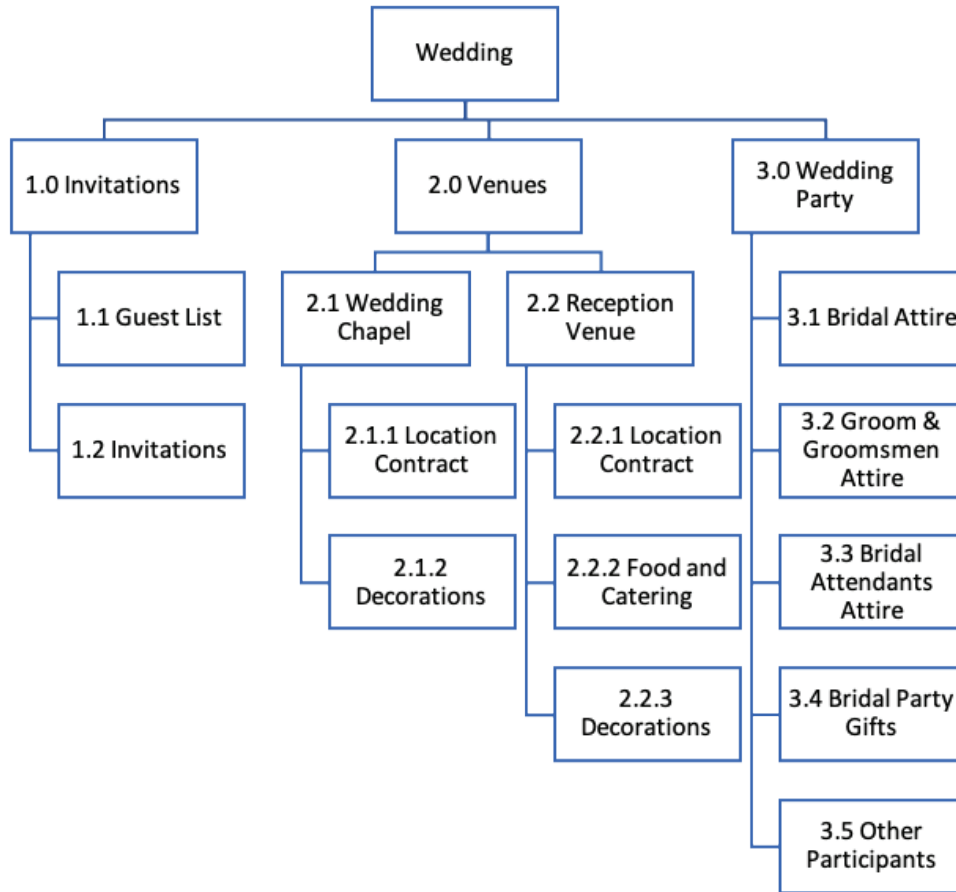


Figure 7.2: WBS for a Wedding

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Each descending level of the WBS represents an increasingly detailed definition of the project work. WBS describes the products or services to be delivered and how they are decomposed and related. It is a deliverable-oriented decomposition of a project into smaller components. It defines and groups a project's discrete work elements in a way that helps organize and define the work. A WBS provides the framework for detailed cost estimating and control, along with guidance for schedule development and resource allocation.

It is important to note that we do not worry about the sequence in which the work is performed or any dependencies between tasks when we do a WBS. That will be considered when we develop the schedule. However, most people think sequentially. This approach can lead to team members spending too much time trying to get the WBS to conform to the order of work needed to achieve the deliverables. The main idea of creating a WBS is to capture all the deliverables, irrespective of their order.

A WBS can be structured in a way that makes sense to you and your project. In practice, the chart structure is often used, but a WBS can also be composed in outline form. The WBS can be organized by deliverable, where the project's major

deliverables are used as the first level in the WBS. For example, the deliverables might include the book, audio file, and video if you are doing a multimedia project. Alternatively, you can organize the WBS by project phases in which each phase would represent the first level of the WBS, and their deliverables would be the next level and so on (e.g., planning, design, production, delivery).

Each element in the WBS needs to be assigned a **unique identifier**. This unique identifier is typically a number, and it will be used to sum and track costs, schedules, and resources associated with WBS elements. Project managers use the WBS during project execution to track the status of deliverables and work packages. The items in a WBS are numbered so everyone on the project team can easily understand the relationships between deliverables, sub-deliverables, and subsequent activities. Notice that in [Figure 7.2](#), “Deliverable 2.1 Wedding Chapel” is decomposed into two sub-deliverables, “2.1.1. Location Contract” and “2.1.2 Decorations.” We can also recognize that “3.5 Other Participants” is a sub-deliverable of “3.0 Wedding Party” because both WBS identifiers begin with “3.”

This numbering system allows for easy reference and filtering. For example, a bridesmaid helping with the invitations only needs to receive details and updates related to sub-deliverables that start with “1.” (the invitations deliverable).

The project manager is free to determine the number of levels in the WBS based on the project’s complexity. You need to include enough levels to accurately estimate project time and costs but not so many levels that it becomes difficult to distinguish between components.

Regardless of the number of levels in a WBS, the lowest level is called a work package. **Work packages** are the components that can be easily assigned to one person or a team of people with clear accountability and responsibility for completing the assignment. Work packages contain information about the work to complete a deliverable, including time, cost, and resource estimates.

Another rule to remember is the **100 percent rule**, one of the most essential things to consider when developing and evaluating the WBS. This rule states that each decomposed level (child) must represent 100 percent of the work applicable to the next higher (parent) element.

Once satisfied that all the deliverables are identified and decomposed to the best manageable level, you can create a WBS dictionary, a tabular representation of the deliverables. A **WBS dictionary** includes information about the source of deliverables, known requirements, assumptions and constraints about the deliverable, and any other information the project manager may need to further plan the project ([Figure 7.3](#)).

IDENTIFYING PROJECT OUTCOMES

Deliverable	Description	Known Requirements	Assumptions & Constraints	Source & Notes
1.0 Invitations				
1.1 Guest List	Developed by bride and groom’s families; includes tracking RSVP	100 from each side of family	200 maximum; finalized by October 31	Bride
1.2 Invitations	Wedding invitations with RSVP card, includes ordering and mailing	Use Aunt Gerry’s printing company		Bride
2.0 Venues				
2.1 Wedding Chapel	Location for wedding (to be determined)	Seating for 200; Accessible	Must be available May 31, 2023	Bride’s Mother
2.1.1 Location Contract	Includes contract and payment for venue and officiant			
2.1.2 Decorations	Wedding chapel and photo area decorations	Steampunk		
2.2 Reception Venue				Bride’s Mother
2.2.1 Location Contract	Includes contract and payment for venue			
2.2.2 Food and Catering	Includes contract and payment for food and catering			
2.2.3 Decorations	Reception decorations			
3.0 Wedding Party				Bride’s Mother
3.1 Bridal Attire	Gown, post-wedding attire, shoes, and accessories			Bride
3.2 Groom & Groomsmen Attire	Tuxedos			Groom
3.3 Bridal Attendants Attire	Dresses and shoes			Maid of Honor
3.4 Bridal Party Gifts	“Thank you” gifts for all bridal party (except bride and groom)		\$50 maximum per gift	Bride
3.5 Other Participants	Mother of bride and groom, father of the bride, flower girl, ring-bearer			Bride’s Mother

Figure 7.3: Sample WBS Dictionary for Wedding

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7.2.3 Assigning Responsibility for Deliverables

Once the project deliverables are identified and requirements are mapped to ensure they are identified and described, the project manager may now assign responsibility or oversight to each deliverable. A **responsibility assignment matrix** (RAM) lists product and project deliverables in the first column and key stakeholders across the top row. Each deliverable is mapped to one or more stakeholders to indicate who has responsibility or oversight to ensure that the deliverables are developed appropriately.

RAMs come in several forms, but one of the most useful is a responsible, accountable, consulted, and informed (RACI) chart, which designates each stakeholder’s relationship to each deliverable. **RACI charts** help project managers determine if they have enough resources for a project and record who is responsible for what (Figure 7.4).

In a RACI chart, stakeholders are given various types of responsibility toward the deliverable.

- **Responsible** - indicates who does the work to produce the deliverable
- **Accountable** - indicates who has final authority over the work package to ensure it was produced appropriately; only one person assigned
- **Consulted** - indicates individuals who provide information about the deliverable
- **Informed** - indicates who is informed after the work package is completed, often because his or her own work depends on it

Deliverable	Bride	Groom	Bride’s Mother	Maid of Honor	Best Man
3.0 Wedding Party					
3.1 Bridal Attire	A	I	R	C	I
3.2 Groom & Groomsmen Attire	C	A	C	I	R
3.3 Bridal Attendants Attire	A	I	C	R	I
3.4 Bridal Party Gifts	C	C	A	C	R
3.5 Other Participants	C	I	R	A	I

Legend Responsible Accountable Consulted Informed

Figure 7.4: Example RACI Chart for Wedding

Source: Original Work

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Deeper Dive

Learn more about the responsibility assignment matrix here.

- Doglione, Cara. 2018. “[Understanding Responsibility Assignment Matrix \(RACI Matrix\).](http://project-management.com/understanding-responsibility-assignment-matrix-raci-matrix/)” PM. January 25. <http://project-management.com/understanding-responsibility-assignment-matrix-raci-matrix/>.

7.3 PROJECT REQUIREMENTS

After the high-level deliverables are identified, the project manager must document all the project requirements. A requirement is something needed or wanted by the project outcome recipients and is a necessary condition to project acceptance. Requirements describe the characteristics of the final deliverable, whether it is a product or service. They describe the required functionality the final deliverable must have or specific conditions it must meet to satisfy the project’s objectives.

Requirements are gathered throughout the project defining process. In chartering, we collect high-level requirements because these may affect scope and deliverables. Then, as the charter comes to completion and gets signed off, these requirements help form the scope statement. However, on larger projects, requirements are more detailed during the planning stage. At this time, a project manager may facilitate a requirements session to gather more details about scope and deliverables. Business analysts support the project manager by identifying and documenting project requirements. Other subject matter experts become more involved as additional requirements not discovered initially during the chartering process are identified. These detailed requirements may increase the project’s complexity and introduce new scope or deliverables. Any changes need to be documented as they will be different from what is in the charter. A requirements traceability matrix ([Figure 7.5](#)) is used to track when requirements are identified and by whom.

The project’s **requirements**, defined by the project scope, describe what a project is supposed to accomplish and how the project is supposed to be created and implemented. Requirements answer the following questions regarding the as-is and to-be states of the business: who, what, where, when, how much, and how does a business process work?

Requirements may include descriptors relating to dimensions, ease of use, color, specific ingredients, and so on. Requirements specify what the final project deliverables should look like and what they should do. Requirements must be clearly stated and concise, measurable, testable, related to identified business needs or opportunities, consistent with other requirements, and defined to a level of detail sufficient for system design.

Requirements can be divided into six basic categories: functional, non-functional, technical, business, user, and regulatory.

7.3.1 Functional Requirements

Functional requirements describe characteristics of the final deliverable in ordinary, non-technical language. They should be understandable to customers, and customers should play a direct role in their development. An example of a functional requirement for the wedding deliverable 2.2 Reception Venue might be, “the venue must include 3 dressing rooms with vanity sinks, showers, and floor-to-ceiling mirrors for the bridal party.”

7.3.2 Non-Functional Requirements

Non-functional requirements specify criteria that indicate how you want the functional requirements to be delivered. Also called “features,” non-functional requirements may be used to judge the final product or service that your project delivers. They are restrictions or constraints to be placed on the deliverable and how to build it. Without any constraints, the solutions offered might result in anything being developed that would satisfy the project scope. Non-functional requirements can be split into two types: performance and development. Performance constraints describe **how** the deliverables should behave or appear.

For example, a performance requirement for the reception venue might be, “the venue should allow room for dancing and dining for 200 guests.”

Non-functional requirements are designed to restrict the number of options the team offers. In addition to performance constraints, it may be necessary to identify development constraints. There are three general types of non-functional requirements:

- **Time:** When a deliverable should be delivered
- **Resource:** How much money or which personnel are available to develop the deliverable
- **Quality:** Standards used to develop the deliverable, development methods, etc.

For the wedding reception venue, a non-functional development requirement might be, “the venue should be available the day of and the day after the reception.”

Quality requirements are an important type of non-functional requirement. It’s not enough to make sure you get a project done on time and under budget. You must make the right product to suit your stakeholders’ needs. Everybody “knows” what quality is. But the way the word is used in everyday life differs from how it is used in project management. **Quality** is the suitability of project outcomes for their intended purpose and refers to “fitness-for-use” or a product or service’s ability to satisfy customer requirements.

Quality means ensuring that you build what you said you would and do it as efficiently as possible. And that means trying not to make too many mistakes and always keeping your project working toward creating the right product. Like the triple constraint (scope, cost, and schedule), you manage project quality by setting goals and taking measurements. That's why you must understand the quality levels your stakeholders believe are acceptable, and ensure that your project meets those targets, just like it needs to meet their budget and schedule goals.

Project quality focuses on the deliverables that reflect the project's purpose. The project manager is responsible for developing a plan that clearly describes the expected deliverables and quality specifications. For example, the manager of a housing construction project needs to understand which rooms in the house will be carpeted and what grade of carpet is needed. A room with a high volume of traffic will need a high-grade carpet.

When the team gathers requirements for the specification, they try to write down all the things the customers want in the product so that you know how to make them happy. Some requirements can be left unstated. Those are the ones that are implied by the customer's explicit needs. For example, some requirements are just common sense (e.g., a specific product can't be made from toxic chemicals that may kill the product user). It might not be stated, but it's a requirement.

Which would you choose: a beautifully designed, well-constructed, solidly built, and all-around pleasing product that does not do what you need or a product that does what you want despite being ugly and hard to use? You'll always choose the product that fits your needs, even if it's limited in other ways. That's why it's vital that the product both does what it is supposed to do and does it well. For example, you could pound in a nail with a screwdriver, but a hammer is a better fit for the job.

Conformance to requirements is the core of both customer satisfaction and fitness to use and is a measure of how well your product does what you intend. Above all, your product needs to do what you wrote down in your requirements document. Your requirements should consider what will satisfy your customer and the best design possible for the job. That means conforming to both stated and implied requirements. In the end, your product's quality is judged by whether you built what you said you would build.

7.3.3 Technical Requirements

Technical requirements emerge from the functional requirements to answer the questions: how will the problem be solved this time, and will it be solved technologically and/or procedurally? They specify how the system needs to be designed and implemented to provide correct functionality and fulfill required operational characteristics. Projects that do not produce a physical product or result may not have technical requirements. The wedding discussed above does not have technical requirements because there is no problem to be solved with developing a physical product or result.

For example, in a software project, the functional requirements may stipulate that a database system will be developed to allow access to financial data through a remote terminal. The corresponding technical requirements would spell out the required data elements, the language in which the database management system will be written (due to existing knowledge in-house), the hardware on which the system will run (due to existing infrastructure), telecommunication protocols that should be used, and security requirements that are needed for access.

7.3.4 Business Requirements

Business requirements describe the sponsoring organization's needs from a management perspective. Business requirements are statements of the business rationale for the project. They are usually expressed in broad outcomes, focused on satisfying business needs rather than addressing specific functions the system must perform. These requirements grow out of the vision for the product that, in turn, is driven by mission (or business) goals and objectives. Business requirements are tied to organizational or department objectives. For example, if a customer service department had an objective to "increase customer satisfaction ratings to 4.2 by year-end," then a business requirement for a related project might be, "the project will support the department's goals of increasing customer satisfaction ratings."

7.3.5 User Requirements

User requirements describe what the users need to do with the system or product. The focus is on user experience with the system under all scenarios. These requirements are included to verify that project outcomes match the end user's expectations. For example, in the wedding project, a user requirement might be, "the bride will need access to the dressing rooms 3 hours before the wedding starts to change into her wedding attire."

7.3.6 Regulatory requirements

Regulatory requirements can be internal or external, usually non-negotiable, and includes restrictions, licenses, and laws applicable to a product or business imposed by the government. Obtaining a marriage license three days before the wedding would be an example of a regulatory requirement for the wedding project.

7.3.7 The Importance of Documenting Requirements

Accurately specifying requirements is one of the most challenging undertakings faced by project managers. While the project manager makes sure requirements are documented, the project manager does not perform this task alone. The project manager enlists the help of all key stakeholders (business analysts, requirement analysts, business process owners, customers, and other team members) to

IDENTIFYING PROJECT OUTCOMES

conduct discussions, brainstorming, and interviews to document requirements. The project manager is responsible only for enabling the process and facilitating it.

Inadequately specified requirements will guarantee poor project results and may also introduce the potential for scope creep. Documenting requirements is more than just writing down the requirements as the user sees them; accurate documentation should cover what decisions have been made and why they have been made. Understanding the reasoning followed to arrive at a requirement is critical to avoid repetition. For example, the fact that a particular feature has been excluded because it is simply not feasible needs to be recorded. The project risks wasted work and repetition if decisions are not recorded, such as when a stakeholder requests the feature be reinstated during development or testing.

The **requirements traceability matrix** is a document that links requirements to their origin and traces them throughout the project life cycle. A requirements traceability matrix helps ensure that each requirement adds business value by linking it to the business and project objectives. It provides a means to track requirements throughout the project life cycle, helping to ensure that requirements approved in the planning stages are delivered at the end of the project. Finally, it provides a structure for managing changes to the product scope. This process includes, but is not limited to, mapping requirements to the following sources.

- Business needs, opportunities, goals, and objectives
- Project objectives
- Project scope, work breakdown structure, deliverables
- Product design
- Product development roadmaps and plans
- Test plans, strategy, and scenarios

Typical attributes included in a requirements traceability matrix may include:

- A unique identifier for each requirement
- A textual description of the requirement
- The rationale or justification for inclusion
- Owner (person responsible for the requirement)
- Source (who identified or asked for the requirement)
- Priority (urgent, high, medium, low)
- Version (to track changes, when and what updates were made)
- Status (such as active, canceled, deferred, added, approved)
- Date delivered.

Additional attributes to ensure that the requirement has met stakeholders' satisfaction may include stability, complexity, and acceptance criteria.

IDENTIFYING PROJECT OUTCOMES

Once the requirements are documented, have the appropriate stakeholders sign off on their requirements as confirmation of what they desire. The project manager then reviews the requirements, incorporates them into the project documentation library, and uses them as input for the project plan.

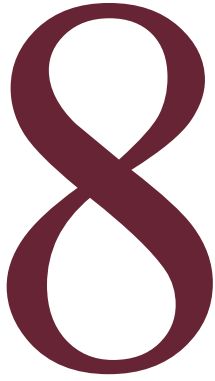
ID	Description	Rationale	Owner	Source	Priority	Version	Status	Delivery Date
001	Wedding lists should include 100 people from each side of the Bride and Groom	Budget is limited and does not allow for more than 100 individuals per side of the family	Bride's mother	Bride's father	High	2.0 (adjustments had to be made based on rise in prices)	Active	
002	Use Aunt Gerry's printing company to print wedding invitations	Using Aunt Gerry's printing company allows for cost savings	Maid of Honor	Bride	Medium	1.0	Active	
003	Wedding decorations need to be Steampunk themed	Wedding decoration must match preferences of bride and groom	Bride's mother	Bride and Groom	Medium	1.0	Active	

Figure 7.5: Sample Requirements Traceability Matrix

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Scheduling Project Work

Project management success includes delivering the correct scope on time and with the agreed-upon budget. When we discussed projects in [Chapter 1](#), we learned that projects have numerous constraints placed on them, specifically cost, scope, quality, risk, resources, and time. In this chapter, we will discuss time constraints and how to develop a project schedule that satisfies these restrictions.

The project manager is responsible for developing and managing a schedule that ensures the project completes on time. On smaller projects managers may create the schedule, but on complex projects the manager may seek the assistance of scheduling experts.

Regardless of who develops the project schedule, the team reviews the scope, constraints, and other project information to determine important dates. Based on this information, the team develops a milestone schedule.

The **milestone schedule** establishes key dates that must be met for the project to finish on time. Milestones help the team meet contractual obligations or communicate progress at appropriate intervals. A milestone schedule may suffice for less complex projects to track progress.

For complex projects, a more detailed schedule is required. In this case, the work packages identified in the WBS form the basis of the schedule. Work packages contain a list of activities to be performed, work assignments, and relationships between the activities. This section will discuss how to identify and schedule project work to develop a schedule baseline.

CHAPTER LEARNING OBJECTIVES

- Understand the processes and activities of identifying and scheduling project work.
- Describe the approaches to assigning resources and estimating activity duration and effort.
- Apply critical path analysis to determine a project's duration and most essential activities.

- Demonstrate awareness of best practices for building quality into a project schedule.
- Employ methods to optimize project schedules.

8.1 IDENTIFYING ACTIVITIES

The **activity definition process** is a further breakdown of the work package elements in the WBS. It documents the specific activities needed to produce the deliverables detailed in the WBS. These activities are not the deliverables but individual units of work that must be completed to produce them. Activity definition uses everything we already know about the project to divide the work into activities that can be estimated. You might want to look at all the lessons learned from similar projects your company has completed to get an idea of what you need to do on the current one.

Project team members with prior experience developing scope statements and WBS can help you define activities by sharing their expert judgment. **Expert judgment** is the application of specialized knowledge and skills to make decisions and provide solutions, often provided by an individual with specialized training or experience. Suppose you are asked to manage a project in a new domain. In that case, you might rely on subject matter experts to help define tasks so you can understand what activities will be involved. You may want to create an activity list and then have the expert review it and suggest changes. Alternatively, you could involve experts from the beginning and ask to have an activity definition conversation with them before making your first draft of the list.

Now that the activity definitions for work packages have been completed, the next task is to complete the **activity list**, which includes all the activities that must be accomplished to deliver each work package, plus everything else that needs to be done to complete your project (Figure 8.1). **Activity attributes** include a description of the work, relationships, constraints, assumptions, and other important information you may need as you plan the project. Activities should be tracked back to a specific work package.

