Project Management

A Guide to the Kepner-Tregoe® Method

KEPNER® TREGOE

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Acknowledgment

Plain and simple, this book could not have been written without the pioneering work of Jim Schlick. As Kepner-Tregoe's head of Product Development in the mid-'80s, Jim surveyed the project management landscape at the time and saw it littered with tools and methods: network diagrams, critical paths, Gantt charts, resource allocation, earned value analysis. What was missing, Jim found, was a simple, systematic, rational approach to defining, planning, and implementing projects.

As he tracked the performance of projects, Jim observed a few important things. Some project managers jumped into various planning activities, without giving thought to why the project was being undertaken. Not surprisingly, the results they achieved were less than successful. Those who followed a more structured, step-by-step thinking process had an interesting habit of finishing on time, within budget, and with the desired results.

Jim researched the best project management tools, charted the thinking processes behind successful projects, and assembled the results into a rational methodology. This methodology starts with framing the project's statement and objectives; moves on to organizing the work, resourcing, and staffing; proceeds to assigning dates and assessing risks; then, focuses on monitoring, modifying, and finally, closeout. For each step in the process, he generated a list of questions that forces project managers to think about why that step is important and what the best way is to accomplish it. What resulted was Kepner-Tregoe's project management process. This process approach continues today to be a distinction and a strength.

Jim Schlick still consults for Kepner-Tregoe as a partner and project management expert. He has served as a mentor to the authors in their professional endeavors, and his ideas form the core of this book.

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CHAPTER ONE

ONE

An Introduction to Project Management

JoAnn Margolis sank into her chair and let out a groan. Things just weren't going as she had hoped. In fact, her life at Genco Inc. had become downright miserable during the course of Project BluePrint, and she wondered what would become of her and her team if they continued to struggle.

"If I had known what was coming, even if it was just an inkling…" she thought, "I never would have become involved…." She pushed the dark thoughts aside and concentrated on the document in front of her. It was a summary that she and her project team had prepared to update the vice president on their concerns with the project. The document stated the project's status honestly; in their last meeting, the team had unanimously decided it was better to be truthful now than to get penalized later. She reviewed the top concerns:

- ✓ *Project team members don't have enough time to complete their work on this project because of other higher-priority projects.*
- ✓ *Project contributors are in constant flux; they have been pulled into other departments, or other projects full time, or have left the organization all together.*
- ✓ *The objectives for the project have changed several times as the project proceeded.*
- ✓ *The internal customers—information technology and product development departments—are unhappy with the results to date, given the money spent (the project is 40% over budget).*
- ✓ *Other people in the company are spreading rumors suggesting that the company plans to jettison the project and the team members along with it.*

- ✓ *The project team believes that the project could have been completed by now if it were not for the lack of resources and the many unexpected problems that have cropped up.*
- ✓ *The project is currently five months behind schedule.*

JoAnn knew that she could add a few more concerns to the list, like her inexperience in conducting negotiations, handling conflict and understanding company politics, and her naïve assumption that most people would understand what needed to be done without having it spelled out for them. But she left these off. Even though she believed that these concerns were not entirely her fault, her reputation as a project manager in the company was already in jeopardy—she didn't need to fan the flames. And besides, the other concerns were just as much to blame for derailing the project as her inexperience.

JoAnn attached the document to her e-mail, and sent it off to the vice president. She was learning, but would it be fast enough to save the project?

There's no getting around it: As a project manager, you've got a tough job. You need to understand the specific content of the project you're managing and also be a master of project management skills. You must be able to balance politics, personal motivations, and unforeseen problems while striving to meet tight deadlines and budget restrictions. In short, you're a bit like a referee in a sporting event: do a good job, and nobody notices. Make a mistake, and everyone points the finger at you as the cause.

Consider our character JoAnn. She entered a politically charged situation when she agreed to manage this project. And she did it without the requisite project management skills and experience, and enough technical know-how. What's more, most of the stakeholders in the company were suspicious of the project and were reluctant to make the necessary commitment, which further impeded her ability to complete it. And the project's sponsors (senior management) saw the intended results as critical to the ongoing success of the company—adding stress to the already pressure-packed situation.

Nevertheless, the company viewed JoAnn as a "can-do" individual and talked her into accepting the challenge fully expecting her to succeed. And though she was a novice at managing projects, JoAnn believed it would boost her career and build valuable experience. She was only half right.

So what do you think of JoAnn's foray into project management? Did JoAnn fail in her planning and execution, or did the people involved not understand the plan, support it, and contribute what was needed to implement it?

Truth be told, it was probably some of both. Effective project management requires the right kind of individual with the right set of skills, experience, and ability. It also requires commitment from the people involved in working on the project, those who will be impacted by it, and those who need to approve it or accept its outcome. But most of all, project management requires the project manager to produce results. When it comes down to it, project management is about doing "things," and getting other people to do "things" in a structured and focused way.

Project management does not have to be a negative exercise. To be sure, the example involving JoAnn and her team was not meant to scare you. There are projects that finish within budget, on time, and with the desired results. And those that do go awry don't usually result in the kind of catastrophe that befell JoAnn and her team. Instead, the JoAnn saga was meant to illustrate typical concerns that project managers encounter on a daily basis, as well as to start you thinking about how you might avoid them by managing a project more effectively.

So where do you start?

When the topic of project management surfaces in the business world, many people automatically envision schedules, budgets, Gantt charts, and software packages that automate planning. That's only part of the picture. While these tools are often integral parts of project management, there are other, more important processes and ideas that are at the heart of a successfully managed project.

As a first step, let's look at the basic definition of a project. A **project** involves a one-time series of interrelated tasks that must be completed within a budget and by a specific time. There are always reasons or needs for undertaking a project, and they will differ from project to project. Here are some typical examples of projects:

- Building a manufacturing plant
- Developing a new product
- Launching a marketing plan
- Installing technology to streamline operations
- Expanding customer service capability
- Upgrading telecommunications
- Moving an office from one location to another
- Developing a new hiring system

The ultimate goal of a project is to achieve desired results or meet a need within the allocated time and cost constraints. This book will present and describe Kepner-Tregoe's time-tested process for successful project management. It's our belief that by following this process, this step-by-step approach, you'll improve your chances of completing your project on time, within budget, and with the desired results.

The pages that follow separate the project management process into three parts:

1. Definition
2. Planning
3. Implementation

In **Definition** (Chapter Two), you'll clarify project objectives and begin determining what activities and resources will be required to complete the project. For example, if JoAnn had started her project by gaining agreement to clear and achievable objectives from senior management, the outcome might have been better. And just as importantly, if senior management had engaged in up-front thinking about their goals and how they could best be met by a project, the results might have been career enhancing rather than career damaging.

In **Planning** (Chapter Three), you'll assign the necessary resources to meet project objectives, sequence and schedule activities, and determine ways to protect and enhance the plan. Senior management unintentionally set JoAnn up for failure by not providing her with the skills needed to manage a project or to negotiate for resources with functional managers, and by not communicating the priority for the project to the rest of the company. On the other hand, JoAnn and her team never took the time to formally plan for things that could go wrong. When problems surfaced, they weren't prepared. The project schedule and budget suffered as a result.

In **Implementation** (Chapter Four), you'll finally start doing the work as planned, monitoring and modifying it to keep the project on track. JoAnn seems to have a firm grasp on monitoring her project, exemplified by her list of clearly written concerns to the vice president. However, monitoring and modifying a project plan during implementation requires much more than the listing of concerns. As our story unfolds, JoAnn and her team are in the middle of a disastrous implementation. Who knows how successful they might have been if the project had been defined and planned effectively?

The project management process presented in this book isn't difficult to understand. Throughout the text, you'll receive special "tips" ☞ that explain how to apply some of the concepts. You'll also encounter "pitfalls" ⚠ that warn you of common mistakes project managers make in certain areas of the process. Reviewing these reminders will help guide

your project management efforts. Further, from time to time, rational process techniques of Situation Appraisal, Decision Making and Problem Solving will be referred to in conjunction with a step in the project management process. Complete readings  of these rational process techniques are included in this book. In the *Join Together* sections you will find information on interacting with people during a particular activity. And in *The More You Know…* sections you will find techniques that may help you manage your project in unique ways.

This process is the result of decades of research and experience in managing both successful and not-so-successful projects. Research conducted by NASA (National Aeronautics and Space Administration) and others as far back as the early 1970s identified characteristics of unsuccessful projects that are still applicable to this day.* They include:

- Starting without a clearly defined reason for doing the project
- Selecting the wrong project manager
- Lack of management support
- Inadequately defined tasks
- Ineffective use of project management process
- Reluctance to end the project

The genius of project management isn't in these ideas, but in their rigorous application to your project. The research has also shown that successful projects share the following common characteristics:

- A committed project team
- Accurate initial cost estimates
- A project team with relevant knowledge and skills
- Funding availability throughout the project
- Effectiveness of planning and control techniques
- Minimal amount of start-up difficulty
- A project team that has more of a task vs. social orientation
- Minimum amount of bureaucracy
- A project manager that is often on site
- Clearly established criteria for success

Throughout this book, not only will you receive detailed instruction on the technical aspects of managing a project, you'll also learn the principles of project communication (in the *Join Together* sections) for gaining commitment and approval from everyone involved in your project. Project communication occurs between the project manager and others throughout a project's life cycle. It is used to give and gather information, gain and test understanding, and determine the appropriate action to take. In addition, in **People in Projects** (Chapter Five) and **Decision Making and Problem Solving** (Chapter Six) you'll find specific concepts, tools, and techniques to add to your project management skills portfolio.

What the symbols mean

 Tips explain how to apply some of the concepts.

 Pitfalls identify common mistakes people make in certain process areas.

 The book icon directs you to where you will find readings on rational process or on project management tools.

* The research was conducted under the sponsorship of NASA, NGR 22-03-028. The complete report is entitled "Determinants of Project Success," by David C. Murphy, Bruce N. Baker, and Dalmar Fisher. It may be obtained from the National Technical Information Services, Springfield, VA, 22151, by referencing the title and the accession number: N-74-30392, September 15, 1974.

CHAPTER TWO

TWO

Project Definition

Moving the Corporate Customer Services department will be a huge undertaking. Although the project manager, Tim Dwight, has seven years of experience in managing complex projects, the rest of the project team is new to the project management game. What's more, many team members hold a personal stake in the outcome of the project; they are members of the Corporate Customer Services department.

During the first project team meeting, Tim explains the decision by the company's executive committee to move Corporate Customer Services. As the team already knows, an old building houses the current offices, and it's not equipped to meet the department's increased technological needs. In addition, Tim tells the group, the executive committee recently agreed to expand the department by adding 45 new people within the next year. The new office provides extra space for the already cramped department and leaves room for the upcoming growth, as well as some additional future expansion. It also allows the company to upgrade the technological capabilities of the department and its work environment. New furniture and décor will be part of the plan.

By the end of the meeting, the group knows that they have three months to plan and conduct the move, and that the budget, provided to them by the executive committee, is $170,000. They also understand the need for a smooth, well-managed move, and the reasons behind the deadline.

Why are you doing this project?

Too often, project teams begin to plan a project before they have taken the time to truly consider why they are doing it, how they are going to do it, and what it's going to take to get it done. There is a tendency to start out by building Gantt charts—and project management software prompts this behavior—without considering the fundamental purpose of the project. Jumping to the creation of time lines is often the first wrong step taken by project teams destined for trouble.

So think about—and then answer—the above questions before you jump into project planning. If you need some help, consider the following:

- The reasons why the project is necessary for your department, organization, client, community, or yourself
- The overall purpose of the project
- The threats, opportunities, and needs that are driving the project

Capture this "why" information as background for the project; you'll use it as you create a project statement and develop objectives, and you may decide to also use it to demonstrate the thinking that occurred prior to the start of the project.

☞ Tip

Sometimes background information may be provided to you by senior management in a **project charter** or a signed contract. Such a document formally recognizes the existence of the project and gives the project manager the authority to spend resources on project activities. The charter or contract will include the business need for undertaking the project and the results to be delivered. It could also include preliminary product/service descriptions that will have to be refined as the project progresses.

With your background information in hand, you're ready to start the first part of the project management process—Definition. During Definition, you'll answer four basic questions:

- What is the project statement?
- What are the project objectives?
- What needs to be accomplished to complete the project?
- What resources are needed to complete the project?

This information will provide you and your project team with a framework that will guide the planning and implementation of your project.

Four activities will help you find answers to these questions:

- State the Project
- Develop Objectives
- Develop the Work Breakdown Structure
- Identify Resource Requirements

STATE THE PROJECT

Stating the project is the first step in Definition. A **project statement** is a clear, concise phrase that describes the project's overall goal, as well as its time and cost boundaries.

"Move the Corporate Customer Services department within three months at a cost not to exceed $170,000" is an example of a project statement. We will use this example throughout this book. It contains three elements: 1) An action word with an end result (this is called the "**performance**" element); 2) A target date for completion (the "**time**" element); and, 3) An overall project cost (the "**cost**" element). A triangle often serves as a visual representation of these three elements, indicating the need to balance all three.

Take note: The project statement is not merely a group of words; the three elements shouldn't be plucked from the sky, nor should they be a product of one person's or one group's demands. Instead, the project statement should reflect, at a very high level, the reason for doing the project.

To accurately assess project timing, consider how much time it has taken your organization to complete similar projects in the past. In addition, think about when you'll need to complete the project in order to gain or optimize its benefit.

You may be uncertain about including a budget limit in your project statement. However, it makes good sense to do so even at this early stage. By examining cost realistically, you can change the end result—or even the scope—of your project. For example, after estimating how much the project will cost, you may discover that the expected benefit does not justify the cost of the project. If you're struggling to calculate the cost of a project, don't take a "wild guess." Instead, wait until later in Definition or Planning (when you'll have factored in the specific cost of resources).

Developing a project statement will focus members of the team on the intended outcome of the project. It will also ensure that everyone involved has the same understanding of what the project will accomplish, by when, and for how much.

JOIN TOGETHER

When you develop the project statement, involve project team members, key contributors, key stakeholders (including sponsors and functional managers), customers, and experts. Refer to the following bulleted list for a description of each group:

- **Project team members** are people designated by you or someone else to be on the project team. The project team usually produces the bulk of the project work.

Tip

If you are struggling to come up with time and cost information for your project statement, use ballpark figures until you can get better information. This technique will prompt others to audit your figures and provide you with a better time frame or a more realistic cost.

Tip

Use the project statement as a communication tool by keeping it visible on all project documentation.

Pitfall

Don't be overly influenced by the time and cost of similar projects you've managed in the past. If your current need requires completing the project significantly faster, at less cost, or at a different quality level, then design the work or solution differently from previous projects.

- **Contributors** are people who are not on the project team but are asked to contribute their time and/or effort to the project.
- **Stakeholders** represent people who are impacted by the project now—or will be in the future. Some stakeholders will exert enormous influence on the project, like sponsors who typically provide the political, financial, and logistical support, champion the project, and approve the results; others, like functional managers, provide human and other resources such as equipment, facilities, etc.
- **Customers** refer to people for whom the project results are produced; they can be internal or external customers, and usually are also considered stakeholders.
- **Experts** (also known as Subject Matter Experts or SMEs) are individuals who hold special experience, knowledge, or skills that relate to the planning or implementation of the project. They're also considered contributors.

You'll need the commitment and involvement of all of these groups to the project. For example, they may possess critical information that you need to formulate the project statement. Including them in your discussions will increase the probability of winning their commitment and harnessing their knowledge up front…and throughout the life of the project.

However, keep in mind that gaining agreement on a project statement may not always be easy, especially if the need for the project (and its value) is not clearly understood among the people involved. If necessary, tap into the list of threats and opportunities that the project will address (you prepared this list prior to Definition), and present it to those involved in project statement discussions. This will demonstrate your thinking, compare it to the thinking and expectations of others, and focus attention on a project statement that best represents what the project should accomplish. Situation Appraisal is a rational and effective method for identifying, clarifying, and prioritizing threats and opportunities. This method is described in more detail on pages 118–121.

☞ Tip

Even after you've agreed on a project statement with everyone involved, you may need to revise it during Definition and Planning. Go ahead with the revision if it improves the accuracy and relevancy of your project statement.

pp. 118–121

THE MORE YOU KNOW...

It's possible that several different projects could address the same set of needs. If this is the case, develop a project statement for each project. Then, compare the project statements and select the one that will best meet your needs with the least amount of risk and potential adverse consequences. (Keep in mind that you may be forced to go further into the definition and planning of each project to make a fair and accurate comparison. If you invest the time to do this, try combining details of several different projects to create a superior hybrid.) For more information on choosing between alternatives, see pages 122–126 on Decision Analysis.


pp. 122–126

Before you move to the next activity, take a step back and critically assess your project statement. Are you certain that the project should be undertaken? Are you sure that the project, stated as is, will meet the need or resolve the concern? Confirming that your organization should, in fact, do the project—and that the project will meet the need—is the first step towards a successful project.

DEVELOP OBJECTIVES

Tip

Objectives should communicate the specific value the project will deliver, *not* how the project will be completed.

At the outset, we recommended that you think about and record the reasons why you're doing this project. Now you'll develop **objectives**, the next activity in Definition. Objectives will further clarify and expand on the reasons for undertaking this project.

Project objectives should be written as short statements and should describe 1) specific results and value that the project will deliver and 2) constraints within which the project must be completed.

To develop project objectives that represent **results**, ask the following questions:

- What do you want to have at the end of the project in terms of benefits or capabilities?
- What value should the project produce?
- How will you know when you satisfy each objective? (measure and standard)
- What short- and long-term benefits do you want?

pp. 14–15

Your answers will reflect things like: impact on market size, market share or margin; customer satisfaction; quality levels; business and financial results; technological innovations or trends; organizational issues; and, facilities and equipment usage. (For a complete list to consider when developing objectives, review Helping You Develop Objectives on pages 14–15.)

Example 2-1 shows objectives developed for the project statement, "Move the Corporate Customer Services department within three months at a cost not to exceed $170,000." Objectives 1 through 4 represent results.

Example 2-1: Project Objectives

Project Statement

Move the Corporate Customer Services department within three months at a cost not to exceed $170,000

Project Objectives

At the end of the project, we will have:

1 Maximized the ability to quickly revise future office layouts
2 Minimized barriers to information flows (including voice, data, document, and interpersonal communication) among department offices
3 Minimized overall traffic by creating the shortest, most direct traffic flows within office space
4 Provided for current and future storage space
5 Met corporate requirements for minimum office floor space; lighting levels; heating, ventilation, and air conditioning (HVAC); background noise levels; work space ergonomics
6 Not exceeded $100,000 in external costs for moving equipment and furnishings
7 Completed the move within three months
8 Maximized effective use of existing equipment
9 Not interrupted current customer requirements and workload
10 Not exceeded $70,000 for new equipment and office furnishings
11 Fit office layouts within allocated office area
12 Brought all computer and telecommunication equipment up to corporate standards
13 Complied with government safety and health regulations

Project objectives that represent **constraints** will expand on the boundaries that you set in the project statement, and will also consider other restrictions. To write project objectives that represent constraints, ask the following questions:

- What requirements must be met?
- What constraint, restrictions, or resource limitations do we face?
- What resources should be used or saved?

Each project objective should contain a clear measure and standard of performance. Try including the phrase, "as shown by…" or "as measured by…" at the end of each objective. Then, complete the phrase with information on how you expect to measure the objective and what level of performance you expect, such as a specific number or an agreed upon value. For example, if your objective is to "Maximize the ability to quickly revise future office layouts," then you can measure the objective by the total number of hours it will take to revise the layout for a workstation and set the standard at "not more than ___ hours per workstation." Or, you can measure the objective by the total cost to revise the layout for a workstation and set the standard at "not more than ___ cost per workstation." Metrics like these give the people who have to revise the layout a very precise idea of the scope of the work.

Again, review the project objectives in Example 2-1. Objectives 5 through 13 are constraints.

Most projects will have more objectives dedicated to results rather than constraints, but this isn't a universal formula. Some projects will require you to work within very strict boundaries (many constraints), while others will be entirely flexible (few or no constraints).

The primary reason for developing objectives is to provide you and other project participants with a basis for defining the specific work that needs to be done to complete the project. However, project objectives also focus the project team by guiding their decisions, and offer other interested stakeholders and customers a summary of the project's intent.

JOIN TOGETHER

The project communication that began around the project statement should continue while you are developing objectives. Once again, securing the commitment and experience of your project team members, stakeholders, customers, experts, and key contributors will be critical to the success of your project. Individuals in each group can contribute to the development of objectives in several ways—by surfacing the original ideas, writing the objectives, refining the objectives, suggesting ways to measure the objectives, or reviewing the entire list of objectives. However, it's critical that you, as the project manager, ensure the list of objectives is reasonable, and accurately reflects what value your customers expect to receive from the project.

☞ Tip

When developing objectives with large groups of people, using creative techniques such as brainstorming or **Nominal Group Technique** (NGT) will encourage the involvement of everyone in the group. NGT prevents excessive influence by a few individuals by asking everyone to generate ideas anonymously. These ideas are then collected and written on easels or white boards. Next, the ideas are clarified in full group and each individual short lists the ideas they think have high priority. Finally, the highest priority ideas are selected from among this shortened list.

THE MORE YOU KNOW...

In some cases, you may find it effective to split project objectives into two different categories. The first category represents primary results and restrictions that will be directly addressed by the project. Designate these under the heading, "At the end of the project we will have…." The second category represents indirect benefits and less important restrictions. These can be designated under the heading, "Other project objectives are…."

It's possible that some project objectives absolutely must be met, while others can be satisfied to varying degrees. The absolute requirements are called **Must objectives.** These objectives should be mandatory, have a set limit that must be met, and be realistic to accomplish.

Helping You Develop Objectives

Project objectives are critical to a successful project outcome because they establish the criteria that you'll use to make decisions about the project and guide the project team.

If you're struggling to compile a complete list of objectives, or if you want to brainstorm additional objectives to make sure you have thought of everything, use the list below to stimulate your thinking. For each thought starter, ask yourself, "How should (thought starter) influence my choice?"

Thought Starters

Human Resources
- Motivation and attitudes
- Skills and ability
- Performance and productivity
- Development and growth
- Health and safety
- Equal rights and opportunities

Facilities and Equipment
- Space
- Flexibility and adaptability
- Location
- Compatibility

Organization
- Relationships among units, functions, individuals
- Discussions
- Responsibility and delegation
- Formal and informal organization
- Coordination
- Information systems

Material
- Sources and availability
- Quality
- Grade
- Handling and storage

External Influences
- Economic trends
- Competition
- Vendors and contractors
- Company image, positioning
- Law and government
- Environment
- Community
- Technology

Output
- Quality
- Quantity
- Pace and timing
- Distribution

Money
- Capital or fixed costs and expenses
- Support, maintenance, and life cycle costs
- Price
- Margin or profit
- Return

Ideas and Process
- Security, proprietary position
- Knowledge capture and retrieval
- Research
- Capabilities
- Networks

Strategy
- Competitive advantage
- Target market
- Product platforms and mix
- Market size
- Market share
- Key strategic indicators

Time
- Life span of project
- Life span of output
- Time to first return

Customers
- Marketing
- Sales
- Support
- Location

Personal
- Goals and plans
- Family
- Strengths and weaknesses
- Interests
- Values and beliefs

Example 2-1 contains a Must objective: Office layouts must fit within allocated office area.

The remaining objectives can be classified as **Want objectives**. Although they may be important to accomplish during the project, they do not have an absolute minimum or maximum threshold that must be met. "Minimized barriers to information flows" in Example 2-1 is an example of a Want objective. For more information on Must and Want objectives, see Decision Analysis on pages 123–124.

 pp. 123–124

Finally, you, your project team, and the customer will use project objectives to assess progress and evaluate performance. After the project has been completed, you'll ask, "How well did we meet each objective?" The answers will help you and your customer create a "report card" at the end of the project.

Make sure no objective is repeated or contains more than one requirement, and that all of your objectives represent "why" you are doing this project rather than "how" you plan to do it. Some characteristics of good and poor objectives that you can use to audit your project objectives are listed below.

Good Objectives are…	Poor Objectives are…
Stated in terms of specific end results	Stated in terms of activities, deliverables, features, or processes
Each limited to a single important result	More than one objective in the statement
Clearly stated	Compound, too broad
Achievable in a stated time period	Never fully achievable; in a stated time period
Related to the outcome of the project	Ambiguous in defining what is expected
Important to the success of the project	Not of real consequence
Precisely stated in terms of quantities, where possible	Too brief, indefinite, long, or complex
Definite measurement standards and methods	Theoretical, idealistic, or impractical
Formally documented	Verbalized only; assumed to be understood by everyone
A mix of short- and long-term objectives	Either all short- or long-term focused
Unique	Duplicates or restatements of other objectives

On some occasions, a single objective may mean different things to different people. It's very important to express what you're trying to achieve when you write an objective so that it's clear to you and to others. There's a tendency to want to get away with a minimum number of words. Thus, people may abbreviate objectives into a few terse words and subsequently cause major communication difficulties. It's always worthwhile to ask, "Is (objective) understandable to someone other than myself?" or "What do I/we mean by (objective)?"

DEVELOP WORK BREAKDOWN STRUCTURE

Your project statement and objectives should communicate *what* you're doing and *why* you're doing the project, as well as the boundaries you'll recognize. The next activity, Develop Work Breakdown Structure, will communicate *how* you'll do it.

A **work breakdown structure (WBS)** identifies the scope of all the work to be accomplished during the project and organizes it to show how all the pieces fit together. To create a WBS, follow these steps:

1) Review the project statement and objectives. The WBS organizes the work that's necessary to accomplish your project goals. It is the skeleton on which the whole project rests. The quality of the choices made in defining the organization of the work could mean the difference between a successful project implementation or a "death march." So it's important that when developing the WBS, you remember why you are doing the project in the first place.

2) Create a list of major deliverables that represent the project's overall output. To identify each major deliverable and accomplishment, ask:
   - ➢ What are the major components that must be produced to meet project objectives?
   - ➢ What are the major achievements that must be accomplished to meet project objectives?
   - ➢ What categories or groupings represent work that should (logically) be managed together?

   Your answers to these questions will begin to identify major deliverables that will, in turn, provide the framework for the remainder of the work breakdown structure.