Work Package ID	Activity ID	Description	Relationships with Other Activities	Assumptions & Constraints	Notes
3.1 Bridal Attire	3.1.1	Schedule fitting with the dress shop		Myrtle's has the dress designer in stock	Identify wedding dress designer and style
3.1 Bridal Attire	3.1.2	Purchase wedding dress	Depends on 3.1.1	Max \$1500	
3.1 Bridal Attire	3.1.3	Shop for reception attire			

Work Package ID	Activity ID	Description	Relationships with Other Activities	Assumptions & Constraints	Notes
3.1 Bridal Attire	3.1.4	Shop for honeymoon attire			Need to find out weather in France and Italy during honeymoon week
3.1 Bridal Attire	3.1.5	Schedule hair and makeup stylist		Alexia is not available on wedding day	
3.1 Bridal Attire	3.1.6	Shop for shoes and accessories for wedding dress		Includes veil, shoes, jewelry	

Figure 8.1: Activity Definition for Work Package 3.1 Bridal Attire

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Sometimes, project managers must begin projects without knowing much about the work that will be done later. **Rolling-wave planning** lets you plan and schedule only the portion you know enough about to plan well. When you don't know enough about a project, you can use the higher-level deliverables as placeholders for unknown portions until you know more.

As the team defines project activities, they may also estimate how long these tasks will take. For some activities this information may already be established, but in others the project manager may have to develop a best guess. One consideration is what your team members with the most experience at a task estimate for the time it will take. Building consensus is another approach.

8.2 ESTIMATING ACTIVITY DURATION AND EFFORT

Once you're done with activity identification, you can now determine how long each activity will take. That's done in a process called **activity duration estimating**, where you look at each activity in the activity list, consider its scope and resources, and estimate how long it will take to perform.

Estimating activity duration means starting with the information you have about that activity and the resources assigned to it and then working with the project team to come up with an estimate. Most of the time, you'll start with a rough estimate and then refine it to make it more accurate. You'll use one or more of the following tools and techniques to create the most accurate estimates:

1. **Expert judgment** involves relying on your project team members who are familiar with the work that must be done to develop activity estimates. If you don't get their opinion, there's a considerable risk that your estimates will be wrong.

2. **Analogous estimating** is when you look at similar activities from previous projects and how long they took. This strategy only works if the activities and resources are similar to the current project.
3. **Parametric estimating** means plugging data about your project into a formula, spreadsheet, database, or computer program that comes up with an estimate. The software or formula that you use for parametric estimating relies on data of actual durations from past projects.
4. **Three-point estimating** calculates duration based on three values: a realistic estimate that's most likely to occur, an optimistic one that represents the best-case scenario, and a pessimistic one that represents the worst-case scenario. The final estimate is a weighted average of the three.
5. **Reserve analysis** means adding extra time to the schedule (called a contingency reserve or buffer) to account for extra risk.

In developing estimates for tasks, you often must distinguish between the *duration* and *effort* needed to complete the task. **Duration** refers to the amount of time elapsed to complete an activity, while **effort** refers to how much time people spend completing the activity. Duration and effort can be measured in hours, days, weeks, or months, depending on the activity.

For example, if you were assigned a project to paint a room, you might have several tasks to complete (Figure 8.2). Looking at tasks B and C in particular, we might define these as effort-based tasks. We estimate it would take two hours for B and six hours for C, assuming we only have one resource (person) working on the tasks. However, we might be able to cut that time in half by adding a second person to help remove the furniture and paint the room. Therefore, painting the room would take six hours of *effort* that could be divided between two resources and accomplished in three hours.

Activity	Duration	Effort
A) Order the paint and supplies	1 week	1 hour
B) Remove the furniture and prepare the room	2 hours	2 hours
C) Paint the room	6 hours	6 hours
D) Let the paint dry	2 days	0 hours
E) Restore the furniture back to the room	2 hours	2 hours

Figure 8.2: Comparing Duration and Effort

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On the other hand, tasks A and D would be duration-based tasks. We estimate it will take one week to receive the paint and supplies orders and two days for the paint to dry before we can move the furniture back into the room. Regardless of how many people are working on the project, adding more people will not change

the speed at which the paint dries. (Although a project manager may find other resources, such as industrial fans, that could speed along the drying time of the paint at additional expense.)

8.3 ASSIGNING PROJECT RESOURCES

Project Resources include people, equipment, physical locations, money, or anything else you need to complete the activities you are planning. Every activity on your activity list needs to have resources assigned to it. Before you can assign resources to your project, you need to know their availability. Resource availability includes information about what resources you can use on your project, when they're available to you, and the conditions of their availability.

Resource management is the efficient and effective deployment of an organization's resources when needed. Such resources may include financial resources, inventory, human skills, production resources, or information technology (IT).

Don't forget that some resources, like consultants or training rooms, must be scheduled in advance and might only be available at certain times. You'll need to know this information before you can finish planning your project. If you are starting to plan in January, a June wedding is more challenging to plan than a December wedding because the wedding halls are all booked up in advance. That is a resource constraint. You'll also need the activity list that you created earlier, and you'll need to know how your organization typically handles resources. Once you understand these things, you're ready to estimate resources.

The goal of activity resource estimating is to assign resources to each activity in the activity list. A project manager may use one or more approaches to estimate activity resources ([Figure 8.3](#)).

SCHEDULING PROJECT WORK

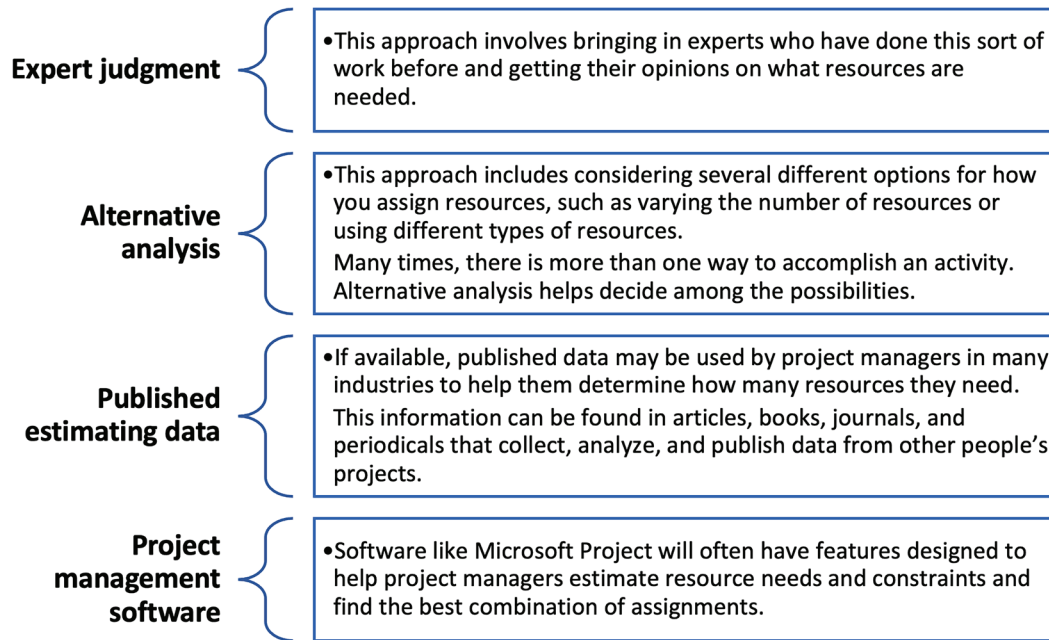


Figure 8.3: Approaches to Estimating Activity Resources

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8.4 MAPPING RELATIONSHIPS BETWEEN ACTIVITIES

After identifying the activities, the project team sequences the tasks according to the order in which they are to be accomplished. An outcome of sequencing is the project network diagram. A **network diagram** represents the logical sequence of activities needed to complete a project.

Many project managers use network diagrams when scheduling a project. The network diagram is a way to visualize the interrelationships of project activities. Network diagrams provide a graphical view of the tasks and how they relate to one another. The activities in the network are from the WBS work packages. All the work package activities must be included in the network diagram because they must be accounted for in the schedule. Leaving even one activity out of the network could change overall schedule duration, estimated costs, and resource allocation commitments. The first step is to arrange the activities from your WBS into a sequence. Some activities can be accomplished at any time throughout the project, while other activities depend on input from another activity or are constrained by time or resources.

The WBS is not a schedule, but it is the basis for it. The network diagram is a schedule but is used primarily to identify critical scheduling information that ultimately goes into user-friendly schedule formats, such as milestone and Gantt charts. The network diagram provides visual information to the project team by showing how the activities are related ([Figure 8.4](#)), where the risk points are in the

schedule, how long it will take as currently planned to finish the project, and when each activity needs to begin and end.

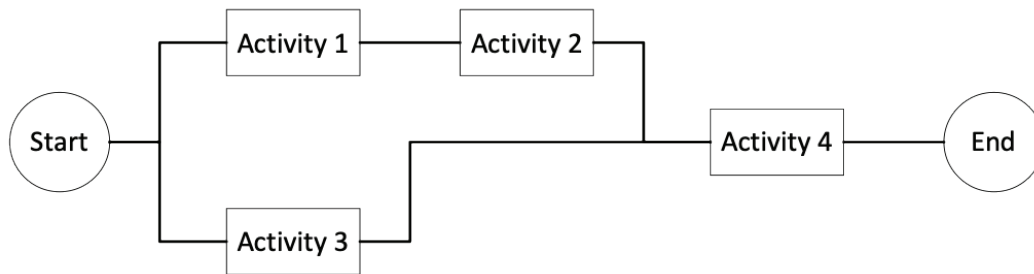


Figure 8.4: Sample Network Diagram

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There are two primary ways to design network diagrams. Showing the activities in rectangles and their relationships as arrows is called a **precedence diagramming method (PDM)**. This kind of diagram is also called an **activity-on-node diagram (AON)**. Another way to show how tasks relate is with the **activity-on-arrow diagram (AOA)** where the arrows represent the activities or tasks. Although AON is more commonly used and is supported by all project management programs, PERT is the best-known AOA-type diagram and the historical basis of all network diagramming. The main difference is the AOA diagram is traditionally drawn using circles as nodes, with nodes representing the beginning and ending points of the arrows or tasks.

All network diagrams have the advantages of showing task interdependencies, start and end times, and the critical path but the AOA network diagram has some disadvantages that limit their use.

The three major disadvantages of the AOA method are:

1. The AOA network can only show finish-to-start relationships. It is not possible to show lead and lag except by adding or subtracting time, which makes project tracking difficult.
2. Instances of “dummy activities” can sometimes occur in an AOA network. **Dummy activities** are activities that show the dependency of one task on other tasks but for other than technical reasons. For example, one task may depend on another because it would be more cost effective to use the same resources for the two; otherwise, the two tasks could be accomplished in parallel. Dummy activities do not have durations associated with them. They simply show that a task has dependence on another task.
3. AOA diagrams are not as widely used as AON diagrams simply because the latter are somewhat simpler to use, and all project management software programs can accommodate AON networks, whereas not all can accommodate AOA networks.

How do you figure out a schedule that makes everything fit together? Until you have finished building the schedule, you will find it nearly impossible to have a complete view of your resource needs. The same goes for your activity list and duration estimates. When you lay out the schedule, you'll likely discover that some of your activities and durations conflict.

Some activities must be done sequentially while others can be done concurrently. The project manager should schedule activities in a way that effectively and efficiently uses resources and completes the project in the shortest time. On larger projects, several paths are created that represent a sequence of activities from the beginning to the end of a project. The longest path to project completion is the **critical path**.

Knowing where your critical path is can give you a lot of freedom. If you know an activity is not on the critical path, then you know a delay in that activity may not necessarily delay the overall project. This knowledge can help with handling emergencies. Even better, it means that if you need to bring your project in earlier than was initially planned, you know that adding resources to the critical path will be much more effective than adding them elsewhere.

The schedule can be displayed in a variety of ways, some of which are variations of what you have already seen. Project schedule network diagrams will work as schedule diagrams when you add the start and finish dates to each activity. These diagrams usually show the activity dependencies and critical path. Project managers can use critical path analysis to keep projects on track (see [Section 8.4.1](#)). **Critical path analysis** identifies the string of activities that, if you add up all the durations, is longer than any other path through the network. It starts with the first activity in the network and ends with the last one. Knowing the critical path is essential because every activity on the path must finish on time for the project to come in on time. A delay in any one of the critical path activities will cause the entire project to be delayed.

Relationships between activities or scheduling constraints should be listed in the attributes along with descriptions and any other information about resources or time that you need for planning. **Predecessor** relationships occur between activities that must occur in a particular order. The three main kinds of predecessors are **finish-to-start (FS)**, **start-to-start (SS)**, and **finish-to-finish (FF)**. The most common kind of predecessor is the finish-to-start. A finish-to-start relationship means that one task needs to be completed before another one can start. This sequence is the most common relationship identified between tasks. It's called finish-to-start because the first activity's finish leads into the second activity's start.

We can also think of relationships between activities as mandatory or discretionary. **Mandatory predecessors** are the kinds that must exist just because of the nature of the work. You can't address an invitation that hasn't been printed yet. Printing invitations is a mandatory predecessor for addressing them. **Discretionary predecessors** are optional relationships, usually process- or

procedure-driven or best-practice techniques based on experience. In the wedding example, the bride and groom want the bridesmaids to arrive at the reception before the couple arrives. This setup is not a requirement, rather it’s a matter of preference.

In [Figure 8.5](#), the activities in the wedding work package “3.1 Bridal Attire” have different relationships. Activities 3.1.1 and 3.1.2 have finish-to-start relationships, which tells us that 3.1.1 must finish before 3.1.2 can start. Activities 3.1.3 and 3.1.4 have a start-to-start relationship, which tells us that the two activities can start at the same time. Activities 3.1.2 and 3.1.6 have a finish-to-finish relationship, which tells us that they must finish together.

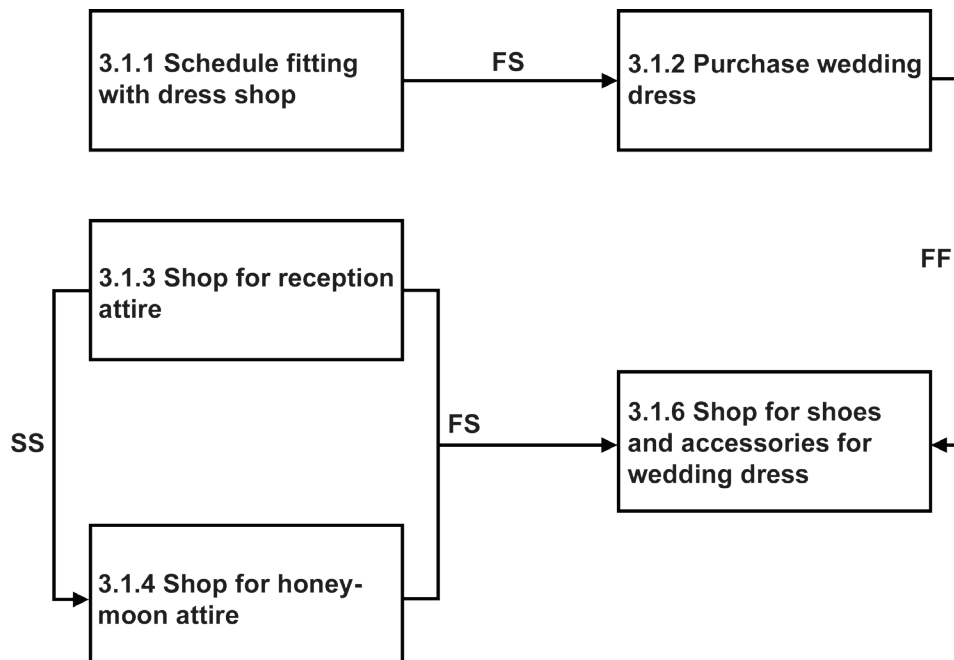


Figure 8.5: Predecessor Relationships for Activities in Work Package 3.1

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8.4.1 Critical Path Analysis

Once a network diagram has been made and estimated activity durations have been assigned, the critical path can be identified. Critical path analysis identifies flexibility in the project schedule. During the life of the project scheduling conflicts often occur, and the project manager is responsible for reducing these conflicts while maintaining quality and meeting cost goals. Mapping the critical path helps to identify the activities that need to be monitored most closely.

Using this method, the following attributes of each activity can be calculated ([Figure 8.6](#)):

- **Early start time (ES)** – earliest time an activity can start based on predecessor relationships

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- **Late start time (LS)** – latest time an activity can start based on successor relationships
- **Early finish time (EF)** – earliest time an activity can finish based on predecessor relationships
- **Late finish time (LF)** – latest time an activity can finish based on successor relationships
- **Slack or float (SL or FL)** – the difference between an activity’s early start and late start; activities on the critical path will have a slack = 0.

These activity attributes are calculated using two processes: the forward pass and the backward pass. The forward and backward pass are also used to fully calculate the critical path(s) in a project.

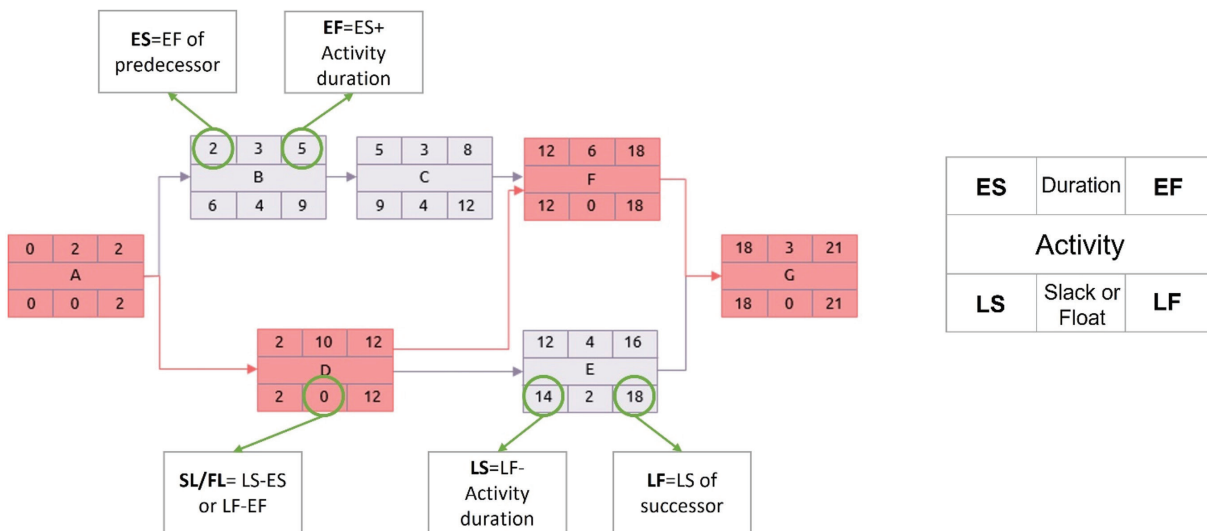


Figure 8.6: Completed Critical Path Analysis with Schedule Attributes

Source: Original Work

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Deeper Dive

To see how to conduct a forward and backward pass on a project network diagram, watch the following video.

- Christiansen, S. (2019). [Project Management Networks Part 2: Forward and Backward Pass](http://pmf.video/video6) [YouTube]. Retrieved from <http://pmf.video/video6>

Step-by-step instructions for conducting critical path analysis can be viewed here.

- Praxis Framework Limited. (2019). [Critical Path Analysis](https://www.praxisframework.org/en/library/critical-path-analysis). Retrieved from <https://www.praxisframework.org/en/library/critical-path-analysis>

8.5 BUILDING QUALITY INTO THE SCHEDULE

The project manager is responsible for developing a project quality plan that defines the quality expectations and ensures that specifications and expectations are met. Developing a good understanding of project deliverables through documenting specifications and expectations is critical to a good quality plan.

Quality planning focuses on taking all the information available to you at the beginning of the project and figuring out how you will measure quality and prevent defects. Your company should have a quality policy that states how it measures quality across the organization. You should make sure your project follows the company policy and any government rules or regulations on how to plan quality for your project. You need to plan which activities you will use to measure the quality of the project's product, and you'll need to think about all the quality-related activity costs you want to complete. Then you'll need to set some guidelines for what you will measure against. Finally, you'll need to design the tests you will run when the product is ready to be tested.

The project manager integrates the processes for ensuring that the specifications and expectations are met are integrated into the project schedule. Just as the project budget and completion dates may change over the life of a project, the project specifications may also change. Changes in quality specifications are typically managed in the same process as cost or schedule changes. The impact of such changes is analyzed for influence on cost and schedule, and with appropriate approvals, changes are made to the project execution plan.

Although any of the quality management techniques designed to incrementally improve operational work can be applied to project work, the unique aspects and relatively short duration of projects makes minor improvements less attractive on projects. Rework on projects, as with manufacturing operations, increases the cost of the product or service and often increases the time needed to complete the reworked activities. Because of a project's time constraints, appropriate skill development, material allocation, and work process setup early in the project are critical to success. On more complex projects, time is allocated to developing a plan to understand and cultivate the appropriate skill levels and work processes.

Project management organizations that execute several similar types of projects may find process improvement tools helpful in identifying and improving the baseline processes used on their projects. Process improvement tools may also be helpful in identifying cost and schedule improvement opportunities. Opportunities for improvement must be found quickly to influence project performance. The investment in time and resources to find improvements is greatest during the early stages, when the project is in the planning phases. During later project stages, as pressures to meet project schedule goals increase, there is less focus on making changes in work processes.

8.6 CREATING A PROJECT SCHEDULE

A project schedule can be built from the top-down or from the bottom-up (Figure 8.7). **Top-down scheduling** is useful when project objectives are clearly identified, but the underlying deliverables or work is not so clear. The schedule is estimated based on consensus or experience and will be refined as the deliverables are further defined. While top-down estimating helps determine the overall project schedule during the early stages of a project, it does not enable the project manager to effectively monitor progress.

Bottom-up scheduling helps the project manager more effectively monitor progress and starts with identifying the deliverables (see Section 7.2.2). After the project team organizes deliverables down into work packages, the team identifies activities needed to complete each work package, including durations and relationships between tasks and deliverables, and assigning resources. The project manager uses these activities to determine the project schedule.

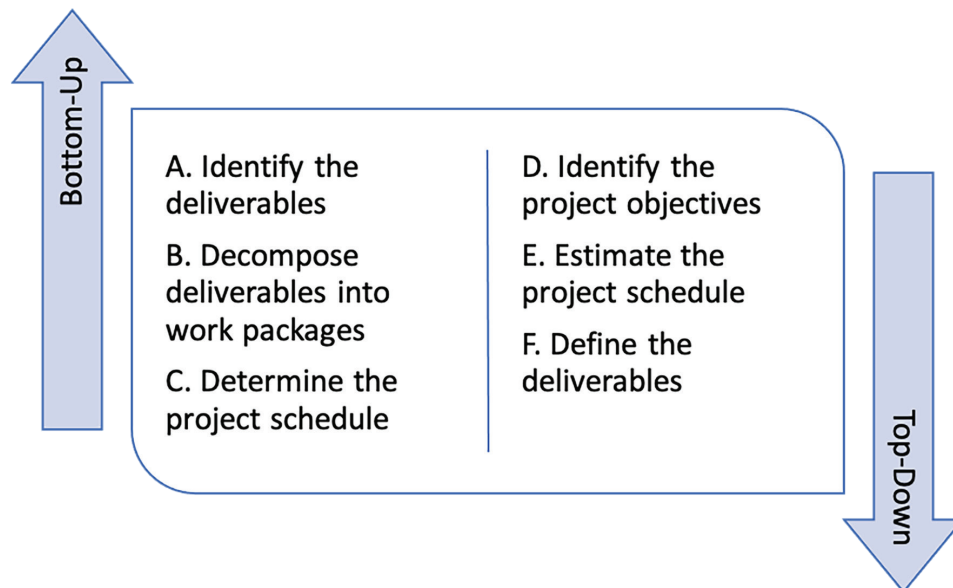


Figure 8.7: Bottom-Up versus Top-Down Scheduling

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Up to this point, we have identified project deliverables and the activities required to produce them. We have identified activity relationships, durations, and resources. However, we still do not have a project schedule. A **project schedule** displays activity durations, resources, relationships, and timing. A project schedule will also include **milestones**, which are activities with zero duration and effort that show target dates for completing various aspects of project work. The important checkpoints for your project are tracked as milestones. Some of them could be listed in your contract as requirements of successful completion; some could just be significant points that you want to keep track of. The milestone list needs to let

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everyone know which milestones are required and which are not. Milestones do not have assigned durations or resources but serve as time markers to allow the project manager to monitor delivery.

WBS	Name	Duration	Start	Finish	Predecessors	Resource Names
	Wedding	1 day?	11/1/22 8:00 AM	11/1/22 5:00 PM		
1.0	1.0 Invitations	87.5 days	11/1/22 8:00 AM	3/2/23 1:00 PM		
1.1	1.1 Guest List	87.5 days	11/1/22 8:00 AM	3/2/23 1:00 PM		
1.1	Prepare Guest List	10 days	11/1/22 8:00 AM	11/14/22 5:00 PM		Bride; Groom; Mother of Bride; Mother of Groom
1.1	Initial Guest List approved	0 days	11/14/22 5:00 PM	11/14/22 5:00 PM	4	
1.1	Update Guest List with RSVPs	60 days	12/8/22 1:00 PM	3/2/23 1:00 PM	10	Maid of Honor
1.1	Final Guest List confirmed	0 days	3/2/23 1:00 PM	3/2/23 1:00 PM	6	
1.2	1.2 Invitations	27.5 days	11/1/22 8:00 AM	12/8/22 1:00 PM		
1.2	Order wedding invitations	25 days	11/1/22 8:00 AM	12/5/22 5:00 PM	5FF	Bride, Mother of Bride
1.2	Mail wedding invitations	2.5 days	12/6/22 8:00 AM	12/8/22 1:00 PM	9	Bride; Maid of Honor

Figure 8.8: Project Schedule with Durations, Relationships, and Resources

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Project schedules can be viewed as either a table (Figure 8.8) or as a time-based visual of project work. A **Gantt chart** is one type of visual time-based chart, developed by Henry Gantt, that illustrates a project schedule (Figure 8.9). Gantt charts are easy to read and commonly used to display schedule activities. These charts display the start and finish dates of terminal and summary project elements. Terminal and summary elements comprise the project’s work breakdown structure. Some Gantt charts also show dependency relationships (i.e., precedence network) between activities.

Gantt charts show all the stages of a project and their duration as a bar chart with the time scale across the top. The key stages are placed on the bar chart in sequence, starting in the top left corner and ending in the bottom right corner.

A Gantt chart can be drawn quickly and easily and is often the first tool a project manager uses to provide a rough estimate of the time it will take to complete essential tasks. Sometimes it is helpful to start with the target deadline for completion of the whole project because it is soon apparent if the time scale is too short or unnecessarily long. The detailed Gantt chart is usually constructed after main objectives have been determined.

For a complex project, you may decide to produce a separate Gantt chart for each project stage. If you do this shortly before each key stage begins, you will be able to take any last-minute eventualities into account.

These charts provide a valuable tool for monitoring and control as the project progresses. Various software apps and tools are available to assist project managers in creating dynamic Gantt charts. Once the data have been entered, a program helps you work on “what if” scenarios, showing what might happen if a project stage is delayed or sped up.

SCHEDULING PROJECT WORK

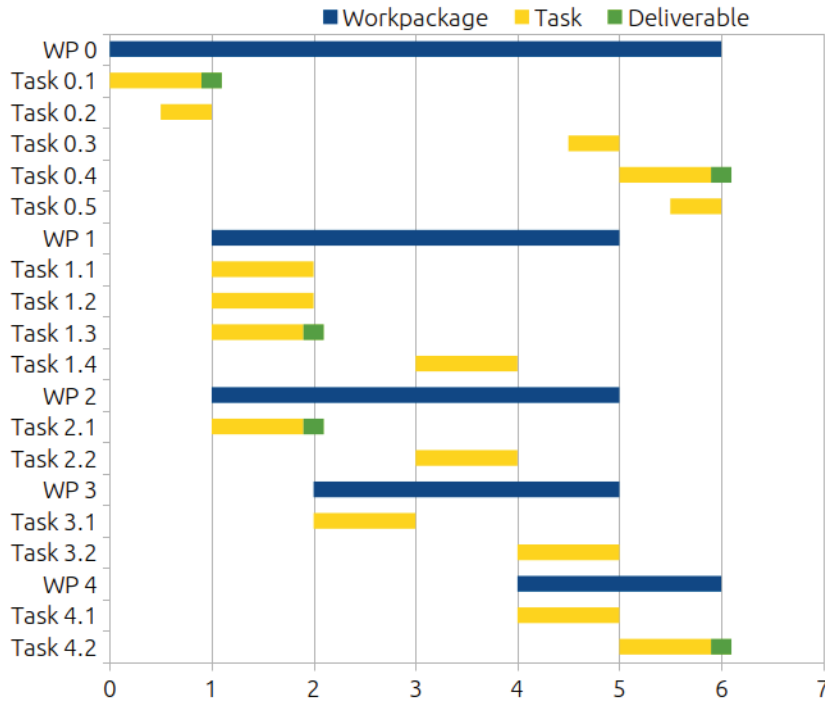


Figure 8.9: An example of a Gantt Chart

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Sometimes you need to give some extra time between activities. **Lag time** is when you purposefully put a delay between the predecessor task and the successor. For example, when the bride and her father dance, the guests wait awhile before joining in. **Lead time** is when you give a successor task some time to get started before the predecessor finishes. For example, you might want the caterer to prepare the dessert an hour before everybody is finished eating dinner.

The final project schedule is called a **schedule baseline**, which will be used by the project manager during the production phases to monitor work and ensure the project stays “on schedule.”

8.7 OPTIMIZING THE PROJECT PLAN

Optimizing the project plan includes evaluating the schedule and budget to ensure they are as accurate and realistic as possible. Project schedules can be optimized using several methods, including crashing and fast-tracking, discussed below. PERT analysis (see [Section 8.7.4](#)) is one method of optimizing a project schedule based on probabilities and prior experience.

8.7.1 Optimizing the Project Schedule and Budget

Because certainty during planning is challenging to achieve, a project manager must carefully review the schedule and budget before publishing baselines.

Schedule optimization is the final step in the process in which the project manager and team take a very critical look at the draft schedule and seek ways to improve it—that is, to make it more accurate, realistic, effective, and faster.

Much of project planning involves making estimates and assumptions, which introduces variables and risk to a project. Sometimes a task takes longer than initially estimated, whether due to optimistic anticipation of what work needs to be done, or to unforeseen challenges that arise. Therefore, a project manager must know the critical path (or paths) of a project.

If the critical path can be completed before the client needs the project completed, the project has a positive total float or project slack. In other words, the project can likely be completed ahead of schedule. If, after mapping out the tasks and determining the critical path, the PM determines that the project cannot be completed by the client's deadline, the project has a negative float. If the projected total time is much longer than the project sponsor's expectations, the PM will need to renegotiate the time scale.

8.7.2 Crashing and Fast-Tracking a Project Schedule

To successfully manage a project, the project manager must also know how to accelerate a schedule to compensate for unanticipated events that delay critical activities—those activities along the critical path. Project managers rely on two common techniques: crashing and fast-tracking. **Crashing** is a form of schedule compression that involves applying additional resources to a task along the critical path at the lowest incremental cost. The additional costs may be in the form of additional personnel, equipment, overtime, or expedited manufacture or delivery of equipment.

For effort-driven tasks, adding personnel or equipment can decrease the amount of time it takes to complete a task. In the room painting example ([Figure 8.2](#)), we estimated a room could be painted in six hours using one individual. If we pay for a second worker, the painting could be completed in half the time, thereby cutting the time for that task in half. Spread over several rooms, additional personnel could decrease the amount of time needed to complete a project, but such a decision does come at additional cost.

For duration-driven tasks, additional resources could come in the form of expediting production or shipping needed parts. For example, when working on a wedding, the wedding planner may decide that invitations need to be mailed out two weeks prior to the initially planned date. The wedding planner may pay a priority fee to the printing shop to move the wedding's priority to the front of the queue for printing as well as to pay for overnight shipping, rather than waiting an additional 3–5 days for standard mail delivery.

Another method for compressing the schedule is fast-tracking. **Fast-tracking** refers to starting tasks in parallel that are typically done sequentially. As the most common relationship between dependent tasks is a finish to start relationship,

fast-tracking can involve starting a task before the predecessor task is completed. One downside to fast-tracking is that it may introduce additional risk to a project.

For example, a wedding generally needs a venue for the ceremony, and sometimes a venue for the reception. The standard plan may show that the task involving designing and printing the wedding invitations are dependent on having the venues selected and reserved. However, the printing company may need six weeks to print the invitations, which will make it challenging to address the invitations in time to mail them six weeks before the wedding. If the PM decides to print the invitations without having a contract signed, she runs the risk of having to redo all the invitations if the contract falls through. If the PM only develops a sample, she may save some days off the project by writing the venue information on the invitations. The PM must balance risk with potential savings in any step that is fast tracked.

A key differentiation to remember between crashing and fast-tracking is this: crashing involves adding additional resources to a project, which can affect the budget. Fast-tracking involves modifying the sequence of activities, which can increase risk in the project, but no additional resources are added.

When optimizing the schedule, one must consider the effect on project costs, benefits, and risks. There may be opportunities to speed up the schedule, but if the cost for crashing is high, the PM must weigh the added costs with the time savings. Similarly, with fast-tracking, the risk introduced to the project may not be worth the incremental time savings.

If a project manager does not include steps to optimize the project schedule and avoid the potential risks of doing so, they must be ready to address potential changes to the project schedule following established change management processes. Even the best project schedules will need to be adjusted once the work begins to produce project outcomes, because as Mike Tyson, world-famous boxer of the 1980s said, “everybody has plans until they get hit for the first time.”¹⁴

8.7.3 Optimizing Project Resources

Resource leveling is used to examine unbalanced resource use (usually people or equipment) over time to resolve over-allocations or schedule conflicts. When performing project planning activities, the project manager will attempt to schedule some tasks simultaneously. When more resources, such as machines or people, are needed than are available or perhaps a specific person is needed in both tasks, the tasks will have to be rescheduled sequentially to manage the constraint. For example, multiple shipments might arrive at a warehouse at the same time, but the warehouse operator has one forklift to move the shipments that cannot be moved by hand. Some tasks that are waiting on a shipment may have to be delayed while the forklift is being used to deliver materials for another task. If the tasks that are being delayed are on the critical path, the decisions for using the forklift may delay the entire project.

Resource leveling during project planning is the process of resolving these conflicts. It can also be used to balance the workload of primary resources over the course of the project, usually at the expense of one of the traditional triple constraints (time, cost, scope). When using specially designed project software, leveling typically means resolving conflicts or over-allocations in the project plan by allowing the software to calculate delays and update tasks automatically. Project management software leveling requires delaying tasks until resources are available. In more complex environments, resources could be allocated across multiple, concurrent projects thus requiring the resource leveling process to be performed at company level. In either definition, leveling could result in a later project finish date if the tasks affected are in the critical path.

8.7.4 PERT Analysis

Program Evaluation and Review Technique (PERT) was one of the first systems for diagramming and analyzing project networks. Many of the techniques covered in this and other project management textbooks originated with PERT. Over the years, PERT concepts have been augmented and extended. As a result, many project managers don't directly mention PERT, but use a variation of the PERT system as it was developed in the 1950s.

PERT is useful for analyzing the variability in project time estimates. Estimate variability represents a substantial source of risk for any project. A PERT analysis can help project managers make better assumptions about the likely completion time for tasks and projects. A **PERT analysis** gives the project manager the information needed to address estimate variability by adding time buffers and allocating contingency funds.

A PERT analysis starts with a three-point time estimate. For each activity, estimators provide:

- An **optimistic time estimate** (if all goes well, what is the shortest time one could realistically expect to complete this activity?)
 - This will be designated in calculations as "O."
- The **most likely time estimate** (if all goes as expected, what is the average time one could realistically expect to complete this activity?)
 - This will be designated in calculations as "M."
- A **pessimistic time estimate** (if work goes poorly, what is the longest time one could realistically expect to complete this activity?)
 - This will be designated in calculations as "B."

PERT uses a weighted average to reflect that the most likely estimate (M) should be weighted more heavily than the others. For PERT, this weighted average is called T_e and is computed by the formula below. This equation can be adjusted for different circumstances, but the version below is the generally accepted formula.

$$\text{Estimated Time} = T_e = \left(\frac{O + 4M + P}{6} \right)$$

Project management studies have found that T_e values follow a beta distribution of probable completion dates. As a result, when given the values for O, M, and P for each task on the critical path, the project manager can calculate the probability of the project being completed within a given time. The variance can tell us the probability that an activity will complete within a given time. For calculations involving PERT, the calculation of the variance for project activities is as follows:

$$\text{variance} = \sigma^2 = \left(\frac{O - P}{6} \right)^2$$

To determine the probability of completion, a formula is used that compares proposed schedule completion dates (T_s) with the time predicted by our critical path (T_e). This equation determines a statistical Z value and the probability of meeting the proposed completion date. The formula for this calculation is:

$$\text{Probability} = Z - \text{Value} = \frac{T_s - T_e}{\sqrt{\sum(\sigma_{T_e})^2}}$$

This Z value can then be found in a probability table or calculated using a spreadsheet program like Excel. More advanced simulations can use these variances to calculate probabilities of all network paths to produce a robust (although time consuming) model of a project's probable completion date, which paths/tasks present the most risk, etc.

9

Budgeting Projects

Once we know the activities and resources required to complete a project, we can create a project budget. Every project boils down to money. If you had a bigger budget, you could probably get more people to do your project faster and with more outcomes. That's why no project plan is complete until you come up with a budget. But no matter if your project is big or small, or how many resources are used or activities identified, the process for figuring out the bottom line is always the same. A project manager must provide detailed estimates for all project costs by adding up the cost estimates into a budget plan. This budget plan will make it possible to track the budget while work is ongoing.

CHAPTER LEARNING OBJECTIVES

- Understand the processes and activities of estimating project costs.
- Apply best practices to develop and optimize project baseline budgets.

9.1 ESTIMATING PROJECT COSTS

Often when you start a project, the project sponsor has an expectation of how much it will cost or how much time it will take. When you make an estimate early in the project without knowing much about it, that estimate is called a **rough order-of-magnitude estimate** (or a ballpark estimate). This estimate will become more refined as time goes on and you learn more about the project.

Here are some tools and techniques for estimating cost:

- **Determining resource cost:** People who will be working on the project all work at a specific rate. Any materials you use to build the project (e.g., wood or wiring) will be charged at a rate too. Determining resource costs means figuring out what the rate for labor and materials will be for each activity.

- **Vendor bid analysis:** Sometimes you will need to work with an external contractor to get your project done. You might even have more than one contractor bid on the job. This tool is about evaluating those bids and choosing the one you will accept.
- **Reserve analysis:** You need to set aside some money for cost overruns. If you know that your project has a risk of something expensive happening, setting aside cash to deal with the risk is good management practice. **Reserve analysis** means putting some cash away in case of overruns.
- **Cost of quality:** You will need to figure the cost of all your quality-related activities into the overall budget. Since it's cheaper to find problems earlier in the project than later, quality costs are associated with everything your project produces. Cost of quality is just a way of tracking the cost of those activities and is the amount of money it takes to do the project right.

Once you apply these tools, you will arrive at an estimate for how much your project will cost. The project manager should keep a record of all supporting information used when making this estimate. That way, everyone knows the assumptions made when preparing the budget estimate. Now the project manager can build the budget plan.

9.1.1 Activity-Related Costs

The most accurate and time-consuming estimating method is to identify the cost of each item in each scheduled activity, including labor and materials. **Bottom-up estimating** means breaking down complex activities into pieces and working out the costs for each component. The process involves estimating individual activity resource needs or costs and then adding these up together to come up with a total estimate. Bottom-up estimating is a very accurate means of estimating, provided the estimates at the schedule activity level are accurate. However, it takes a considerable amount of time to perform bottom-up estimating because every activity must be assessed and estimated accurately to be included in the bottom-up calculation. The smaller and more detailed the activity, the greater the accuracy and cost of this technique.

Resource-based cost refers to the cost of human effort to complete an activity. An hourly rate is often assigned to each project resource, which is multiplied by the number of effort-hours to complete an activity. This value identifies the resource, or labor, cost of an activity. **Materials-based cost** refers to the cost of materials and supplies needed to complete the activity. Note that [Figure 9.1](#) does not include any resource costs. All costs are material costs. Some projects only have resource-based costs, while other projects have only material costs. Most projects have a combination of resource-based and material-based costs.

BUDGETING PROJECTS

Work Package ID	Activity ID	Description	Resources	Estimated Costs
3.1 Bridal Attire	3.1.1	Schedule fitting with dress shop	Maid of Honor	0
3.1 Bridal Attire	3.1.2	Purchase wedding dress	Mother of Bride	1500
3.1 Bridal Attire	3.1.3	Shop for reception attire	Bride, Maid of Honor	500
3.1 Bridal Attire	3.1.4	Shop for honeymoon attire	Bride, Maid of Honor	1000
3.1 Bridal Attire	3.1.5	Schedule hair and makeup stylist	Maid of Honor	250
3.1 Bridal Attire	3.1.6	Shop for shoes and accessories for wedding dress	Bride, Maid of Honor, Mother of Bride	250
Total Work Package Cost				\$3500

Figure 9.1: Example Activity Costs for 3.1 Bridal Attire

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9.1.2 Other Project Costs

9.1.2.1 Procurement Costs

Procurement costs relate to the expenses associated with outsourcing work or obtaining project materials from sources outside the organization. The costs associated with procurement are above and beyond material costs and include fees and other service charges incurred during procurement.

Contractual agreements with vendors often require partial payment of costs during the project. Those contracts can be managed more conveniently if the unit of measure for partial completion is the same as that used for cost budgeting. For example, if a graphic designer is putting together several pieces of artwork for a textbook, their contract may call for partial payment after 25% of their total number of drawings is complete.

Vendors and suppliers usually require payments during the life of a contract. On contracts that last several months, the contractor will incur significant cost and want the project to pay for these costs as early as possible. Rather than wait until the end of the contract, a schedule of payments is typically developed and connected to the completion of a defined amount of work or project milestones. These payments made before the end of the project and based on work progress are called progress payments.

For example, a contract might develop a payment schedule that pays at three points: first, for the curriculum design, second, after curriculum development, and third, when the curriculum is completed and accepted. In this case there would be three payments made. The project has a defined amount of work to be accomplished, a time frame for accomplishing that work, and a quality standard the work must achieve before the contractor is paid.

9.1.2.2 Contract Planning

Contract planning includes processes for planning individual work contracts. The organization usually has standards relating to how contracts will be managed, the metrics that need to be met for the contracts to be considered successful, seller selection, and contract administration. Once the project team determines needed services, the project manager may send out requirements to sellers. Vendors and sellers bid for the chance to work on the project. The project manager selects the best vendor and contracts are signed. Once the work begins, the project manager monitors the vendor to ensure they are following the contract specifications. When the work is done, the project manager closes out the contract and fills out all the paperwork.

Some tools and techniques used during the procurement planning stage include make-or-buy analysis and contract type definition. **Make-or-buy analysis** assists with determining whether you should be contracting the work or doing it yourself. It could also mean deciding whether to build a solution to your problem or buy one that is already available. Most of the same factors that help you make every other major project decision will help you with this one. For example, consider:

- How much does it cost to build it as opposed to buying it?
- How will this decision affect the project scope?
- How will it affect the project schedule?
- Do you have time to do the work and still meet your commitments?

As the project team plans out what will and won't be contracted, the team needs to evaluate their reasoning very carefully. There are some resources (like heavy equipment) that the company can buy, rent, or lease depending on the situation. The project manager should examine leasing-versus-buying costs to determine the best way to proceed.

Once the decision to engage in contracts is made, the project managers needs to decide what type of contract to pursue. Several types of contracts exist, and the goal is to choose one that creates the most fair and workable deal for you and the contractor. **Fixed price contracts** have the lowest risk for a project because no matter how much time or effort the vendor spends, you always pay the same. **Cost reimbursable contracts** are another type of contract where the seller charges you for the cost of doing the work plus some fee or rate. The third major kind of contract is a **time and materials contract**, which is where the client pays a rate for the time spent working on a project and pays for all the materials used to do the work.