3) Separate each major deliverable into sub-deliverables. This involves breaking down each major deliverable into its component parts. To help you separate, ask:
   - ➢ What needs to be done to produce this major deliverable?
   - ➢ If we were to watch this actually being done, what activities would we witness being completed?

   Your answers will become sub-deliverables.

   In addition, sometimes it will be useful for you to break down your sub-deliverables into sub-sub-deliverables.

   A good rule of thumb: Stop breaking the work down when you've reached the point where primary responsibility can be assigned to one person or one group and a reasonable estimate can be made as to what kind and how many resources you'll need. This is the point

☞ Tip

Several major deliverables may support a single project objective or multiple project objectives may be supported by one major deliverable.

☞ Tip

Should you record "Report written" or "Report" to describe writing a report? Both methods are acceptable, but the first better communicates the desired output (report), the mode (written versus printed or copied), and specific scope (written versus outlined, summarized, or delivered verbally).

How Do Your Work Packages Measure Up?

Review your work packages. Do they contain **performance standards**? Performance standards describe the expectations for the work; ensuring their integration into your work packages will clarify exactly what needs to be done. Performance standards can appear in the following forms:

1. Design specifications—describe the work package output in terms of physical characteristics. For example, a work package to "dig a house foundation" may state it should be dug exactly five meters deep, 20 meters wide, and 30 meters long.
2. Performance specifications—operational capabilities the work package must achieve. For example, a work package to "produce a racing engine crankshaft" could state that it must be capable of turning 15,000 revolutions per minute for four hours before failing.
3. Functional specifications—similar to performance specifications, these describe the required end use. For example, a work package to "produce a computer training room" might say the room must accommodate up to 12 people for training in project management software. It doesn't specify type and quantity of computers, size of room, etc. This gives those responsible for the work package more latitude to find creative, less expensive, and/or better ways to meet the goal of software training for 12 people at a time.

Use the type of performance standard that best reflects the results you want to achieve. It's possible that more than one type of performance standard is needed to describe all aspects of a work package's desired output.

Record performance standards, assumptions you make, and further details about the work in a **work breakdown structure dictionary**. A work breakdown structure dictionary is a compilation of the details and history of the project. It will help ensure that work is well understood and can be resourced, planned, and implemented accurately. This will be especially helpful for tasks that are complex, new, or are likely to be handed off during the project. Software packages often allow for the creation of work breakdown structure dictionaries.

where you'll feel comfortable handing the work to someone else, knowing that they'll understand what needs to be done.

The lowest level deliverable is called a **work package**. This is the level at which responsibility is assigned, resources are consumed, and work is completed. (For more information on separating and clarifying, see Situation Appraisal on pages 119–120.)

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4) Select a type of structure for your work breakdown structure. A project structure is a way of organizing major deliverables that will make it easier to manage and communicate. Here are some common types of structures:

   - ➢ Product-based (major deliverables organized by tangible outputs)
   - ➢ Process-based (major deliverables organized by workflow)
   - ➢ Phase-based (major deliverables organized by stages)
   - ➢ Resource-based (major deliverables organized by type of resource)

   Sometimes, the project work suggests an approach naturally; other times you'll need to think about which approach will best help you

⚠ Pitfall

Don't separate deliverables into too much detail! This will complicate the project and make it difficult to monitor during implementation. The level of detail in the WBS should represent the level of detail that will actually be managed by the project manager. Any more detail than necessary and the WBS becomes a blueprint for communication overload.

manage and monitor the project. For example, most research and development project managers choose a phase-based approach for structuring project work. Because future work often depends on the result of current work or research, it makes sense to organize the work in phases like discovery, validation, prototyping, etc.

At this point, you may consider breaking off a piece of the project and treating it separately as a subproject. For more information on subprojects, see Splitting Projects into Subprojects on pages 28–29.

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5) Record the relationship between major deliverables and work packages. Each deliverable should be equal to the sum of its work packages. In other words, completion of sub-deliverables should, by definition, complete a major deliverable. Look at major deliverable 1. Office Layouts in Example 2-2. It's broken down into three sub-deliverables (1.1 Relationship charts prepared, 1.2 Department block layouts drawn, 1.3 Department detailed layouts drawn). As a result of completing these three sub-deliverables, "Office Layouts" is completed. Also notice that deliverable 1.1 is further broken down into two sub-sub-deliverables (1.1.1 Interviews conducted and 1.1.2 Relationship charts prepared).

☞ Tip

How do you know which work "goes together" to form a major deliverable? Group the work together according to these criteria—work that will be accomplished during the same time period, share similar resources, be tied to the same output, be funded in the same way, or be done in a particular way because of how the organization is set up.

Example 2-2: Work Breakdown Structure—Indented Outline

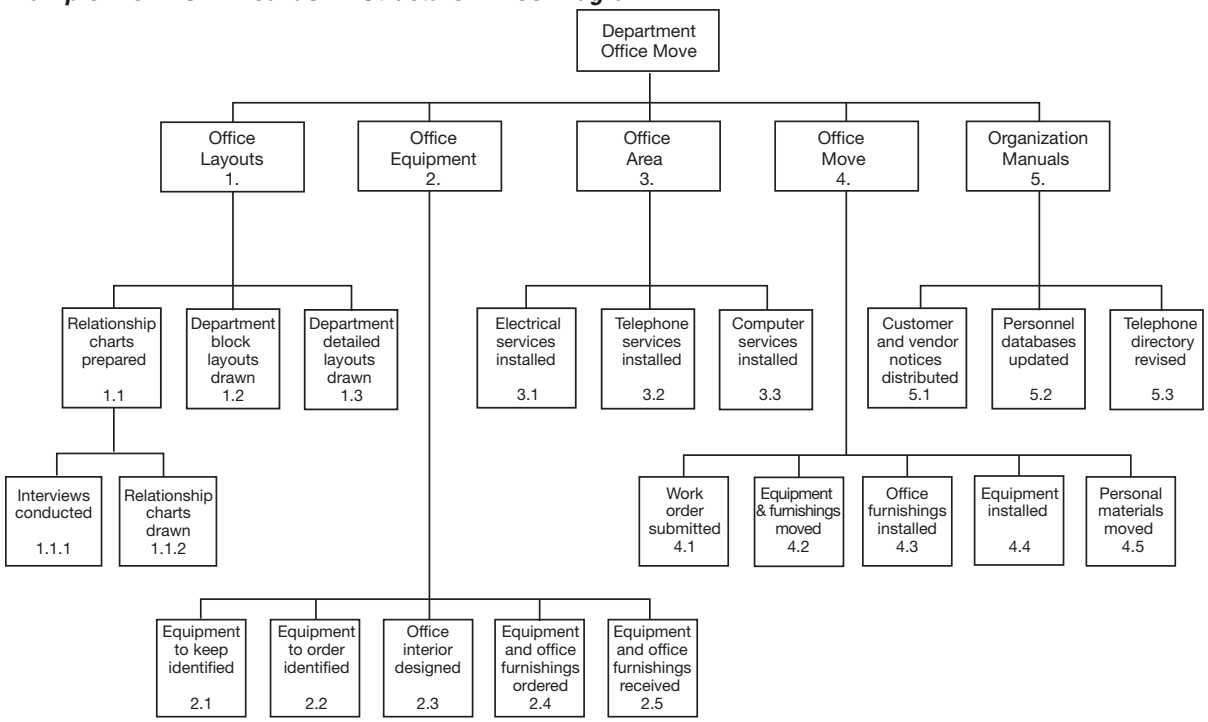
Project Statement

Move the Corporate Customer Services department within three months at a cost not to exceed $170,000

Work Breakdown Structure

1. Office Layouts
   - 1.1 Relationship charts prepared
     - 1.1.1 Interviews conducted
     - 1.1.2 Relationship charts drawn
   - 1.2 Department block layouts drawn
   - 1.3 Department detailed layouts drawn
2. Office Equipment
   - 2.1 Equipment to keep identified
   - 2.2 Equipment to order identified
   - 2.3 Office interior designed
   - 2.4 Equipment and office furnishings ordered
   - 2.5 Equipment and office furnishings received
3. Office Area
   - 3.1 Electrical services installed
   - 3.2 Telephone services installed
   - 3.3 Computer services installed
4. Office Move
   - 4.1 Work order submitted
   - 4.2 Equipment and office furnishings moved
   - 4.3 Office furnishings installed
   - 4.4 Equipment installed
   - 4.5 Personal materials moved
5. Organization Manuals
   - 5.1 Customer and vendor notices distributed
   - 5.2 Personnel databases updated
   - 5.3 Telephone directory revised

Example 2-3: Work Breakdown Structure—Tree Diagram



There are several tools you can choose from to depict this relationship. The two most common are the **indented outline** and the **tree diagram**. Example 2-2 depicts an indented outline. As you can see, the levels of work are indented, and numbering is shown as a 1, 1.1, 1.1.1 system. A tree diagram, on the other hand, is found in Example 2-3. It shows the relationships between work packages and deliverables using lines and boxes.

6) Review the work breakdown structure. This activity should not be a mere glance at your outline or diagram. Rather, it should be a close examination to ensure that all project objectives are supported by the work described, and all work packages support at least one objective. To review your work breakdown structure, ask:

   - ➢ What objective does this work package support? (If it doesn't support an objective, it doesn't belong in your work breakdown structure.)
   - ➢ Are all of the project objectives sufficiently supported by the work described? (If they are not, this may be an early sign you won't achieve all of your goals.)

☞ Tip

It may be a good idea to include such work as planning the project, managing the project, conducting project meetings, and closing out the project in your WBS to get a better sense of the total scope of the project.

- Can all work packages be assigned resources and responsibility? (If not, then the work packages may be poorly worded, frivolous, or in need of further clarification or separation.)

Developing a work breakdown structure will help you and the project team determine how you'll accomplish the project objectives. It will also communicate to the project team how much and what kind of work will be expected on the project, and to some extent, how that work will be managed and controlled. When you have the work breakdown structure in place, you and your project team will have the basis for establishing resource requirements, budgeting and pricing, assigning responsibility, sequencing and scheduling, and reporting for project monitoring.

JOIN TOGETHER

Consider involving the same groups of people (project team, stakeholders, experts, customers, key contributors) you included in discussions on project statement and objectives…with one exception. If possible, invite current and past project managers who have managed similar projects to help develop or review your work breakdown structure. Perhaps more than anyone else involved, they will help you identify omissions, areas for improvement, and potential problems and opportunities.

Keep in mind, however, that you should set expectations about the level and extent of each group's participation. As project manager, you can choose to develop the work breakdown structure alone, develop it by involving others in decisions about structure and content, or assemble a group to develop the entire thing. Your choice should be driven by a need for commitment to the project's implementation, as well as availability of information. For more information on managing the involvement of others, see Managing Involvement on pages 100–104.

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THE MORE YOU KNOW...

It's possible that, in your organization, nothing like the project you're going to do has ever been done before. In fact, it's possible that nothing like it has ever been attempted. There are no previous project managers or internal experts to consult, and consequently, you may find it difficult to anticipate the work required beyond a short time frame. What's more, the structure and type of future work may depend upon the outcome of work in the near term. If this is the case, consider using a technique called **moving window** (also known as **rolling wave**) to plan your project by phases. At agreed-upon time intervals, you and the project team will meet to flesh out the project plan, including more details as necessary to implement and control the next phase of the project.

IDENTIFY RESOURCE REQUIREMENTS

Once you've established what you are going to do (project statement), why you are going to do it (objectives), and how you're going to do it (work breakdown structure), you can identify what and how many resources are required to get it done.

Think of the work breakdown structure (which you developed in the last activity) as a series of project outputs—a collection of major deliverables that describe what work will be completed. If the work breakdown structure is the output, then **resource requirements** are the inputs—things that the project will consume in order to produce the outputs.

The approach to developing project resource requirements consists of identifying three elements for each work package:

1) Type of resources that will be required
2) Amount of each type that will be needed
3) Cost of the resources

Identify which of the following *types* of resources you'll need to complete each work package—human, facilities, equipment, materials and supplies, and "special" resources.

Frequently Forgotten Resource Requirements

Have you ever left for a long business trip or vacation, only to be plagued by the feeling that you've forgotten something? Well, before embarking on your project management journey, make sure you include all resource requirements—even the ones that project managers most often forget.

- ✓ Cost-of-living adjustments, especially if the project has a lengthy time line
- ✓ Off-site differentials (labor and material costs may differ significantly in other locations)
- ✓ Equipment costs to perform or measure special operations
- ✓ License, permit, or certification costs
- ✓ Tariffs and duties
- ✓ Currency exchange
- ✓ Rush charges
- ✓ Overtime
- ✓ Documentation and reporting
- ✓ Planned rework

The Guess Work in Estimating

Identifying resource requirements requires you to estimate how much of those resources you will need. The three generally accepted estimating methods for project management are:

- ✓ Analogous—you establish a total cost based on the typical cost of similar projects, and then assign a percentage of the costs across the major deliverables. This estimate is developed to test the available budget.
- ✓ Detailed—you establish the total cost by adding the cost of all the work packages.
- ✓ Parametric—you use accepted norms for incremental pricing to obtain the estimate. For example, it will cost $.20 per square foot to carpet your office.

There are also three different types of estimates you can produce. The type you choose should depend first on how rigorous you need to be to satisfy project stakeholders, and then on how rigorous you need to be for planning purposes.

- ✓ Order-of-magnitude—primarily used for determining project feasibility (accurate from -25% to +75%). This is calculated at the major deliverable level.
- ✓ Budget—rely on previous project data and benchmarking, and is used for general planning and budgeting (accurate from -10% to +25%). Budgets are calculated the sub-deliverable level.
- ✓ Definitive—based on the detailed work plans and resource charts, and used to manage project performance (accurate from -5% to +10%). A definitive estimate is calculated at the work package level.

☞ Tip

Use project team members and contributors to brainstorm a list of all the resources you'll need to complete this project. Then, identify which resources will be required for each work package.

- ➢ **Human resources** identifies specific professional and technical skills, and the knowledge and experience the work package will require
- ➢ **Facilities** refers to the specific type of location, space, or work area required (physical plant)
- ➢ **Equipment** represents the tools, machines, or systems needed (electrical or mechanical and reusable)
- ➢ **Materials** and supplies are the raw materials, purchased goods, parts, sub-assemblies, supplies, books, or documents required (consumables)
- ➢ **Special resources** refer to anything that might not be commonly available in your organization and that could require special effort to obtain. For example, if a compact disc manufacturer needed gold to complete a project, it might be considered a special resource since it's not something the organization uses regularly.

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Not all of these resources will come from within your organization. If you need to explore outside vendors, it's important to know more about contracts. (See Contracts for Survival on pages 29–30.)

Once you've identified the type of resources you'll need to complete each work package, you can determine the *amount* of each resource the work package will require. For example, look at work package 3.1 in Example 2-4. For knowledge and skills, the project team determined it

would require two people with electrical skills working for three days for a total of 48 hours (based on the assumption that it would take one hour to hook up each workstation); and, someone from facilities to oversee the work. For materials, it was determined that electrical wiring (cable and connectors) would be needed for 48 workstations.

Now that you've determined the type and amount of each resource needed for each work package, you'll need to estimate the total *cost*. Do this by multiplying the cost per unit of a specific type of resource by the amount of units needed. For example, if a work package calls for someone with "database administration skills" to spend 18 person-days, and the cost is $400 per day, then the total cost for this resource would be $7,200 (18 x $400 = $7,200). Example 2-4 displays the resource or skill needed, percentage of time allocated to each work package, and a cost estimate.

When you estimate the time you'll need for human resources, use units that represent actual **time-on-task** rather than the overall duration of the task. For example, if you'll need a technical writer for four hours a day, two days a week over the course of three weeks, the total time will be 24 hours (4 x 2 x 3 = 24), not three weeks.

To complete your cost estimate, total the resource costs for each work package, then total the resource costs for each major deliverable. Finally, total all of the major deliverables to determine overall project cost.

Alternatively, it may be important to total resource costs by type. For example, you may want to separate total equipment costs if they represent a cash outlay as compared to human resources that will be accounted for only as an internal billing charge to the project.

Identifying resource requirements will help you assess the total effort required to complete the project—giving you, as well as management and other project stakeholders, an understanding of the true cost of the project. In addition, outlining resource requirements at the beginning of a project will provide you with a basis for controlling project costs and monitoring resource use during implementation. It is the starting point for establishing the **code of accounts** or **chart of accounts**. These terms refer to the numbering system that will identify and track cost for each work package by type of expense, such as labor, materials, equipment, etc. Your organization's finance or accounting department may have a chart of accounts in place that apply here.

JOIN TOGETHER

Once again, you should rely on your project team and experienced project managers for input. However, also include the human resources themselves as well as their managers, since they usually have the best estimates as to how much time and effort it will take to complete their

piece of the project. Including your resources will help you gain their commitment to the project. Involving the managers will enhance their willingness to release the resources to your project.

In addition, include experts who can provide initial estimates and validate estimates based on experience. Historical documents and com-

Example 2-4: Resource Requirements

	Knowledge/Skills				Facilities				
Work Packages	Type	Amount	Unit Cost	Total Cost	Type	Amount	Unit Cost	Total Cost	Type
2.3 Office interior designed	Interior design skills	1x4 days = 32 hrs	$150 per hr	$4,800					
	Facilities management skills	1x2 days = 16 hrs	$0	$0					
	Department knowledge	3x1/4 day = 6 hrs	$0	$0					
	Project management skills	1x1/4 day =2 hrs	$0	$0					
	Engineering skills	1x1/4 day = 2 hrs	$0	$0					
2.4 Equipment and office furnishings ordered	Purchasing skills	1x1/2 day = 4 hrs	$0	$0					Workstations
	Facilities management skills	1x1/4 day = 2 hrs	$0	$0					
2.5 Equipment and office furnishings received	Receiving/ storing skills	1x1 day = 8 hrs	$0	$0					
	Facilities management skills	1x1/4 day = 2 hrs	$0	$0					
3.1 Electrical services installed	Electrical skills	2x3 days =48 hrs	$65 per hr	$3,120					
	Facilities management skills	1x1/2 day = 4 hrs	$0	$0					
Totals				$7,920				$0	

mercial cost estimating databases can also be helpful, if you have access to them.

It may also be useful to divide identifying resource requirements into two rounds. In the first round, you'll calculate an initial estimate with the help of others. In the second round, you'll review the initial estimate with

Equipment			Materials				Special Resources				($)	Notes
Amount	Unit Cost	Total Cost	Type	Amount	Unit Cost	Total Cost	Type	Amount	Unit Cost	Total Cost		
							Travel/ Entertainment			$250	$5,050	Assumes designers will want to tour site Assumes 3 department mgrs.
12	N/A	$70,000	Purchase orders	N/A	N/A	$0					$70,000	Assumes 12 new workstations $70,000 is a discounted price
			Electrical wiring	N/A	N/A	$6,000					$9,120	Assumes electrical service for 48 work stations and 1 work station per hour to wire Assumes 2 electricians Assumes cabling runs and connections for 48 workstations
		$70,000				$6,000				$250	**$84,170**	

☞ Tip

If you make assumptions when estimating the type, amount, or cost of resources, document them in the work breakdown structure dictionary and attempt to confirm them with experts or stakeholders.

☞ Tip

You need to account for a resource's time on your project *even if* your organization does not account for their internal billing rate. This will help with scheduling from a limited pool of resources that is required to support several projects.

☞ Tip

You also need to understand the burden rates for work groups and departments. Many salaried organizations can only come to terms with human resource capacity constraints when they see the financial implications of adding more projects to their portfolio.

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the same resources, as well as with others who can spot inaccuracies, oversights, or shortcuts.

THE MORE YOU KNOW...

You may want to do a cost/benefit analysis before implementing your project. Once you've established the overall cost of the project, you'll be able to compare it with the value described in the project statement and objectives. This will confirm whether you should continue defining and planning the project, whether adjustments need to be made, or whether the project should be completely rethought, delayed, or abandoned.

If adjustments need to be made at the work package level, examine the work packages and ask:

- How does this work package help us reach our objectives?
- Can we eliminate this work package and still meet the objectives?
- Is the cost for this work package greater than the value it delivers?
- Does this work package create more value, functionality, or reliability than is needed?
- Is there an alternative way to accomplish or complete this work package so that it has a better benefit-for-cost ratio?

There's also the possibility that you'll choose between several alternatives when selecting a resource. If this is the case, there are a number of variables to consider including things like:

- Geographic locations
- Transportation options
- Local/federal laws and regulations
- Organizational policies and procedures
- Industry best practices
- Political dynamics
- Availability of resources
- Time needed to acquire new capabilities

For more information on making a decision, see pages 122–126 for a description of Decision Analysis.

Dealing with uncertainty is almost unavoidable when it comes to estimating the amount and cost of resources. Therefore, many project managers tend to *overestimate* to ensure that they don't "blow the budget." After all, it's much easier to explain why you performed under the budget than why you overshot your mark.

Common methods for preparing for the unexpected include contingency planning, backup resources, and reserve funds. All three (and there are others) basically refer to built-in "space" to accommodate the unex-

pected. Some project managers increase the amount of particular resources needed, others increase the duration of specific tasks, and still others use multipliers to pad their estimates. In some organizations, a contingency fund is established in case resource estimates prove inaccurate, significant changes in scope occur, or unanticipated threats alter the project plan. However, a project manager must present clear, documented reasons for tapping reserve funds, and often, approval must come from management.

The best way to handle uncertainty isn't to randomly pad your resource requirements. Rather, it's to examine the likelihood that an estimate will be inaccurate, the potential magnitude of the difference, and what the impact will be to the overall project (and organization) if it's incorrect. For example, estimating resources and costs associated with work packages that have not been done before will probably have a high likelihood of being inaccurate. In this case, you may want to overestimate. For more information on planning for what could go wrong, see Protect the Plan on pages 54–58.


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Pitfall

Don't overestimate just to avoid rigorous estimating. Overestimating work package requirements without precise calculation can result in an inaccurate overall estimate. This could threaten the approval of the project, or occupy resources that could be better spent elsewhere.

ADDITIONAL DEFINITION TOPICS

CHOOSE TO WIN: SELECTING A PROJECT MANAGER

Organizations around the world embrace project management as the way they accomplish work. Not surprisingly, the role of the project manager has become increasingly critical, and the demands and responsibilities of the job have grown.

As a project manager, you're sensitive to the needs of the project, and smart enough to sell it to senior management and other stakeholders. You work effectively with theoretical-minded scientists and researchers while still staying within the budget. And you balance the differing schedules and work styles of creative individuals like graphic designers and software programmers with the need to meet deadlines. Sound a bit like a superhero?

Well, that's why selecting a project manager demands a careful, rational process. Choosing the right project manager might mean the difference between a successful project and a failure.

Each project is unique and will require specific selection criteria. However, there are several generic criteria that will get you started. In general, a project manager should have:

- Management skills for team building, negotiating, delegating responsibility, managing performance, managing the involvement of others, and conducting project communication
- Technical knowledge and skills relevant to the project
- Project management skills
- Problem-solving and decision-making skills
- Commitment to the project's success
- Support from their manager
- Time to devote to the project
- Ability to develop a working relationship with team members and other stakeholders

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For more information on establishing objectives to help you decide on which project manager to pick, see Decision Analysis on pages 122–126.

SPLITTING PROJECTS INTO SUBPROJECTS

Most project managers prefer to maintain control over all aspects of their projects; relinquishing a major deliverable or two can carry a negative connotation because it implies that they can't handle the work. Not true. In fact, determining whether part of your project should be man-

aged separately is often necessary if you want to complete the overall project on time and within budget. Subprojects can be done within an organization, or completely delegated to an outside vendor or contractor.

Complex or lengthy projects often require subprojects to group or manage activities that are similar in nature, share resources, share funding, or have constraints that require they be done together.

Here's a list of questions to help you decide whether to split your project into two or more subprojects:

- Is the overall project too large or complex for a single person to manage effectively? If so, consider separating it.
- Does work for one part of the project require specialized knowledge? Specialized or technical work may require a subproject manager with skills or knowledge in that area.
- Should resources be managed differently for part of the project? It's often best to manage work together if it requires the same type of resources or special cost accounting.
- Is someone needed to sponsor a part of the project? Grouping work together that shares a need for the same special influence can help expedite the process.

Once you've sliced off a subproject, treat it like a "mini-project." Assign a separate subproject manager; develop a statement, objectives, and work breakdown structure; review the resource requirements; then, follow the remaining steps and activities in this book. Remember to keep the project objectives for the subproject consistent with the overall project objectives. It may require additional or different monitoring, and the subproject manager may choose to add more detail to the work breakdown structure, responsibility assignments, and schedule.

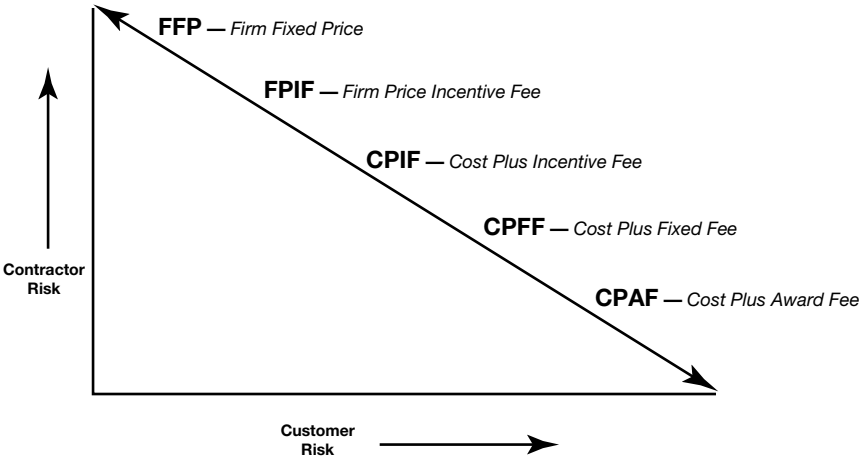
CONTRACTS FOR SURVIVAL

If you decide to use an outside vendor to provide a resource or handle a work package or subproject, first study the types of contracts available:

- **Firm Fixed Price (FFP)**—the vendor will only receive the agreed price, regardless of any unanticipated cost or schedule overruns
- **Firm Price Incentive Fee (FPIF)**—the vendor receives the agreed price plus a bonus for on-time or early completion
- **Cost Plus Incentive Fee (CPIF)**—the vendor receives actual costs to provide the goods or services plus a bonus for on-time or early completion
- **Cost Plus Fixed Fee (CPFF)**—the vendor receives actual costs plus a guaranteed fee, even if the project is not completed
- **Cost Plus Award Fee (CPAF)**—the vendor receives actual costs plus an award based on performance against some quality indicator(s)

Your choice will depend on the goods or services being provided, as well as the financial risk involved (for the vendor as well as your organization). Obviously, Firm Award Price (FFP) contracts are high-risk for the vendor and low-risk for the customer. Conversely, Cost Plus Award Fee (CPAF) contracts place most of the potential risk with the customer, and very little with the vendor. The others represent risk ratios somewhere between those extremes. The type of contract chosen should reflect several things, including:

- The degree of difficulty in providing the goods or services
- Whether it involves hazardous materials or methods
- Whether there will be future use for the goods or services
- Whether the deliverable is well defined and unlikely to change.