9.1.2.3 Quality Costs

Delivering a project's quality requirements means considering the cost of quality, which includes costs over the life of the product, not just those incurred during the project. **Cost of quality** is what you get when you add up the cost of

all the prevention and appraisal activities you are going to do on your project. It doesn't just include testing. Instead, it includes any time spent writing standards, reviewing documents, meeting to analyze the root causes of defects, and reworking to fix the defects once they're found by the team; in other words, the cost of quality includes absolutely everything you do to ensure quality on the project. Cost of quality helps determine whether your project is doing well or having trouble. For example, suppose your company tracks the cost of quality on all its projects. You could tell if you are spending more or less than has been spent on other projects to get your project up to quality standards.

Quality costs are typically divided into two categories: cost of conformance (or good quality) and cost of nonconformance (bad quality). The **cost of conformance**, or the cost of good quality, includes the cost of preventing quality defects as well as the cost of appraising or detecting defects in the project deliverables or processes. Prevention costs are associated with planned activities such as setting quality standards, developing a project quality plan, conducting deliverable reviews during an Agile sprint review meeting, evaluating process capability, and educating and training team members on quality standards and processes.¹⁵ Appraisal costs come in the form of measuring and monitoring activities to evaluate “purchased materials, processes, products, and services to ensure that they conform to specifications.”¹⁶ Audits, inspections, and testing also fall under the appraisal cost category.¹⁷

The **cost of nonconformance**, or the cost of poor quality, is a result of quality failures—both during and after the project. **Internal failure** costs, which are incurred when defects are discovered before deliverables are received by the customer, could include costs of scrap, rework, and failure analysis.¹⁸ **External failure** costs occur when deliverables that fall short of established quality standards are not detected until after transfer to the customer; such costs could accrue from repair work, complaint resolution, and warranty claims.¹⁸ Another way to look at nonconformance costs is to think of internal failure costs as “waste” and external failure costs as “downstream consequences,” of which there can be many.¹⁹

9.1.3 Project Reserves

Most projects have something unexpected occur that increases costs above the original estimates. If estimates are rarely exceeded, the estimating method should be reviewed because the estimates are too high. It is impossible to predict which activities will cost more than expected, but it is reasonable to assume that some of them will. Estimating the likelihood of such events is part of risk analysis, which is discussed in more detail in [Section 10.1.4.1](#). Instead of overestimating each cost, money is budgeted for dealing with unplanned but statistically predictable cost increases. Funds allocated for this purpose are called **contingency reserves**. Because it is likely that this money will be spent, it is part of the total budget for the project. If this fund is adequate to meet the unplanned expenses, then the project will complete within the budget.

BUDGETING PROJECTS

If something occurs during the project that requires a change in project scope, money may be needed to deal with the situation before a change in scope can be negotiated with the project sponsor or client. It could be an opportunity as well as a challenge. For example, if a new technology were invented that would significantly enhance your completed project, acquiring the new technology would add cost and require a change to the scope, but it would be worth it. Money can be made available at the sponsor’s discretion to meet needs that would change the project scope. These funds are called **management reserves**. Unlike contingency reserves, they are not likely to be spent and are not part of the project’s budget baseline, but they can be included in the total project budget.

9.2 DEVELOPING THE BASELINE BUDGET

Once you have broken your project down into activities, you will be able to calculate your overall project costs by estimating and totaling the individual activity costs. The process of subtotaling costs by category or activity is called **cost aggregation**.

A budget baseline is established once all known project costs are identified ([Figure 9.2](#)). The project manager uses the **budget baseline** during the project’s production phases to monitor costs and ensure the project stays “on budget.”

Deliverable	Cost	Cost Notes	Planned Expense Month
1.0 Invitations	-		
1.1 Guest List	\$0		
1.2 Invitations	500		November 2022
2.0 Venues	-		
2.1 Wedding Chapel	-		
2.1.1 Location Contract	500		December 2022
2.1.2 Decorations	500		April 2023
2.2 Reception Venue	-		
2.2.1 Location Contract	500		December 2022
2.2.2 Food and Catering	3500		1/2 March 2023 Remainder June 2023, post event
2.2.3 Decorations	1000		April 2023
3.0 Wedding Party	-	Bridal attendants pay for own attire	
3.1 Bridal Attire	3500		Partial payment February 2023, Remainder May 2023
3.2 Groom & Groomsmen Attire	2000		May 2023
3.3 Bridal Attendants Attire	-		

BUDGETING PROJECTS

Deliverable	Cost	Cost Notes	Planned Expense Month
3.4 Bridal Party Gifts	1000		May 2023
3.5 Other Participants	200	Flower girl and ring bearer	April 2023

Figure 9.2: Example Baseline Budget

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9.2.1 Time-Phased Budgets

While a baseline budget like the one shown above is helpful, it does not tell the project manager when to expect project expenses to occur. A time-phased budget helps address this issue. A **time-phased budget** shows planned expenses during each reporting period for the duration of the project and can be used to measure and monitor cost performance after it has been approved by the key project stakeholders.

The aggregated budget is integrated with the project schedule to produce the time-phased budget. Costs are associated with deliverables, and since each deliverable has a start date and a duration period, it is possible to calculate how much money will be spent by any particular date during the project. Recognizing that all the money required to deliver the project is not needed upfront allows the project's cash flow needs to be effectively managed. For smaller organizations facing cash flow challenges, this can result in significant savings as the money required to pay for resources can be transferred to the project account shortly before it is needed. These transfers must be timed so that the money is there to pay for each task without causing a delay in the start of the next task. If the money is transferred too far in advance, the organization will lose the opportunity to use the money somewhere else, or they will have to pay unnecessary interest charges if the money is borrowed.

Work Package	Planned Cost	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
A	\$8,000	\$4,000	\$4,000						
B	\$18,000		\$6,000	\$6,000	\$6,000				
C	\$6,900			\$2,300	\$2,300	\$2,300			
D	\$25,000			\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	
E	\$4,000					\$1,000	\$1,000	\$1,000	\$1,000
F	\$14,900					\$7,500	\$7,400		
G	\$10,000							\$5,000	\$5,000
H	\$9,000					\$4,500	\$4,500		
I	\$31,200	\$7,800	\$7,800	\$7,800	\$7,800				
J	\$11,700					\$3,900	\$3,900	\$3,900	
K	\$2,000					\$500	\$500	\$500	\$500

BUDGETING PROJECTS

Work Package	Planned Cost	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
L	\$9,600			\$2,400	\$2,400	\$2,400	\$1,200	\$1,200	
Week Total		\$11,800	\$17,800	\$23,500	\$23,500	\$27,100	\$23,500	\$16,600	\$6,500
Cumulative		\$11,800	\$29,600	\$53,100	\$76,600	103,700	\$127,200	\$143,800	150,300

Figure 9.3: An Example of a Time-Phased Budget

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After reviewing the time-phased budget shown above, we can see that the cumulative project budget is expected to be \$150,000, with the largest amount of money spent in week 5. A budget displayed in this way will help the project manager monitor and control costs during project execution (discussed in [Chapter 11](#) and [Chapter 13](#)).

10

Documenting the Project Plan

Just like the project charter provided a starting point for project planning, a project management plan provides the starting point for project execution, the phase in which the team produces outcomes. The project management plan contains instructions for managing various aspects of the project and contains the baseline scope, schedule, and budget.

In this chapter, we will discuss risk management and the steps to develop the project management plan.

CHAPTER LEARNING OBJECTIVES

- Identify the importance of managing uncertainty and risk by identifying and prioritizing project risks and developing optimal risk responses.
- Examine the key components of a project management plan.
- Understand how to create a project management plan that can be used to guide work during the production stage.

10.1 DOCUMENTING THE PROJECT MANAGEMENT PLAN

During the planning process, the project manager documents how the team identified various project components. The information identified here is generally contained in a single document, the project management plan. The **project management plan** acts as a guidebook for how the project will be monitored and controlled during the production and delivery stages.

The project management plan includes several subsidiary plans that detail how various aspects of the project will be planned, monitored, and controlled. The project management plan can be a few pages or many pages, depending on project size and complexity. Typical contents of a project management plan include:

- Scope Management Plan
- Schedule & Budget Management Plan
- Stakeholder, Team, and Communication Management Plan
- Risk Management Plan
- Quality Management Plan
- Procurement Management Plan
- Change Management Processes
- Scope, Schedule, and Budget Baselines

10.1.1 Scope Management Plan

The scope management plan provides details on how the project team identified scope, requirements, and deliverables, the process for submitting additions to scope or requirements, and the methods for reviewing and implementing changes. These processes were discussed in [Section 7.2](#) and [Section 7.3](#). The scope management plan does not list the project scope details and/or requirements (that information goes in the baselines section).

Deeper Dive

Read more about scope change control here.

- Millhollan, C. (2008). [Scope change control: control your projects or your projects will control you!](https://www.pmi.org/learning/library/scope-control-projects-you-6972) Paper presented at PMI® Global Congress 2008—North America, Denver, CO. Newtown Square, PA: Project Management Institute. <https://www.pmi.org/learning/library/scope-control-projects-you-6972>

10.1.2 Schedule & Budget Management Plan

Developing the project schedule was discussed in [Chapter 8](#) and developing the project budget was discussed in [Chapter 9](#). The project schedule and budget management plan should provide a summary of the schedule and budget and information about how these elements were determined. The plan should also discuss how the project schedule and budget will be monitored and adjusted during production phases. This section answers the following questions:

- What is the initial schedule and budget for this project? (Only provide high-level details here, as the baselines will be included in a separate section.)
- How was the schedule and budget developed?
- How were activity durations estimated?

- Are the numbers used for budgeting rough estimates based on top-down estimation techniques, such as analogous or parametric estimating, or are they hard constraints?
- What contingency funds have been allocated?
- How will the schedule and budget be monitored? What information will be shared to report schedule and budget adherence?
- What processes will be followed to make changes to the schedule and budget?

10.1.3 Stakeholder, Team, and Communications Management Plans

The stakeholder, team, and communications management subsidiary plans identify how project stakeholders and team members were identified and how stakeholders will be engaged ([Section 6.1](#)) throughout the project. Additionally, this section will include the project communications plan ([Section 5.4](#)). Team management plans will also be included here to describe how the project manager will manage the project team during the project and transition off the project after completion.

Communication is one of the most effective ways to keep stakeholders engaged. To be effective, project communications must be developed and delivered in ways that consider stakeholder roles and communication preferences. Project managers must proactively determine if the selected communication methods will be suitable for the key stakeholders. This is done by directly asking them and monitoring their responsiveness to the communication delivered.

Another essential way to determine if project stakeholders are well-informed is to pay careful attention to the questions they ask. Questions about project progress addressed in recent project communications are a good sign that the communication techniques may not be effective for a particular stakeholder. When this occurs, it is time to revisit the communication plan and make the appropriate adjustments.

10.1.4 Risk Management Plan

The risk management plan focuses on understanding how risks will be identified, documented, and assessed, as well as documenting the project team's authority to manage risks without external approval. This section may include the following:

- A specific risk matrix such as the example shown in [Figure 10.2](#).
- Risk categories that the team can manage without external approval (e.g., only medium or low risks).
- Risk categories that require approval from the project sponsor or a

higher authority in the organization (e.g., any manager can sign off on a risk response for a medium risk, but only the CEO or CFO can approve the response to a high risk).

- Prescribed responses to specific types of risks (e.g., any risk to personnel must include insurance [transfer] and the approval of a division director [escalate]).

Processes to complete the risk management plan are discussed below.

10.1.4.1 Documenting Project Uncertainty

Throughout a project, situations will arise that can impact the project both negatively and positively. **Risks** are uncertain events that may negatively or positively affect project processes or outcomes. **Opportunities** are positive risks and **threats** are negative risks. The project team should begin identifying risks and opportunities early in the project. During the chartering process, the PM documented high-level risks and provided potential responses. However, the chartering phase is only one part of identifying and planning for risks. Just as the schedule and scope must be developed and adjusted throughout the project, the team must also identify and evaluate risks throughout the project.

Risk management involves identifying potential risks or opportunities and documenting the action that is to be taken that will maximize the opportunity or minimize the risk. For risks, the goal is to reduce the probability that a problem will occur or reduce impact on the project if it does occur. For opportunities, the goal is to increase the probability that the opportunity will occur or increase impact on the project if it does occur.

Project teams use a **risk register** to document and track risks ([Figure 10.1](#)). A risk register should include the following elements:

- **ID:** A unique identifier for the risk or opportunity
- **Description:** A description of the risk or opportunity
- **Trigger:** The triggering events that indicate the situation described is happening or about to happen
- **Likelihood:** The relative likelihood (or probability) of the risk or opportunity occurring
- **Impact:** Severity of the risk or impact to the project if the risk or opportunity occurs
- **Response Plan:** Any potential responses if the risk is triggered
- **Owner:** The individual who is responsible for monitoring for the trigger event

If the risk is triggered, it should also include:

- **Trigger Date:** the date the trigger happened

- **Actual Response:** details on what was done in response to the risk
- **Response Date:** the date the response was enacted
- **Actual Impacts:** details on the risk's effect on the project, including budget, schedule, scope, and quality
- **Resolve Date:** the date the risk or opportunity went away or was otherwise resolved

Risks should be assessed as soon as the project team identifies them. Risk assessment involves considering the likelihood and impact of a risk event and estimates how much effort would be required to respond to the risk. Although a team may identify some implausible risks, the decision to develop a response plan relies on the expert judgement of the project manager and the team.

Test Your Knowledge

When planning for an outdoor fundraising concert, the event project team may need to make plans for inclement weather. They might even break this down to different levels such as rain versus a thunderstorm and how they would react to each. A fundraiser for a potentially controversial subject may also need to consider the risk of protestors and disruptions, while most weddings likely would not have such situations.

ID	Description	Trigger	Probability	Severity	Response	Owner
R01						
R02						
R03						
R04						
R05						
R06						

Figure 10.1: Sample Risk Register

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Evaluating the probability and severity of a risk or opportunity is helpful to determine risk responses. Some organizations use a risk assessment matrix ([Figure 10.2](#)) to determine how much effort is needed to address a risk.

DOCUMENTING THE PROJECT PLAN

Risk Assessment Matrix		Probability (Expected likelihood or frequency)				
		Frequent: Continuous, regular, or inevitable	Likely: Several or numerous occurrences	Occasional: Intermittent chance of happening	Seldom: Infrequently happens	Unlikely: Could possibly occur but improbable
Severity (Impact or consequence)		A	B	C	D	E
Catastrophic: company readiness eliminated, unacceptable loss or damage	I	EH	EH	H	H	M
Critical: company ability to operate significantly reduced, severe injury, loss, or damage	II	EH	H	H	M	L
Moderate: somewhat reduced ability to operate, minor injury, loss, or damage	III	H	M	M	L	L
Negligible: little or no impact on organization, minimal injury, loss, or damage	IV	M	L	L	L	L
Legend: EH=Extremely High Risk, H=High Risk, M=Medium Risk, L=Low Risk						

Figure 10.2: Risk Assessment Matrix

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Some organizations may require a plan for response to all risks; for the most part, however, those items falling into the low-risk zone are not usually addressed. The team should assess whether a response is necessary and what the response should be. Risk responses can be categorized in several ways.

Responses to negative risks (threats) include:

- **Mitigate** – reduce the likelihood or impact of an event
- **Transfer** – shift the risk to another entity, usually at a fee, such as with an insurance policy
- **Avoid** – decide to take actions that eliminate the possibility of the risk event occurring
- **Escalate** – agree that a risk response is so great that it falls outside the scope of a project or the authority of the project manager
- **Accept** – evaluate the risk and decide nothing will be done to mitigate or avoid it. Often, this is how low risk or highly unlikely risks are managed.

Responses to positive risks (opportunities) include:

- **Exploit** – actively look for the chance to take advantage of the situation
- **Enhance** – either increase the impact of the event or the probability that it will occur
- **Share** – partner or share the risk with another organization
- **Escalate** – as with a negative risk, agree that it falls outside the scope of the project to manage or decide upon
- **Accept** – take no proactive actions

To apply some of these, imagine having to take a group of fifteen people across a busy road at an event. You may identify several risks, but perhaps the most obvious is the risk that someone will be struck by a car. The road you are crossing has a history of occasional pedestrian accidents. The outcome of such an accident could be critical (serious injury) or catastrophic. Therefore, you rate the risk as “high.” You can respond to this risk in several ways ([Figure 10.3](#)).

Response Type	Example actions to apply the response
Mitigate	Take the group to a crossing light to cross, have everyone wearing reflective safety gear, have a crossing guard in place, request a police escort.
Transfer	Verify your event insurance includes coverage, purchase additional insurance if necessary and abide by their requirements.
Avoid	Change the location of the activity that requires crossing a road to one that does not.
Escalate	Forward the information regarding the need to cross the road to the project sponsor or company supervisor.
Accept	Take no action and let the people know to cross the road.

Figure 10.3: Possible Risk Response Options to Crossing a Busy Road

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Regardless of the response the project team selects, the project manager must add the activities to the project schedule to enact a response. A good practice is to assign risk response activities to deliverables that would be affected by the risk. If you cannot identify a single deliverable affected by the risk, or the risk has the potential to affect more than one deliverable, then you can add a project management deliverable for “Risk Management Plans” and assign risk monitoring and response activities there. However, this approach increases the risk of not monitoring because team members may not pay attention to project-management deliverables.

10.1.5 Quality Management Plan

Planning for quality is part of the initial planning process (see [Section 3.5.3](#), [Section 8.5](#), and [Section 9.1.2.2](#)). The project manager uses early scope, budget, and schedule estimates to identify processes, services, or products where the expected grade and quality should be specified. Risk analysis is also used to determine which risks could affect quality.

The quality plan for each project will differ depending on the project's needs, but some common elements of a quality plan include:

- **Quality Assurance Processes:**
 - The project's approach to quality management
 - How the quality requirements will be defined for deliverables and processes
- **Quality Control Procedures:**
 - Who, when, and how quality will be monitored and controlled
 - How defects will be prevented and corrected
- **Quality Definitions**

The purpose of quality assurance is to create confidence that the quality plan and controls are working correctly. This is done by an internal review of the plan, testing, and revisions policies or by an audit of the same items performed by an external group or agency. Time must be allocated to review the original quality plan and compare it to how quality is being ensured during project implementation. Quality control focuses on ensuring that deliverables produced by the project meet quality requirements ([Section 7.3](#)).

10.1.6 Procurement Management Plan

Procurement management plans document what the project manager may need to contract and how they will engage in contracts with vendors and suppliers. The project manager must start with a plan for the whole project. Before doing anything else, the project team needs to identify all the work that may need to be contracted out for the project. The project manager should plan for any purchases and acquisitions and determine what kinds of contracts make sense. The procurement plan should describe all aspects of the project that will be contracted out.

The procurement management plan details how the project manager will manage the procurement process. It includes the following information:

- The types of contracts you plan to use (see [Section 9.1.2.2](#)) and any metrics that will be used to measure the contractors' performance
- The planned delivery dates for contracted work or products
- The company's standard contract documents

- The number of vendors or contractors involved and how they will be managed
- How purchasing may impact the project plan's constraints and assumptions
- The coordination of purchasing lead times with the project schedule's development
- The identification of prequalified sellers (if known)

10.1.7 Change Management Plan

Change is a common occurrence on projects. Since projects require integrating many different components, such as human resources, communication, and vendor management, change in one of these components often has a ripple effect throughout the entire project.

Effective **change management** addresses the full effect of change and allows the project leader to understand how change impacts the project's objectives (Figure 10.4). Duration and cost estimates are frequent change factors, for example. Despite best efforts to estimate as accurately as possible, things can and do go wrong. Resource shortages are difficult to anticipate but are expected. In addition, collaboration time (time for input/discussion) can be very challenging to estimate because stakeholders are often busy people with conflicting schedules. When collaboration finally occurs, it may be much later than the project team hoped for, and the schedule change would be largely out of the team's control. A change like this would require the project manager to trigger the change management process documented in the project management plan.

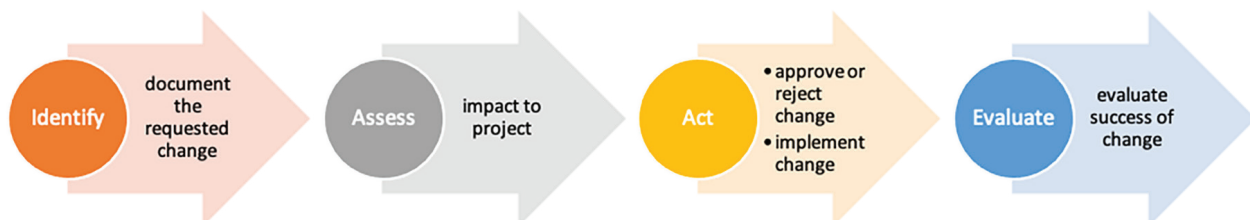


Figure 10.4: A Simple Change Control Process

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Documented change management plans enable effective decision-making with project sponsors on thresholds, approval requirements, and communication preferences. If a change will alter the project's duration, budget, scope, and/or quality, most project sponsors will want to ensure that approval to proceed is obtained before the change is made.

The development approach (see [Chapter 3](#)) selected for a given project also has a significant impact on how change is managed. Change is more difficult when

predictive approaches are used because it is often not expected or considered when commitments have already been made. When the predictive development approach is used, the change process is initiated with a change request. This document identifies what the change is about, its impact on the project, the organizational value, and what would be required to implement it. Not all changes are approved, as they may not provide enough organizational value, be affordable, or be feasible from a scheduling perspective. If the change is approved, it is sent back to the project team for implementation.

However, change is expected when an adaptive approach is followed. When using the predictive development approach, the project team needs to discuss change management processes with the project sponsor during the planning phase. This approach is often unnecessary when an adaptive methodology is being used because the product owner is involved in the planning of every iteration. In fact, the product owner decides the scope of each iteration while trying to maximize organizational value and adhere to scheduling and budget constraints.