Tip

In certain countries, the government or other agencies sometimes provide incentives for hiring non-traditional sub-contractors. Project managers should examine their project plans for opportunities where such sub-contractors could best be utilized.

Select the contract that represents risk that is acceptable to both the vendor and your organization. Your organization's legal, contracting, and purchasing departments may have policies and procedures in place that apply here.

ASSESSING THE FINANCIALS

Cost is often a critical factor in projects. The money spent should be considered as an investment and a reasonable return should be expected. The worth of the investment is often the deciding factor for whether a project gets done, or which among several possible projects deserves allocation of limited resources. Organizations typically use several methods to assess a project's financial soundness.

- **Payout Time** is one method of evaluating the investment. This simply compares all the project expenses to the expected net income by time period (e.g., by month or year), and finds the point when the investment will be repaid. Capital is not included in the expenses because it does not represent worth that leaves the organization. Cash spent on capital is simply converted to physical and durable

goods retained within the organization. Project income is in the form of revenue or savings produced from the project. Organizations often have set standards for payout time. For example, a policy may state that no project will be approved with a projected payout time of more than one year.

- **Return on Original Investment** (ROI) is the ratio of annual profit to the investment in the project. The average annual profit produced by the income is divided by the total project investment. Multiplying this number by 100 represents the ratio as a percentage. To calculate ROI, capital is included in the project expenses since it represents money that could be invested elsewhere. Any depreciation expected on that capital must also be subtracted from the annual profit. Many organizations use ROI to compare projects competing for the same investment, or to test against a set minimum return that any project must out-perform.
- **Net Present Value** (NPV) calculates how much value a project will produce beyond an expected return should the investment be retained in another minimally acceptable form. For example, an organization may have a choice between keeping cash invested in a certificate of deposit returning 10 percent, or putting it into a project. NPV calculates how much more cash the project will return than if the cash were kept in the certificate of deposit. This is calculated using the following formula:

$$NPV = \frac{\text{Year 1 Income}}{(1 + \text{Accepted Return})^1} + \frac{\text{Year n Income}}{(1 + \text{Accepted Return})^n} - \text{Investment}$$

- **Internal Rate of Return** (IRR) considers the time value of money. In other words, it factors in not only the return, but also how quickly it will be realized. It shows this as a discount rate that makes the expected returns equal to the current investment. This rate can be compared to the rates earned by investing the money in other projects or investments. If the project requires borrowing, an organization will usually insist that it must earn an IRR that is at least several percentage points higher than the cost of borrowing to compensate for the risk, time, and trouble associated with the project. For example, consider a project costing $7,500 and expected to return $2,000 per year for five years, or $10,000 total. The IRR calculated for the project would be 10 percent. If the cost of borrowing is less than 10 percent, the project may be justified. If the cost of borrowing is 10 percent or greater, the project will break even at best. The easiest way to calculate IRR is to use a financial calculator or present value tables. If the income is uneven each year, IRR can be calculated by trial-and-error, using different rates in the following formula, until the rate equals the expected return.

$$\text{Investment} = \frac{\text{Year 1 Income}}{(1 + \text{IRR})^1} + \frac{\text{Year n Income}}{(1 + \text{IRR})^n}$$

DEFINITION SUMMARY

Definition serves as the precursor to Planning and Implementation. It's here that the scope and reasons for completing the project become clear to the project team, project stakeholders, and contributors. It's the time when you begin to gain commitment from these groups. It's also the time when the organization decides to link its resources to the objectives it's trying to achieve.

In *The Modern Theme*, Jose Ortega y Gasset wrote "To define is to exclude and negate." Although he intended a negative connotation, you might agree that his words apply to the work done during project definition. To define your project is to specify its purpose and scope, excluding everything else. Or, as the anonymous sculptor said, "When I sculpt a statue of an elephant, I take a block of stone and chip away everything that doesn't look like an elephant."

CHAPTER THREE

THREE

Project Planning

It was a struggle, but they did it. Under Tim's (the project manager) direction, the project team outlined the project statement and objectives, and assembled a work breakdown structure with resource requirements. The group feels satisfied with their accomplishments to date, but their excitement is dulled by the Planning activities lurking before them. Their challenge? To create a project plan that balances resource availability with resource needs, minimizes scheduling conflicts, arranges the work in the appropriate sequence, and accomplishes all of this without major schedule or cost problems.

In this latest meeting, Tim starts posing questions to the group: Who is actually going to do the office layouts? Whose approval is needed for them? Who has primary responsibility for working with the movers? Which moving company will they hire? How much time will the movers need? Who needs to supervise the installation of the new furniture? Should the furniture be in hand before the office area is prepared? What could go wrong in any of these steps?

The team feels buried, but Tim guides them through the planning process using questions in a step-by-step format.

How will you do the work?

In Definition, you established why you were doing this project, and you wrote a project statement and objectives to capture and formalize your reasoning. You also recorded how the work needed to be accomplished to achieve these goals by developing a work breakdown structure. Now, in Planning, you'll create a plan to actually complete the work you've identified.

During Planning, you'll ask five questions:

- Who will be responsible for each work package in the work breakdown structure?

- In what order should (or must) the work packages be accomplished, and how much time will it take to complete each work package?
- How should the project be scheduled against a calendar?
- Are enough resources available when needed?
- What problems or opportunities may occur during the project, and what can be done now to plan for them?

Put simply, you'll gain an understanding of who will do what and when.

Five project management Planning activities will structure your answers:

- Assign Responsibility
- Sequence Deliverables
- Schedule Deliverables
- Schedule Resources
- Protect and Enhance the Plan

ASSIGN RESPONSIBILITY

A work package, like any form of work, will have a higher likelihood of being completed if you formally assign it to a specific individual or group. Work left unassigned is often overlooked, forgotten, or dropped because of the "I-thought-you-were-going-to-do-it" syndrome.

Therefore, assigning responsibility for each work package is the first activity in Planning.

To assign responsibility, examine each work package in your work breakdown structure, as well as the knowledge and skills necessary to complete it (you documented these resources when you identified resource requirements). Then, ask the following questions:

- Who has the knowledge, skills, expertise, information, or experience to complete this work package?
- Who will provide the resources (facilities, equipment, materials and supplies, special requirements) you need to complete this work package?
- Who needs to approve, commit to, or review this work package?

The answers will identify specific names and responsibilities associated with each work package. One of the most effective tools for charting this information is the **Responsibility Assignment Matrix (RAM)**.

TOOL: RESPONSIBILITY ASSIGNMENT MATRIX

Construct a RAM to match people with work packages in an organized fashion. A RAM is a chart that lists work packages along its vertical axis and individuals or groups along its horizontal axis. Within each cell are listed the activities that the individual or group is responsible for. In Example 3-1, the first column lists deliverable 2. Office equipment from the work breakdown structure, as well as its related work packages. The remaining columns list the departments, teams, or individuals that will contribute to this project.

Decide each person's or group's responsibilities: will they be reviewing work, making sure resources are in place, preparing a facility, creating a product, facilitating a meeting, writing a press release, conducting interviews, producing a report, designing a part, etc.? Record this information in the corresponding RAM cell. Your RAM should also identify the person who has **primary responsibility** for completing the work package. In Example 3-1, that person is identified with a **P**. Identifying someone with primary responsibility will reduce misunderstandings among the team and other contributors and will help you monitor progress more effectively. Only one person should have primary responsibility for a work package. All others have secondary responsibility.

Take time to assign responsibility for your work packages using a RAM or an equivalent tool. This will establish clear ownership of all tasks

Tip

What if you assign responsibility to individuals who have more capability than you need? Or, alternatively, what will you do if you assign responsibility to people with less-than-ideal experience, skills, or ability? In either case, you'll need to re-estimate cost and time-on-task.

Pitfall

Don't forget government regulations (local, state, and federal laws) and labor agreements! These factors can influence how you staff your project, the number of hours you assign to individuals, and how much their time will cost. Considering them during Planning will save rework and potential legal ramifications later in the project.

Example 3-1: Responsibility Assignment Matrix

Project Statement

Move the Corporate Customer Services department within three months at a cost not to exceed $170,000

Work Breakdown Structure	Project Manager	Facilities Manager	Purchasing Coordinator	Department Managers	Receiving Clerk	Engineer	Interior Decorator	Senior Vice President
2. Office Equipment								
2.1 Equipment to keep identified	Provide input, as needed	Recommend a list of equipment to keep **(P)**		Approve equipment to keep for own dept.	Check transportation cost	Check compatibility, usability, safety issues		
2.2 Equipment to order identified	Monitor cost and availability of equipment	Recommend a list of equipment to order **(P)**	Check availability of equipment with potential vendors	Approve the equipment list		Provide input, as needed		
2.3 Office interior designed	Review recommendation and design	Recommend an interior decorator Get design approved **(P)**		Approve recommendation and design		Review recommendation and design	Submit detailed design plans	
2.4 Equipment and office furnishings ordered			Submit purchase orders for equipment and furnishings **(P)**					Approve purchase orders
2.5 Equipment and office furnishings received	Monitor arrival date				Receive and store equipment and furnishings **(P)**			

(P) Designates primary responsibility; others have secondary responsibilities.

required to successfully complete the project. It will also involve project communication to secure commitment of project contributors and the approval of their managers.

Tip

Remember the additional, secondary resources you identified? Obtaining their time may not require a formal work negotiation, but you should still approach them (and their managers) to negotiate their time and secure their commitment.

JOIN TOGETHER

Assigning responsibility often occurs over the course of several rounds of negotiation. These rounds can take place during one meeting, or occur over several conversations. The first round, called the **initial work negotiation**, involves you (the project manager) and the provider(s) of primary resources (**resource or functional managers**). Sometimes, the resource manager is the individual who will be assigned the work package; in other cases, the resource manager is the manager of the individual(s) you need. Regardless, there are generally four topics that should be addressed during the initial work negotiation:

- How appropriate are task and performance expectations for the designated individual?
- How available is that individual to work on the project?
- How realistic is the budget and timing?
- How committed is the resource provider?

After you gain their commitment, the resources become project contributors. Even so, you'll continue negotiations throughout Planning and Implementation regarding their time and availability.

You'll also need to agree on what's expected of project contributors. This round of project communication will involve you, the contributors, and their managers. In this round, you and the individual agree (with the manager's input) to **performance expectations.** (See People in Projects on page 91 for information on the Performance System and setting performance expectations.) Use the following questions as a checklist to ensure you prepare the resource properly for the task at hand. Discuss your answers in the meeting:

- What exactly is expected as an outcome of the work packages assigned to the contributor?
- Does the contributor understand what is expected and agree to it?
- Is the contributor capable of meeting the expectations?
- Will the contributor's work environment support performance on this project?
- How will the performance of the contributor be measured?
- What is the relative priority of this work compared to other projects and work the contributor is assigned to?

In Example 3-2, performance expectations have been set for one activity that the Facilities Manager will undertake in order to complete

Tip

When negotiating for resources, remember to separate the people from the issue; focus on the issue and not the individual positions; examine various alternatives to resolve the issue; and insist on using a set of objectives to help guide the discussion.

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Tip

You will receive the best performance from those contributors who not only understand and agree to your expectations, but who also have a genuine interest in the project and stand to receive positive consequences from their involvement. Clarify the benefits of working on your project, and try to align contributors with tasks they actually *want* to perform.

Example 3-2: Performance Expectations for the Facilities Manager

Work Breakdown Structure	Activity	Requirements	Measures	Standards
2. Office Equipment				
2.3 Office interior designed	Recommend an interior decorator	Quantity	Number of interior decorators evaluated	Evaluate at least 4
		Quality	Degree to which interior decorators evaluated meet decision criteria	Two best choices must meet at least 80% of all Want objectives
		Timeliness	Time to complete the Decision Analysis	No more than 3 days
		Cost	Cost involved in making the decision (gathering data, setting objectives, touring the facilities)	No more than $250

Pitfall

Do not try to set measures or standards for every activity of each work package. It will bog you down. Select the most important activities, especially those that may still be unclear to the resource provider, and flesh out expectations for them. As for the rest, verbal agreements, ground rules, or rules of thumb should suffice.

Pitfall

When you negotiate, consider the viewpoint of the resource provider. He or she may be short-staffed, overworked, or face negative consequences for releasing a resource to you. Negotiating with this in mind will increase your chances of securing the resource you want, or at least gaining the next best alternative.

work package 2.3 Office Interior Designed. Before the office interior can be designed, an interior decorator has to be hired. The decision has to be approved by the department managers. There are certain requirements or aspects of performance of the activity that will be measured. These are typically in the area of quality, quantity, timeliness, and cost. A measure indicates how you will assess performance against the requirements; standards set the specific level of performance that is expected.

THE MORE YOU KNOW...

You may require a specific individual who is not readily available to contribute to your project. Ask yourself how critical it is for this particular individual to complete this particular work package. If you decide the resource is irreplaceable, it could mean you have to shift your project schedule to accommodate the resource, or resume negotiations to release some of his or her time (you'll make this type of decision during the Schedule Resources activity).

If you decide someone else will suffice, you'll need to select a new person and conduct another initial work negotiation. Consider the answers to these questions as you choose the best replacement:

- What objectives will the alternate resource need to satisfy to be acceptable?
- What restrictions, policies, procedures, or standards must be considered?
- Can this individual be developed to better meet project requirements?

SEQUENCE DELIVERABLES

You've identified *who* will be responsible for the project work. Now you'll determine the order in which the work packages should be completed, how long each will take to finish, and the total duration of the project.

Arrange the work packages in the order you will accomplish them. Some work packages must be completed before others can be started, while others can be done at the same time. Review the relationships in Example 3-3; they're identified in the column labeled "Precedence Relationships." Work package 1.1.2 (Relationship charts drawn) shouldn't start until 1.1.1 (Interviews conducted) is completed. Likewise, work packages 2.1, 2.2, and 2.3 must precede work package 2.4 (Equipment and office furnishings ordered). Identify relationships between all work packages, then arrange them in a table as shown in Example 3-3. This is called a **precedence table.**

As you organize your work packages, you'll discover several different kinds of precedence relationships. Some work packages have a

Tip

It's tempting to position work packages in linear order ("first we will do this, then we will do that, next we will accomplish this"). However, finding ways to complete work packages simultaneously will reduce overall project duration, as long as they don't compete for resources.

Example 3-3: Precedence Table

Project Statement		
Move the Corporate Customer Services department within two months at a cost not to exceed $170,000		
Work Packages	**Precedence Relationships**	**Duration**
1.1.1 Interviews conducted	None	3 days
1.1.2 Relationship charts drawn	After 1.1.1	2 days
1.2 Department block layouts drawn	After 1.1.2	2 days
1.3 Department detailed layouts drawn	After 1.2	4 days
2.1 Equipment to keep identified	After 1.3	1 day
2.2 Equipment to order identified	After 1.3	1 day
2.3 Office interior designed	After 1.3	8 days
2.4 Equipment and office furnishings ordered	After 2.1, 2.2, 2.3	1 day
2.5. Equipment and office furnishings received	After 2.4	11 days (10 days to fill order, 1 day to receive and store)
3.1 Electrical services installed	After 1.3	3 days

The Order of the Day

You can use four types of precedence relationships to determine how work packages should be ordered:

Finish-to-start—Simplest, most commonly used technique; refers to finishing work package A before starting work package B. (e.g., Finish hiring the operator before starting to train the operator.)

Finish-to-finish—Finish A in order to finish B. (e.g., Finish final customer requirements meeting to finish documenting the requirements.)

Start-to-start—Start A in order to start B. (e.g., Start writing the book before starting to edit the book.)

Start-to-finish—Start A in order to finish B. (e.g., Start project manager selection process to finish the proposal development process.)

mandatory (hard logic) dependency on one another; for example, a house cannot be framed unless the foundation is finished. Other work packages have a **best-practice (preferential) relationship.** For example, it's more efficient to run electrical wires *after* plumbing has been installed. It's also possible that some work packages have **discretionary dependency**, that is, they're arranged in a certain order because the customer or project manager wants it that way. For example, the owner of the house wants the driveway completed before the deck is built. And finally, some work packages have an **external relationship**, meaning that they have a relationship with activities outside the project that dictate the order of their completion. For example, if major road construction (not related to your project) will cut off access to your building site, you may want to complete certain work packages earlier to avoid this threat.

Tip

Did you make any assumptions when estimating elapsed time? If so, remember to record them in your work breakdown structure dictionary, along with plans to check or confirm your assumptions later.

Determine the duration of each work package from start to finish, given the caliber and availability of resources. Your estimate should represent **elapsed time** of each work package, not actual time-on-task (you calculated time-on-task in Identify Resource Requirements).

For example, review work package 2.5 in Example 3-3. The time-on-task to receive the office equipment is one day. However, the duration, or elapsed time, for the supplier to fill the order is 10 days, making the total duration for that work package 11 days. Record the duration for each work package in a table (see Example 3-3) or enter it directly into your project management software. Another way to estimate duration is to examine the availability of a specific resource. If time-on-task of a work package is 10 days and you have two resources who can work on this but only at the rate of one day a week, your total duration will be five weeks.

As you finalize the elapsed time of a task, keep in mind there is often a need to add **lag time**. Lag time refers to the necessary, built-in gap between the timing of two work packages. For example, if you paint a

room as one work package, and hang framed pictures as the next work package, you'll need to add lag time for the paint to dry. You could include this lag time as part of the work package's duration, or you could build a gap between work packages. Either way, you need to have sufficient time between when the actual paint work finishes and the work of hanging the pictures starts to allow for drying time.

Using the above information, you'll be able to estimate the total duration of the project. There are several tools that will help improve your accuracy in this calculation.

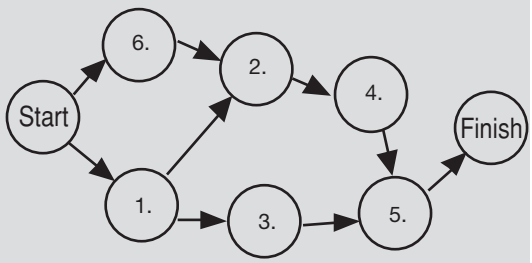
TOOLS: NETWORK DIAGRAMS

For small projects, relying on your precedence table and a simple network diagram will be sufficient for demonstrating project flow and calculating project duration.

Construct a **network diagram** based on your precedence table. A network diagram is a common method of demonstrating the sequence of work packages in a project plan. Using a combination of arrows ➔ and nodes ○, you can graphically depict the flow of the project from start to finish.

Example 3-4: Activity-on-Node or Precedence Diagramming Method

Work Packages	Precedents
1. System designed	None
2. System purchased	1., 6.
3. Personnel trained (at vendor site)	1.
4. System installed	2.
5. System pilot tested	3., 4.
6. Region offices contacted	None



On the left side of the page, draw a "start" node, and on the right, a "finish" node. Software frequently uses rectangles to represent nodes. Represent each work package with a node, and use arrows to show the relationship from one work package to another. In Example 3-4, work package 4. (System installed) cannot be started until work package 2. (System purchased) has been completed, and work package 2. cannot begin until both work packages 6. (Region offices contacted) and 1. (System designed) are completed. Review your network to ensure that every node, with the exception of the start and finish nodes, has at least one entering and one exiting arrow. This representation of the precedence table is called **activity-on-node** diagram. (You may also be asked to use an **activity-on-arrow** diagram. See example 3-5, in which the arrows represent work packages and the nodes represent starts and finishes.

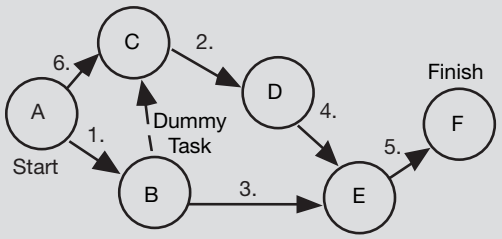
☞ Tip

Don't add extra time to the critical path to ensure an on-time finish. For example, on a 20-work-package project, if everyone has an extra day added as a precaution, you may have increased your project's duration significantly. It's better to evaluate individual work packages to uncover specific potential problems that might cause delays. Go to "Protect the Plan" for more information on identifying and preparing for potential problems.

This type of diagram sometimes contains dummy activities. Such an activity indicates a precedence relationship but does not consume resources. It is shown by a broken arrow.) Example 3-6 illustrates a detailed network diagram for the Corporate Customer Services office move.

Example 3-5: Activity-on-Arrow or Arrow Diagramming Method

Work Packages	Precedents
1. System designed	None
2. System purchased	1., 6.
3. Personnel trained (at vendor site)	1.
4. System installed	2.
5. System pilot tested	3., 4.
6. Region offices contacted	None
Dummy task	1.



To reveal the minimum amount of time it will take to complete the entire project, find the path that represents the *most* elapsed time through the network diagram and has no slack. This is the **critical path** because it represents the minimum elapsed time required to complete your project. If something impacts the duration of work packages on this path, it will directly impact the finish date of the entire project. (See "More About Critical Path" on pages 60–61.)

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Look at Example 3-6. The critical path is highlighted. Add up the duration of the work packages on the critical path, and you'll see that it's 38 days—the longest path. If your estimates are accurate, it's also the least amount of time it will take to complete the entire project.

One type of network technique is called the **Critical Path Method (CPM)**. In this method, you assign each work package a *single* duration estimate you and your team believe is the most probable duration. Then add up the duration of all work packages on the critical path to calculate the time it should take to finish your project. (For how to calculate the critical path using CPM, see pages 60–61.)

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The **Program Evaluation and Review Technique (PERT)** is another network technique. It uses a statistical approach to calculating the probability of work packages being completed on time. With PERT, you and your project team assign three duration estimates to each work package: optimistic, most likely, and pessimistic. Then, using a weighted average of the three estimates, you calculate the shortest time to complete the project. PERT calculations are useful when there are significant variations in optimistic and pessimistic estimates, and when there is great uncertainty or risk involved regarding project outcomes. (For how to calculate the critical path using PERT, see pages 61–62.)

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There are many project management software programs that will calculate the critical path for you using either CPM or PERT or both.

Sequencing your work packages will provide you, your project team, and project contributors with the order in which work packages must get done to complete the project. It will also offer a more accurate estimate of how long your project will take to complete. Remember your project statement? You may need to revise the completion date based on your work in this section.

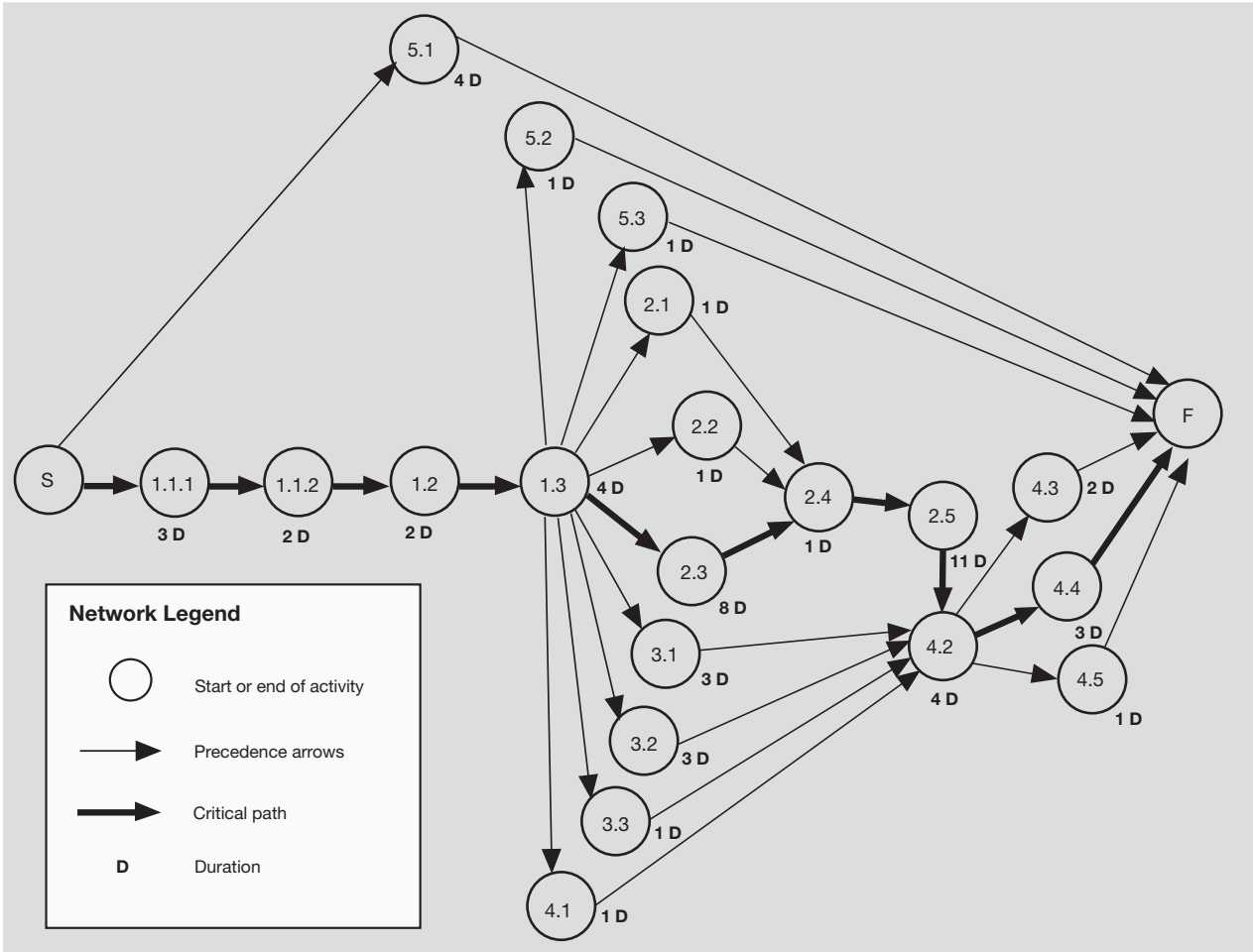
Pitfall

Look at the length of the other paths in your network. If they are nearly as long as the critical path, they will need to be monitored carefully. Slippages on these paths could change your critical path.