10.1.8 Scope, Schedule, and Budget Baselines

The project management plan also contains baselines for the project scope, schedule, and budget. These baselines define the project's starting point and is used by the project manager to track progress. Project scope, schedule, and budget may be updated through the change control process as the project continues into the production phase, but the original baselines will be kept as a reminder of the initial project plan.

Deeper Dive

You may have heard the term project plan more than you have heard of a project management plan. The two terms sound similar but are quite different. A project plan is often used to refer to the project schedule. As we know, the project schedule is only one component of the project management plan.

We have discussed the components of a project management plan in this chapter, so you now know that this document has many pieces of information for the project manager to organize and then follow during project execution.

1. Conduct an internet search for “project management plan” and identify three examples or templates.
2. Compare the three examples. How are they different? How are they the same? Do any of the examples only focus on the project schedule?

3. Why do you think a project management plan is a better choice to manage a project than a project plan?

10.2 MOVING FROM PLANNING TO PRODUCING

Once the project manager thoroughly documents the project management plan with its subsidiary management plans, stakeholders and functional managers review and approve the plan. The review process ensures they have read the schedule, understand the dates, understand the resource commitments, are aware of the budget, and will cooperate. The project manager also needs to confirm with functional managers that resources will be available as outlined in the schedule. The project should not move into deliverables production until the project manager receives approval and commitment for the resource assignments outlined in the project management plan. Once the project management plan is approved, it will become the management guidebook for the remainder of the project. The project manager will monitor progress and task completion against the schedule baseline to determine if the project is on course as planned. The project manager will also monitor expenditures against the budget baseline to determine if the project is on or over budget.

11

Managing and Measuring Project Work

Once a project has been approved to move into the execution, or production, phase, the project manager puts the documented plans into motion, and the team begins performing the work. During this stage, the project manager is responsible for maintaining control and communicating with stakeholders as needed. The project manager monitors progress, records variances from the original plan, and makes appropriate adjustments as necessary.

During this phase, team members complete the tasks, and progress information is reported through regular team meetings. The project manager uses this information to maintain control over direction by comparing progress reports with the baseline schedule and budget to measure activity performance and take corrective action as needed.

The first course of action should always be to return the project to the original plan. If that cannot happen, the team should record variations from the original plan and record and publish modifications. Throughout this step, project sponsors and other key stakeholders should be kept informed of the project's status according to the agreed-on frequency and format of communication. The plan should be updated and published regularly. Status reports should always emphasize the anticipated endpoint in terms of cost, schedule, and quality of deliverables. Each project deliverable should be reviewed for quality and measured against the acceptance criteria. After this phase, and once all deliverables have been produced to the customer's satisfaction, the project is ready for closure, which will be discussed in [Chapter 14](#).

CHAPTER LEARNING OBJECTIVES

- Understand the project manager's role during the project production phase.
- Explore appropriate methods to monitor and control changes to project scope, schedule, budget, and other factors.

- Determine how to follow and execute planned strategies or frameworks during the project production phase.
- Identify appropriate quality assurance and control processes to ensure the quality of project deliverables.

11.1 MANAGING CHANGES TO SCOPE, SCHEDULE, AND BUDGET

When you find a problem, you can't just make a change to the project. First, you must identify possible changes and evaluate how the proposed change affects the triple constraint (time, cost, scope) and project quality. You will then have to figure out if the change is worth making. If so, you will implement the change control processes you documented in the project management plan (Figure 11.1).



Figure 11.1: Using a Simple Change Control Process

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Change control allows project managers and teams to make changes in an organized way. Any time you need to make a change to your plan, you must start with a **change request**, which is a document that the person making the request must complete. Any change to your project must be documented so you can figure out what needs to be done, by when and by whom, and what the effects will be. The project manager documents information about all proposed changes in a project **change log** (Figure 11.2).

ID	Change Description	Owner (BA)	Date Identified	Impact Assessment	Action (with Date)
1	Add ability to attach and download documents to job website	Fred	9/3/2022	Increases project scope but will not affect schedule or budget	Approved by Sponsor 9/21/2022; added to requirements register 9/22/2022
2	Change company codes to add additional code for upcoming purchase of new office location	Claire	9/30/2022	Does not increase scope, but will delay availability of codes report by 2 days for testing	On hold until release 2 (10/15/2022)

Figure 11.2: Example Change Log

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Project leaders must constantly examine what has changed or should change to successfully achieve project objectives. When the need for change is discovered, it is essential that the team assess the change's impact, and appropriate team communication must occur quickly. In addition, the project team must understand priorities and trade-offs regarding a change. These priorities will impact how and when change is introduced.

For instance, on projects where the timeline is the most important constraint, project teams will attempt to protect the schedule by making trade-offs with the budget, scope, and/or quality. The team must conduct an impact assessment before acting. The assessment may lead to recommendations provided to the project sponsor (and appropriate designates) for decisions to be made with stakeholder involvement. Since the production phase uses the most time and resources, costs are usually the highest during this phase, so care must be taken when deciding to make changes.

Once the change request is documented, it is submitted to a change control board. A **change control board** consists of a group of people who review changes for approval. Not every change control system has a board, but many do. The change request could also be submitted to the project sponsor or management for review and approval. Putting the recommended changes through change control will help you evaluate the impact and update all necessary documents. The project manager sends only approved changes to the project team for implementation.

11.2 MANAGING PROJECT RESOURCES

Project managers are also responsible for monitoring the availability and effectiveness of non-labor resources. Several instances may arise that can negatively affect a project, such as faulty or ineffective equipment needing to be replaced, or new equipment and technology may be required. These changes may lead to additional work in procurement management.

11.3 MANAGING STAKEHOLDER EXPECTATIONS

Generally, project managers cannot control stakeholders. However, they can significantly influence stakeholder engagement levels. During the planning phase, a stakeholder register was created, which now provides an effective starting place for determining how to engage stakeholders while working on project outcomes. In this stage, the project manager focuses on keeping high interest, high power/influence stakeholders informed of the project's progress (see [Section 6.2.2](#)).

Now, during the production phase, the project team continues to look for new stakeholders and monitors the engagement level of existing stakeholders. Engagement techniques, such as those discussed in [Section 6.2.2](#), will vary from one organization to another as their respective cultural norms and values influence how individuals work together.

Whatever methods the team uses to engage stakeholders, they must keep stakeholders informed of the project's progress and follow suitable approaches for meaningfully involving stakeholders throughout the project lifecycle. A project leader's interpersonal skills are critical in stakeholder management. Some stakeholders may become unresponsive to the team's requests. When this occurs, the project leader's relationship-building skills will be tested as they attempt to understand the stakeholder's actions. Conflict resolution skills, as mentioned in [Section 1.4.3.8](#), are vital because stakeholders are likely to have differing priorities. Successfully navigating these conflicts can be the difference between project success and failure.

11.4 IMPLEMENTING RISK RESPONSES

Monitoring and controlling risks involve implementing the risk management plan identified during the planning phase ([Section 10.1.4](#)). A key aspect of this plan is the risk register, which helps the team track project risks, triggers (early warning signs), and risk responses. Project teams may implement risk responses in any phase if documentation is kept up to date.

Many project teams establish contingency plans and funds to account for risks that cannot be anticipated ([Section 9.1.3](#)). When these unanticipated risks materialize, the team will determine if the contingency plans and funds will adequately address these risks and, if so, implement them. The project team must identify workarounds if contingency plans or funds do not suffice. Contingency plans and workarounds are then monitored to determine if they are effective. Additional corrective action may be required, which will mean enacting the change control process documented in the project management plan ([Section 10.1.7](#)).

11.5 CONFLICT MANAGEMENT AND NEGOTIATION

As discussed in [Section 1.4.3.8](#), conflict management and negotiation are essential power skills for project managers. Proactive conflict management requires the project manager to continuously monitor stress levels in the team to anticipate the likelihood of rising conflict. Monitoring resource utilization levels in the project schedule and staying connected to team members are critical activities that the project leader must perform. There are several approaches to managing conflict, with different responses recommended based on conflict characteristics and relationship quality between individuals engaged in a conflict.

The Thomas and Kilmann model²⁰ identifies six approaches to facilitating agreement between parties in conflict ([Figure 11.3](#)).



Figure 11.3: Thomas & Kilmann Conflict Model for Getting Agreement

Source: Original Work

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Whetten and Cameron developed a response-to-conflict model that balances the issue’s importance against relationship importance (Figure 11.4, Figure 11.5).²¹ The model presents five responses to conflict: avoiding, forcing, collaborating, compromising, and accommodating.

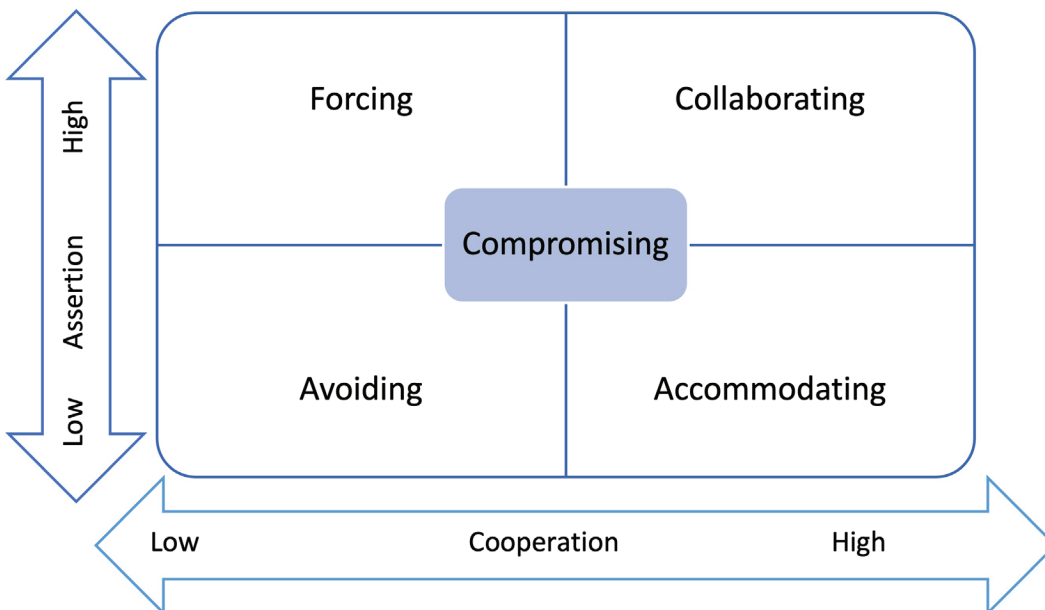


Figure 11.4: Approaches to Resolving Conflict Based on Cooperation and Assertion²²

Source: Original Work

Attribution: Juanita Woods, adapted from Ruble and Thomas, 1976, and Whetten and Cameron, 1984

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MANAGING AND MEASURING PROJECT WORK



Figure 11.5: Conflict Resolution Responses

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Each of these approaches can be effective and useful depending on the situation. The chosen response depends on two factors: the level of assertiveness and level of cooperation between the parties in conflict. Project managers will use each conflict resolution approach depending on the project manager's assessment of the situation.

Collaboration involves developing a solution that fully satisfies both parties but requires a high level of trust between the people involved, and plenty of time to develop the outcome. This strategy requires high levels of cooperation and assertiveness to push toward a “win-win” solution. This is the ideal response to conflict on projects, and the project manager should always have collaboration as the goal. However, due to time constraints and authority levels, project managers may need to consider one of the other approaches.

Compromise involves developing a solution that partially satisfies both parties and requires participants to be willing to give up concessions to resolve the conflict. This approach results in partial wins for both parties, and while results may be less than satisfactory, resolution allows the project to move forward.

Accommodating is a response that requires one party to allow concessions to maintain harmony and goodwill. This response typically arises when the two parties have unequal power, such as a disagreement between the project sponsor and a project team member. In this case, the project team member may have to concede their position to resolve the conflict.

Forcing, on the other hand, occurs when there is not enough time to collaborate or problem-solve, and an urgent response is required. This type of conflict resolution may be necessary when critical decisions need to be made or a

quick response is required. Project managers may need to force an end to conflict within the team if there is not enough time to work out an agreeable resolution. Project managers should not rely on forcing to resolve conflict, because doing so repeatedly will erode the trust the team has in their leadership and support.

Avoiding, or **withdrawing**, is another option when encountering conflict. This approach occurs when no one engages in the conflict, and the conflict does not get resolved. While this is technically a response, it is not encouraged, because avoiding conflict may lead to increasing problems within the team or with stakeholders. Ignoring problems early in a project often leads to bigger, more expensive problems later on.

Most project managers have a default approach that has emerged over time and is comfortable. For example, some project managers find that leveraging power is the easiest and quickest way to resolve problems. “Do it because I said so” is the mantra for project managers who use forcing as the default approach to resolve conflict. Some project managers find accommodating the client to be the most effective approach when dealing with conflict. The effectiveness of a conflict resolution approach will depend on the situation. The forcing approach often succeeds when a quick resolution is needed, and investment in a decision by the parties involved is low.

Test Your Knowledge

In the two scenarios below, identify the most appropriate approach to conflict and explain how you would resolve the situation.

Example 1: Two senior managers want the same corner office with a window, and one is your friend.

Example 2: Your client adamantly rejected a request for a change order because she thought the change should have been foreseen by the project team and incorporated into the original scope of work.

Project managers often seek a **compromise** as a method for resolving conflicts. With compromise, both sides must give up some portion of what they are looking for to push towards project completion. Because this process requires all parties to give up some portion of their position without collaborating on a mutually beneficial solution, it is often described as a **lose-lose** scenario in project management terms.

Collaboration is one approach that increases the likelihood of a mutually acceptable solution for the project. To resolve conflict collaboratively, a project manager should evaluate the situation, develop a shared understanding of the problem, develop alternative solutions, and work with involved parties to select a solution.

Evaluating the situation typically includes gathering data. In the example of a change order conflict, gathering data would include a review of the original scope of work and possibly people's understandings, which might go beyond the written scope.

The second step in developing a resolution to conflict is to restate, paraphrase, and reframe the problem to develop a shared understanding. In our example, the common understanding may explore the change management process and determine that the current process may not achieve the client's goal for minimizing project changes. This phase is often the most difficult and may take time and energy to develop a shared understanding of the problem.

After the problem has been restated and agreed on, alternative approaches are developed. Identifying alternatives is a creative process that often means developing a new approach or changing the project plan. The result is a resolution to the conflict that is mutually agreeable to all team members. If all team members believe every effort was made to find a solution that achieved the project charter and met as many of the team members' goals as possible, there will be a more significant commitment to the agreed-on solution.

This is not to say that collaboration is always the best way to achieve conflict resolution. In times of great uncertainty and rapid change, direct and decisive action may be more effective at achieving certainty and the ability to move forward rather than collaboration and problem solving.

11.6 ENSURING AND CONTROLLING QUALITY

From the quality management plan included in the project management plan ([Section 10.1.5](#)), you know your guidelines for managing project quality. Strategies for monitoring project quality and the reasons for all the steps taken are included in the plan. Everyone on the team must understand the rationale behind the metrics used to judge project success or failure.

During the project's execution phase, the team evaluates what has been produced by the project to determine if quality is within the specified limits and analyzes causes of variation. These activities are called **quality control**. This evaluation is often done by a separate quality control group, and project managers need to know a few key terms to understand their reports. Because several of these terms are similar, it is valuable to know the distinction between them. The quality plan specifies the **control limits** of the product or process, which are the minimum and maximum permissible values for measurements. The range between those limits is the **tolerance**. Tolerances are often written as a number, plus or minus the tolerance. The plus and minus signs are written together, \pm .

Tools are selected that can measure the samples closely enough to determine if the measurements are within control limits and if they are showing a trend. Each measurement tool has its own tolerances. The choice of tolerance directly affects the cost of quality (COQ). In general, it costs more to produce and measure

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products that have small tolerances. The costs associated with making products with small tolerances for variation can be very high and not proportional to the gains. For example, suppose the cost of evaluating each screen while it is created in an online tutorial is greater than delivering the product and fixing any issues after the fact. In that case, the cost of quality may be too high, and the instructional designer will tolerate more defects in the design.

Check sheets, histograms, and Pareto charts are used to display quality problems. When a quality-control issue occurs, a project manager must choose which problem to address first. One way to prioritize quality problems is to determine which ones occur most frequently. The data can be collected using a **check sheet**, which is a basic form on which the user can check in the appropriate box each time a problem occurs. The data collection process can also be automated by using the appropriate technology ([Figure 11.6](#)).

Motor Assembly Check Sheet

Name of Data Recorder: Lester B. Rapp
 Location: Rochester, New York
 Data Collection Dates: 1/17 - 1/23

Defect Types/ Event Occurrence	Dates							TOTAL
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
Supplied parts rusted								20
Misaligned weld								5
Improper test procedure								0
Wrong part issued								3
Film on parts								0
Voids in casting								6
Incorrect dimensions								2
Adhesive failure								0
Masking insufficient								1
Spray failure								5
TOTAL		10	13	10	5	4		

Figure 11.6: Sample Quality Check Sheet

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Once the data are collected, they can be analyzed by creating a type of frequency distribution chart called a histogram. A **histogram** is a column chart where the widths of the columns fill the available space on the x-axis and are proportional to the category values displayed on that axis, while the height of the columns is proportional to the frequency of occurrences ([Figure 11.7](#)). Most histograms use one width of a column to represent a category, while the vertical axis represents the frequency of occurrences.

Overlapping Histogram

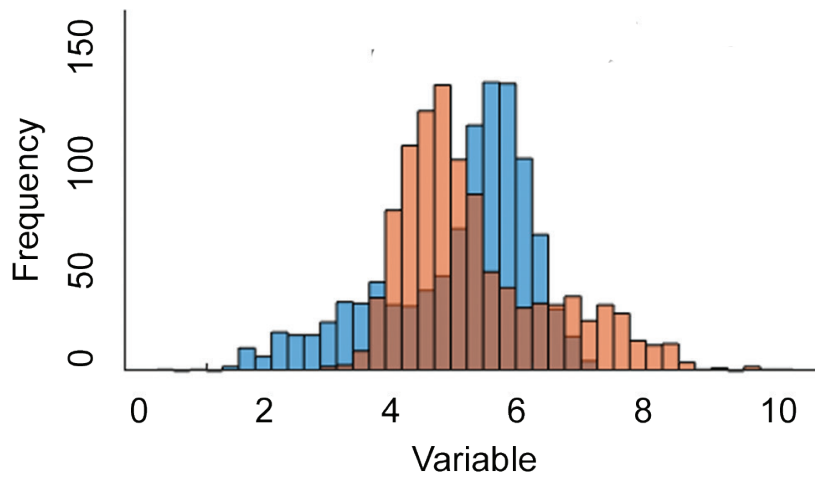


Figure 11.7: Sample Histogram

Source: Original Work

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A variation on the histogram is a frequency distribution chart invented by economist Vilfredo Pareto and is known as a **Pareto chart**, in which the columns are arranged in decreasing order with the most common on the left and a line added that shows the cumulative total (Figure 11.8). The combination of columns and a line allows the user to tell which problems are most frequent and what fraction of the total they represent.

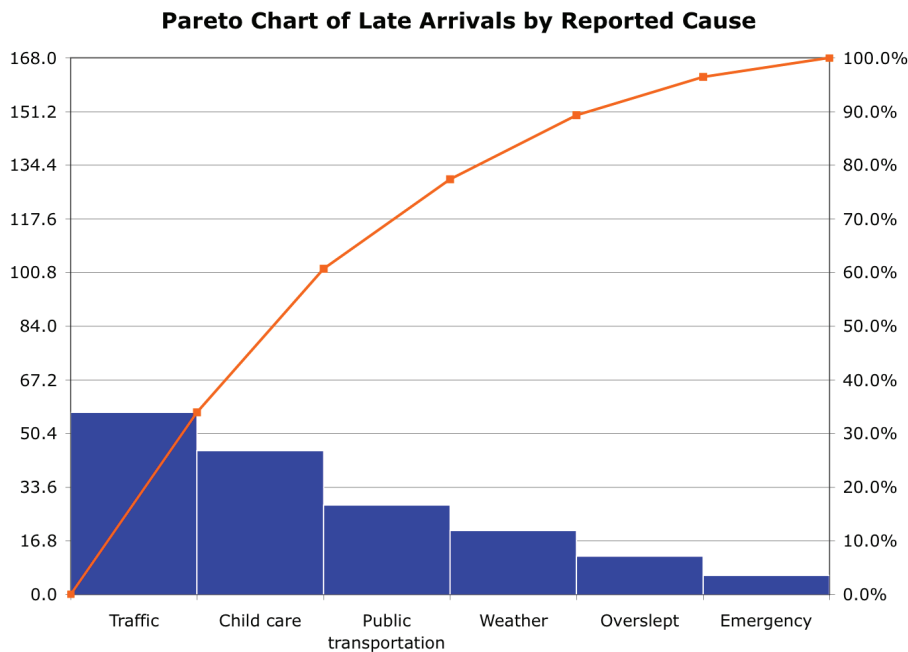


Figure 11.8: Sample Histogram

Source: Wikimedia Commons

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Test Your Knowledge

Analyzing Quality Processes in Safety Training

A technical college responsible for training employees in safe plant practices evaluates its instructor selection process at the end of training to see if it had the best criteria for selection. For example, it required the instructors to have master's degrees in manufacturing to qualify as college instructors. The college used a student exit survey to ask what they thought would improve instruction for future classes on this topic.

Some students felt it would be important to require that instructors have more years of training experience, while others recommended that instructors seek certification at a training center. The college considered these suggestions and decided to retain its requirement of a master's degree but add a requirement that instructors be certified in plant safety.

11.7 MANAGING PROJECT LEARNING AND KNOWLEDGE

It may be evident at this point how much information a project manager produces and interacts with during a project. In every stage of a project, knowledge is shared while information is collected and communicated. A best practice of project management is to ensure that project knowledge is organized and made available to the current and future teams working on similar projects.

Project learning includes the active and passive acquisition of new knowledge and skills through working on a project.

Project knowledge management is a process that includes all activities related to creating, storing, sharing, and reusing information about the project. This includes capturing both explicit and implicit knowledge. **Explicit knowledge** includes the information visibly shared within the team, while **implicit, or tacit, knowledge** includes personal beliefs, experiences, and know-how all team members hold but is not easily sharable.

Deeper Dive

Review the following resources to learn more about project knowledge management.

- Gasik, S. (2011). [A model of project knowledge management](https://journals.sagepub.com/doi/pdf/10.1002/pmj.20239). *Project Management Journal*, 42(3), 23-44. <https://journals.sagepub.com/doi/pdf/10.1002/pmj.20239>

- Hanisch, B., Lindner, F., Müller, A., & Wald, A. (2008). [Project knowledge management: status quo, organizational design, and success factors](#). Paper presented at PMI® Research Conference: Defining the Future of Project Management, Warsaw, Poland. Newtown Square, PA: Project Management Institute. Available at <https://www.pmi.org/learning/library/project-knowledge-management-life-cycle-7137>

12

Working with Project Teams

The project manager is involved in a project throughout its life cycle, from the early stages of identification through planning to the end of the project where the deliverables are handed off to the appropriate stakeholders. Being a project manager can be extremely rewarding but comes with challenges. A project manager may have responsibility for a project's success but often does not have full authority over the resources required to complete the project successfully. This lack of authority is one reason why having excellent interpersonal skills is vital for project managers; they may have to negotiate for resources from upper management or functional managers within the organization.

Being a great communicator and working well with various personalities are key skills for a project manager (skills that can be developed and improved by anyone) but so are leadership and team-development skills. A project manager will use these skills with all project stakeholders, including the team. One of a project manager's primary responsibilities is to motivate and strengthen the project team. This chapter focuses on the project manager's role as a team leader.

CHAPTER LEARNING OBJECTIVES

- Understand the skills project managers need to effectively lead project teams.
- Demonstrate awareness of how power, influence, and project politics may negatively affect a team's effectiveness and identify appropriate strategies to minimize adverse effects.
- Identify important aspects of shared team leadership and how to build influence without authority.
- Explain the team formation process and how project managers can develop high-performing project teams.

12.1 LEADING PROJECT TEAMS

In [Chapter 1](#), we discussed “power skills for project managers” and identified nine essential interpersonal skills a successful project manager should have. Since then, we have discussed how projects are identified, planned, and monitored, briefly mentioning the numerous interactions between the project manager and team. In this section, we will focus on the leadership and interpersonal skills a project manager needs to successfully develop high-performing teams through all project stages.

12.1.1 Project Team Challenges

While a team is producing the project deliverables during the production phase, project managers facilitate the team’s work to produce these deliverables. The project manager also keeps track of team performance.

Regarding the team, efficient project leaders are continuously assessing team members and individual and team performance. Effective coaching and mentoring skills are essential and can differentiate between project success and failure. In addition, a project leader must sometimes make the difficult decision to replace team members when they cannot perform as expected or the ensuing conflicts cannot be resolved.

Lastly, many projects require people with different skills at different times. Project leaders should actively monitor when these skills will be required and ensure people join or transition off the project at the appropriate times.

The project team and key stakeholders must perceive a project manager as credible. A successful project manager can solve problems and demonstrate a high tolerance for ambiguity. The environment changes frequently on projects, and project managers must adapt their leadership approach for each situation. Successful project managers must also have good communication skills. Here are some difficulties you may encounter in dealing with team members:

- **Conflicting priorities:** because project team members are borrowed and don’t report to you, their priorities may be elsewhere.
- **Difficulty meeting deadlines:** they may juggle many projects within their full-time job and have difficulty meeting deadlines.
- **Personality conflicts:** differences in social style or values may cause these, or may result from bad experiences when people worked together in the past.

Managing project teams require interpersonal skills. Here are some suggestions that can help:

- Involve team members in project planning.
- Arrange to meet privately and informally with each team member at several points in the project, perhaps for lunch or coffee.

- Be available to hear team members' concerns at any time.
- Encourage team members to pitch in and help others when needed.
- Complete a project performance review for team members.

A skilled project manager can avoid many common project problems, such as communication breakdowns, uncommitted team members, or role confusion within the team. Each of these challenges can be resolved by improving communication, team-building, and organizational skills.

A good project manager is also a good leader and can support the team in building interpersonal and team skills. In the following sections, we will explore the project manager's role as team leader, common leadership styles and how to adjust them, and the concept of shared team leadership.

Deeper Dive

Are you ready to lead project teams? Take the online assessment at the link below to find areas you can strengthen before your next big project.

- Psychtests AIM Inc. (n.d.) [Leadership Skills Test](https://testyourself.psychtests.com/testid/2152). Retrieved September 16, 2022, from <https://testyourself.psychtests.com/testid/2152>

To see how your skills stack up against others, read the article here:

- Psychtest AIM Inc.. (2011) [The Ultimate Leaders: PsychTests Releases Study on Leadership Qualities That Differentiate the Best from the Rest](https://archprofile.com/corporate/tools/article?tip=21). Retrieved September 16, 2022, from <https://archprofile.com/corporate/tools/article?tip=21>

12.1.2 The Project Manager as Team Leader

As a team leader, the project manager engages in one or more leadership styles when interacting with the project team. **Leadership style** is a function of both the leader's personal characteristics and the environment in which leadership occurs, a topic that many researchers have attempted to understand. Researchers on leadership describe leadership styles based on several factors, including:

- Approach to decision-making (autocratic or democratic),²³
- Strategic orientation (pathfinders (visionaries), problem solvers (analytical), or implementers (team oriented)),²⁴ and
- Focus (transactional (focused on actions and decisions) or transformational (focused on the long-term needs of the group and organization)).²⁵

Fred Fiedler introduced the **contingency theory**, which is the ability of leaders to adapt their leadership approach to the environment.²⁶ However, regardless of the working environment, most leaders have a dominant leadership style that is most comfortable for them.

A leadership style reflects personal characteristics and life experiences. Although a project manager's leadership style may be predominantly a *pathfinder* (using Leavitt's taxonomy), most project managers become *problem solvers* or *implementers* when they perceive the need for these leadership approaches. A leadership approach incorporates the dominant leadership style and Fiedler's contingency focus on adapting to the project environment. No leadership approach is specifically appropriate for managing all projects. Due to the unique circumstances inherent in each project, the leadership approach and management skills required to be successful vary depending on project complexity. However, research that studied project management leadership traits concluded that good communication skills and the ability to build harmonious relationships and motivate others are essential.²⁷

In the late 1960s, Douglas McGregor put forth two models to explain how managers view their employees' and team members' motivation towards work, Theory X and Theory Y. These theories describe two very different viewpoints on how employees act and how they are motivated. Project managers who align with **Theory X** think that employees generally try to avoid work when they can, don't take responsibility for getting work done, and may be incompetent or incapable of performing quality work. These project managers will try to micromanage employees. Unfortunately, this style of leadership often leads to a self-fulfilling prophecy, whereby employees become unmotivated because they are not trusted.

Project Managers aligned with **Theory Y** believe that team members put forth their best efforts without being closely managed, ask questions without prompting, and desire to meet their goals and take responsibility for their work. These project managers will trust their team and not micromanage.

In general, a project manager with a Theory Y mindset will be able to establish trust with team members and lead them from formation to become a high-performing team.

Deeper Dive

Stephen Covey has written an excellent book titled *The Speed of Trust*. In his book, he talks about how easy it is to get work done with a colleague or partner you trust and how difficult it can be to work with someone you don't trust. If someone on the team cannot be trusted, the project manager must get rid of them quickly. Project managers who can build trust between team members early in the process will have a team that can work well together when challenges arise. Learn more at the Franklin Covey website.

- Franklin Covey. (2022) [The Speed of Trust](https://www.speedoftrust.com/). Retrieved September 16, 2022, from <https://www.speedoftrust.com/>

12.1.3 Adjusting Leadership Styles

Beyond this broad set of leadership skills, a successful leadership approach will depend on project characteristics. For example, a transactional project manager with a strong autocratic leadership approach may be very successful on a small software development project or construction project where tasks are clear, roles are well understood, and the project environment is cohesive. This same project manager is less likely to be successful on a larger, more complex project with a diverse team and complicated work processes.

Matching the appropriate leadership style and approach to a project's needs is critical to success. Even experienced project managers are less likely to be successful if their leadership approach does not support the project's unique nature. Each project phase may also require a different leadership approach. During the project's start-up phase, when new team members are first assigned to the project, the team may require a command-and-control leadership approach. Later, as the project moves into the conceptual phase, creativity becomes essential, and management takes on a more transformational leadership approach.

Deeper Dive

What is your leadership style? Learn about different styles of leadership and your leadership style by completing the survey at Leadership IQ.

- Murphy, Mark. (2022) [Leadership Styles Quiz- Which Of These Styles Do You Use?](https://www.leadershipiq.com/blogs/leadershipiq/36533569-quiz-whats-your-leadership-style). Retrieved September 17, 2022, from <https://www.leadershipiq.com/blogs/leadershipiq/36533569-quiz-whats-your-leadership-style>

Most experienced project managers can adjust their leadership approach to the needs of the project phase. Occasionally, on large and complex projects, some companies will bring in different managers for various phases. Changing project managers may bring the right level of experience and appropriate leadership approach, but it is also disruptive. Senior management must balance the best leadership approach with the cost of disrupting established relationships.

12.1.4 Shared Team Leadership

One way to balance a larger project's unique needs is to share leadership duties and responsibilities between team members. **Shared team leadership**, where individuals share leadership responsibilities at various points in the team's life, maximizes shared knowledge and expertise.²⁸ Since everyone on the team has responsibility for leading certain work aspects, they can use their expertise to lead most effectively in specific areas.

For example, on a large project a primary manager may lead one project phase while one or two project associates assist with administrative duties and reports during another phase. Then, as a new phase begins, the responsibility for leadership would shift to an associate who then becomes the primary project manager.

Test Your Knowledge

Shared Leadership on a Construction Project

Let's say a team of project managers is overseeing the construction of a new hospital, which is a major construction project. During the initial phases of construction, the team member with extensive experience in foundational work and overcoming environmental factor issues may be the primary PM, while two other associates assist with reports and other necessary duties.

However, once the construction team has completed the outer shell of the building and closed off the exterior with a roof, walls, and any glass or other materials, the project enters a new phase. This process is sometimes called "achieving envelope" as the building interior is now sealed off from the elements. The project leadership may then shift responsibility to one of the associates who is far more familiar with interior infrastructure, like heating, plumbing, and electrical, and the unique regulations for healthcare facilities such as redundant power, medical gas lines, air filtration, and air pressure requirements.

12.2 LEADING WITHOUT AUTHORITY

Even though a project manager is responsible for managing a project and ensuring the project completes within stated constraints, the organizational structure and culture affect how much authority, a type of power, a project manager may hold ([Section 2.2](#)). Managing projects without power can be complex, so it's essential to know the various types of power and influence that a project manager may need to rely on in absence of formal authority. Authority, in this sense, is the right to exercise power.

12.2.1 Power

Power is the ability to influence the behavior of others to get what you want.²⁹ Having power and using power are two different things. For example, imagine a manager who has the power to reward or punish employees. When making a request, the manager will probably be obeyed even if the manager does not actually reward employees. The fact that the manager can give rewards and punishments will be enough for employees to follow the request. Giving rewards is one source of power. Researchers identified five additional sources of power: legitimate, reward, coercive, expert, information, and referent.³⁰ You might earn power from one source or all six depending on the situation. Let us look at each of these in turn.

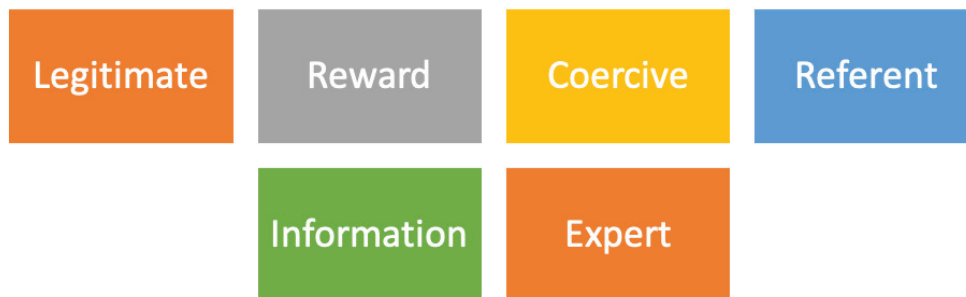


Figure 12.1: Types of Power Available to Project Managers

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Legitimate power is power that comes from one's organizational role or position. For example, a boss can assign projects, a police officer can arrest a citizen, and a teacher assigns grades. Others comply with the requests these individuals make because they accept the legitimacy of their positions, whether or not they like or agree with the request. A project manager may receive legitimate power, or authority, over a group of people or set of processes by organizational leaders.

Reward power is the ability to grant a reward, such as an increase in pay, a perk, or an attractive job assignment. Reward power tends to accompany legitimate power and is highest when the reward is scarce. Anyone can wield reward power, however, in the form of public praise or giving someone something in exchange for their compliance. If a project manager has access to discretionary funds to reward project team members, then that project manager may have reward power.

In contrast, **coercive power** is the ability to take something away or punish someone for noncompliance. Coercive power often works through fear or discomfort, and it forces people to do something that ordinarily they would not choose to do. The most extreme example of coercion is government dictators threatening physical harm for non-compliance. Parents may also use coercion, such as grounding their child as punishment for noncompliance. Project managers may use coercive power when team members are not performing to expectations,

but this type of power must be used judiciously because threatening team members or taking away benefits can backfire and cause the team to lose respect.

Expert power comes from knowledge and skill. A project manager may have expert power from his ability to know what customers want—even before they can articulate it. Others with expert power in an organization include long-time employees, such as a steelworker who, through experience, knows the temperature combinations and length of time to get the best yields. Other team members can also hold expert power if they hold expertise that is valuable to the team's objectives.

Information power is similar to expert power but differs in its source. Experts tend to have a vast amount of knowledge or skill, whereas information power is distinguished by *access* to specific information. For example, knowing price information gives a person information power during negotiations. Within organizations, a person's social network can either isolate them from information power or serve to create it.

One thing to be aware of is the potential for some members of an organization to hold vital information to themselves to increase their perceived or actual power. A project manager may need to identify these individuals and develop an approach to accessing the information the individual is keeping from others, especially when that information is critical to a project's success. Sometimes, the project manager might need to work directly with that individual to achieve information requirements, while at other times the project manager will need to carefully find other conduits for information within the organization. Stakeholder analysis can be an effective tool in identifying where these potential obstacles may occur.

Referent power stems from personal characteristics, such as the degree to which we like, respect, and want to be like a given leader. Referent power is often called charisma, which is the ability to attract others, win their admiration, and hold them spellbound. People with dynamic personalities may also hold referent power just because of how they behave around others.

Which power is best for a project manager? It depends. Legitimate power is formal power given to a project manager by the organization, but not all project managers are so lucky. Often, project managers need to rely on expert or referent power to motivate a team to work with them and follow their lead. Reward power can be helpful, but only to a point, and many project managers may not have access to rewards that team members find valuable. Coercive power should be used least often and only to correct unacceptable team behaviors that disrupt effectiveness.

Deeper Dive

How do project managers lead projects without legitimate or formal power?

- Gemmill, G. R. & Thamhain, H. J. (1974). [The effectiveness of different power styles of project managers in gaining project support](https://www.pmi.org/learning/library/power-styles-project-managers-support-1970). *Project Management Quarterly*, 5(1), 21–28. <https://www.pmi.org/learning/library/power-styles-project-managers-support-1970>

12.2.2 Influence

When possible, we tend to rely on power to achieve goals. Indeed, starting at infancy, we all try to get others to do what we want. We learn early what works in getting us to our goals. Instead of crying and throwing a tantrum, we may figure out that smiling and using language causes everyone less stress and brings us the rewards we seek.

By the time you start in the workplace, you have had vast experience with influence techniques. **Influence** is the ability to persuade others to do things for you when you don't have power or authority over them. You have probably picked out a few techniques that you use most often. To be effective in a wide number of situations, however, you should expand your repertoire of skills and become competent in several techniques, knowing how and when to use them as well as understanding when they are being used on you. If you watch someone who is good at influencing others, you will probably observe that person switching tactics depending on the context. The more tactics you have at your disposal, the more likely it is that you will achieve your influence goals.

Test Your Knowledge

Do You Have the Characteristics of Powerful Influencers?

People who are considered skilled influencers share the following attributes. How often do you engage in these skills? 0 = never, 1 = sometimes, 2 = always.

- _____ 1. present information that can be checked for accuracy.
- _____ 2. provide a consistent message that does not change from situation to situation.
- _____ 3. display authority and enthusiasm (often described as charisma).
- _____ 4. offer something in return for compliance.
- _____ 5. act likable.
- _____ 6. show empathy through listening.
- _____ 7. show you are aware of circumstances, others, and yourself.
- _____ 8. plan ahead.

If you scored 0–6: You do not engage in much effective influencing behavior. Think of ways to enhance this skill. A great place to start is to recognize the items on the list above and think about ways to enhance them for yourself.

If you scored 7–12: You engage in some influencing behavior. Consider the context of each of these influence attempts to see if you should be using more or less of it depending on your overall goals.

If you scored 13–16: You have a great deal of influence potential. Be careful that you are not manipulating others and that you are using your influence when it is important rather than just to get your own way.

Researchers have identified distinct influence tactics and discovered that there are few differences between the way bosses, subordinates, and peers use them. The nine influence tactics include rational persuasion, inspirational appeals, consultation, ingratiation, personal appeal, exchange, coalition tactics, pressure, and legitimating tactics.³¹



Figure 12.2: Common Influence Tactics

Source: Original Work

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Rational persuasion includes using facts, data, and logical arguments to try to convince others that your point of view is the best alternative. This is the most applied influence tactic. One experiment illustrates the power of reason.³² In the experiment, researchers lined people up at a copy machine. Another person, after joining the line asked, “May I go to the head of the line?” Amazingly, 63% of the people in the line agreed to let the requester jump ahead. When the line jumper made a slight change in the request by asking, “May I go to the head of the line because I have copies to make?” the number of people who agreed jumped to over 90%. The word “because” was the only difference. Effective rational persuasion includes the presentation of information that is factual, clear, specific, relevant, and timely. Across studies summarized in a meta-analysis, rationality was related to positive work outcomes.³³

Inspirational appeals seek to tap into our values, emotions, and beliefs to gain support for a request or course of action. When President John F. Kennedy said, “Ask not what your country can do for you, ask what you can do for your country,” he appealed to the higher selves of an entire nation.³⁴ Effective inspirational appeals are authentic, personal, big-thinking, and enthusiastic.

Consultation refers to the influence agent’s asking others for help in directly influencing or planning to influence another person or group. Consultation is most effective in organizations and cultures that value democratic decision making.

Ingratiation refers to different forms of making others feel good about themselves. Ingratiation includes any form of flattery done either before or during the influence attempt. Research shows that ingratiation can affect individuals. For example, in a study of résumés, those résumés that were accompanied with a cover letter containing ingratiating information were rated higher than résumés without this information. Other than the cover letter accompanying them, the résumés were identical.³⁵ Effective ingratiation is honest, infrequent, and well-intended.

Personal appeal refers to asking another person for help and relying on feelings of friendship or loyalty to persuade them to help you. We enjoy saying yes to people we know and like. Personal appeals are most effective with people who know and like you.

Exchange refers to give-and-take in which someone does something for you, and you do something for them in return. The rule of reciprocity says that “we should try to repay, in kind, what another person has provided us.”³⁶ Applying this rule obliges us and makes us indebted to the giver. For example, if you offer to take a shift for your friend so they can go on a date in exchange for them taking one of your shifts later, you are engaging in an exchange-based influence tactic.

Coalition tactics refer to a group of individuals working together toward a common goal to influence others. Common examples of coalitions within organizations are unions that may threaten to strike if their demands are not met. Coalitions also take advantage of peer pressure. The influencer tries to build a case by bringing in the unseen as allies to convince someone to think, feel, or do something. This tactic is popular among advertisers and businesses that use client lists to promote their goods and services. The fact that a client bought from the company is a silent testimonial.

Pressure refers to exerting undue influence on someone to do what you want or else something undesirable will occur. Like coercive power, this tactic often includes threats and frequent interactions until the target agrees. Research shows that managers with low referent power tend to use pressure tactics more frequently than those with higher referent power.³⁷ Pressure tactics are most effective when used in a crisis and when they come from someone who has the other’s best interests in mind, such as getting an employee to participate in an employee assistance program to deal with a substance abuse problem.

Legitimizing tactics occur when the appeal is based on legitimacy or position power. This tactic relies upon compliance with rules, laws, and regulations. It is

not intended to motivate people but to align them with a direction. Obedience to authority is filled with both positive and negative images. Position, title, knowledge, experience, and demeanor grant authority, and it is easy to see how it can be abused. If someone hides behind people's rightful authority to assert themselves, that person can appear as heavy-handed and taking away choice. If you act, speak, and look like someone in authority, many individuals will assume you must be an authority figure. Consider the number of commercials with doctors, lawyers, and other professionals who look and sound the part, even if they are actors. People want to be convinced that a person is an authority worth heeding. Authority is often used as a last resort. If it does not work, you will not have much else to draw from to reach your goal of persuading someone.

12.2.2.1 Responses to Influence Tactics

Responses to influence attempts include resistance, compliance, or commitment. **Resistance** occurs when the influence target does not wish to comply with the request and either passively or actively repels the attempt. **Compliance** occurs when the target does not necessarily want to obey, but they do. **Commitment** occurs when the target not only agrees to the request but also actively supports it. Within organizations, commitment helps to get things done because others can help to keep initiatives alive long after compliant changes have been made or resistance has been overcome.

12.2.2.2 Directions of Influence

In an organization, **influence** can be applied upward, downward, or with people who are at the same level as you. **Upward influence**, as its name implies, is the ability to influence your boss and others in positions higher than yours. Upward influence may include appealing to a higher authority or citing the firm's goals as an overarching reason for others to follow your cause. **Downward influence** is the ability to influence employees lower than you. This is best achieved through an inspiring vision. By articulating a clear vision, you help people see the end goal and move toward it. You often do not need to specify precisely what needs to be done to get there—people can figure it out independently. An inspiring vision builds buy-in and gets people moving in the same direction.