Example 3-6: Activity-on-Node Network Diagram

Project Statement

Move the Corporate Customer Services department within three months at a cost not to exceed $170,000



JOIN TOGETHER

Estimating the time it'll take to finish a work package will be very difficult—if not impossible—without involving others, especially those individuals who you've assigned to handle them. Make sure you involve contributors, project team members, and others who have managed or contributed to similar projects in the past.

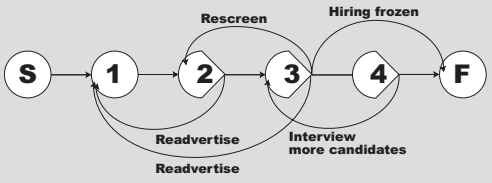
They can also advise you and your team on whether work packages must be done sequentially or can be done concurrently, and on the validity and accuracy of your network diagram assumptions.

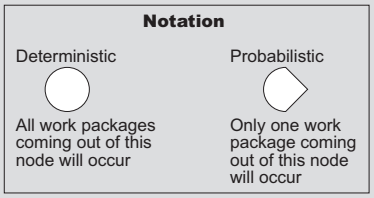
THE MORE YOU KNOW...

You may be involved in managing a project that requires a change in direction or a repetition of steps. If this is the case, consider using the **Graphical Evaluation and Review Technique (GERT)**. This is a network technique that is similar to PERT but has the advantage of allowing you to omit certain portions of the network, complete certain work packages partially, or repeat certain work packages several times. This technique allows for looping, in which the network path passes through the same node more than once (e.g., clinical trials that must be repeated several times). It also allows for branching, in which the network path can split in one of two or more directions depending on the results of an event or work package (e.g., design changes if a product fails testing).

Example 3-7: Network with Probabilistic Branching and Looping

Work Packages	Precedents
1. Position advertised	None
2. Resumes screened	1.
3. Interviews conducted	2.
4. Offer accepted	3.





SCHEDULE DELIVERABLES

You've estimated the duration and set the sequence of each work package, and determined the approximate length of the entire project. Now it's time to link work packages with actual start and finish calendar dates.

Using the precedence and duration work you did in Sequence Deliverables, follow these steps:

- Select the project start date
- Identify all non-working days (i.e., company holidays, weekends, vacation days) on the calendar
- Identify any date constraints that were surfaced during objectives-setting or initial work negotiations
- Schedule a start and end date for each work package and record them on a time line or calendar
- Identify the overall completion date

Keep the following in mind when scheduling your project:

- Schedule all work packages to begin as soon as possible. If you schedule them to begin as late as possible, all work packages will become critical, even those that have **slack time**. Slack time (also called **float** or **total float**) is the amount of time that a work package can be delayed from its early start without delaying the project's finish date. **Free float** is the amount of time that a work package can be delayed without affecting the early start of work packages immediately succeeding it. Critical path work packages do not have slack time.
- You and your project team may be forced to deal with a predetermined completion date (for example, a date the lease expires on your organization's rented office space). In such cases, find out the absolute latest date your project must start by "moving" backward from the completion date until you arrive at the start date. This will help you determine whether you can complete the project on time, and whether you need to start immediately or add additional resources.
- As you schedule your project, you could uncover slack time. For example, one of your work packages that must be finished by January 14 cannot start until January 6 because the work it depends on will not be completed until close of business on January 5. Since this work package will require three days to finish, the latest you can start is January 11. You have five days of slack time for this work package. (To uncover the slack time for a specific work package, calculate the difference between the earliest start and finish time and the latest start and finish time. To learn how to do this, see More About Critical Path on pages 60–61.) Use slack time to help match resources with work packages.

Tip

Don't assign aggressive start and finish dates without sound reasoning. Although it's usually better to pursue a schedule that completes the project quickly, compare the benefits of speed with its risks and potential adverse consequences.

Tip

Take into account non-working days (like holidays and weekends) when you schedule deliverables.

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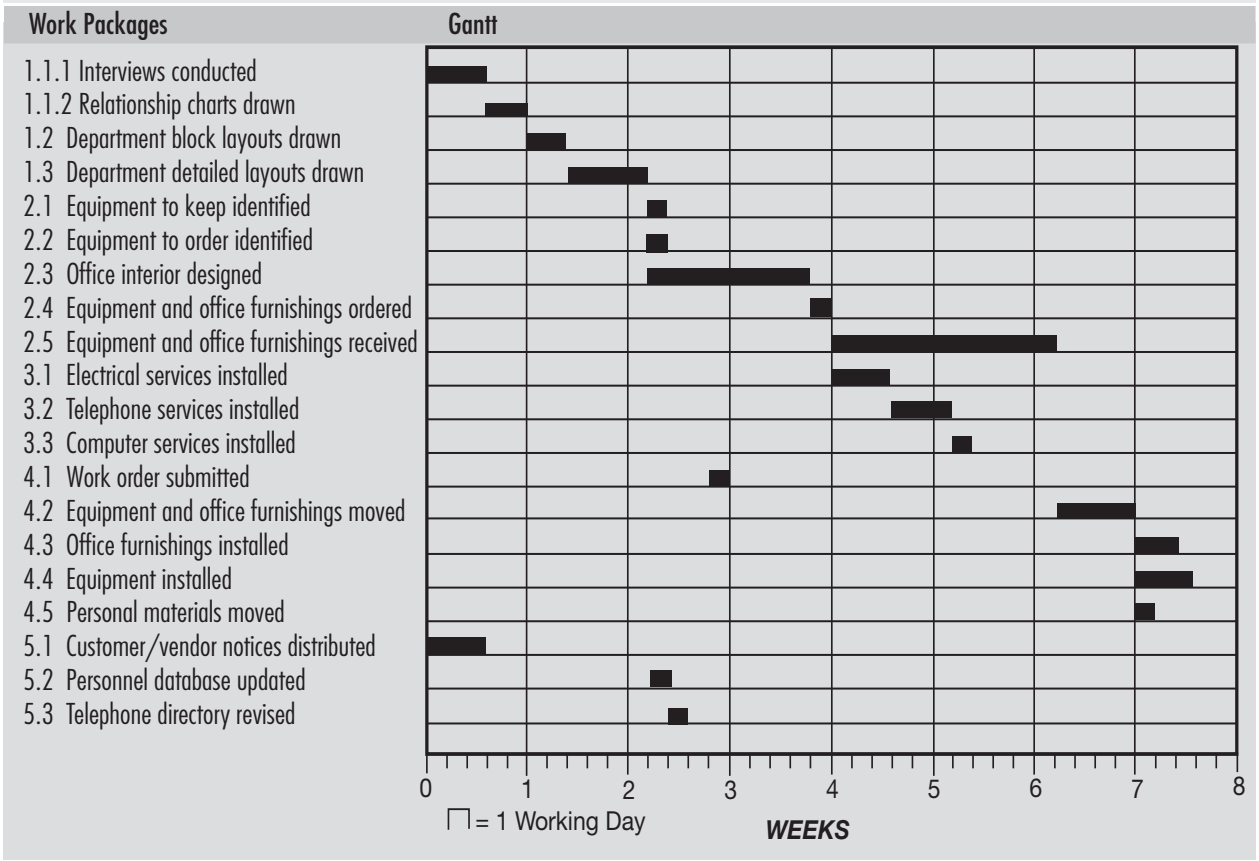
Example 3-8: Gantt Chart

Project Statement

Move the Corporate Customer Services department within three months at a cost not to exceed $170,000



TOOL: GANTT CHART

As you learned in Sequence Deliverables, a table is often the most effective tool for communicating work package duration and precedence when it comes to small projects. A table can also display work package start and end dates for a small project.

However, as the size and complexity of your project increases, consider plotting your start and finish dates on a **Gantt chart**. A Gantt chart is a graph that uses horizontal bars to represent the project time line. To construct a Gantt chart, record work packages on the vertical axis and the time line on the horizontal axis. Then draw bars to represent the duration of the work package over time. Example 3-8 depicts a Gantt chart. The solid black lines summarize work package start and end dates.

If you're using project management software to plan your project, you'll be able to highlight the critical path and add the primary person

Tip

If you are asked for a Gantt chart at the start of a project, you could be setting yourself up for failure. The Gantt chart is valuable only after you've done the thinking required in Definition, Assign Responsibility, and Sequence Deliverables.

responsible, the names of other resources, and precedence relationships to your Gantt chart. Use the Gantt chart to monitor the performance of the project team and contributors against the deadlines.

Determining the actual dates when work packages will begin and end provides an important basis for communicating progress against the plan. It also informs resources, vendors, suppliers, and contributors when their services will be required on the project, and lets stakeholders know the true date the project team is targeting for completion.

JOIN TOGETHER

Although it's important to gather scheduling input from resource managers and contributors, creating a first draft on your own will speed up the process. During the next project management activity, Schedule Resources, you'll gain the necessary commitment and acceptance of the schedule.

THE MORE YOU KNOW...

After scheduling the project work, you may discover the schedule needs to be "crashed." **Crashing** refers to shortening the project schedule by compressing the critical path without changing the sequence of work. It involves a trade-off: shorter work package durations versus potentially higher work package costs, due to adding human or material resources and possibly questionable results.

Before deciding whether you should crash the schedule, first you must determine if reducing project duration justifies the increased cost and other potential consequences. For example, there may be a penalty associated with project delay greater than the increased cost of reducing project duration. Or you may compromise the quality of an output by shortening the duration.

Crashing the critical path won't always result in the time savings you expect. For example:

1. Your critical path is 122 days
2. You shave the current critical path by 30 days to 92 days
3. However, your new critical path may be more than 92 days because another path through the project could be longer than 92 days

You should also take into account what the impact of crashing your project will be on other projects around the organization. Accumulating more resources than you initially planned for might prevent them from being used on other equally important projects, thereby delaying their important deadlines.

Pitfall

Too many work packages scheduled at the same time might be difficult to manage, and could also compete for resources. In addition, if more than one is on the critical path, you'll risk delaying the overall deadline.

Pitfall

You may need to compress the critical path to meet a deadline set by someone else. As you consider ways to compress the critical path (e.g., working overtime, adding resources, splitting into two concurrent work packages), beware of putting too much strain on project resources. Doing this would risk the overall success of the project.

To assist you in crashing your schedule, review your project plan and ask the following questions:

- ➢ Which work package durations on the critical path can be shortened? How?
- ➢ Which work packages can be subdivided to run concurrently?
- ➢ How can the relationship or order of work packages on the critical path be altered to shorten the schedule?
- ➢ How can slack time be used to complete additional work on the critical path?
- ➢ How can slack time be used to reallocate resources to critical path activities?

SCHEDULE RESOURCES

This is the project management activity during which you'll confirm and finalize the scheduling of resources. In Assign Responsibility, you linked work packages with specific individuals and resources. Now you'll ensure these individuals (and their managers) are committed to providing necessary resources (materials, facilities, etc.) and are available for completing their work on scheduled dates.

Your first step in Schedule Resources is to review your project schedule and Responsibility Assignment Matrix. Record the calendar dates associated with each project resource. Include start and finish dates, time-on-task, and slack time for each work package that is the responsibility of the resource. Remember to include individuals who will do the work and also obtain or release other resources (like cash, equipment, storage space, etc.) that you'll need.

Next, revisit the initial work negotiation with each resource manager to reconfirm their commitment of people and materials and to let them know the exact time frame the resources will be needed. If the resource is unavailable at the time you require, consider the following alternatives:

- Alter the schedule to accommodate originally assigned resources if the person or resource is not replaceable. However, it may be possible to use slack time, overtime, and other creative approaches to change the schedule without a significant impact on quality or overall project completion (although they could impact costs). One of the most helpful tools for this is a **resource leveling diagram**. Go to the "Tools: Resource Loading and Leveling" section for more information. (See pages 50–52.)
- Select another resource to perform the function. This may require you to renegotiate with resource managers for another human resource, or to settle for a different type of facility, equipment, material, or special resource.
- Outsource the work package to an external resource. While outsourcing may seem like the easy way out of a resource quagmire, remember that outsourcing could boost costs and demand that you closely manage the quality of the work. It can also compromise your ability to develop skills and organizational capability.

After you've scheduled resources for each work package, audit the use of resources in the project plan by asking the following questions:

- How many activities is any given resource working on simultaneously? Is this too many?
- On which dates is any given resource not scheduled to do work?
- Are any resources scheduled to work more than 100 percent of their time?

Your answers to these questions might compel you to use **resource loading** or **resource leveling** tools.

Pitfall

Watch for another difficulty: the cost of obtaining the resource is more than you planned *on the dates when it is needed*. For example, if you need a block of hotel rooms in New York City between the Thanksgiving weekend in late November and New Year's, it will cost significantly more than at most other times.

pp. 50–52

Tip

If you decide that project contributors must meet a more aggressive schedule, ask them for input. Involving them will help build their commitment to the schedule.

Tip

Create a project staff directory that includes names, addresses (e-mail and location), phone and fax numbers of all project team members and contributors. Also include any other information the team decides is relevant.

☞ Tip

Few people work without breaks, interruptions, or distractions. If you've assigned someone to a work package that requires working an eight-hour day, don't be surprised if that work package takes more than a day to complete.

TOOLS: RESOURCE LOADING AND LEVELING

Resource loading and leveling diagrams provide information about resource availability, how the resources are being used, and to what work packages they're assigned.

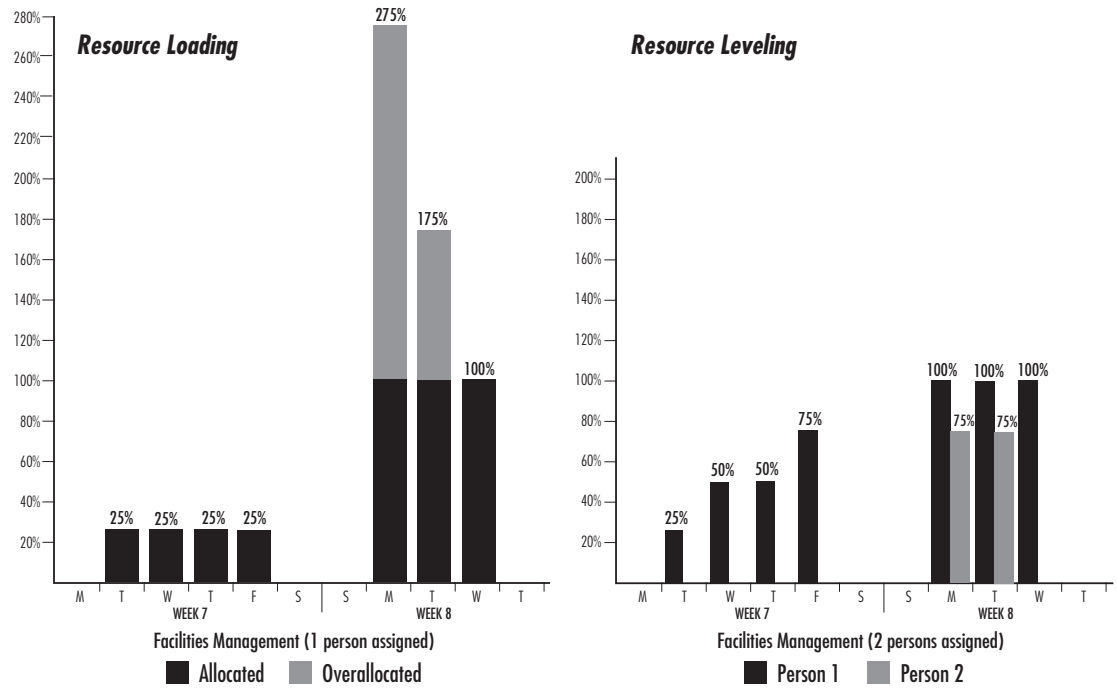
Resource loading diagrams help you allocate resources over the duration of the project. This will ensure you haven't loaded any team members or contributors onto work packages that represent more than 100 percent of their available time. In addition, the diagram will assist you in identifying and capitalizing on those resources that are under utilized. Resource loading diagrams generally require software to construct.

Likewise, a resource leveling diagram will assist you to balance over- and under-loading by creating consistent utilization of resources. If you discover that a resource is overloaded, take one of the following actions:

- ➢ Extend the duration of the work package to allow more time for the resource to complete it.
- ➢ Move resources from other work packages so that it will be completed on time.
- ➢ Add resources.
- ➢ Shift the work packages around so that the resource can complete it when he or she has time.

Example 3-9 is a "before and after" picture of a resource's workload. The "before" chart shows facilities management skills overloaded for week 8 of the project. The "after" diagram is a result of decisions that the project

Example 3-9: Resource Loading and Leveling



Example 3-10: Revised Gantt Chart

Project Statement

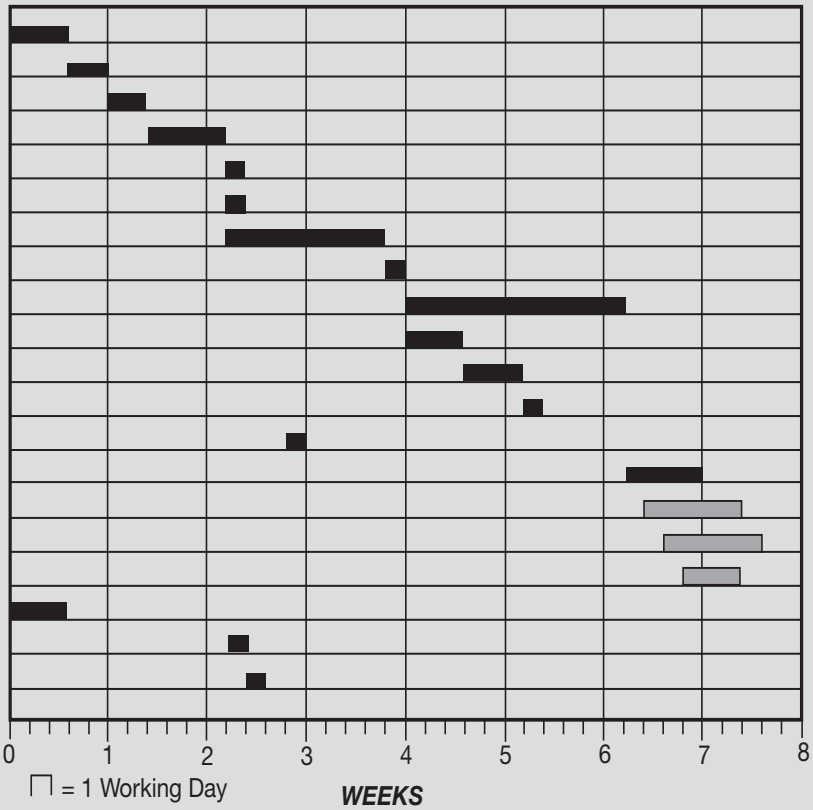
Move the Corporate Customer Services department within three months at a cost not to exceed $170,000

Work Packages

1.1.1 Interviews conducted
1.1.2 Relationship charts drawn
1.2 Department block layouts drawn
1.3 Department detailed layouts drawn
2.1 Equipment to keep identified
2.2 Equipment to order identified
2.3 Office interior designed
2.4 Equipment and office furnishings ordered
2.5 Equipment and office furnishings received
3.1 Electrical services installed
3.2 Telephone services installed
3.3 Computer services installed
4.1 Work order submitted
4.2 Equipment and office furnishings moved
4.3 Office furnishings installed
4.4 Equipment installed
4.5 Personal materials moved
5.1 Customer notices distributed
5.2 Personnel database updated
5.3 Telephone directory revised

Changes to schedule after resource leveling

Gantt



manager could make to level the resources. Those decisions might be to: add **lead time** (accelerating the start of a dependent work package) by installing office furnishings (4.3) and equipment (4.4) soon after the start of equipment and office furnishings moved (4.2); use the slack time available in moving personal materials (4.5); and add another resource to those work packages. Lead time can also be added to 4.5 (Personal materials moved). The project manager then updates the resource requirements, responsibility assignment matrix, network diagram, and the Gantt chart (see Example 3-10) to reflect these changes.

Most project management software can prepare resource loading and leveling diagrams. If you have access to a program, use it to develop these diagrams. However, tap your experience and discussions with resource managers to guide decisions about leveling and loading rather than have the program make the decisions for you.

The primary purpose for scheduling resources is to confirm that they will be available when required. Taking care to corroborate dates and times with resource managers and contributors will increase the likelihood of their commitment.

Pitfall

Don't assume that everyone will understand and use your project schedule. Some people may prefer to receive only the dates that affect them. Or they may want to walk through the schedule in a meeting. Probe each group's needs and accommodate them as best you can.

JOIN TOGETHER

At this point in planning your project, you'll need to involve several different groups to help satisfy various needs:

- **Functional managers** (also known as department heads): Depending on your organization, functional managers may be the same people as resource managers, or they may be an entirely different group. If they are different, you should also negotiate with them for the release of their people from other projects and day-to-day work.
- **Senior management** (may also be project sponsors or stakeholders): This is the group that should handle high-level questions regarding priority. Should you remove resources from project A in order to complete project B by the project deadline? Should you increase cost by $30,000 in order to finish the project two weeks early? Prepare well-thought-out alternatives to help senior management make informed decisions.
- **Project team members and contributors**: Tap these groups for input on how to schedule the project more efficiently. They may even have ideas about how to do the work in completely different, more effective ways.
- **Finance department**: Share your plan with them so they can help you manage your cash resources wisely and within company policy.

The above groups should also be consulted if you decide to crash the project's critical path. Be prepared to discuss positive and negative consequences, and be sure everyone understands that compressing the critical path can mean higher costs, reduced quality, more risk, and changes to the project scope. Use Potential Problem Analysis (see pages 54–58) to prepare for potential problems that crashing the critical path might cause.

pp. 54–58

THE MORE YOU KNOW...

As project manager, you may be held accountable to organizational standards for cash expenditures. If this is the case, you'll probably want to scrutinize how and when cash needs to be spent during the project. You can do this by creating a **spend plan**—a report of when you'll spend cash to acquire resources, when you'll actually use those resources, and for how long you'll need the resources.

A spend plan addresses these aspects because they can lead to additional costs. Take, for example, the cost implications of acquiring materials that aren't needed until months later. You may incur additional costs such as warehousing and transportation.

Your spend plan will help you balance costs over the span of the project, forecasting when you're going to need cash resources and how much you'll need. It can also help prevent you from exceeding the spend limit for any given time period.

PROTECT THE PLAN

The project statement is written, the objectives are developed, and the work breakdown structure has been fleshed out. The work packages are sequenced and scheduled. The resources are assigned and scheduled. Your project plan is finished, right?

Wrong.

One of the most important yet overlooked facets of successful project management is the ability to identify—and prepare for—things that could go wrong. In "Protect the Plan," you'll identify where problems might occur, which problems concern you the most, and what actions you'll take to prevent or contain them.

TOOL: POTENTIAL PROBLEM ANALYSIS

How do you sort through the hundreds, perhaps thousands, of negative scenarios that could develop during the course of your project? And once they are identified how do you stop them from negatively impacting your project plan?

Dr. Charles Kepner and Dr. Benjamin Tregoe developed a technique in the late 1950s called **Potential Problem Analysis (PPA)**. It is a step-by-step method for identifying what could go wrong when undertaking a project and actually planning actions for prevention and containment.

PPA requires six steps that can be as detailed or as cursory as you wish:

1. Identify areas in the plan where you anticipate problems or where problems could most severely impact success
2. Identify the specific problems that could occur
3. List the likely causes for these problems
4. Plan actions that will prevent the likely causes from occurring
5. Plan actions that will minimize the impact if the problems do occur
6. Modify your project plan to include those actions

To complete step 1 (identify areas of the plan where you anticipate problems), have your project plan available and ask the following questions about the work packages:

- ➢ Where do you anticipate problems?
- ➢ Where will problems impact the plan most in terms of time, cost, and performance? Which ones are on the critical path?
- ➢ Where is work most complex?
- ➢ Where will something new be attempted?
- ➢ Where will new employees be involved?

☞ Tip

Although protecting the plan against risk is the last step in project planning, risk prevention should be an ongoing endeavor throughout the life of the project.

⚠ Pitfall

Your project team members or contributors might label PPA as "pessimistic" or a "waste of time." If this occurs, try these explanations: 1) PPA is actually proactive because it seeks to remove problems from the future and 2) If you have the time to go back and fix things when they go wrong, you have time to prevent them now.

- Where have you failed before?
- Where is responsibility shared or unclear?

Use your answers to target the work packages you'll analyze. Then identify specific problems that could occur (step 2) in each work package. When thinking of what could go wrong, consider how the following could impact the successful completion of a work package:

- Natural phenomena (like flooding, earthquakes, blizzards)
- Work setting of the project team or contributors
- Expectations, misunderstood goals, or pressure from others
- Incorrect information
- Poor estimates
- Poorly skilled staff
- Completing the action itself
- Design errors, changes in requirements, resourcing shortages, scheduling conflicts

Construct a table with five columns and enter your potential problems into the first column. Refer to Example 3-11.

Next, consider the probability and seriousness of each potential problem, one at a time, and identify those you'll attempt to prevent. Choose potential problems that will have a serious impact on your plan in terms of meeting key objectives, satisfying customers, conserving resources, ensuring safety, and are very likely to happen if you don't take action. Don't waste time and money preparing for trivial problems. For the serious and highly probable ones, ask yourself and your team, "What could cause this potential problem to occur?" Your answers are **likely causes**. Enter them into the second column of your table (step 3). As Example 3-11 shows, there may be more than one likely cause for each potential problem.

Consider each likely cause one at a time. In the third column of your table list **preventive actions** (step 4)—actions taken to prevent each likely cause. For example, if you identify a potential problem as "Installation of e-mail application delayed" and a likely cause as "Our information technology department lacks the skills required to install the application," one preventive action could be "Send two information technology department employees to training prior to start of installation project." As Example 3-11 shows, there may be more than one preventive action for each likely cause.

Finally, redirect your attention to the potential problems. What if this potential problem occurred despite your efforts to prevent it? What would you do to minimize the damage? Your answers to these questions become **contingent actions** (step 5)—actions you'll prepare now but will only use if the potential problem occurs. As Example 3-11 shows, there may be more than one contingent action for each potential problem.

Tip

When writing likely causes, make sure you include what is likely to cause the problem and how it will cause the problem. Doing so will point to how you can prevent the problem. For example, one likely cause of a factory fire could be that solvents are not stored correctly. Storing them properly in the future could prevent another fire.

Tip

When adding preventive and contingent actions to your plan, you will need to go back and refine the WBS, the resource requirements, the RAM, the network diagram, and the Gantt. You may also elect not to plan for some of these actions because of the impact to your budget.

Example 3-11: Protect the Plan

Critical area of the plan:

3.3 Computer services installed

Potential Problem	Likely Causes	Preventive Actions	Contingent Actions	Triggers
Users can't access their network files after the move	Improper packing of the server causes damage during the move	Assign technical staff to be on site throughout the move to monitor packing Check packing and positioning before server is moved	Recheck Internet Protocol (IP) addresses and hub connections Install backup mirror server	A user calls technical staff and reports they can't retrieve files Jerry Harper reads error messages upon server boot up
	Lightning damages power supply	Accept the risk		
	Data cable is not installed properly	Test cable before connecting workstations Install all network connections between data outlets and computers Provide technicians with accurate documentation for hub connections		

Modify the plan

Add the following actions to the project plan:

Check packing and positioning before server is moved

Test cable before connecting workstations

Inspect all network connections between data outlets and computers

Give technicians accurate documentation for hub connections

Assign responsibility to recheck Internet Protocol (IP) addresses and hub connections

Prepare backup so ready if needed

Install backup mirror server

Copy server data to backup mirror server

Send e-mail to tell users to call us if they can't access the network

Record contingent actions in the fourth column of the table and make sure you add a **trigger** (part of step 5) for each one in the fifth column. A trigger warns you the potential problem has occurred, and if necessary, initiates the contingent action. For example, if you are launching a new foot powder product, and you identify your potential problem as "Allergic reaction by customers causes negative product publicity," one contingent action might be "Submit test results to the media, demonstrating product safety." Your trigger might be "100 customers call our customer service line to report allergic reaction" or "Media representative calls us for our comment on allergic reaction to the product."

It is also possible to have several triggers for the same potential problem. In this case, each trigger would start different contingent actions, depending on the actual timing and severity of the problem. For example, being two days behind schedule three weeks into the project might trigger a different response than being one week behind schedule with only one week prior to the scheduled finish date.

The final step of PPA is just as important as the previous five—transforming your thinking into action. Modify your project plan (step 6) by adding preventive actions, contingent actions, and triggers as work packages. Treat them as you would any other work package, including the primary resources responsible, a start and finish date, and performance expectations. If necessary, change work breakdown structure and resource requirements to reflect the additional work. If this increases the overall budget, it must be justified in terms of reduced risk and agreed to by the customer and/or stakeholders.

Preventing problems, and being ready to fight them if they do occur, gives you a better chance to complete your project on time, within budget, and with acceptable performance.

JOIN TOGETHER

The two most valuable groups of people to involve in protecting your plan against risk and adverse consequences are 1) those who have managed or contributed to similar projects in the past, and 2) those who are completely new to this type of project. Experienced individuals bring a well-honed knowledge of the "usual suspects"—those problems that seem to happen every time. Novices supply a fresh perspective. Their thinking is not hindered by ideas of "the way things should be" or "this is what always happens."

THE MORE YOU KNOW...

It's not always necessary to conduct a full PPA, carefully carrying out and documenting all six steps. Depending on the nature of your project, you can use a full PPA (complex, high impact projects) or short-version PPA thinking (simple, less important projects). Use enough Potential Prob-

Tip

Specificity is essential when thinking about the damage that could be caused by a potential problem. Being specific will allow you to focus on the most appropriate contingent action to take. Ask, "If this [potential problem] occurs, what is likely to happen?" Record your answers as a list of *likely effects*, and then set contingent action(s) for each likely effect. Doing this will give you a greater number of actions you can prepare for should the potential problem occur.

Pitfall

Once the danger of the potential problem has passed, remove the preparations you've made for the contingent action. Keeping these actions in place when they are no longer required may lead to unnecessary cost or additional problems.

lem Analysis to reduce project risks to acceptable levels. Depending on the consequences of late completion, or even complete project failure, more analysis and preventive and contingent actions may be needed.

For short-version Potential Problem Analysis, ask questions like:

- What could go wrong?
- What would cause it to go wrong?
- What can I do to stop it from going wrong?
- What will I do if it does go wrong?

Thinking about the answers (and what you can do to prepare) will help protect the action you're about to take. For example, when driving to the airport you could get a flat tire, run out of gas, get caught in traffic, etc. How you prevent and prepare for these events could mean the difference between catching your flight in time or missing it.

A quick Potential Problem Analysis can also be useful as you move from Planning into Implementation, especially if a change outside your control comes to your attention. For example, you suddenly learn that a key employee will be absent for three days. By quickly jotting down potential problems, you may find that actions like immediate reallocation of key people are necessary.

You may feel there's not enough good information to do a Potential Problem Analysis. However, keep in mind you're constantly taking what you have learned in the past to predict the future. Similarly, you can upgrade information for use in a Potential Problem Analysis if you:

- Ask specific questions. Too often the issues you're trying to predict are global. By separating and making questions specific, the issues not only become easier to handle, but also suggest available information that will help.
- Look at basic cause-and-effect relationships that influence the outcome you're trying to predict; get available information about these factors. Past records and projected changes can then be assessed to make more accurate judgments.

There's always the temptation to include contingency funds in the budget to deal with problems that you didn't anticipate. This can be effective, but only if you have a good understanding of the reasons for doing so. For example, some organizations tack on a standard percentage of the project budget for contingencies (such as 10% or 15%), no matter what the project. However, what happens when it comes time to allocate contingency funds? How will you know how much to allocate, given that there may be overruns further along in the project? By assessing risks for each work package and calculating a contingency amount based on this analysis, you'll have a better idea of how much total contingency money you'll need and how much can be allocated for each potential problem. If there's an early need for project funds in an area you identified as low-risk, you'll know you have to be cautious in your expenditure.

ENHANCE THE PLAN

After looking into the future to determine what could go wrong, step back and put on your thinking cap. Consider things that could go better than expected. The types of things you're looking for include:

- Ways the plan could be completed even more effectively
- Ways the plan could be completed at less cost
- Additional organizational benefits that could result from doing the project or some of the work packages
- Places where just a small improvement in time, money, or performance could yield large benefits.

TOOL: POTENTIAL OPPORTUNITY ANALYSIS

Potential Opportunity Analysis (POA), the tool for encouraging things to go even better than expected and capitalizing on them when they do, uses logic similar to Potential Problem Analysis (PPA). You examine the plan for areas where there's the possibility for large benefit, identify the potential opportunities and likely causes, and record actions to promote them. Then, reexamining the potential opportunities, you prepare for actions that will capitalize on them if they do happen and add triggers to alert you that the opportunity is about to occur.

Construct a five-column table similar to PPA, keeping in mind that the results of your POA should also become part of the project plan. Example 3-12 shows a POA for work package 2.5 Equipment and office furnishings received.

Example 3-12: Enhance the Plan

Critical area of the plan:

2.5 Equipment and office furnishings received

Potential Opportunity	Likely Cause	Promoting Actions	Capitalizing Actions	Triggers
Equipment and furnishings arrive earlier than expected	Vendor expedites order	Call vendor with preorder information	Complete office preparations earlier in the schedule	Vendor confirms earlier date with Facilities manager
		Offer to expedite payment	Ace Movers start move earlier	Facilities manager calls Ace Movers the next day

Modify the plan

Add the following actions to the project plan:

Contact vendor about expediting equipment and office furnishings order. If successful, notify Receiving and Accounting to expedite vendor payment

Reschedule the move and installation of equipment and office furnishings work packages for completion earlier

Contact Ace Movers to arrange for possible earlier move

ADDITIONAL PLANNING TOPICS

MORE ABOUT CRITICAL PATH

Think of the critical path as a jigsaw puzzle composed of many pieces of unequal length. As one puzzle piece ends, the next one (which is dependent on its predecessor) begins. Fit the pieces together and they reveal a picture.

The puzzle pieces are your work packages—some are longer than others, but each one depends on its predecessor. Ideally, as each work package ends on time, the next one begins on time, and so on throughout the project. The cumulation of work package durations on the critical path is the total duration for the project.

Example 3-13: Critical Path Method

Project Statement

Move the Corporate Customer Services department within three months at a cost not to exceed $170,000

Work Packages	Precedence	Duration (Days)	Earliest Start	Earliest Finish	Latest Start	Latest Finish	Slack (Days)	Critical Path
S—Start of project		0	0	0	0	0	0	Yes
1.1.1 Interviews conducted	None	3	0	3	0	3	0	Yes
1.1.2 Relationship charts drawn	1.1.1	2	3	5	3	5	0	Yes
1.2 Department block layouts drawn	1.1.2	2	5	7	5	7	0	Yes
1.3 Department detailed layouts drawn	1.2	4	7	11	7	11	0	Yes
2.1 Equipment to keep identified	1.3	1	11	12	18	19	7	
2.2 Equipment to order identified	1.3	1	11	12	18	19	7	
2.3 Office interior designed	1.3	8	11	19	11	19	0	Yes
2.4 Equipment and office furnishings ordered	2.1, 2.2, 2.3	1	19	20	19	20	0	Yes
2.5 Equipment and office furnishings received	2.4	11	20	31	20	31	0	Yes
3.1 Electrical services installed	1.3	3	11	14	28	31	17	
3.2 Telephone services installed	1.3	3	11	14	28	31	17	
3.3 Computer services installed	1.3	1	11	12	30	31	19	
4.1 Work order submitted	1.3	1	11	12	30	31	19	
4.2 Equipment/office furnishings moved	2.5, 3.1, 3.2, 3.3, 4.1	4	31	35	31	35	0	Yes
4.3 Office furnishings installed	4.2	2	35	37	36	38	1	
4.4 Equipment installed	4.2	3	35	38	35	38	0	Yes
4.5 Personal materials moved	4.2	1	35	36	37	38	2	
5.1 Customer/vendor notices distributed	None	4	0	4	34	38	34	
5.2 Personnel database updated	1.3	1	11	12	37	38	26	
5.3 Telephone directory revised	1.3	1	11	12	37	38	26	
F—Project finished	4.4	0	38	38	38	38	0	Yes

There is more than one method for calculating the critical path and communicating it to your project team. Use the **forward and backward pass** to calculate the critical path. Review Example 3-13. This table shows the work packages, their duration, and the earliest and latest start and finish times. To calculate the earliest start and finish times using the forward pass, do the following:

- Assume that each work package begins immediately after the related preceding work package is completed.
- Determine the earliest finish time using a simple formula: Earliest start time + duration = earliest finish time.
- Begin at the start node of your project and make a forward pass through the project plan by determining the earliest point in time each work package can begin and end.
- Start at zero. The earliest start time for the work package that begins at the first node is zero.

Next, calculate the latest finish time and latest start time for each work package using the *backward pass*. Follow these steps:

- Determine the latest start time using a simple formula: Latest finish – duration = latest start time.
- Begin at the finish node, using the earliest finish time of the last work package as the starting point. Then, make a backward pass through the project plan by determining the latest time each work package can begin and end and still complete the project by the earliest finish time.

Now compare the earliest finish and latest finish times. If they are *no*t the same, then that work package has slack time and is off the critical path. (You can also use this formula: Latest start (or finish) time - earliest start (or finish) time = slack time.) Once again, review Example 3-13. Work packages 1.1.1, 1.1.2, and 1.2 (among others) do not have slack time and therefore are on the critical path. The path through the project network that determines the shortest time within which the project can be completed (zero slack time for all tasks on that path) is the critical path. Example 3-13 displays a table that includes a column labeled "critical path." Check that column to see which work packages are on the critical path.

MORE ABOUT PERT

PERT (Program Evaluation and Review Technique) uses a statistical approach to arrive at the project's duration. PERT is a variation of the critical path method. Like the critical path method, it is developed along network diagram principles. The critical path method, however, bases its time estimates on historical data, and work package durations are generally the average time that it has taken to complete similar work packages in the past. Sometimes, though, you will not have historical data to go by and you will have to rely on experience and good judgment to figure out

how long it's going to take you to complete the work packages. PERT approximates the average completion time, thereby giving you a better understanding of when your work packages will probably be completed.

PERT relies on the weighted average of three time estimates—optimistic, most likely, and pessimistic—to determine the expected completion time for each work package (see Example 3-14). You can then calculate the critical path and the completion times for the project. This technique is used when work packages contain a high degree of uncertainty. For example, if a supplier can deliver a hard-to-obtain resource on time, you could finish a particular work package within a few weeks, but if the supplier cannot deliver the resource for several months, then your project's time line could change significantly. It is also a useful technique to use when you are undertaking a unique project, one that has a great deal of risk, where the results are difficult to predict—such as a research and development project—and where there is no historical information to guide you. A PERT calculation will give you a better understanding of duration probabilities and the duration boundaries within which you can complete the project.

To calculate PERT:

- Assign three time estimates to every work package.
- Determine the weighted average for each work package using this formula:

$$\frac{(1 \times \text{Optimistic}) + (4 \times \text{Most Likely}) + (1 \times \text{Pessimistic})}{6}$$

- Calculate the project's duration using the forward and backward pass, as you did in the critical path method.

Example 3-14: Calculating PERT

Project Statement

Move the Corporate Customer Services department within three months at a cost not to exceed $170,000

Work packages		Duration	Optimistic Duration	Most Likely Duration	Pessimistic Duration
1.1.1	Interviews conducted	3d	1d	3d	5d
1.1.2	Relationship charts drawn	2.17d	1d	2d	4d
1.2	Department block layouts drawn	2d	1d	2d	3d
1.3	Department detailed layouts drawn	4.33d	3d	4d	7d
2.1	Equipment to keep identified	2.17d	1d	2d	4d
2.2	Equipment to order identified	2d	1d	2d	3d
2.3	Office interior designed	8.83d	6d	8d	15d
2.4	Equipment and office furnishings ordered	2d	1d	2d	3d
2.5	Equipment and office furnishings received	11.5d	5d	11d	20d

PLANNING SUMMARY

It was Lady MacBeth who warned, "What's done cannot be undone."

Perhaps this is an exaggerated statement. Perhaps not. Regardless, in Planning you map out exactly who is going to do what, when they are going to do it in calendar time, and how you're going to mitigate risks. This lays the groundwork for producing results during Implementation.

CHAPTER FOUR

FOUR

Project Implementation

The plan is now in hand, and the project team members review it one last time. They reveal additional potential problems and add preventive and contingent actions to the plan. They are now ready to get to work.

The project starts smoothly, in part due to Tim Dwight's experience. During Planning, he focused part of the Potential Problem Analysis on the start-up activities. However, the team faces a slew of conflicts as implementation continues. The Facilities Manager submits her resignation to the company, so the team loses a critical resource. Vice president of Corporate Customer Services Peter Baldwin, who is responsible for the project funds, intends to keep an eagle eye fixed on each piece of the project to make sure the budget is adhered to. Other personnel changes and scope changes pop up, and the team is forced to alter the plan along the way.

Are you ready to do the work?

After defining the reasons for doing the project and planning how it will be accomplished, you should be ready to move into Implementation. This is where "sweating the Definition and Planning" helps you minimize "bleeding the Implementation." It's now time to do the work. Guided by the project plan, you'll use project resources to produce the deliverables that will fulfill the project statement and objectives.

During Implementation, you and your project team will answer five questions:

- How will work start?
- How will the project team and contributors communicate during implementation, and what kinds of documentation will they be expected to produce?

- How will the project be monitored and how should progress be reported?
- How will concerns (uncovered during monitoring) impact the project plan?
- What activities will be completed to evaluate and finalize the project?

Four Implementation activities will assist you in answering these questions:

- Start to Implement
- Monitor the Project
- Modify the Project
- Closeout and Evaluate

Before you start to implement, "freeze" your project plan so that you can compare the original to the final, changed plan. The original establishes a baseline and allows you to track how the project is actually doing against the plan. Some software packages will automate baselining for you.

START TO IMPLEMENT

Implementation can start several weeks, or even months, after you've defined and planned the project. This gap, however small, will probably require you to review and revisit some of the resource commitments gained during the previous planning activities.

Review the plan and pay special attention to the initial days and weeks of the project. A project that starts with a stumble tends to finish badly. Confirm that your project team and contributors know when their time or resources are needed, and just as important, when their project activities should begin.

It's also critical that everyone involved understands the project statement and objectives. If you haven't done so already, provide your project team and contributors with the specific "why" behind their work, as well as how their activities relate to overall project goals.

In addition, meet with your project team to establish **ground rules.** Ground rules are operating principles that govern a project team as they implement the project plan. They can be as trivial as, "Team members can call each other at home before 10 p.m. during the work week, and between 11 a.m. and 11 p.m. on weekends"; or as critical as, "Each team member must submit a status report using the designated template every Friday before 3 p.m." (See Example 4-1).

Ground rules should address three main areas:

1. Working together
2. Controlling changes in the project and work environment
3. Improving project monitoring

Let's look at these in more detail.

Any project team that wants to succeed needs clear, accepted principles for *working together*. To do this, establish:

- The decision-making authority of each member of the project team (for example, who will be responsible for making changes to the project plan?)
- How conflicts with the customer, the organization, and other contributors should be resolved (for example, should they be immediately escalated to the project manager or handled by each team member?)
- How feedback on individual performance will be communicated (for example, in a monthly report or informally by the project manager as work is completed?)
- How new ideas and suggestions will be handled (for example, should they be included in a weekly status report or sent immediately to the project manager?)

☞ Tip

Reserve a conference room or office space (sometimes called a "war room") where project artifacts like schedules and records can be kept and maintained. You and your team can also use this space to conduct impromptu project meetings and store shared project documentation. Make schedules and issue resolution visible on the walls.

- How team members will communicate among themselves (for example, is e-mail the preferred method? What information should be handled over the phone and what should be saved for project meetings?)
- How project status and customer feedback will be reported to the team (for example, will you hold bi-weekly face-to-face meetings; or will you put out a daily e-mail; or both?

An established method for handling and *controlling changes* is also paramount to the success of the project. To do this, you and your project team will agree on:

- How problems and potential problems will be reported (for example, what magnitude of cost or schedule overrun warrants an immediate alert to the project manager?)
- How changes to the project plan will be documented and communicated (for example, will a new project plan be sent to the team each time a change is made? What changes require written approval from the customer?)
- Who possesses the authority to approve changes (for example, who else besides the project manager can approve a change to resources, schedule, and/or deliverables?)

A third aspect to consider when crafting ground rules is *improving project monitoring.* These guidelines will set the groundwork for the later activity, Modify the Project. They include determining:

- What information should be reported back to the project manager, how often, and in what format (for example, weekly status reports)
- How the project team will record their time and expenses (for example, have you established a project code and codes within it to match major deliverables?)

Helping You Start to Implement

Starting out your project on the right note is critical to a successful outcome. The checklist topics listed below can help steer you away from some of the usual communication breakdowns that are often part of a project launch.

Checklist

- ✓ Individual and/or group communications planned
- ✓ Project documentation assembled to guide implementation
- ✓ Materials, facilities, equipment, funding, etc., in place for initial tasks
- ✓ Ground rules established for team interaction, communication
- ✓ Potential Problem Analysis and Potential Opportunity Analysis done for critical initial tasks
- ✓ Team and team member performance expectations agreed to and in place
- ✓ Monitoring systems and methods agreed to and in place
- ✓ Issue resolution protocols agreed to and in place
- ✓ Reporting systems and methods agreed to and in place
- ✓ Change control systems agreed to and in place

Example 4-1: Ground Rules

SUBJECT: Ground Rules

August 9

TO: Corporate Customer Services Project Team

FROM: Tim Dwight

Thanks for participating in yesterday's kickoff meeting. As discussed, along with the project baseline, please keep the following ground rules available for easy reference throughout the project.

- Don't hesitate to come to me, but look first to the person with primary responsibility for your tasks if you have questions or concerns about your work.
- Please seek out approval for any overtime of more than two hours or unbudgeted expenses of more than $250.
- This project will be moving fast. Please report the following to me:
  - One day prior to your task's date, confirm your readiness
  - Once a day while the task is underway, report percent complete and concerns
  - On the day of completion, confirm with Actual versus Plan for time and cost, and any remaining concerns.
- Use e-mail for routine reporting
- Use the phone and voice mail for any urgent issues.
- It is OK to call me at home after hours and during the weekend.

I look forward to our working together and seeing us all comfortably ensconced in our spanking new offices.

In the Corporate Customer Services example, Tim Dwight holds a kickoff meeting. Since not disrupting service to customers during the office move is crucial, everyone who will be involved in the project is invited. The project plan and responsibility assignments are reviewed and questions from the group are discussed. The meeting is short, but beneficial. The discussion clears up questions about moving the computer, plans for the new office space, equipment being purchased, time frame for the actual move, etc. Also discussed are reporting responsibilities, review meetings, escalation of issues, potential problems and opportunities, etc. As a result of the discussions, the plans changed slightly and this is reflected in the Gantt (see Example 4-2). The overall budget was baselined at $165,483 and the overall duration at 45 days, an increase of 7 days from the initial 38 days shown in Example 3-10. Weekly review meetings were scheduled for Monday of each week. A closeout meeting and opening celebration were added to the Gantt chart as well as new work packages resulting from potential problem and opportunity analyses.

You and your project team should use the checklist on page 68 as thought starters for establishing your own set of ground rules. Your list should reflect the unique needs of your organization and project.

Preparing to start may seem like overkill after all the planning that you have just done but, in fact, taking the time to do this thoroughly can help prevent common start-up problems, especially if some time has elapsed between the project planning and the start-up.

JOIN TOGETHER

The theme throughout this activity is communication with your project team and contributors—reconfirming expectations and commitments, revisiting the project statement and objectives, and developing ground rules. This does not always require face-to-face meetings. Depending on the number and proximity of team members, it may be easier to send a quick e-mail or voice mail.

At the same time, don't ignore the benefit of bringing the project team together. Gathering people in one place (at one time) ensures that everyone will hear the same message. In addition, it creates the opportunity for participants to get to know one another more personally, propose ideas to the entire group, or resolve pre-implementation concerns. It may also provide an opportunity for the project sponsor or for a senior manager or champion to address the team and show their support for the project.

If you're having trouble deciding whether to hold a face-to-face meeting, first establish meeting objectives. Do you want the people involved to interact individually? Do you merely want information from each of the members? Do you need to dig further into concerns? Then ask yourself, "Is there another way to meet these objectives besides a face-to-face meeting?" For more on running project meetings, see "Meetings" on pages 105–109.

pp. 105–109

THE MORE YOU KNOW...

If your project requires a formal start, schedule a kickoff meeting for project team members and contributors. This will give you the opportunity to socialize your project plan, review commitments, and officially initiate the project, while providing them with the chance to ask questions and clarify potential misunderstandings.

Example 4-2: Project Baseline Schedule

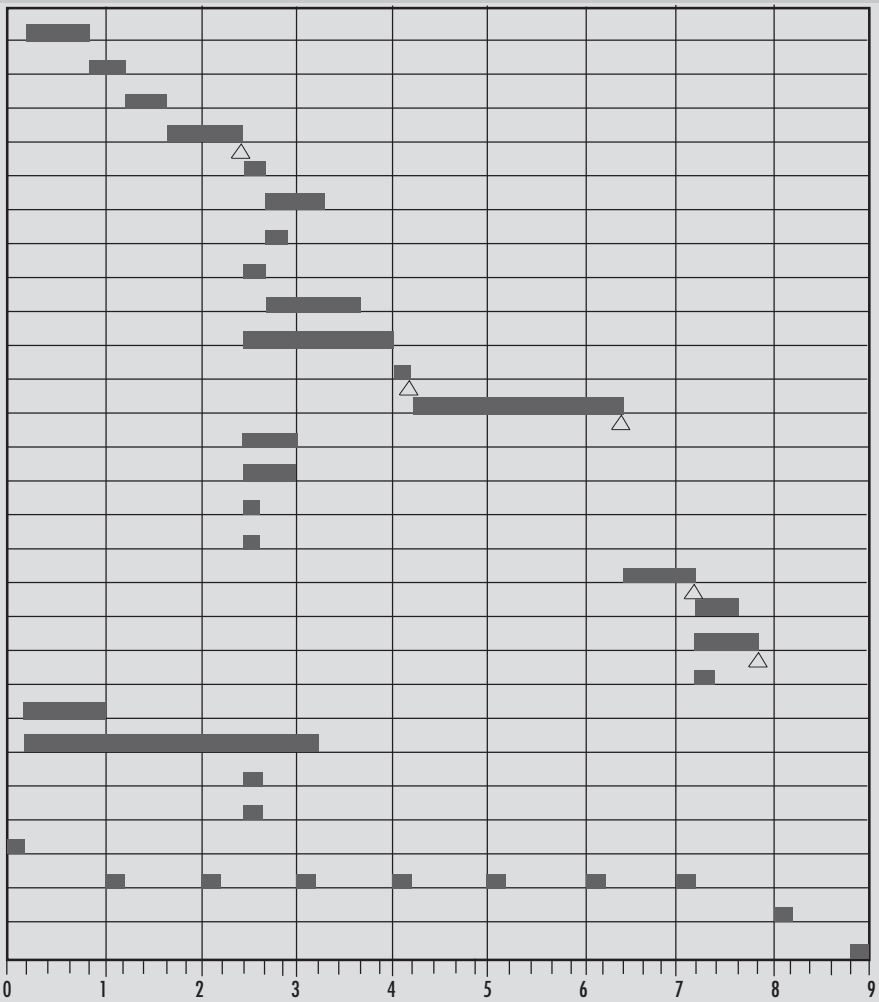
Project Statement

Move the Corporate Customer Services department within three months at a cost not to exceed $170,000

Work Packages

1.1.1 Interviews conducted
1.1.2 Relationship charts drawn
1.2 Department block layouts drawn
1.3 Department detailed layouts drawn
2.1 Equipment to keep identified
2.2 Old equipment prepared *
2.3 Contact COMP/AX for support *
2.4 Equipment to order identified
2.5 Equipment pre-ordered *+
2.6 Office interior designed
2.7 Equipment/office furnishings ordered
2.8 Equipment/office furnishings received
3.1 Electrical services installed
3.2 Telephone services installed
3.3 Computer services installed
4.1 Work order submitted
4.2 Equipment and office furnishings moved
4.3 Office furnishings installed
4.4 Equipment installed
4.5 Personal materials moved
5.1 Customer/vendor notices distributed
5.2 Corporate brochure updated +
5.3 Personnel database updated
5.4 Telephone directory revised
6.1 Kickoff meeting held
6.2 Weekly review meeting held
6.3 Closeout meeting held
7.0 Opening celebration

Gantt



* Potential Problem Analysis revisions
\+ Potential Opportunity Analysis revisions
△ Milestones
▬ Baseline

MONITOR THE PROJECT

> **Tip**
>
> Save project reports. Not only are they important during project implementation, but they also contribute to a project history that you and others can review and learn from in the future.