Peer influence, which involves influencing others who are equal to you in the organization, occurs all the time. But to be effective within organizations, peers need to be willing to influence each other without being overly competitive. There are times to support each other and times to challenge—the end goal is to create better decisions and results for the organization and hold each other accountable. Executives spend much of their time working to influence other executives to support their initiatives.

12.2.3 Political Behavior

Organizational politics are informal, unofficial, and sometimes behind-the-scenes efforts to sell ideas, influence an organization, increase power, or achieve other targeted objectives.³⁸ Politics has been around for millennia. Aristotle wrote that politics stems from a diversity of interests, and those competing interests must be resolved in some way. “Rational” decision-making alone may not work when interests are fundamentally incongruent, so political behaviors and influence tactics arise.

Political skill refers to peoples’ interpersonal styles, including their ability to relate well to others, self-monitor, alter their reactions depending upon the situations they are in, and inspire confidence and trust.³⁹ Researchers have found that individuals who are high in political skill are more effective at their jobs, or at least in influencing their supervisors’ performance ratings.⁴⁰

Today, work in organizations requires skill in handling conflicting agendas and shifting power bases. Effective politics isn’t about winning at all costs but about maintaining relationships while achieving results. Although often portrayed negatively, organizational politics are not inherently wrong. Instead, project managers and team members need to be aware of the potentially destructive aspects of organizational politics to minimize their harmful effect. Of course, individuals within organizations can waste time overly engaging in political behavior.

Politics are a part of organizational life because organizations are made up of people and groups with different interests that need to be aligned. In fact, 93% of managers surveyed reported that workplace politics exist in their organization, and 70% felt that to be successful, a person must engage in politics.⁴¹ The negative side of organizational politics is more likely to flare up in times of organizational change or when difficult decisions must be made with scarce resources, breeding competition among organizational groups. Adverse outcomes of organizational politics can include aggressive competition between department managers, a hostile work environment, or an environment where people are afraid or worried about job security. To minimize overly political behavior, company leaders can provide equal access to information, model collaborative behavior, and demonstrate that political maneuvering will not be rewarded. Furthermore, leaders should encourage managers throughout the organization to provide high levels of employee feedback about their performance.

12.3 DEVELOPING HIGH-PERFORMING PROJECT TEAMS

12.3.1 Understanding Teams

A team is a group of people working together to accomplish a shared goal. Teams are different than groups because team members must **collaborate**, or work together, to achieve goals. Team members are also **interdependent** in that

they must rely on one another to get things done because each team member holds **complementary skills**, so no one person must be skilled in everything required to achieve the goal.

The Tuckman team development model is an elegant and helpful way of explaining team development behavior. The model explains that as the team develops maturity and ability, relationships establish, and the team becomes more effective. The project manager can help the team move through these stages by coaching, directing, and delegating. Managing the interactions of various team members is an essential aspect of project management.

12.3.2 Identifying Skilled Team Members

When developing the team, the project manager works with functional managers to select team members with the knowledge, skills, and abilities to accomplish the work required for the project to be successful. Typically, the more knowledge, skills, abilities, and experience a team member brings to the project, the more that team member will be paid. Therefore, to keep personnel costs lower, the project manager will develop a team that balances experience levels, knowledge, skills, and abilities required to accomplish the work.

For example, a large construction project generally requires a licensed architect. However, for the remodeling of a room, especially one that only requires different furniture, wall paint, and lighting, paying to have an architect on the project likely would be an inefficient use of resources.

On smaller, less complex projects, the project manager can provide daily guidance to project team members and be consulted on all significant decisions. Larger, more complex projects have too many important daily decisions for the project manager to be involved in at the same level. The PM can delegate decision-making authority to project team leaders. Larger, more complex projects will typically pay their personnel more because of the need for knowledge and experience. On larger, more complex projects, the project manager will develop a more experienced and knowledgeable team that will enable the PM to delegate more responsibility.

The project manager must be able to evaluate the knowledge, skills, and abilities of project team members and evaluate the complexity and difficulty of the project assignment. Often project managers want to employ team members they have worked with before. Because the project manager knows the team member's skill level, project assignments can be made quickly with less supervision than with a new team member with whom the project manager has little or no experience.

Deeper Dive

To learn best practices about how project managers can ensure the best people are hired on a team, listen to this podcast by Cesar Abeid, PM for the Masses, "A Blueprint for Hiring Team Members."

Abeid, C.(2022). [A Blueprint for Hiring Team Members](https://open.spotify.com/episode/2vwkHksogqOoSWKWrsfMo7?si=ab8746560foc48ec) [podcast]. PM for the Masses. Retrieved September 17, 2022 from <https://open.spotify.com/episode/2vwkHksogqOoSWKWrsfMo7?si=ab8746560foc48ec>

12.3.3 Team Development

Many management professionals and academics have studied project team development. Bruce Tuckman⁴² observed that teams go through a series of developmental stages: forming, storming, norming, performing, and adjourning (Figure 12.3). Each stage has predictable characteristics.

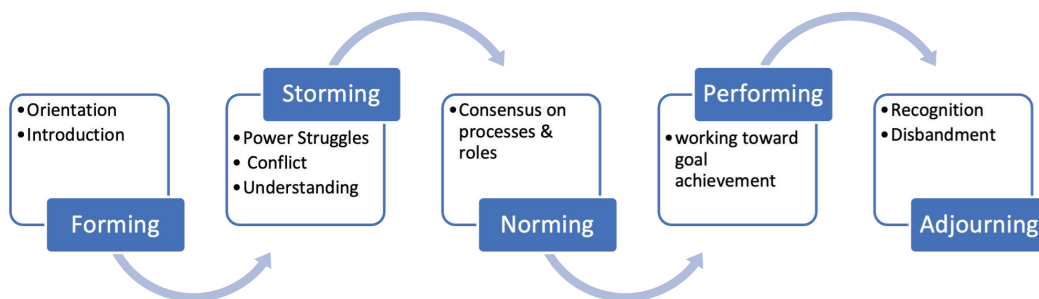


Figure 12.3: The Tuckman Model of Team Development Stages

Source: Original Work

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Forming: The group is brought together for the first time. The team begins orienting themselves to the task at hand. At this stage, there may be little agreement on how to approach the project, and team members may struggle with understanding the project's purpose. The project manager needs to provide guidance and direction during this stage.

Storming: Team members are trying to figure out their roles in the group. Conflict and power struggles are common, but so is a clearer vision for the group. During this stage's intergroup conflict, the project manager provides support and coaching.

Norming: At this stage, the team will have developed a consensus regarding roles, processes, and approaches to the work. The project manager should participate by working as the group's facilitator during this stage.

Performing: At this point, the group has a clear vision and purpose and is focused on meeting performance goals, project milestones, and other benchmarks. The project manager should be able to delegate more responsibility to the team with less supervision.

Adjourning: Once the project is completed, the team should collect lessons learned and transition to other projects or roles. The project manager should

recognize the work done by the team and help them transition to their next project by providing recommendations and letters of support.

12.3.4 Characteristics of Effective Teams

Effective teams have several common characteristics: high levels of team trust, strong group cohesion, and engaged team members.

Trust is the foundation for all relationships within a project. **Trust** is a psychological state held by individuals based on how well they can rely on others to be honest, fair, and considerate. We perceive people to be **trustworthy** when they exhibit these characteristics. In teams, trust is an essential component of effective teamwork. Without a minimum level of trust, communication breaks down, and eventually, the project suffers in the form of increased costs and delayed schedules. Often, when reviewing a project where the performance problems have captured the attention of upper management, the indicators show that project costs are increasing and the schedule is slipping. The underlying cause is usually blamed on communication breakdown. Upon deeper investigation, this communication breakdown is associated with a breakdown in trust.

On projects, trust is the filter through which we screen the information we share and receive. The more trust team members feel in a team, the easier it is for information to flow between team members. Conversely, as trust diminishes data has a harder time getting through, and projects highly dependent on an information-rich environment will suffer from information deprivation.

Building trust in a project begins with the project manager. On complex projects, assigning a project manager with a high perception of trustworthiness can help establish necessary trust levels. The project manager can also establish the cost of lying, which communicates an expectation for and the value of trust within a team. Project managers ensure that the official and operational goals are aligned, and should create an atmosphere where informal communication is expected and reinforced.

Informal communication is important to establishing personal trust among team members and with project stakeholders. Allotting time during project start-up meetings for team members to develop personal relationships is valuable to establishing team trust. Informal discussions allow for a deeper understanding of everyone on the team and create an atmosphere where trust can emerge. Small events that reduce trust sometimes occur on a project without anyone remembering what happened to create an environment of distrust. Taking fast and decisive action to communicate the expectation of honesty and creating a trusting atmosphere are critical steps a project manager can take to ensure success.

Project managers can also establish expectations for team members to respect individual differences and skills, look for and react to the positives, recognize each other's accomplishments, and value peoples' self-esteem to increase a sense of benevolent intent.

Team **cohesion** develops as team members see themselves as an integral part of a team and are dedicated to the team's success. Team cohesion creates a productive environment because all members are motivated to support team success. Project managers can build and support cohesion by helping members identify strongly with the team's goals and processes.

Project managers can undertake team building, relationship-building, and other interventions to foster cohesion. Cohesive teams also contribute to individual members demonstrating higher engagement levels.

Engaged team members contribute to effective project teams. **Engagement** occurs when individuals are strongly invested in their team emotionally, cognitively, and socially. Engaged team members care about the team's work and how well the team performs. Such team members are also more likely to go above and beyond the minimal requirements to complete their work.

Deeper Dive

To learn more about engaging a project team for increased performance, check out this article available at PMI.org

- Woods, J. M. (2015). [Engaging your team to greater project performance](https://www.pmi.org/learning/library/engaging-team-great-project-performance-9941). Paper presented at PMI® Global Congress 2015—North America, Orlando, FL. Newtown Square, PA: Project Management Institute. <https://www.pmi.org/learning/library/engaging-team-great-project-performance-9941>

12.3.5 Accelerating Team Development

Project managers who can quickly move the team from the Forming stage to the Performing stage will have considerable advantages in terms of achievement. To do this, project managers incorporate team-building activities into the project. **Team building** activities focus on increasing motivation for people to work together cooperatively to be more effective in reaching goals.

Starting the project with some team-building activities will let the team start to form as a group, resolve interpersonal conflicts, and develop norms of behavior in a low-risk environment. Unfortunately, some project managers perceive taking time for team building as a waste of time. However, the time invested pays off with a much more motivated and better-performing team.

Project managers have many opportunities to incorporate team-building activities into the planning process. Perhaps the most essential process a project manager can facilitate is helping team members learn to trust each other.

Deeper Dive

Read the following article by Wilemon and Thamhain to learn about team building in project management.

- Wilemon, D. L. & Thamhain, H. J. (1983). [Team Building in Project Management](https://www.pmi.org/learning/library/team-building-development-project-management-5707). *Project Management Quarterly*, 14(2), 73–81. Retrieved from <https://www.pmi.org/learning/library/team-building-development-project-management-5707>

13

Monitoring and Reporting Project Status

In the production phase, the project manager is responsible for keeping the project on track with careful monitoring and control processes to ensure the final deliverables meet the customer's acceptance criteria. This phase is typically where approved changes are implemented. Changes are often identified by looking at performance and quality control data. Routine performance and quality control measurements should be evaluated regularly throughout the implementation phase. Gathering reports on those measurements will help determine where the problem is and the recommend changes to fix it.

CHAPTER LEARNING OBJECTIVES

- Use earned value analysis to communicate the status of the project's progress, budget, and schedule.
- Understand the importance of communicating project status.
- Understand the types of project communications used and when to use each type.

13.1 EARNED VALUE ANALYSIS

Earned Value Analysis (EVA) is one of the best tools for summarizing a large project's progress and forecasting its final cost. Earned value analysis is not required for all projects nor is it appropriate for all projects, but it is an essential tool that project managers can draw on when needed.

Earned value analysis (EVA) is a monitoring and controlling process that compares project progress to the project baseline (original plan). EVA measures the performance of a project in terms of cost and schedule. It can tell the team if a project is behind schedule, ahead of schedule, under budget, or over budget.

EVA provides tangible numbers for making these judgments and can be used to forecast where a project will end up in terms of time and cost. As a result, EVA

helps the project manager communicate progress to all stakeholders and focuses the team's attention on any changes needed for the project to be completed on time and within budget.

Test Your Knowledge

Earned Value Analysis Example

Assume that the direct costs of a project are budgeted at \$100,000 and the project is scheduled to take 12 months. If it is three months into the project and \$25,000 has been spent, a naive project manager might assume that the project is 25% done and on track to finish within the project timeline and budget.

In this example, the project is certainly 25% done as far as the time allowed for the project and 25% done with the budget, but what is not known is which activities have been worked on and whether those activities are complete or still in progress. If only 10% of the scheduled work has been completed, then the project may be in trouble. Alternatively, if 50% of the scheduled work has been completed, then the project may end up completing much earlier and with much less expense than planned. Either situation requires action:

- If a project is going to be over budget or take more time, the project manager needs to figure out what can be done to correct the situation. Should they try to get more resources and time, or should they re-evaluate the project entirely? It may be helpful to review sunk costs discussed in [Section 4.3](#).
- If a project is going to be done in significantly less time and/or with significantly less cost, then the project manager should see if some of the resources allocated for the project can be released to other projects and priorities in the organization and evaluate the impact of an earlier completion date.

Initial Data	Variance Analysis	Forecasting
<ul style="list-style-type: none"> • Planned Value (PV) • Actual Costs (AC) • Earned Value (EV) • Budget at Completion (BAC) 	<ul style="list-style-type: none"> • Cost Variance (CV) • Schedule Variance (SV) • Cost Performance Index (CPI) • Schedule Performance Index (SPI) • Percent Complete Index-Budget (PCIB) • Percent Complete Index-Cost (PCIC) 	<ul style="list-style-type: none"> • Estimate to Complete (ETC) • Estimate At Completion (EAC) • Variance At Completion (VAC) • To Complete Performance Index (TCPI)

Figure 13.1: Earned Value Terms

Source: Original Work

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13.1.1 Planned Value (PV)

Planned Value reflects the amount of money that the project is expected to spend on activities. For each activity, there is a total Planned Value (cost). More importantly, the amount that was going to be spent on each activity over time is also known.

Planned value is determined by identifying what percentage of activities or deliverables were planned for completion up to a certain point. Planned value is the target of work to be completed up to the project status date. Project managers who do not conduct an earned value analysis run the risk of misinterpreting or miscommunicating the meaning of project information that is collected during the execution phase.

13.1.2 Actual Costs (AC)

Actual Costs are how much money was spent on an activity at a given time. Actual costs reflect what has been spent on the project, and not what was planned to be spent. The accounting department provides actual cost data based on invoices, paychecks, and receipts related to the activity. While the project manager may have been planning to spend \$78 on Activity 1 by the end of week one, the accounting department may share that the actual cost (AC) at the end of week one for Activity 1 is \$400. However, the project manager still doesn't know if spending \$400 on Activity 1 by the end of week one is good or bad until determining how much work has been performed.

13.1.3 Earned Value (EV)

Earned Value is a measure of how much work was completed on the project at a given point in time. An easy way to calculate earned value is to multiply the percentage of work completed by the total planned value for a given task, deliverable, or phase.

$$\text{EV} = \text{Total PV} \times \text{Percentage WORK Complete}$$

One thing to watch out for is that the calculation of EV is not time dependent; it uses the total PV for an activity, not the value for PV at a certain point in time as found on a time-phased budget. For example, if Activity 1 is 100% complete at the end of week one, then $\text{EV} = \$468 \times 100\%$, or $\text{EV} = \$468$. On the other hand, if no progress has been made on this activity (0% complete), then $\$468 \times 0\%$, or $\text{EV} = \$0.00$.

Another way to calculate EV is to collect actual work performance data from the people working on the project. This requires team members to track the time spent on each assigned activity and may be difficult depending on the type of work performed. Collecting performance data in this way is time-consuming for the project manager and team and is often only done on very large or expensive projects where it is important to track actual work on project activities.

13.1.3.1 Earned Value for Project Work

When calculating EV, project managers may have to make some trade-offs. They must consider how much time and how many resources to devote to measuring an activity's progress. In some cases, a project manager will use a professional estimator to figure out the percentage completed on activities. This is usually done for those activities that cost a lot of money or take a lot of time (say 80–90 days (about 3 months) or more).

For most activities, however, it doesn't make sense to spend that much effort estimating the percentage completed. As a result, project managers have developed simple guidelines, or earning rules, for quickly assessing the percent-complete for an activity (Figure 13.2). These earning rules work well for small or simple projects because generally each activity tends to be short in duration. Project managers will use one of these rules to estimate the percent-complete for most of their activities or work packages.

Rule	Percent Complete Calculation
0/100 Rule	No earned value is counted for an activity until it is 100% complete.
50/50 Rule	Percent complete is calculated at 50% when the activity starts. The remaining 50% is added when the activity is complete.
25/75 Rule	Percent complete calculated at 25% when the activity starts. The remaining 75% is calculated when the activity is complete.

Rule	Percent Complete Calculation
20/80 Rule	Percent complete is calculated at 20% when the activity starts. The remaining 80% is calculated when the activity is complete.
Professional Estimation	Estimates are developed by the subject matter expert based on their knowledge of the work completed and work remaining.

Figure 13.2: Earning Rules to Report Earned Value on Activities

Source: Original Work

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13.1.4 Budget At Completion (BAC)

The sum of planned value for all activities is also known as the **Budget at Completion (BAC)** and is what should be budgeted for all project activity costs. This is referred to as the project’s direct costs. Contingencies, indirect costs, management reserves, etc., are not included in this total.

13.1.5 Analyzing the Project Schedule

Earned value analysis can be an effective way to measure the efficiency of a project’s schedule while the project is being executed. However, project managers need to be cautious when considering schedule metrics as they are only a measure of how efficiently the project is using money and only effective prior to a task’s completion.

Project managers should also consider variance when determining project status. **Variance** measures the difference between what was planned and the project’s actual performance. **Schedule Variance (SV)** is used to determine the project schedule’s status. SV equals Earned Value minus Planned Value.

$$SV = EV - PV$$

If the SV is negative, then that means less work has been completed than was planned. If SV is positive, then more work has been completed than was originally planned.

SV can be calculated for each activity, for segments of a project (for example a deliverable or sub-deliverable), or for the entire project. While SV provides a dollar amount that reflects how well the project is doing at turning dollars into completed activities, **Schedule Performance Index (SPI)** provides an indicator of the overall schedule performance to date. Remember that some limitations exist on using money to measure time. Those limitations apply to SPI as well. To know whether a project is behind or ahead of schedule, and by how much, a project manager will also look at the planned start and finish dates, milestones, etc.

$$SPI = \frac{EV}{PV}$$

An SPI that is < 1 means that the project is behind schedule. An SPI that is $= 1$ means that the project is on schedule. An SPI that is > 1 means that the project is ahead of schedule.

13.1.6 Analyzing the Project Budget

Cost Variance (CV) is used to determine the project budget's status. CV is calculated as Earned Value minus Actual Costs.

$$CV = EV - AC$$

If CV is negative, that means that the project work is costing more than planned. If CV is positive, then the project work is costing less than planned.

CV can be calculated for each activity, for segments of a project (for example a deliverable or sub-deliverable), or for the entire project. While CV provides a dollar amount that reflects how much over or under the project is at a particular point in time, The **Cost Performance Index (CPI)** provides both an indicator of overall cost performance to date and a good idea of how the project work is trending regarding cost performance. CPI is calculated as follows:

$$CPI = \frac{EV}{AC}$$

A CPI that is < 1 means that the cost of completing the work is higher than planned (over budget). A CPI that is $= 1$ means that the cost of completing the work is right on plan (on budget). A CPI that is > 1 means that the cost of completing the work is less than planned (under budget).

13.1.7 Forecasting Project Costs from Current Status

Earned value analysis provides additional values that can be calculated to answer some questions about the future of a project, such as:

- If things continue as they have been, how much will it cost to complete the remaining work?
- If things continue as they have been, what will be the final project cost?
- How much will the projected final cost vary from our current project budget?

13.1.7.1 Estimate to Complete (ETC)

It is relatively simple to calculate the cost to complete the remaining work on a project (assuming the performance on the rest of the project will continue as it has thus far). **Estimate to Complete (ETC)** tells us what the remaining work will cost if the current CPI holds, and is calculated as follows:

$$ETC = \frac{(BAC - EV)}{CPI}$$

However, this formula assumes that past performance is a valid indicator of how future performance will fare. The project team may have had several events early in the project that were not expected and extended their efficiency. In such a case, the CPI is not factored into the ETC and the following formula is used:

$$ETC = (BAC - EV)$$

Test Your Knowledge

How do you know which formula to use?

The project manager must decide which formula to use, depending on how things are progressing and the project manager's professional judgement. For example, when working on a new database project, the programming team could be faced with two different issues that require the project manager to use a different formula.

1. The programmers are finding the system more difficult and less straightforward, so their progress has slowed a bit. They do not think this will change for the rest of the project. In this case, the project manager would use the formula that includes the CPI.
2. The programmers were working in an office building adjacent to a construction site that, in the first weeks of work, had numerous power outages and false fire alarms requiring them to stop work and often evacuate the building. The construction issues have ceased and should not be a problem moving forward. In such a case, the project manager should use the ETC that does not include the CPI.

13.1.7.2 Estimate at Completion (EAC)

Now that the project manager knows ETC, they can estimate what the total cost will be when the project is complete, or the **estimate at completion**.

$$EAC = AC + ETC$$

13.1.7.3 Variance at Completion (VAC)

Variance at Completion is the difference between the original budget (the BAC) and the current estimate at completion (EAC).

$$VAC = BAC - EAC$$

13.1.7.4 To Complete Performance Index (TCPI)

As we have seen, CPI provides an indicator of overall project cost performance to date. To know what the CPI will need to be to complete the project within the original baseline, the project manager will want to find the value of the **To Complete Performance Index (TCPI)**. TCPI determines how efficient the team must be with the budget going forward.

$$TCPI = \frac{(BAC - EV)}{(BAC - AC)}$$

A TCPI that is less than 1 means that more budget remains than work that needs to be done. If the CPI is greater than 1, the TCPI will be less than 1. A TCPI that is equal to 1 means that the project has the right amount of budget for the remaining work. A TCPI that is greater than 1 means that there is more work than budget left. If the CPI is less than 1, then TCPI will be greater than 1.

13.1.7.5 Percent Complete (PCI_B and PCI_C)

When reviewing the CV, SV, CPI, and SPI, the project manager also needs to know the percent of the project that is complete. If CPI is .75 but the project is only 2% complete, then it might not be cause for alarm. If CPI is .75 and the project is 50% completed, then it might be time for serious re-evaluation of the baseline, and the project itself.

Earned value analysis provides two methods for calculating the percentage of the project that is complete.

- **Percent Complete Index—Budget (PCI_B)**
- **Percent Complete Index—Cost (PCI_C)**

PCI_B is the percentage of work that is complete based on baseline budget. This is the percent complete index that is used when the project manager trusts their initial project baseline. The earned value inputs are used to calculate PCI_B:

$$PCI_B = \frac{\sum EV}{BAC}$$

MONITORING AND REPORTING PROJECT STATUS

Please note that in this equation EV is the sum of EV for all activities.

PCI_C is the percentage of work that is complete based on the actual costs (AC) and the estimate at completion (EAC). The project manager uses this index if they had to revise the baseline due to changes in scope, if rolling wave planning is used, or if there is some other reason the project manager doesn't trust the baseline costs.

$$PCI_C = \frac{\sum AC}{EAC}$$

Question	Timing	Answer	Formula
How much work should be done?	Now	Planned Value	PV
How much work has been done?	Now	Earned Value	EV
How much did the "is done" work cost?	Now	Actual Cost	AC
How much was the total project supposed to cost?	Now	Budget at Completion	BAC
How much is the project ahead of or behind schedule?	Now	Schedule Variance	$SV = EV - PV$
How much is the project over or under budget?	Now	Cost Variance	$CV = EV - AC$
How efficient is the project so far with its schedule?	Now	Schedule Performance Index	$SPI = \frac{EV}{PV}$
How efficient is the project so far with its budget?	Now	Cost Performance Index	$CPI = \frac{EV}{AC}$
How much more do we expect to spend to finish the project?	End	Estimate to Complete	$ETC = \frac{(BAC - EV)}{CPI}$ OR $ETC = (BAC - EV)$
What do we now think the total project will cost?	End	Estimate at Completion	$EAC = AC + ETC$
How much has the budget changed since the baseline?	End	Variance at Completion	$VAC = BAC - EAC$
How efficient do we need to be to finish the project with the baseline budget?	End	To-Complete Performance Index	$TCPI = \frac{(BAC - EV)}{(BAC - AC)}$
What is the percentage of work that is completed based on the baseline budget?	Now	Percent Complete (BAC)	$PCI_B = \frac{\sum EV}{BAC}$
What is the percentage of work that is completed based on the new estimate at completion?	Now	Percent Complete (EAC)	$PCI_C = \frac{\sum AC}{EAC}$

Figure 13.3: A Summary of Earned Value Formulas

Source: Original Work

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13.2 COMMUNICATING PROJECT STATUS

At all stages of a project, the project manager collects and analyzes data and reports project status using good communication practices ([Section 5.4](#)). **Project reports** provide senior management and project teams an opportunity to see whether a project is on track and to determine whether they should do something different to ensure the project meets their goals.

In general, project managers should avoid periodic reports except in those cases in which the flow of data is periodic. Reports issued daily, weekly, monthly, or quarterly generally do not get read. Instead, let a project's milestones, scope changes, problems, and the team's need for information dictate the timing of reports.

13.2.1 Types of Project Reports

Project managers generally produce three main types of project reports.

- **Status reports** – These reports indicate the current project progress. The report might include information about procurement, delivery, and usage. These reports identify where we are today and use the information from performance reports to conduct earned value analysis (see [Section 13.1](#)).
- **Projection Reports** – The reports provide forward-looking projections and emphasize where the project will end up given current trends.
- **Exception Reports** – These reports identify exceptions, problems, or situations that exceed the threshold limits on such items as variances, cash flows, or when resources are assigned.

13.2.2 Creating A Project Status Report

A project status report is an essential tool for the project manager to communicate with project team members and stakeholders. Just as a project charter should provide the team with a shared understanding of the project's purpose, how and when the project will take place, and who is involved, the project status report provides a common understanding of where the project stands at a particular moment in time.

Generally, the PM determines the status report frequency and format early in a project as part of communications planning. The report may be a document distributed electronically, physically at a meeting, or as part of a regularly updated website. Typical elements of a status report include:

- **Project information:** identifying information such as the project name, the organization's name, the unique project identifier, the project manager's name, the report date, the dates the report covers, the client or sponsor's name, etc.

MONITORING AND REPORTING PROJECT STATUS

- **Overall Status:** An overall status of the project's health (see [Figure 13.4](#))
- **Key Performance Indicators:** A summary of project success measures
- **Work Completed to Date:** A summary of the work that was completed since the last report
- **Work Planned for Next Period:** The work that is expected to be done in the next period
- **Key Issues:** A summary of key issues that arose, including progress made on previous issues that were identified
- **Activated Risks:** Risk responses for risks that became issues
- **Performance Metrics:** EVA metrics ([Section 13.1](#))

As a project manager, you should consider the audience for your status report and their needs. Some stakeholders need to know only high-level information, while others may wish to have detailed financial analysis. Many times, the project manager may use a simple, traffic-light analogy, or RAG status, to communicate the project's status ([Figure 13.4](#)). Green means the project or an aspect of the project such as the schedule is going well. Yellow may indicate some issues or risks may affect the project or that the project is slightly off in a particular metric. Red would indicate a significant risk to the project has been realized or that a roadblock has appeared.

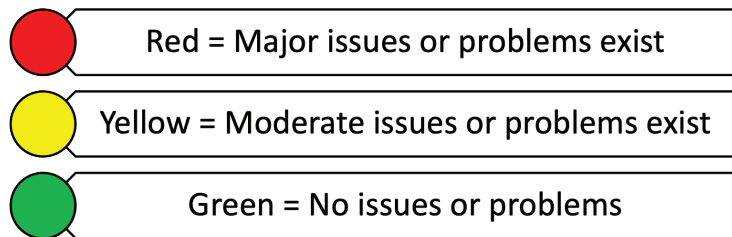


Figure 13.4: RAG Status Meanings

Source: Original Work

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Deeper Dive

To learn how to create a status report easily and quickly, watch the video by Adriana Girdler, “[Project Management Status Reports \[WHAT TO INCLUDE\]](#),” available at https://youtu.be/8C1PBSs_cMI?t=38.

14

Closing Projects

Delivery of the product, service, or result occurs after the project team completes all deliverables. The work completed to deliver, or “hand off,” the project results are often captured in a project’s closing or completion phase.

During the closure, or completion, phase the emphasis is on releasing the final deliverable to the customer, handing over project documentation to the business, terminating supplier contracts, releasing project resources, and communicating the project’s closure to all stakeholders. The last remaining step is to conduct lessons-learned studies to examine what went well and what didn’t. Through this type of analysis, the wisdom of experience is transferred back to the project organization, which will help future project teams.

CHAPTER LEARNING OBJECTIVES

- Develop an understanding of the closing stage of predictive projects.
- Understand the various post-implementation activities that may occur after projects end.

14.1 THE CLOSING STAGE PROCESSES

Every project needs to end, and that’s what project completion is all about. The whole point of the project is to deliver what you promised. By delivering everything you said you would, you make sure that all key stakeholders are satisfied and all acceptance criteria have been met. Once that happens, your project can end. However, project completion is sometimes a neglected phase of the project life cycle.

Some people may say that once the project is over, it’s easy to pack things up, throw some files in a drawer or on a shared drive, and start moving on to the next project. However, spending time to close projects is not wasted time. Project closure is an essential step because all projects need a formal shutdown process. During **project closure**, the project manager releases resources, updates and

stores project documentation for future use, and ensures proper handoff of the product, service, or result to the end users.

The key activities in project closure are gathering project records; disseminating information to formalize acceptance of the product, service, or project; and performing project closure activities.

As the project manager, you will need to review project documents to ensure they are up to date. For example, perhaps some scope change requests were implemented that changed some characteristics of the final product. The project information you are collecting during this phase should reflect the characteristics and specifications of the final product, which may be different from what was initially planned.

Don't forget to update your resource assignments as well. Some team members may have changed over the course of the project. You need to verify that you've updated all the resources and their roles and responsibilities.

Once the project outcomes are documented, you'll request formal acceptance from the stakeholders or customers. They're interested in knowing if the product or service meets the objectives the project set out to accomplish. If your documentation is up to date, you'll have the project results at hand to share with them.

14.1.1 Schedule and Budget Closure

During project closure, the baseline activity schedule and network diagram are compared to the final schedule of activities. Events that caused changes to the schedule are reviewed to see how the use of contingency reserves and float mitigated the disruption those events may have caused. The original estimates of contingency time are reviewed to determine if they were adequate and if the estimates of duration and float were accurate. These activities are necessary for the project team to develop expertise in estimating schedule elements in future projects—they are not used to place blame.

A review of budget estimates for the cost of work scheduled is compared to the actual costs. If the estimates are frequently different from the actual costs, the estimating method is reviewed. Issues relating to the budget are identified and documented so that future projects may avoid similar issues.

14.1.2 Risk Closure

Before closing the project, a project manager reviews the project risks to close out risks that did not occur and evaluate events that did occur to determine if additional risk planning might have identified a way to prevent the event. Some questions that should be answered at this time include:

- Did events occur that were unforeseen?
- What cues existed that may have allowed the team to predict these events?
- Was the project contingency sufficient to cover unforeseen risks?

Even if nothing went wrong on a project, planning and implementing risk mitigation plans are beneficial and not a waste of money. Understanding the cost of avoiding risk versus the cost of unexpected events helps the organization understand the benefit of being proactive in preparing for risks versus waiting for risks to occur.

14.1.3 Closing Procurements

Contracts end as projects end. Procurement closure is concerned with completing and settling the terms of any contracts used on the project. It supports the project completion process because the contract closure process determines if the vendors completed their contracted work accurately and satisfactorily. Keep in mind that not all projects are performed under contract, so not all projects require the contract closure process. Obviously, this process applies only to those phases, deliverables, or portions of the project that were performed under contract.

Contracts may have specific terms or conditions for completion. You should be aware of these terms or conditions so that project completion isn't held up because you missed an important detail. If you are administering the contract yourself, be sure to ask your procurement department if there are any particular conditions that you should be aware of so that your project team doesn't inadvertently delay contract project closure.

One of the purposes of the contract closure process is to provide formal notice to the seller, usually in written form, that the deliverables are acceptable and satisfactory or have been rejected. If the product or service does not meet the expectations, the vendor will need to correct the problems before you issue a formal acceptance notice. Before the contract is closed, any minor items that need to be repaired or completed are placed on a punch list, which is a list of all the items found by the client, team, or manager that remain to be done.

Ideally, quality audits were performed during the project, and the vendor was given the opportunity to make corrections earlier in the process than in the closing phase. It's not a good idea to wait until the very end of the project to spring all problems and issues on the vendor at once. It's much more efficient to discuss problems with your vendor as the project progresses because doing so provides the opportunity for correction when problems occur. The project team will then work on all the items on the **punch list**, or a list of outstanding action items or issues that need to be addressed before the project is closed. If there are large items on a punch list where the amount of work is significant, the project team will continue to work and delay further closure activities.

Once the punch list becomes smaller, the project manager begins closing the project, maintaining only enough staff and equipment to support the team completing the punch list. If the product or service does meet the project's expectations and is acceptable, formal written notice to the seller is required, indicating that the contract is complete. This is the formal acceptance and closure

of the contract. It's your responsibility as the project manager to document the formal acceptance of the contract.

Often, the contract lists all provisions for formalizing acceptance and closing the contract. If you have a procurement department handling the contract administration, they will expect you to inform them when the contract is complete and will follow formal procedures to let the seller know the contract is complete. However, you will also note the contract completion in your copy of the project records.

14.1.4 Acceptance of Project Deliverables

Acceptance of project deliverables is one of the most important activities to perform during project closing. This is where the project manager ensures that the products, services, or results are satisfactory to the customer and meet their requirements. At this stage, the project manager reviews the **definition of done checklist** and **requirements traceability matrix** to ensure all acceptance criteria and technical performance specifications have been satisfied.

The project manager also reviews client relationships and decides whether to include the client in project decisions and alignment meetings. The client may be given the opportunity to express satisfaction and identify areas in which project communication and other factors could be improved. Often a senior manager from the organization interviews the client to develop feedback on team performance.

During acceptance of project deliverables, the project manager may also generate a report that provides an overview of the project to provide stakeholders with a final summary. The report includes the original goals, objectives, and statements about how the project met these requirements. Performance on the schedule and budget are summarized and an assessment of client satisfaction is provided. A version of this report can be provided to the client as a stakeholder and as another means for obtaining feedback.

14.1.5 Quality and Continuous Improvement Plans

Quality management is a continual improvement process that includes learning from past projects and making changes to improve the next project. This process is documented as evidence that quality management practices are in use. Some organizations have formal processes for changing work processes and integrating project lessons learned so other projects can benefit. Some organizations are less formal in their approach and expect individuals to learn and take the experience to their next project and informally share what they learned with others. However, all organizations should strive to make project lessons learned accessible and searchable by project teams.

14.1.6 Project Lessons Learned

Before the team is dissolved and begins to focus on the next project, a review is conducted to capture the lessons that can be learned from this project, often called

a lessons-learned meeting or document. **Lessons learned** include everything the team discovered while working on the project, including what they did well and what could have been done better. During a lessons learned meeting, the team explores what went well and captures the processes to understand why they went well. The team asks if the process is transferable to other projects. The team also explores what did not go well and what people learned from the experience. The process is not to find blame but to learn and improve.

Test Your Knowledge

The Importance of Lessons Learned

Ordering equipment is a common occurrence on many projects. Your team may have found that although some parts are easily obtained within a week, certain parts are now taking more than two months for delivery. This delayed one part of your project. In the future, your team has learned the lesson to account for supply-chain difficulties and allow two to three months lead time on equipment parts.

Capturing lessons learned from a project should be part of every project closure process. Project participants should meet to identify what went right and what went wrong on the project. They should make a list of their successes, mistakes, unjustified assumptions, and the things that could have been done better. The lessons learned list should be stored with the rest of the documents.

14.1.7 Project Closure Reports

Because every project is unique depending on the context and project requirements, each project may require a different type of closing report. Four types of closing reports may be produced for different purposes:

- **Project Evaluation and Review Report** (After-Action Report)
 - Prepared by the core project team, the purpose is to compare results to commitment, identify lessons learned, and identify opportunities to refine existing project management processes.
- **Audit Report**
 - A project audit is a more formal final review by a group outside the project team. This is a special type of evaluation. It involves a thorough examination of the project's management, its methodology and procedures, records, properties, inventories, budgets, expenditures, and progress.

- **Final Report**
 - The final report is prepared by the project manager and should contain the following information: project performance summary and evaluation of project success, project management performance summary and evaluation of project management success.
- **Senior Management Report**
 - The report to senior management is formatted as a short executive summary of the project evaluation and review report and is the final report prepared by the project manager. This report may be written or presented verbally to senior management, depending on the organization's expectations.

14.1.8 Archiving Project Information

Documents associated with the project must be archived and stored in a safe location where they can be retrieved by other project managers or organizational leaders for future reference. Organizations are legally obligated to store signed contracts or other documents that might be used in tax reviews or legal claims. Project managers must be aware of the organization's policies on legal document storage and retrieval. Many project documents can be stored electronically.

Care should be taken to store documents in a form that can be recovered quickly. If the documents are stored electronically, standard naming conventions should be used so documents can be sorted and grouped by name. If documents are stored in paper form, the expiration date of the documents should be determined so they can be destroyed at some point in the future.

14.1.9 Releasing the Project Team

Releasing project team members is not an official process. However, it should be noted that at the end of the project, you will release your team members and they will go back to their functional managers or get assigned to a new project. You will want to keep their managers, or other project managers, informed as you get closer to project completion so that they have time to adequately plan for the return of their employees. Let them know a few months ahead of time what the schedule looks like and how soon they can plan on using their employees on new projects. This gives the other managers the ability to start planning activities and scheduling dates.

You should also schedule time to celebrate the team's accomplishments and officially recognize team member efforts, thank them for their participation, and officially close the project. A celebration helps team members formally recognize the project's end and brings closure to the work they've done. It also encourages them to remember what they've learned and start thinking about how their experiences will benefit them and the organization during the next project.

14.2 POST-PROJECT WORK

Once the project deliverables are handed off to the relevant parties and the project manager releases the team, there may be additional activities to be performed that were agreed upon in the project charter. Post-project support and evaluations are two examples of work that the project manager may need to oversee before leaving the project.

With some projects, the project sponsor agrees to implement a post-project plan to turn over the project to operations. Software projects need a support team that can assist clients. Buildings have numerous systems in place such as air conditioning and lighting that need maintenance. A project manager who does not plan for what happens with the new product or service after the project closes may end up having to support a continually growing set of products.

You should account for this transition in a set of documents that include support and transition. A support contract defines how the project outcome will be supported for the stakeholders and what additional costs are associated with this support. For contractors, a support contract may be a source of additional revenue for the company but should not be managed by the project team.

Projects for internal customers, especially IT or Business process projects, often result in the unstated expectation that the project team will perpetually support the product. This can overwhelm any team and lead to the project team not being able to take on new projects.

One way of addressing the possibility of the perpetual support expectation is through a “Service Turnover Checklist.” **Service turnover checklists** ensure that the project gets appropriately documented and that the team adequately defines support levels for the new product or service. The turnover checklist will also confirm at what point the project team members are excluded from supporting the additional service. Your organization may have one division devoted to projects and another that manages the ongoing service afterwards. The ongoing support services division will have a part in ensuring they have enough documentation to respond to questions from and provide support to clients.

In larger projects, especially construction projects, the project manager needs to include in their transition plans the documentation for all warranties on equipment and services that were part of the project. These should be organized and provided for the client in a clear, logical fashion. The project manager may also want to provide quotes for ongoing support services from other vendors and extended warranties.

In the end, it is the responsibility of the project manager to ensure that not only is the project completed to the satisfaction of the key stakeholders, but that the key stakeholders also have access to resources to support them in the future, whether they choose to avail themselves of that option or not.

Project management leaders may also conduct **post-implementation audits**, which is a review conducted several months after a project has been completed and delivered to the customer. The purpose of the audit is to assess

CLOSING PROJECTS

whether the project met its objectives, whether the benefits promised in the project plan were realized, and identifies any lessons that can be learned for future projects. This review is essential as it allows organizations to determine the success of their projects and make improvements in their project management processes, leading to better outcomes and increased efficiency in future projects.

15

Your Next Steps in Project Management

Managing projects can be a rewarding experience for people who enjoy diverse job opportunities and working with others to create new and innovative products or services. But sometimes it is difficult to know how to get started. In this chapter, we will discuss steps you can take to start or build your career in project management.

CHAPTER LEARNING OBJECTIVES

- Identify actions you can take to begin your career in project management.

15.1 STARTING YOUR CAREER IN PROJECT MANAGEMENT

To get started in a project management career, consider the following suggestions.

Gain education and certification. Consider obtaining a bachelor's or master's degree in a relevant field, such as business administration, engineering, or computer science. Because project management is a tool used in many industries, you should think about the field you want to be in and learn as much about that field as you can. While you don't need to be an expert to manage a project, it does help if you understand the terminology and processes that are common in your field. For example, if you want to work in construction project management, it would be helpful to understand construction industry regulations, processes, and standards associated with safe practices.

Obtaining a professional certification in project management can also help you stand out among other job applicants. The Project Management Institute (www.pmi.org), for example, offers entry level, advanced, and specialized certifications in project management. The Certified Associate in Project Management (CAPM) is an excellent entry-level certification you can obtain without related work experience. If you have three or more years of work experience, you might consider the

Project Management Professional (PMP) certification. Credentials such as these demonstrate your commitment to being an excellent project manager.

Build practical experience. Gain experience by working on projects in your current job or volunteer for projects in your community. Documenting your experience and responsibilities will help demonstrate your skills and knowledge. For example, you may be able to include on your résumé the group projects you worked on while obtaining your degree, especially if you led the team. If you have worked as a volunteer with an organization and helped plan or manage a project, you can include this information on your résumé. Once you start thinking about all the work you do for your job, community, and education, you will be able to identify many activities that can support your experience with planning and managing projects.

Network with project managers. Join professional organizations and attend conferences and events to network with other project managers and build relationships within the industry. PMI chapters are located worldwide in major and not-so-major metropolitan areas and offer local networking and career development opportunities. Attending chapter events will give you the opportunity to meet professionals working in project management and explore the career opportunities in your area.

Stay current on best practices in project management. Stay current with industry trends and best practices by reading industry publications, attending training and workshops, and participating in continuing education opportunities. The discipline of project management is founded on the basic principles of effective planning and management of projects, but the best practices for planning and managing projects evolve as technology and the workplace evolve. Good project managers keep up with the latest trends in project management through continuous learning and self-development. PMI chapters typically offer learning and development events in your local area, making membership in a local chapter even more beneficial to your career.

Connect with a mentor or career advisor. Find a mentor who can provide guidance and support as you grow in your career. A mentor can also help you navigate the challenges you may encounter in your career.

Deeper Dive

PMI has launched a student and early career web site where you can learn about free and low-cost opportunities for building your project management career.

- [PMI Early Career Resource Page. https://www.pmi.org/pmi-for-students](https://www.pmi.org/pmi-for-students)



Appendix

A.1 INDEX

Refer to the page number after each term for an explanation of the term. Definitions are provided in the following section.

Alternatively, you can visit the PMI Lexicon of Project Management Terms at <https://www.pmi.org/pmbok-guide-standards/lexicon>.

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A.2 END NOTES

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