Your project has now begun, and you are consuming resources and producing deliverables—hopefully not without a watchful eye. In this activity, you'll tackle project monitoring—watching how your project is operating compared to what you planned.

Put simply, monitoring asks you to make decisions regarding *what* will be monitored and *when* it will be monitored. And, if you haven't done so already, you'll determine *how* this data will be reported and *who* will receive the report.

You should ensure that *all* time, cost, and performance data are gathered from *all* work packages; this will present a picture of the overall project. However, as project manager, you'll have neither the time nor the energy to review in detail this tonnage of data. Instead, you must decide how to best allocate your time and attention to this data. *This is the act of monitoring.*

So, what will you monitor? Examine the three areas described below—time, cost, and performance—for guidance on how to monitor.

Time

Most project managers choose to monitor the project's critical path, since it determines whether the project will ultimately be completed on time. However, there are other aspects you can focus your attention on, including:

- Delay of work packages not on the critical path
- Work packages completed ahead of schedule
- Lag time needed versus lag time planned
- Triggers or thresholds

Example 4-3: Time Variance

Work Packages	Baseline Duration	Actual Duration	Duration Variance	Baseline Start	Actual Start	Baseline Finish	Actual Finish
2.0 Office Equipment	20d	22d	2d	7/24	7/22	8/20	8/20
2.1 Equipment to keep identified	1d	2d	1d	7/24	7/25	7/24	7/26
2.2 Old equipment prepared	3d	3d	0d	7/25	7/29	7/29	7/31
2.3 Contact COMP/AX for support	1d	1d	0d	7/25	7/29	7/25	7/29
2.4 Equipment to order identified	1d	2d	1d	7/24	7/25	7/24	7/26
2.5 Equipment pre-ordered	5d	5d	0d	7/25	7/29	7/31	8/2
2.6 Office interior designed	8d	16d	8d	7/24	7/22	8/2	8/12
2.7 Equipment/office furnishings ordered	1d	8d	7d	8/5	8/5	8/5	8/14
2.8 Equipment/office furnishings received	11d	10d	-1d	8/6	8/6	8/20	8/20

Above all, what you choose to monitor should alert you if the project has fallen behind or is ahead of schedule. Example 4-3 shows duration variances for completed work packages. Work package 2.6 Office interior designed, which was originally eight days long, now shows a duration of 16 days, but the overall duration increase for major deliverable 2. Office Equipment is only two days. This was accomplished through the judicious use of lead and slack time.

Cost

Keeping a project within budget can be a tough battle. Your best chance for success starts with realistic estimates, and a strong commitment to monitoring resource expenditures. Calculate how much of your budgeted resources you've spent (this can include cash, materials, people hours, etc.) compared to the budget for the work completed, and how much remains to complete the project. Example 4-4 contains a column that charts the cost variance—the difference between planned cost and actual cost—for each work package. It shows several work packages being over the budget limit, indicating that major deliverable 2. Office Equipment is close to $6,870 over its baseline cost. These costs were incurred partly through the acquisition of additional equipment and because of under-estimating interior designer involvement.

Pitfall

Resist the urge to micro-monitor unless it's required for quality control purposes. Hawking every deadline and expenditure will cause you to expend time and energy that you may need for handling more important project issues. On the other hand, not monitoring work packages that are important but not on the critical path is also a mistake.

Example 4-4: Cost Variance

Work Packages	Baseline Cost	Actual Cost	Cost Variance
2.0 Office Equipment	$78,947.87	$85,816.98	$6,869.12
2.1 Equipment to keep identified	$960.37	$1,920.74	$960.36
2.2 Old equipment prepared	$2,000.00	$1,654.00	($346.00)
2.3 Contact COMP/AX for support	$0.00	$0.00	$0.00
2.4 Equipment to order identified	$937.50	$1,875.00	$937.50
2.5 Equipment pre-ordered	$0.00	$0.00	$0.00
2.6 Office interior designed	$5,050.00	$7,367.25	$2,317.25
2.7 Equipment/office furnishings ordered	$70,000.00	$73,000.00	$3,000.00
2.8 Equipment/office furnishings received	$0.00	$0.00	$0.00

Performance

Back in Definition, you established objectives to identify project goals. You also may have constructed a work breakdown structure dictionary and populated it with performance standards. These objectives and performance expectations now become the primary sources for monitoring project performance.

To monitor project performance against goals, ask:

- What will tell us if we are meeting the objectives?
- How well is our performance meeting the objectives?

Pitfall

Don't provide every project detail to customers and stakeholders—it invites them to resolve minor concerns that are better left to the project manager and team. However, don't hide facts or significant threats to the project from them.

Answering these questions will require that you and your project team engage in *predictive monitoring*. Predictive monitoring involves judging whether project objectives will be met by the end of the project…based on progress made against them to date. If some of your objectives will be met several months or years later, there's even more reason to monitor progress now so that you'll have a factual basis for judging whether the objective will eventually be met. If you determine that objectives might not be fulfilled, you'll take action in the next activity—Modify the Project.

There are many approaches to "when" you should monitor a project. Some project managers prefer to scrutinize the start and finish of every work package; others monitor on a weekly or monthly interval. Still others only pay attention to certain work packages on the critical path. How often you choose to monitor will depend on the size and complexity of your project, as well as your personal style of managing. At a minimum, compare the plan to the actual work being completed to see how the project is doing.

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See Example 4-5 for a snapshot of how work is progressing during implementation of the Corporate Customer Services project. You will find that the work for major deliverable 2. Office Equipment has increased by almost 79 hours over the original estimate of 141 hours. This was caused by internal workstation returns being delayed in shipment (see 127–130), and by the change in facilities management leadership.

Example 4-5 Work Variance

Work Packages	Baseline Work	Actual Work	Work Variance
2.0 Office Equipment	140.4h	218.55h	78.15h
2.1 Equipment to keep identified	14h	28h	14h
2.2 Old equipment prepared	24h	24h	0h
2.3 Contact COMP/AX for support	2h	2h	0h
2.4 Equipment to order identified	15h	30h	15h
2.5 Equipment pre-ordered	12h	12h	0h
2.6 Office interior designed	43h	86h	43h
2.7 Equipment/office furnishings ordered	10h	32h	22h
2.8 Equipment/office furnishings received	5h	4.55h	-0.45h

It's possible that you'll need to monitor some parts of the project plan more frequently than others. For example, you may monitor the project after every work package along the critical path to ensure that the project is on schedule, but reserve the rest of your monitoring for milestones (see "Walking the Milestones" on page 75). To determine how often you should monitor the project, answer the following questions:

p. 75

- When will periodic monitoring provide sufficient information to manage results?
- When will detailed, frequent monitoring improve project performance?

Monitor the Project is closely tied to Modify the Project, the next Implementation activity. As you and your project team monitor time, cost, and performance, you'll uncover a variety of *concerns***.** In Modify the Project, you'll analyze these concerns and determine how the project will need to be changed to accommodate them.

Allowing your project plan to proceed without monitoring can be a disaster. If you're extremely lucky, all work packages will be completed on time, within budget, and with the desired results. But don't count on it. Instead, construct a system for monitoring the project so you can measure actual progress against the plan, and thus increase your chances for success.

You can report monitoring results in two different ways. You can use a formal reporting method, sending out a project report on a periodic basis. Or you can engage in informal conversations with your project participants. The best approach is a combination of the two; use the formal reporting cycle to publicize project progress, and informal reporting to provide essential, real-time data.

Pitfall

In the absence of feedback, people will draw their own conclusions about the quality of their work. Make sure you feed back information to team members and project contributors (gathered during monitoring) based on their performance to date. See pages 95–98 for more on feedback.

Walking the Milestones

One approach to monitoring is the use of *milestones*. Milestones are specific points in the project plan that correspond with the completion of major components of the project, such as an important major deliverable, a project phase, a work package, or subproject. Technically speaking, milestones are events of zero duration and don't consume resources. They represent the instant at which something is started or completed. However, milestone activities like scheduled reviews will consume resources and need to be planned.

Use project milestones to mark the points in time to monitor critical portions of the project. Conduct review meetings around project milestones.

Choosing when to place milestones in the project schedule is key to successfully monitoring your project. Create scenarios that represent where you'll set milestones. Here's a list of some points to consider:

- ✓ When important decisions will be made
- ✓ When work packages that affect project timing will be started or completed (for example, work packages on the critical path)
- ✓ When major deliverables that have a significant impact on cost will be started or completed
- ✓ When major deliverables that affect key project objectives are started or completed
- ✓ When an historically difficult work package will be started or completed
- ✓ When something will be tested that may affect project success
- ✓ The start or completion of a subproject

As the project reaches a milestone, you'll monitor the schedule, cost, and performance. The triangles shown in Example 4-2 represent milestones for the Corporate Customer Services project.

Pitfall

Don't overlook concerns that are identified elsewhere outside the bounds of your project monitoring. Stakeholders, management, and others may raise concerns about the value or progress of the project. If you don't address their issues, you'll risk alienating them, or even worse, ignoring a concern that negatively impacts your project.

Your project team could require more instructions on reporting than you provided in the Start to Implement activity. For example, project stakeholders may ask you for monitoring results every month, or after every milestone. In addition, they might expect to receive results in a certain format. If this is the case, prepare report templates for your project team. Here are some of the types of reports you can create:

- Spend plan versus actual spending
- Work plan versus actual
- Planned commitments versus actual
- Cost, schedule, or performance by account, work order, or performer
- Costs by cost center
- Potential problems and opportunities
- How to return plan to Actual
- Executive summary

JOIN TOGETHER

Monitoring involves participation by the project team, contributors, resource managers, and stakeholders. Tapping these groups for their input will help you determine what is important to monitor and how frequently to monitor it. Although you (as the project manager) are responsible for project monitoring, each team member and contributor shares the load. Remember the ground rules you established in Start to Implement? They included how and when project information should be communicated to you, the project manager.

If you want these reports to contain targeted project monitoring data, share the chosen milestones with your team and contributors, as well as what will be monitored. This will help them to include relevant information in their status reports.

Reports will increase the likelihood of getting the right information in a timely way, and ease the burden of preparing final reports.

THE MORE YOU KNOW

It may be that your organization relies on a specific tool to monitor a project. For example, **Earned Value Analysis (EVA)** is used in organizations to make specific calculations for time, cost, and performance to indicate current and anticipated project progress. For more information on EVA, see Additional Topics on pages 84–85. Other tools include variance analysis and trend analysis.

pp. 84–85

MODIFY THE PROJECT

Projects aren't perfect. Even though you invested a significant amount of time and effort in Definition and Planning, you still might be forced to make minor adjustments or wholesale changes as you implement the project.

As you and your project team monitor the project, issues and **concerns** will surface that need to be resolved. A concern can be a problem you need to solve, a decision that you must make, potential problems or opportunities you need to address, or additional actions you need to take. Modify the Project requires you to answer three questions about these concerns:

1. ***What is the data telling you about this concern?***

   You first need to clarify exactly what the concern means. To do this, ask the appropriate project participants the following questions:

   - ➢ How was this concern surfaced?
   - ➢ When is the earliest point in the plan it becomes a concern?
   - ➢ What is meant by…(name the concern)?
   - ➢ What exactly is…?
   - ➢ What evidence do we have about…?
   - ➢ What different problems, decisions, or actions are part of this…?
   - ➢ What else concerns you about…?

   Your answers to these questions will help you to separate and clarify concerns so that you are able to take action to resolve them. See Situation Appraisal on page 119-120 for more information on how to separate and clarify concerns.

2. ***What should you do about the concern?***

   You've captured and clarified concerns. Now you'll need to decide how to handle them. Does the concern require you to make a decision or solve a problem? If so, who will need to be involved, and when? Or does the concern require that an action be taken? Who should take the action?

   In some cases, you'll struggle to decide which concerns should be resolved immediately and which can be delayed until a later time. The Situation Appraisal method on pages 118–121 offers a process for prioritizing your concerns by considering their current impact, future impact, and time frame.

   Once you've clarified and prioritized your concerns, decide what actions to take to resolve them.

☞ Tip

Some organizations require a written change order before a decision to alter the project can be made. Even if you're not required to document changes, doing so will create a tangible agreement or an audit trail for you to present to customers or stakeholders.

☞ Tip

When something goes wrong during Implementation, determine whether it is a time, cost, performance, or people resource issue; identify the work packages affected and if those are on the critical path; determine whether other work packages or any objectives may be affected. Then use Situation Appraisal to separate and clarify the issues. Situation Appraisal together with other project management tools like the Gantt and resource requirements, etc., will make it easier to modify your project.

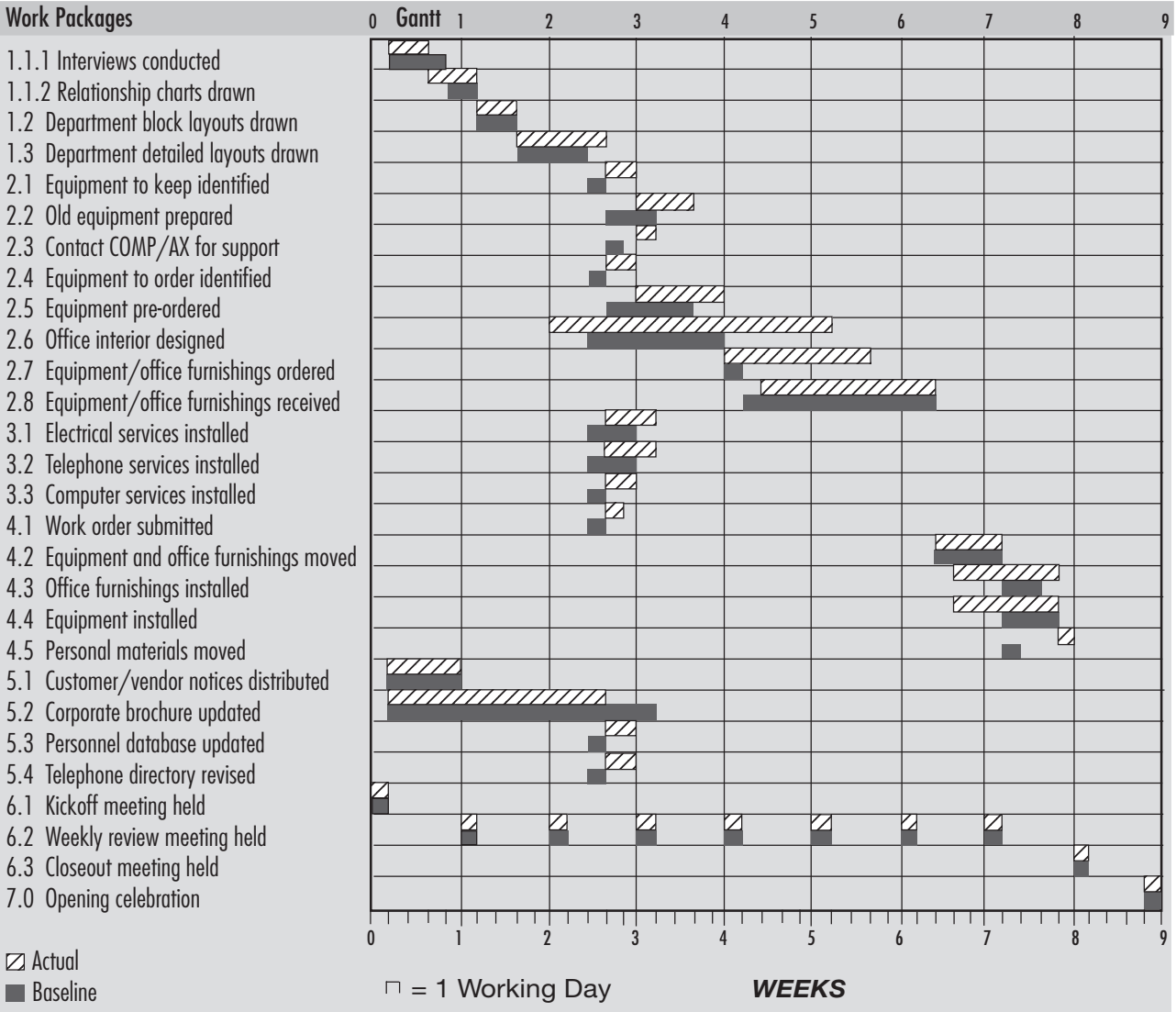
pp. 118–121

Example 4-6: Actual Schedule

Project Statement

Move the Corporate Customer Services department within three months at a cost not to exceed $170,000

Work Packages



3. How will this impact the project plan?

Will you change the project objectives? Rearrange the project schedule? Launch a new project? Change the entire scope of the project? Request additional resources?

Depending on the action you take to resolve the concern, your project plan could be dramatically affected…or minimally tweaked. You need to decide how you'll edit your plan, and how to best communicate the change to project participants and stakeholders.

Keep in mind that the cost of a change (in time and money) may not seem significant at first. However, a change that impacts even one project objective will most likely impact the work breakdown structure, the RAM, resource requirements, and the schedule of work packages. Before you know it, you're dealing with an enlarged scope and/or a woefully delayed project.

So don't jump into a large change. Instead, consider more than one alternative for resolving your concern, and make sure you gain an upfront understanding of the cost and time ramifications of your change. When you decide to make a change to the project plan, however small, make sure you document it and the associated cost and time figures. This will allow you to evaluate the impact of all changes when you evaluate results at the end of the project. In addition, others can use the information to avoid the same problems in the future.

Modifying the project plan will also ensure that the project plan remains relevant and timely to the project team and contributors. If you don't modify the project, the effort you spent to create a guiding document that everyone follows and monitors will be wasted.

Example 4-6 shows the actual schedule versus the baseline schedule. Several modifications were made to the schedule to keep it on track. Work package 2.6 Office interior designed had to start earlier than planned because an interior designer had to be selected early enough to help identify equipment to keep (2.1) and equipment to order (2.4). The resignation of the facilities manager also delayed completion of the work package by eight days. This in turn lengthened the duration of work package 2.7 Equipment/office furnishings ordered from one day to eight days. And although the start of 2.8 Equipment/office furnishings received was delayed by a day, it ended a day early thanks to the equipment being preordered. Other changes made, which impacted the budget by $8,000, were the purchase of fireproof filing cabinets in work package 2.7 Equipment and office furnishings ordered and new customized opportunity management software in work package 3.3 Computer services installed.

JOIN TOGETHER

Changing the project is a significant decision if it impacts the end result, the completion date, or the budget. Therefore, it's necessary that you involve customers and stakeholders in the decision.

Pitfall

There could be potential problems with holding regularly scheduled reviews (e.g., every Friday). They may be inadequate or even unnecessary, particularly if the entire project team is expected to attend. If the team feels they are important, make sure the purpose and expected results are defined before the meeting.

CLOSEOUT AND EVALUATE

The project is finished, but is your work done? Not yet. Closing out a project involves several activities to review and evaluate the external and internal success of the project.

Tip

Include project closeout activities in your work breakdown structure to ensure that they are completed.

To determine how the project performed, consult your objectives first. After all, the objectives represent the goals you said that the project should meet. Then, compare them to the completed deliverables—the outputs of your project. Did the project deliverables satisfy the objectives? If they did, congratulations to you and the project team; you accomplished the most important part of the project. If you fell short, record why and what needs to be done about it.

Now, forget about the external success for a second. Focus on how well you, the project team, and project contributors worked together to manage the project. To conduct a review of the internal functioning of the project, examine the following areas:

- Project schedule (on time or delayed?)
- Accuracy of the resource estimates
- Impact of resource availability or shortages on the project
- Timeliness and accuracy of reporting by the team
- Timeliness and accuracy of feedback provided to the team
- Individual performance of team members and contributors
- Internal obstacles that impeded project work
- Resolution of conflicts
- Acquisition of new capabilities or skills
- What went particularly well and should be repeated
- What went particularly badly and shouldn't be repeated

Pitfall

Check to make sure the contingent actions, capitalizing actions, and triggers you set in "Protect the Plan" and "Enhance the Plan" are disabled—keeping them around might run up cost or cause other problems.

On the opposite page is a closeout checklist and questions that you can use to evaluate your project.

Sometimes, problems in the way the project team worked together can cause a failure to meet objectives. If this is the case, make sure the information is captured. It's also quite possible that you met the objectives, but experienced internal problems and successes that should be captured as lessons learned. Record these as well.

It seems obvious, but communicating the end of a project involves more than a mere, "We're done, folks!" To shut down the project, you'll need to close out any financial reporting you've maintained and release your project resources to other projects and day-to-day work. In addition, you should contact project team members, contributors, and stakeholders to let them know the project is complete (see Example 4-7).

Closeout and Evaluation Checklist

Closeout Checklist

- ☐ Deliverables all completed
- ☐ Contingent actions disabled
- ☐ Project accounts closed
- ☐ Team members recognized
- ☐ Owners, sponsors, vendors notified of close
- ☐ Results documented

Closeout Questions

1. Did the project satisfy the project statement?
2. How well were customers, sponsors, and end users satisfied with the project?
3. If any requirements were not met, explain why.
4. How well were project objectives satisfied?
5. How well did this project stay on schedule?
6. If any major deliverables were early or late, explain why.
7. How well did the team adjust to schedule changes?
8. How well did we estimate resources overall?
9. How did our actual use of resources compare to the plan?
10. How did changes in resource availability affect overall implementation?
11. How well did the team work together?
12. How were performance expectations set and maintained?
13. How well were performance expectations satisfied during the project?
14. What, if any, changes were made to the project definition after implementation started? Why?
15. What, if any, changes were made to the project plan after implementation started? Why?
16. How will you improve the next project you do?

☞ Tip

At the end of a long project, it may be difficult to report on lessons learned. To prevent this from happening and to maximize input, over the life of the project, project managers can ask for one or two things that have gone well and one or two things that could have gone better. At the end of the project, the project manager compiles them as lessons learned.

Team members and contributors should also be given closure—an acknowledgment of their contribution and a formal ending of their commitment to the project. A closeout party, an article in the organization's employee newsletter or intranet, or a scrapbook represent concrete means of providing closure for project team members. But it's also critical that team members receive an individualized summary of their contributions to the project and feedback over the life span of the project. Submitting this report to them and their managers will formally end the performance evaluation.

Finally, you'll need to document the above closeout activities. Include the project's performance against objectives, actual expenses versus the budget, actual timing compared to the schedule, and lessons learned. This closeout document should also contain an executive summary, open issues, and any software files associated with the project. Archive these documents so that they are easily available to future project teams.

JOIN TOGETHER

Gather closeout data from everyone involved in your project—team members, stakeholders, customers, management, contributors, and resource managers—individually and in groups. You'll receive the most candid comments when you meet individually with people. Bringing the team and others together, however, allows you to see areas of consensus and disagreement. It can also spur the addition of forgotten or overlooked ideas.

THE MORE YOU KNOW...

When you recognize project contributors and team members, it's probable you'll want to reward good performance. The more relevant and appealing a reward (or consequence) is to a person, the more likely he or she is to repeat the positive behavior. (For more information on people and performance, see People and Your Project on pages 88–99.) For example, if someone on your team is a hockey fan, an encouraging reward at the end of the project may be premium tickets to a local hockey game. However, avoid offering rewards that serve to de-motivate project participants. For example, public recognition may seem like a positive consequence, but some individuals find being in the limelight embarrassing and therefore punishing.

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Example 4-7: Closeout Report

SUBJECT: Closeout Report

September 3

To: Corporate Customer Services Project Team

From: Tim Dwight

The Corporate Customer Services department has been installed in their new offices within three months as planned. We exceeded the equipment budget of $70,000 by $8,000. This was due to the purchase of fireproof filing cabinets and opportunity management software. Both these items were added at the request of Peter Baldwin, the Corporate Customer Services vice president, and were not on the initial equipment list. We also overran initial estimates on interior design labor costs by $4,216 because it took much longer to identify the equipment to keep and order (2.1, 2.4) and to design the office interior (2.6).

Had we not had a change in facilities management leadership, our original estimates would have been nearer the mark. The overall project cost came in at $177,209 which was $11,726 over the baseline and $7,209 over the $170,000 target set in the project statement.

Most of the work packages were completed either early or on time, with the notable exception of 2.6 Office interior designed which ran eight days over schedule. This was due to the Facilities Manager resigning, a replacement having to be found, and then ramping up to complete the work.

To compensate, the duration of 2.7 Equipment/office furnishings ordered was increased to eight days from the original one day so that the material could be ordered as soon as decisions were made. This resulted in 2.8 Equipment/office furnishing received being completed on time. Thanks to some of the material being preordered, the work package was actually completed in 10 days, instead of 11. The overall duration was 45 days as originally baselined.

The project team and project contributors worked well together and were very flexible in rearranging their work schedules to accommodate the project schedule. All reporting was done in a timely fashion, and concerns were identified and reported to the person with primary responsibility as agreed upon in the ground rules.

All vendor invoices have been paid by Finance and the project codes that were set up for this project are now in the process of being shut down.

Peter Baldwin has expressed his satisfaction with the way this project was completed. In particular he was very impressed that service to customers was not disrupted during the move and that the COMP/AX computer was operational soon after it was set up in its new location. He intends to thank all project contributors at the opening ceremony scheduled for this Friday.

Documents pertaining to this project will be archived in the back office database by Sept. 23 and will be accessible to all project teams after that date.

ADDITIONAL IMPLEMENTATION TOPIC

EARNED VALUE ANALYSIS

> **Tip**
>
> EVA relies on accurate and timely data to produce indicators. Make sure you have—or install—data capture systems for relevant data, then check the key indicators regularly when monitoring.

Budget and schedule reports can tell you whether you've spent more money, or completed less work, or even finished in less time than planned. But they don't tell the whole story. What if you spent less money three months into the project than you planned? Is that good? Not unless you completed as much work as you expected. What if you completed more work in three months than planned? Is that good? Not if you spent more money than planned.

Examining budget and schedule reports may not be sufficient for you to accurately gauge project success. **Earned Value Analysis** will help you reconcile your spending and work completed by comparing them together…against the plan. Example 4-8 shows the breakdown of earned value elements and variances for the Corporate Customers Services project.

Example 4-8: Earned Value Analysis

Work Breakdown Structure	PV	EV	AC	SV	CV	BAC	EAC	Variance
Move Corporate Customer Services	$165,482.87	$165,482.87	$177,208.98	$0.00	($11,726.12)	$165,482.12	$177,208.98	$11,726.12
Office layouts	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Office equipment	$78,947.87	$78,947.87	$85,816.98	$0.00	($6,869.12)	$78,947.87	$85,816.98	$6,869.12
Office area	$77,620.00	$77,620.00	$82,620.00	$0.00	($5,000.00)	$77,620.00	$82,620.00	$5,000.00
Office move	$5,000.00	$5,000.00	$5,000.00	$0.00	$0.00	$5,000.00	$5,000.00	$0.00
Organization manuals	$2,915.00	$2,915.00	$2,772.00	$0.00	$143.00	$2,915.00	$2,772.00	$143.00
Project managed	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Opening celebration	$1,000.00	$1,000.00	$1,000.00	$0.00	$0.00	$1,000.00	$1,000.00	$0.00

The elements of EVA include:

- Planned Value (PV): How much did you budget for all the work packages that were supposed to be completed by now? In other words, how much should you have spent by this point?
- Earned Value (EV): How much did we budget for all the work packages that we actually completed? The reason it is called "Earned Value": *"earned"* because we've actually done the work; *"value"* because of how much we said it was worth when we budgeted for it.
- Actual Cost (AC): How much did it actually cost to do the work we actually did?

Project variance represents how much your actual results are different from the plan. To calculate variance with EVA, use the following formulas:

- EV – AC = Cost Variance
- EV – PV = Scheduling Variance

Another EVA tool is a project performance index, which also gives you a better idea of how well your project performs. Calculate it with the following:

- EV/AC = Cost Performance Index (CPI): 1.0 or more means at or below budget
- EV/PV = Schedule Performance Index (SPI): 1.0 or more means at or ahead of schedule

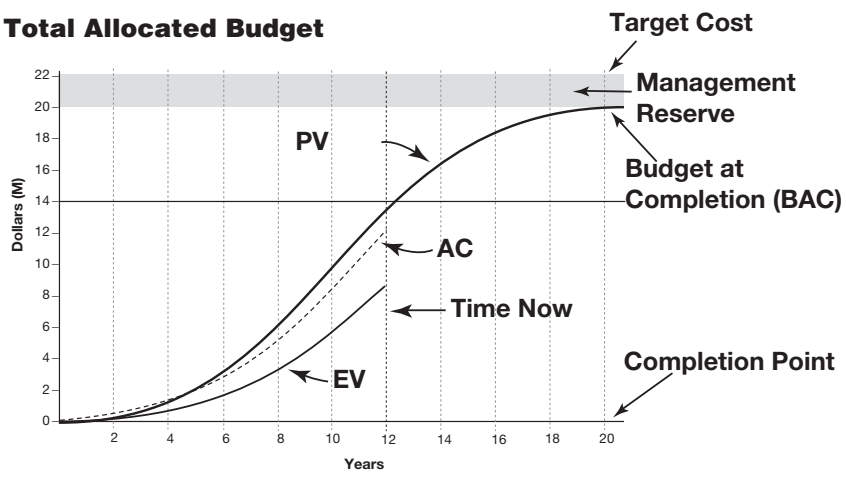
Other calculations you can make using the previous figures:

- Dividing the CPI by the total project Budget at Completion (BAC) will estimate the eventual project cost
- Dividing the SPI by the total project Schedule at Completion (SAC) will estimate the eventual completion time

You can also forecast how much your project is likely to cost based on performance to date. This is known as Estimate at Completion (EAC). Three formulas can be used to calculate it. If variances on your project are seen as typical, use EAC = AC + BAC – EV ÷ CPI. If the variances are seen as atypical and no similar variances are expected, use EAC = AC + BAC – EV. If your previous estimates have to be revised substantially, then use EAC = AC + ETC (estimate to complete or the additional cost to complete the project based on performance to date).

Earned value analysis data can be represented in chart format (see Example 4-8) or as an S-curve (see chart below).

S-Curve Displaying Earned Value Analysis Data



IMPLEMENTATION SUMMARY

This is it. This is when the work you and your team have done in Definition and Planning bears fruit—the results of the project become evident. But as project manager, you aren't afforded the luxury to sit idly by and watch. Instead, you're tasked with monitoring and modifying the project and documenting successes and failures. After all, it was Publilius Syrus who wrote, "It is a bad plan that admits no modification." And that was in the first century B.C. He was on to something. These activities are not only crucial to the successful completion of your current project, but serve as valuable learning points for projects that you and your organization will undertake in the future.

CHAPTER FIVE

FIVE

People in Projects

It's been some weeks now since Tim Dwight, the project manager, tapped Terri Purcell to head up the interior decoration work package. Terri had enthusiastically accepted the assignment, and left Tim's office with every intention of getting started immediately. It has been two weeks since that meeting and, unfortunately, Tim is disappointed in the progress made. Many meetings have been held, with the wrong people in attendance and with no results to show for the time spent. The people that Terri needs to work with don't recognize her authority and responsibility. Terri seems to have numerous questions that Tim can't spare the time to answer. This part of the project seems to be morphing into a major barrier. Doesn't Terri know what's expected of her? Probably not, if Tim did not take the time to explain what he expects of her and the work package that she's assigned to.

Frequently project managers think they have clearly articulated what they expect from project resources only to be disappointed with less-than-desirable results. Most experienced project managers find they cannot communicate often enough or clearly enough or to enough people involved on their projects. So what's a novice project manager to do? How does he or she manage the people component of project management? What skills need to be honed to ensure the right people are being tapped to contribute? That the right questions are being asked? That people are being listened to?

PEOPLE AND YOUR PROJECT

> ☞ **Tip**
>
> Cultivate the belief that people on your team want to perform to the best of their abilities. People generally do not come to work intending to fail.

Your project has top management support; it is well-defined, planned, funded, and resourced. You've done your homework; you've tested your assumptions around budget and time estimates, and conducted thorough Potential Problem and Potential Opportunity Analyses. You will manage the project using the latest tools that technology has to offer.

What else can you do to increase the likelihood that this project will succeed?

How about actively managing the performance of the project contributors? No matter how well defined your project is and how e-savvy your project management tools are, there's no avoiding the people aspect of projects. After all, at its core project management comes down to people getting "things" done. If you expect to deliver the project on time and within budget, you'll need to maintain relationships and effectively manage people.

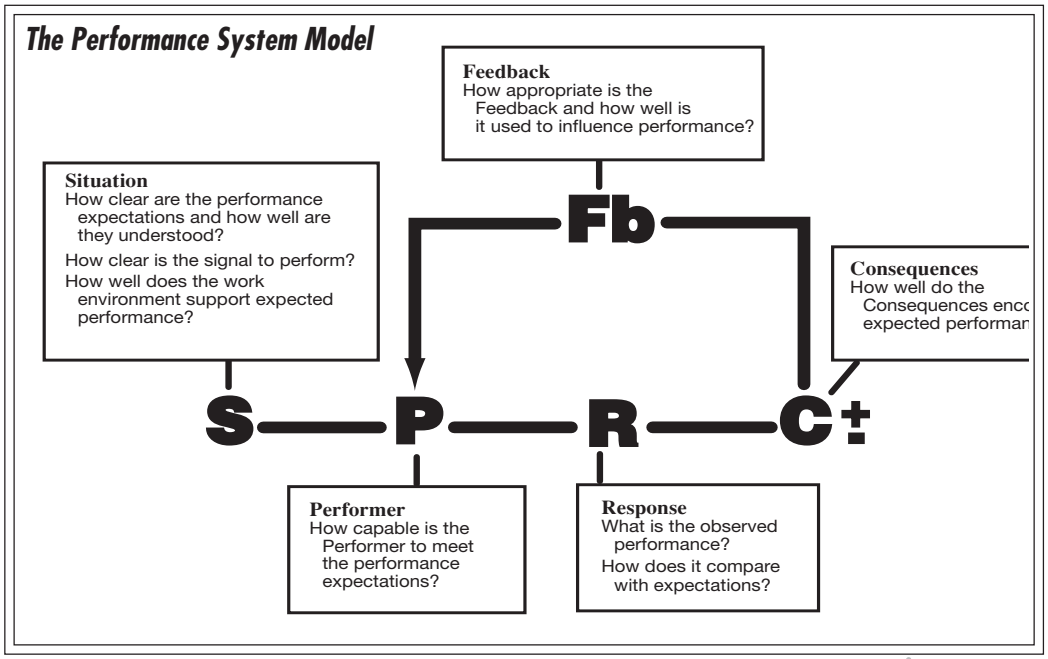
But don't mistake *managing* people in projects for the traditional manager/worker (superior/subordinate) relationship. Managing people in a project environment means that you understand and create temporary conditions that allow for successful human performance. It means that you motivate and guide the actions of everyone involved in the project—from those who report to you (such as contributors and project team members) to those whom you answer to (such as stakeholders and customers).

In the Join Together sections of this book are the first steps towards creating an effective **performance system**. It gives project contributors a framework that describes how the work will be done. The rest of what you need is contained in the application of the performance system model to your project. Described in more detail in the following pages, the performance system model is the result of years of behavioral science research (initiated by B.F. Skinner) that has been validated in numerous project and work environments. The model is separated into five components:

- Situation—The immediate environment or setting in which the person works.
- Performer—The individual or group.
- Response—The behavior or actions of the performer.
- Consequences—Events that follow the response and increase or decrease the probability that the behavior will occur again, given the same situation.
- Feedback—The information that performers receive about progress towards their goals that guides their behavior.

SITUATION

Before you dive into learning about the Situation component, consider how all the components of the performance system model work together to guide behavior. In a particular Situation, a person or group (Performer) takes an action (Response) which produces either wanted or unwanted results for the Performer (Consequences), the project, or the organization. Information (Feedback) is provided to the Performer about the adequacy and appropriateness of the result.

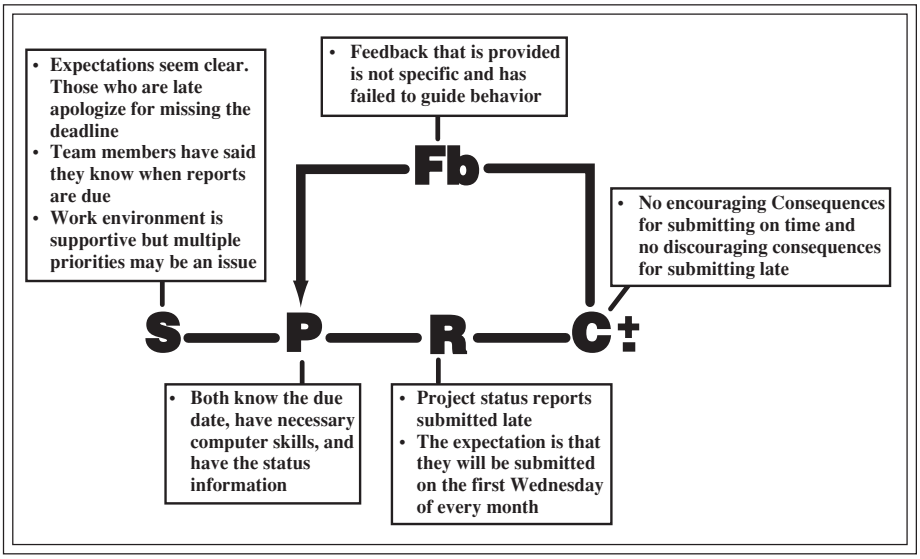


It's true—some project managers are naturals when it comes to applying this model; they work expertly with people, motivate stellar performance, defuse conflicts adeptly, and sway stakeholders and customers. But even the most rational managers among us occasionally rely on vague information and emotions to describe and manage human performance. How many times have you witnessed others using (or even used) the following labels: "lazy," "unmotivated," "uncooperative," or heard a people problem described as "a case of poor communication," "not seeing eye-to-eye," or "two individuals who just don't get along"?

The performance system model will bring the aspects of managing people to the forefront of your mind. It will help you pinpoint concrete, specific behavior, reveal its origins, and take effective action to produce the appropriate behavior. (See Example 5-1 for how this works in a project context.)

Example 5-1: The Performance System in Practice

Background: Project team members on a two-year project are expected to provide status updates on the first Wednesday of every month. Recently, reports from two of the eight team members have been tardy. Below is a Performance System analysis that the project manager conducted before coming up with a solution.



Solution: Modify the Situation by making sure "submitting reports on time" is attainable and that the priority is understood. Provide more immediate, encouraging Consequences and supportive Feedback on all aspects of the status reports. Emphasize value of the reports for sponsors.

Situation refers to the immediate environment or setting in which the Performer works, and that provides the "occasion to perform." It includes three key elements:

- **Performance expectations**—Specific results, measures, and standards desired of the Performer in completing the work.
- **Signal to perform**—A cue or indicator to the Performer that action needs to be taken.
- **Work environment**—How the work is planned, the steps involved, and how each step is completed; what resources are available to help complete the work; and the nature of the physical surroundings.

The Situation is critical to effective performance. If the Performer does not know or understand what is expected, he or she is unlikely to perform as required. Sometimes cues or signals to perform are so difficult to detect or interpret that a Performer is unable to recognize when a Response is required. A person may be called upon to perform two incompatible tasks, making it impossible to do either satisfactorily. Or the job procedures or limited resources make good performance difficult.

To increase the probability of the Performer performing as expected, assess and consider adjusting each aspect of the Situation.

> **Tip**
>
> When analyzing the performance system, gather information from the viewpoint of the Performer.

Performance Expectations

Two types of questions are used to analyze this and other performance system components. The first are general, open questions that guide the analysis and maximize the information gathered. These general questions are usually asked first in the analysis.

The second are specific, binary or closed questions that focus the analysis. These questions help pinpoint the performance system deficiencies and can be used to confirm information gathered through the general, open questions.

The general question for assessing performance expectations is:

- ***How clear are the performance expectations and how well are they understood?***

A more detailed analysis can be completed by gathering information to answer three binary questions. These questions pinpoint the performance system deficiencies related to performance expectations:

- Have performance expectations, including measures, been established for the desired Response?
- Have performance expectations been clarified with the Performer?
- Does the Performer agree that these expectations are attainable?

> **Tip**
>
> Set performance expectations when assigning responsibility and get agreement during work negotiations.

If performance expectations have been established but have not been communicated to the Performers, they will feel that the expectations are incompatible with other aspects of their job, and, therefore, unattainable.

There should be no confusion regarding performance requirements. In order for expectations to be clear, the Performer not only needs to know what is to be done, but which aspects of performance are most important to the organization.

The measures and standards of performance should clarify the organization's desire for quality, quantity, cost, or timeliness—or any combination of these dimensions. Measures define the dimension or aspect of performance that is critical, while standards set the specific level of performance (stated in terms of the measure). For example, for a purchasing coordinator involved in processing equipment orders for your project, a quality measure could be "Number of accurate orders processed." The standard for this measure could be "100%." Or, a timeliness

measure could be "Number of days to process the orders." The standard here could be "Within two days."

Signal to Perform

The general question for assessing the signal is:

➢ ***How clear is the signal to perform?***

A binary question can be used to understand the nature of the signal, its visibility, and clarity:

➢ Can the Performer easily recognize the signal to perform?

Signals are most effective when they are built into the job and do not require judgment on the part of the Performer. Signals should be overt and tangible if they are to be easily understood. The project schedule is one very strong signal for Performers to start the work. Another is the kickoff meeting.

Work Environment

The general question for assessing the work environment is:

➢ ***How well does the work environment support expected performance?***

Additional binary questions pinpoint the performance system deficiencies related to the work environment:

➢ Is the input the Performer receives appropriate, correct, and timely?

➢ Are job procedures and work flow effective?

➢ Have multiple or competing priorities been clarified? Has sufficient priority been assigned to the desired Response?

➢ Are adequate resources available: time, people, money, information, tools, or support equipment?

➢ Do the physical surroundings support effective performance?

The identification of specific weaknesses in the Situation component will indicate where changes are necessary to improve the likelihood of successful performance. While a full analysis of the Performance System should be completed before any solutions are implemented, performance expectations clearly drive successful performance.

The role of the project manager is critical in ensuring that performance expectations are clear and understood by the Performer. When a team of Performers is involved, the project manager may need to clarify and confirm expectations with each individual. This will ensure that the context within which expectations are presented is compatible with an individual's preferred style.

☞ Tip

Studies by human performance technologists like Thomas Gilbert, Geary Rummler, Alan Brache, and others indicate that the majority of performance improvement opportunities are to be found in the performance environment, e.g., Situation, Consequences±, and Feedback.

PERFORMER

The Performer is usually an individual, but may also be a team or larger organizational unit. Performance is more likely to be successful if the Performer has the capabilities to complete the specific task or project.

The general question for assessing the Performer component of the performance system is:

➢ ***How capable is the Performer to meet the performance expectations?***

The pinpointed questions are:

➢ Does the Performer have the necessary knowledge and skill to perform?

➢ Does the Performer know why the performance is expected?

➢ Is the Performer well suited to the job?

Assessing the Performer component of the performance system requires care. While the assessment of knowledge, skill, and understanding may be completed objectively, avoid making assumptions about the nature of individuals and how well suited they are to the job. The personal limitations of a Performer (physical, emotional, and intellectual) are more difficult to assess. But research suggests that, if the organization has been careful in its initial selection of the Performer, subsequent difficulties arising from these limitations, or from preferred communication styles, are rare.

Developing solutions for the Performer component of the performance system also requires care. Consult with the Performer and his or her manager about the best ways to achieve the appropriate levels of knowledge, skill, and understanding. You may choose to accommodate personal difficulties, particularly if they are temporary in nature, but keep in mind that you, as project manager, are responsible for delivering the project's results and for working within the project's constraints. In cases of a clear and continuing mismatch, ask the Performer's manager for a substitute or obtain a contract resource. Such a situation will need to be handled with care, especially if the Performer outranks the project manager, is highly regarded, or is the only resource available.

Pitfall

When faced with a performance issue, avoid jumping to the conclusion that the Performer is at fault. Do a quick analysis to see whether the components of the performance system are working as they should. Chances are one or more components are deficient.

RESPONSE

Responses are the specific, observable actions taken after perceiving signals in the environment. The Response may involve a single action or behavior, or may consist of several actions or behaviors.

When analyzing a performance issue, *the logical place to start is with the Response*. What actions or behaviors have actually occurred? The general questions to help gain that understanding are:

➢ ***What is the observed performance?***

➢ ***How does it compare with expectations?***

➢ ***What are the desired and undesired, or alternative, Responses?***

Tip

When analyzing a human performance issue, begin with the action or behavior you have observed. This will allow you to determine whether performance needs to be modified and what needs to be changed in other components to resolve the issue.

Responses should always be pinpointed—described in behavioral terms, free of generalizations or labels. The description should be clear enough so that someone could replicate the behavior or action simply by reading it. Where possible, track behavior and results over time to determine variations and to assess the impact of changing behavior.

CONSEQUENCES

Consequences are events or conditions that follow a Performer's Response and increase or decrease the probability that the behavior will occur again, given the same Situation. Consequences are useful in explaining why Responses are maintained or modified over time.

There are two types of Consequences that impact behavior: Encouraging or positive Consequences, and discouraging or negative Consequences. Encouraging or positive Consequences reinforce behavior, and increase the probability that a particular Response will occur again. Think of these Consequences as rewards. Discouraging or negative Consequences reduce the probability that the Response will occur again.

Consequences (either encouraging or discouraging) are most powerful when they occur immediately after the behavior or action and are relevant to the Performer.

Consequences should be recognized as encouraging or discouraging in the eyes of the beholder. Do not assume that because a particular Consequence was well-intended, it will have a positive effect on performance. For instance, a Performer may accomplish one of his or her work packages well ahead of schedule. The project manager assigns this Performer additional work packages, perhaps those that are behind schedule. Instead of being thankful for the new challenge, the individual resents the additional workload, and in the future completes project assignments by the exact due date, and not a moment before.

The only way to tell if a Consequence operates as intended is to observe subsequent behavior. If a behavior is followed by Consequence X, and the behavior occurs again, you may assume that it is an encouraging Consequence. If a behavior is followed by Consequence Z, and the behavior disappears or the frequency drops dramatically, you may conclude that it is a discouraging Consequence, despite its intended effect.

Balance of Consequences

The Balance of Consequences demonstrates how the nature and timing of Consequences influence performance overall. Three aspects of Consequences are in question. First, consider how the Consequences to the Performer for the desired Response compare with Consequences to the Performer for other alternative, or undesired, Responses. Second, understand how Consequences to the Performer for the desired and un-

⚠ Pitfall

The Consequences a performer receives may actually encourage responses other than the one you want. The Consequences you put in place should be heavily weighted toward encouraging the desired Response.

desired Responses compare with the Consequences to the organization for the same Responses. Finally, consider the influence of timing on the Balance of Consequences. Are Consequences experienced immediately after the behavior, or are they delayed?

Consequences that exert the strongest influence on behavior are those that are specific and personal to the Performer and that occur within the time frame of performance.

Understanding what the Consequences are for both the Performer and the organization is critical to understanding the Balance of Consequences. The general question for assessing the influence of Consequences within the Performance System is:

- ***How well do the Consequences encourage the expected performance?***

Additional binary questions pinpoint potential deficiencies in Consequences:

- Are the Consequences immediate enough to encourage the desired Response?
- Are appropriate Consequences provided consistently?
- Are the Consequences significant to the Performer?
- On balance, do the Consequences encourage the desired performance?

While it may not always be possible to ensure only positive Consequences for desired performance, you can usually influence performance by adjusting, adding, or aligning Consequences. The goal is to provide Consequences that are relevant to an individual or a group of Performers. The reaction to Consequences will certainly be influenced by the Performer's preferred communication style.

FEEDBACK

Feedback is the performance-based information that Performers receive about progress toward a goal that guides them in maintaining or modifying behavior. Feedback is one of the most critical components in the performance system, because it compares actual performance with expectations. Developing effective Feedback mechanisms should be one of the first steps in influencing performance, since improvement will only be sustained if the Performer is able to detect progress. An inadequate Feedback mechanism is one of the most frequent causes of deteriorating job performance, but deficiencies are relatively easy to correct, frequently requiring only redirection of existing information.

There are four major sources of Feedback, given here with examples:

- The job itself: Noise, gauges, meters, charts, peer and customer reactions
- The Performer: The person checking work against some standard or model

Pitfall

When giving Feedback, pay particular attention to the tone of your voice and your choice of words. Both can have a significant impact on how a message is received and interpreted.

- ➢ The monitoring system: The manager or coach, quality audit, project monitoring system
- ➢ The receiving system: A department or unit that receives and uses the Performer's output, the customer

If properly designed, the job itself serves as the most effective source of Feedback. This Feedback is the most immediate and frequent, and is objective in terms of the performance information and its delivery. The next best option is to provide the Performer with the resources to check personal performance and record progress.

CHARACTERISTICS OF EFFECTIVE FEEDBACK

Frequent and Timely

Generally, the more frequent the Feedback, the greater the possibility of keeping the Performer from drifting off target. Delays in performance Feedback are costly because substandard work continues to be produced during that interval. As time passes, the corrective effect of information is reduced. The Performer may have difficulty remembering what specifically went well or poorly, and relating proposed solutions to the performance in question.

Relevant

☞ Tip

If you are looking to influence performance, make it a point to give Feedback. Without Feedback, Performers do not know whether their performance needs to be maintained or modified.

People will respond to whatever is measured and communicated to them. While Feedback should be provided against all expectations, not every performance expectation needs to have measures. It is better to determine which expectations are most relevant and significant to the job. When performance is in jeopardy because of outputs or behaviors, the leader should focus on more detailed measures and provide Feedback accordingly.

However, it is important to measure all facets of relevant performance. Measuring only quantity or cost will be detrimental to other important dimensions of performance, such as quality, timeliness, safety, productivity, and creativity.

Feedback should be objective information from an unbiased source, assessed against an agreed standard, and showing progress toward that goal. When the Feedback includes criticism, it also acts as a Consequence. The Performer will tend to react emotionally and defensively, failing to respond to the information contained in the Feedback.

Specific and Accurate

The Feedback must be specific enough to allow the Performer to distinguish the effects of performance, and how performance has varied over time. The comment "Nice job," for example, does not tell the Performer about the details or trends of performance and what to do the

next time to repeat success. Pinpointed evidence of inappropriate behaviors or actions is more likely to guide improvement than "unsatisfactory."

The information provided about performance is what differentiates Feedback from Consequences. The Performer will find the information valuable only if its accuracy can be trusted.

Noise-Free

Information needed for effective Feedback is often mixed with irrelevant details or buried in massive amounts of data. This "noise in the system" frequently masks useful information. For example, a project manager may receive numerous computer printouts each week with extensive data on the progress of various projects. While certain pieces of information on the printouts would indicate the effectiveness of project activities and provide information, the effort required to retrieve the information may seem greater than the possible benefit. Hence, the project manager lets the printouts pile up unread.

Confirmed by the Performer

Feedback is valuable only if it results in the Performer maintaining or modifying behavior. For this to take place, the Performer must agree with and accept the Feedback. When the source of Feedback is a gauge, chart, or information system, the Performer must be able to confirm the accuracy and completeness of the data. When the Feedback is given by another person, both people should discuss and confirm the information and its interpretation before actions are agreed to.

The general question for assessing the Feedback component of the performance system is:

➢ ***How appropriate is the Feedback and how well is it used to influence performance?***

The pinpointed questions that help analyze Feedback are:

➢ Does the Performer receive any information about performance?
➢ Is the Feedback used to encourage the desired performance?
➢ Are relevant measures of performance being fed back?
➢ Does the Feedback include information about progress over time?
➢ Does the Performer receive timely Feedback?
➢ Does the Performer receive Feedback frequently enough to maintain or enhance performance?
➢ Is the Feedback specific enough to influence performance?
➢ Does the Feedback include information about the value of the performance to the organization?
➢ Is the Feedback communicated in a positive, nonthreatening manner?

One of the challenges of adjusting a Feedback system to improve performance is to ensure that information is provided in a context relevant to the Performer. The leader and Performer should collaborate to design the most appropriate mechanism.

Obviously, the above description represents the ideal. But it's very possible to approximate this ideal by focusing on the performance system as you would any other critical aspect of project planning—using careful analysis and collaboration to produce the best possible results.

HOW THE PERFORMANCE SYSTEM WORKS IN A PROJECT CONTEXT

If you're able to construct and influence the five components of the performance system, it might look like this:

- People know what's expected of them.
- The need for the performance is clearly communicated.
- Standards have been set and communicated, and will be used to judge success.
- Other tasks or aspects of the work environment do not interrupt or create conflicting job demands (this is also known as "noise").
- The Performer knows how to carry out the task, and is skilled and willing to do so.
- The necessary equipment, budget, personnel, and other support systems are in place, and they function as intended.
- The Consequences are balanced—the Performer is rewarded for performing as desired and there are no incentives for undesired responses.
- Feedback is frequent and provides the information the Performer needs to maintain or modify behavior.

The following table demonstrates how your work in each project management activity should be used to build an effective performance system. Project team members and contributors are referred to as "Performers" because they represent the groups whose performance you'll influence as they do the project work.

Project Management Activity	***How Performance Is Influenced During This Activity***
When you…	Make sure…
State the Project and Develop Objectives	You set the expectations of the Performers against the overall goals of the project; this will tell them what results are expected of the project
Develop the Work Breakdown Structure	You describe the actual work to be done, as well as the measures and standards for evaluating the work
	The work breakdown structure deliverables and work packages contain measures and standards that define the desired Response
Identify Resource Requirements	You and others know what knowledge and skills are needed to do the work
	All the tools and resources needed to complete the work are available
Assign Responsibility	You communicate and explain performance expectations to the Performers
	You align the expectations of the Performers with the overall goals of the project; this will guide their decision making as they complete the work
	The Performers are suited to the work assigned and have the requisite knowledge and skills
	The work they will do is supported by encouraging Consequences (as perceived by them)
Sequence Deliverables and Schedule Deliverables	Everyone involved knows when the work should be completed and in what order. Performers receive a signal to perform.
Schedule Resources	Performers know exactly when they're needed to complete the work. Confirm that other required resources will be available when needed
	The resource manager agrees that the Performer will be available and that the Performer will not be punished for neglecting other work
Protect the Plan	You create a clearly understood backup plan that can be implemented at the moment of need
Start to Implement	Short-term expectations are understood; Performers know what they need to do in the first few weeks so they don't stumble
	Ground rules are established that clarify expectations and avoid creating undesirable Consequences for the project team
	You give project participants a clear signal to start work on the project
Monitor Project	You inform the Performers about what will be measured and what they should report on
	You provide the factual information needed to give meaningful Feedback to Performers
Modify Project	You understand and communicate how expectations have changed and what Consequences need to be modified or changed
	Changes to the plan don't restrict Performers' ability to do the work; you provide reasons for the changes so that people don't get discouraged
Closeout and Evaluate	You understand how the Situation can be improved on the next project; records are kept
	Encouraging or discouraging Consequences of working on the project are revealed
	Timeliness and accuracy of Feedback are assessed

MANAGING INVOLVEMENT

Why manage involvement?

Managing involvement is a method of making choices about who you should involve when managing your project and how they should participate. When should you involve stakeholders, experts, contributors, team members, customers, and others? Should they be included in reaching consensus or only be queried for information?

On the one hand, everyone benefits when people participate: individuals, teams, and organizations. Participation can result in better solutions, build commitment for successfully implementing solutions, increase job satisfaction, develop individuals, and build teams.

On the other hand, participation takes time, uses costly resources, and requires skills in analysis, communication, and conflict resolution. Involving others means that a leader must be willing to risk some loss of control.

TAKING A LEADERSHIP ROLE

Involving people means assuming a leadership role. A leader is the person responsible for resolving a situation, for recommending a resolution, or in this case, for managing a project. Who the leader involves and how they involve them depends on the issues that need to be resolved. In certain situations, consensus might be the most appropriate route to resolve an issue; in others, meeting separately with several individuals might work best. There will be times when no participation is required.

LEADER BEHAVIORS

There are five types of leader behaviors. Each behavior represents a different degree of participation. To match the appropriate behavior to the situation you're dealing with, you must first understand the five behaviors. They are: Resolve Alone, Question Individuals, Consult Individuals, Consult Group, and Resolve as Group.

Resolve Alone

As the leader, you resolve the issue alone using the information currently available. Your behavior is time-efficient, autocratic, and requires no participation. It's referred to as A1 behavior. Analysis skills are required.

Question Individuals

As the leader, you obtain information from the appropriate person(s) individually and then resolve the issue. Your behavior is less time-efficient, autocratic, and does not require the people involved to know any-

thing about the issue or to participate in the analysis. It's referred to as A2 behavior. Analysis and questioning skills are required.

Consult Individuals

As the leader, you explain the issue to the appropriate person(s) individually, request information and analysis, and then resolve the issue alone. Your behavior is less time-efficient, consultative, and requires more participation from other individuals. It's referred to as C1 behavior. Analysis, questioning, and listening skills are required.

Consult Group

As the leader, you share information about the issue with the appropriate people as a group, request information and analysis, encourage an exchange of information and ideas, and then resolve the issue alone. Your behavior is more time-consuming, consultative, and requires more participation from other individuals. It's referred to as C2 behavior. Analysis, questioning, listening, managing meetings, and managing conflict skills are required.

Resolve as Group

As the leader, you share information about the issue with the appropriate people as a group, after having set ground rules for the meeting and criteria for an acceptable solution. The leader is a part of the group and agrees to accept and implement the group's conclusions. The group works together to resolve the issue. Your behavior is the most time-consuming, consensus-oriented, and requires the most participation from other individuals. It's referred to as G2 behavior. Analysis, questioning, listening, managing meetings, managing conflict, setting group boundaries, and building consensus skills are required.

Tip

When developing project objectives, draft them yourself to save time. Then let the rest of the team and appropriate stakeholders refine them. This will allow them to participate and let you gain their commitment.

THE INVOLVEMENT PROCESS

How much participation is required in a given situation depends on two factors: one, whether a **superior solution** is required and two, whether **commitment** is needed to implement the solution.

A superior solution is the "best or technically correct" solution. It's consistent with organizational goals and is based on the best possible information. Some situations require a superior solution. For example, you'll want to select the best resource for a critical task or you'll want to find the true cause of a defect in your new product and then fix it. Other situations don't require a superior solution because all possible solutions are acceptable. For example, all your workers may be qualified for a particular assignment or all potential suppliers may be able to supply quality parts on time. If you require a superior solution, consider whether participation can help you find that solution.

After you have found the superior solution, do you need the commitment of people to implement it? In some situations, commitment is needed for successful implementation. For example, a project team needs to be committed to bring in their project on time, within budget, and with the desired results. In other situations, compliance is all that is needed. For example, expense account guidelines usually only require compliance and not commitment because people will follow the rules if they want to get reimbursed. When commitment is required for successful implementation, you'll need to consider whether participation will generate that commitment. Sometimes people will commit without being involved because they perceive the leader as the expert or as the person who's supposed to resolve the situation. At other times, people won't commit unless they have actively participated in resolving the issue.

A THREE-STEP PROCESS

To resolve any situation successfully, you must determine which leader behaviors (A1, A2, C1, C2, and G2) will provide you with a superior solution and build the commitment you'll need to implement the solution. To do this, you'll need to define the situation, assess the variables, and then select the appropriate behavior.

Define the Situation

The way you define the situation determines both who will be involved and how they will be involved. For example, to "implement fire prevention procedures" you may require the commitment of the group (C2 or G2 behavior) whereas to "find the cause of yesterday's fire" you may need to question individuals (A2 behavior). To develop a clear, concise definition of the situation, ask yourself "What specific concern needs to be resolved?" or "What end result needs to be achieved?"

Assess the Variables

Variables are characteristics that change from situation to situation. To be a successful leader, you should consider seven key variables to determine the degree of participation needed. They are:

- ➢ Superior solution
- ➢ Information
- ➢ Structure
- ➢ Commitment
- ➢ Commitment without participation
- ➢ Goal agreement
- ➢ Conflict about alternatives

To accurately apply the involvement process, you must assess the seven key variables. Each situation variable can be assessed by asking one question. The "yes" or "no" responses to each question will have a

different impact on the choice of leader behavior. Ask the following questions:

- Superior solution: Does it make a big difference which course of action is adopted?
- Information: Do you now have adequate information to analyze this situation?
- Structure: Do you know exactly what information is missing, how to get it, and how to analyze it?
- Commitment: Is the commitment of others, either for judgment, action, or creativity, critical to effective implementation?
- Commitment without participation: Will others commit to a conclusion made by you without their active participation?
- Goal agreement: Is there general agreement about goals between the group and the organization in this situation?
- Conflict about alternatives: Is there likely to be conflict about alternatives within the group?

For example, if you're asked to purchase a critical piece of production equipment and you don't have a good understanding of the production process, you would answer "Yes, it does make a big difference which course of action I adopt," and "No, I don't have enough information to find the superior solution." The leader behaviors you would use are either A2, C1, C2, or G2. You would not use A1 because that leader behavior would not give you the information you require.

Select the Behavior

By combining the variables, you can determine which leader behaviors are likely to succeed. The seven variables combine to form a diagram called the Leadership Tree.

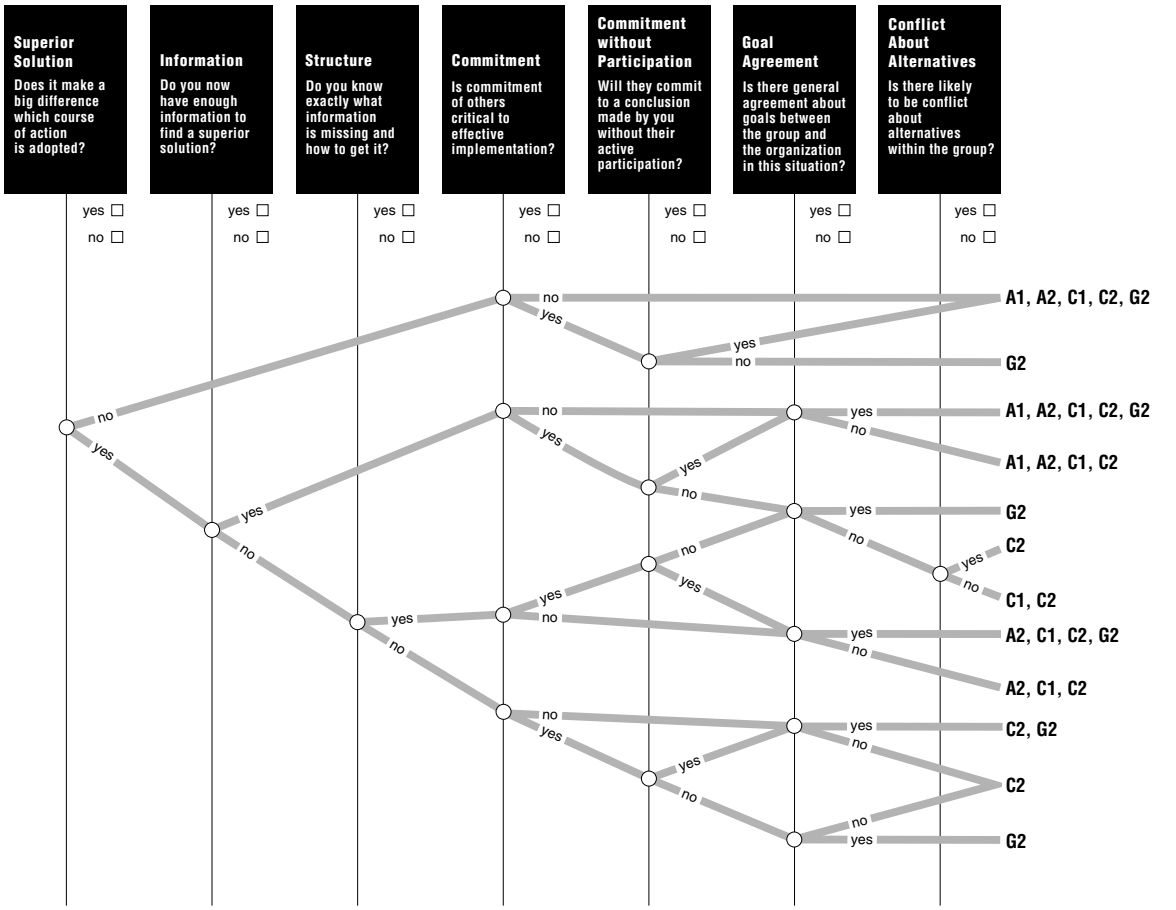
To use the Leadership Tree, start at the left and ask the question for the superior solution variable. Follow either the "yes" or "no" branch for the superior solution variable, then follow either the "yes" or "no" branch for the next variable and so on until you reach the recommended leader behaviors. The Leadership Tree usually indicates more than one leader behavior. Any one of the recommended behaviors has the potential for success. The one you use will depend on the time available, the development needs of individuals and work teams, and other factors such as skills and geographic constraints.

To select an appropriate leader behavior first use the Leadership Tree to consider all combinations of the seven variables. Then consider time constraints and other objectives relating to individual or team development. Finally, ask yourself what could go wrong or better than expected if you use the behavior you've selected, and how you could avoid potential problems or enhance potential opportunities?

Pitfall

Do not fall into the trap of thinking that every situation requires a superior solution. Often, the second best solution is good enough and has the added advantage of being quicker to implement.

Managing Involvement: Leadership Tree



MEETINGS

Meetings, meeting, meetings! For years, project team members have ranked "time spent in meetings" as one of their top workplace complaints. Some of the most common shortcomings are:

- There is no clearly stated purpose for the meeting.
- Participants are ill-prepared.
- The right people are not present, or people who are present have no real involvement.
- The meeting does not focus on one issue at a time.
- Results could have been achieved as well or better without a meeting.
- The meeting runs too long.
- The meeting dissolves rather than ends.
- Participants are unclear on the next steps following the meeting.

These shortcomings seem to be true no matter what the meeting venue, be it a conference call, teleconference, or "virtual meeting." Use the approach outlined below to guide your project meeting management.

BEFORE THE MEETING

Start by asking four key questions:

1. *What concerns do you have about conducting the meeting?*

   Answers to this question will help you plan and prepare for the meeting by developing an agenda, identifying who should attend the meeting, selecting the chairperson and facilitator, announcing the meeting, and resolving other issues that could threaten the success of the meeting.

2. *What concerns need to be addressed during the meeting?*

   Answers to this question will reveal the issues you want to resolve or appraise during the meeting. If necessary, set priority on these issues to determine which ones will be evaluated during the meeting. Record the concerns so that you can track their resolution.

3. *Given your concerns, what do you hope to accomplish in the meeting?*

   Answers to this question become your **primary meeting objective**—the specific, main goal you want to accomplish in a meeting—and your secondary meeting objectives. They will focus the meeting and help you determine how best to conduct the meeting.

4. *Given what you hope to accomplish, who should be in the meeting?*

   Involvement is critical to securing commitment to your project. However, there are more ways to involve people than meeting atten-

Pitfall

The cost of a face-to-face meeting includes attendees' time, travel, and lost opportunities, in addition to the cost of planning, conducting, and following up on the meeting.

dance—copying them on the meeting notes, having them call into the meeting, etc.

Reasons to involve people in a face-to-face meeting:

- They need to be able to receive or participate in the exchange of information firsthand.
- They have content expertise or knowledge that needs to be shared in person.
- They need to be involved for approval and commitment.

Clarifying the purpose of the meeting will focus the meeting for the participants. However, it's important to keep in mind that a face-to-face meeting may not be necessary. A conference call, a virtual meeting, or no meeting at all might be best.

Here are some questions that will help you decide if a face-to-face meeting is necessary:

- Is a meeting the best way of reaching the primary meeting objective?
- How else could the primary meeting objective be achieved?
- What would be the consequences of not holding a meeting?
- Is the meeting worth the cost? What is the value of accomplishing the primary meeting objective?
- What could people be doing instead of meeting?

DURING THE MEETING

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Many project managers start every meeting with a Situation Appraisal (for more on Situation Appraisal, see pages 118–121) to ensure that all participant concerns are included, that the meeting addresses the most important concerns, and that the group agrees on the analysis needed. Concerns not addressed during the meeting can be carried forward to the next one, or assigned for individual resolution. A quick Situation Appraisal is particularly useful at the beginning of a staff, departmental, or project meeting designed to cover a number of topics, as long as you track resolution on all issues and actions surfaced during the meeting.

Even if you don't use Situation Appraisal, separate the content of the meeting from the process of running a meeting. During the meeting, keep the results visible—it keeps people on track and helps capture issues and actions.

When you conduct your meeting, remember that you're appraising what is known at a given time. As time passes and new information comes to light, you may have to reappraise the situation.

Parts and pieces of Situation Appraisal are also very useful during a meeting. For example:

- Separate and clarify concerns raised during any meeting by using the questions "What do you mean by…?" and "What else concerns you about…?"
- Set priorities on concerns or actions using three dimensions: *current impact, future impact,* and *time frame* (for a description of each, see page 120.)
- Assign responsibility for actions to make sure they are completed.

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AFTER THE MEETING

The most important thing you can do after the meeting is to make sure that the results are communicated, and that the progress on actions is monitored. Ask the following questions to help track actions:

- Is the action plan being accomplished?
- Are the results on target?
- Has the primary meeting objective been met? If not, what can we do?

In addition, it may be useful to conduct a post-meeting Situation Appraisal with attendees or members of the project team to identify what still concerns the group about a given situation. This will allow team members to contribute issues that come to mind after a meeting, or that were not given time during the meeting.

COMMON OBSTACLES WHEN INVOLVING PEOPLE

People who join your project meetings may bring one or more of the following obstacles to the process:

- The inability to communicate openly due to bias, hidden agendas, or competing commitments.
- The inability to work around feelings and emotions that might influence their ability to manage or get along with others.
- The tendency to jump to conclusions about other people, the cause of a problem, or the best alternative for a decision.
- The desire to assume responsibility for issues that lie beyond their skills and/or training.
- The use of broad descriptions of concerns or labels rather than specific, pinpointed descriptions.
- The tendency to present rumor and opinion as fact.
- A lack of familiarity or comfort with either the content or the process being used.

Pitfall

General descriptions such as "morale problem" and "communication difficulties" lump together a wide array of concerns, effectively hindering the group's ability to resolve the concern. Breaking down these descriptions into specific concerns is the first step to successful resolution.

HOW TO OVERCOME THE OBSTACLES

Sometimes, taking a step-by-step, clear approach will force people to set aside their biases, unfounded conclusions, and emotions. But if you find these obstacles are regularly a part of your group's project management meetings, here are several methods you can use to overcome them:

- If people begin to discuss content that's related to another project or concern, let them know that what they are saying is valuable, but not relevant to the current issue. Recording this information and promising to revisit it at the appropriate time will relieve the group's need to capture it, while allowing you to stay focused on the step at hand.
- Test the information that's offered as "fact." Questions such as "How do you know that?" or "What is the source of this information?" or "What evidence do you have?" will test the validity of the information. These questions will also help reveal assumptions.

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- Use proper questioning and listening skills to gather the correct, specific, and relevant information from others (see pages 110–114 for more on questioning and listening). Sometimes, using "proper" questioning means phrasing your questions so that everyone, regardless of their experience, understands what you're asking.
- Even the best project management meetings and discussions may result in conflict. This isn't necessarily destructive to your application. In fact, if managed effectively, conflict can bring important issues to light and facilitate the search for constructive solutions. Focusing the debate on facts associated with a specific issue—rather than the emotions involved—will help you funnel the emotion into constructive work on the issue. In addition, being clear about expectations and the commitment you require will also help avoid conflict.

EMOTIONAL CONFLICT

If emotions are present but not brought to the surface, people can become resentful and good working relationships can be destroyed. Allow people sufficient time to ventilate their feelings so their issues can be addressed. Giving them too much or too little time can be equally frustrating. Here are some methods for getting the emotions out into the open:

- Ventilate the emotions: You relieve inner turmoil when you bring feelings into the open. This can be done by:
  - Using unstructured statements like "Something seems to be bothering you…"
  - Reflecting others' feelings by repeating their own statements back to them, for example, "You believe that…," or "You feel that…." This technique helps people to express their feelings more fully.

Tip

Turn emotional expressions into actions by summarizing feelings and asking for specific actions to address the issue.

- Don't interrupt pauses; they allow for expression of emotions.
- Avoid answering an emotionally loaded question. Usually these questions are not asked to gather information but are part of an emotional expression. Respond by reflecting on the feelings implied in the question, or by asking a question in return.
- Identify the source of the emotions. Emotions can come from different places. Some arise from the discussion at hand. Others come from outside issues. Knowing the origin is the secret. If the dispute is outside the discussion's scope, it may be so identified and set aside for resolution later on. But if the issue relates directly to the immediate discussion, then the feelings must be resolved.

JOIN TOGETHER: ABOUT PROJECT COMMUNICATION

To put it simply, project management consists mostly of gathering, organizing, using, and communicating information. Your ability to manage will only be as good as the information you're using. Even the most robust project management software tool will be rendered almost useless without accurate, relevant information.

So this begs the question—how can you improve the chances that the information you're using to manage the project is valid and reliable?

Your best ally, bar none, will be your ability to ask the "right" questions—questions that probe for the type and scope of information you want—and your skill in handling the answers.

Throughout this book, you've encountered sub-sections titled "Join Together" that help you decide who should be included in the project activity, and how you should involve them. However, these explanations didn't provide you with the techniques for actually engaging in these discussions—like questioning and listening skills.

QUESTIONING

There are several types of questions: open questions, closed questions, fact-finding questions, feeling-finding questions, and questions to the void. Is one form of questioning better than the others? Well, it depends on the situation.

Open questions

Open questions invite unrestricted answers. They're used to gather or clarify new information and to stimulate involvement and thinking. The only limit that open questions impose is to confine responses to a defined topic, and therefore they may result in multiple answers to the same question. Also known as "free answer," "free response," or "unrestricted questions," open questions usually start with interrogative words such as "What," "Where," "When," "Who," "Why," or "How." For example, "What work packages are delayed?" or "Where in the schedule do you feel that the timing is too aggressive?"

Closed questions

Closed questions are used to elicit limited information; by design, they elicit a "yes" or "no" answer. Ask a closed question to confirm or verify information, clarify something you're unsure about, limit the choices offered, indicate a direction, or demonstrate understanding. Also known as *"binary,"* "multiple choice," or "restricted" questions, closed questions usually start with interrogative words such as "Do," "Have," "Will," "Can," "Are," or "Is." For example, "Is John Smalley the only person assigned to

that work package?" or "Can we finish the software installation before April 14?"

Sometimes people will answer a closed question as if you asked an open question. Be ready for a long answer, even though you expect a short one.

Fact-finding questions

Use fact-finding questions to solicit specific, objective information rather than opinions, assumptions or insights. To create a fact-finding question, choose your words so that they clearly ask for facts only—for example, "What specific evidence do you have that the marketing department is responsible for the late product launch?" or "Exactly how many dollars are we over budget?"

Feeling-finding questions

Unlike fact-finding questions, feeling-finding questions solicit subjective, sometimes emotional expressions of opinion or judgment. Again, choose your words carefully to ensure that the person you're questioning understands that you're looking for their opinion—for example, "In your opinion, what could have gone better about the first part of this project?" or "Why do you believe that Jane should be selected as the project manager?"

Questioning to the void

This is a questioning strategy in which you ask a series of questions to extract as much specific and complete information as possible. The premise is that people often do not have all the information you need or will not volunteer all the information you need without rigorous questioning. After asking a series of such questions, you'll ultimately reach the "void," or the place where there is no further information you can gain from that source. At that point, you need to decide whether you have enough information to resolve your concern or whether to seek another source to fill in the gaps.

There are three types of questions used in this strategy: turnaround questions, "What else…?" questions, and "Why?" questions. You should use all three types of questions to make project concerns more specific and easier to work on. As with the other types of questions, be careful of your tone of voice when using this questioning strategy: it can leave people with the impression that they're being interrogated, or that they're involved in a strange verbal game.

- **Turnaround questions** re-ask the question based on the answer. Use turnaround questions when you are searching for the most specific answer. When you stop making progress, you've reached the void. An example: "When can you complete the business plan?" (Probably next week.) "When next week?" (Sometime by the end of next week.)

Tip

Some people may feel more valued and involved when asked feeling-finding types of questions, while others may feel uncomfortable with the personal nature of the questions. You must be prepared to deal with the emotions evoked by these questions.

"When sometime by the end of next week?" (By Thursday afternoon.) "When on Thursday afternoon?" (3:30 p.m.) At this point, you've hit the void. You now know precisely at what time the business plan will be ready.

➢ **What else…? questions** re-ask the question in the same form. You would ask a "What else…?" question when you are searching for the most complete information you can get about a concern, or when you are seeking to break down a broad concern into more specific concerns. When you stop making progress you've reached the void. An example: "What concerns you about the pollution management project?" (Fish are now dying.) "What else concerns you about the pollution management project?" (The Department of Environmental Protection may fine us, adding to our already over-run budget.) "What else concerns you about the pollution management project?" (We could receive bad press coverage, which would reflect poorly on the project team.) "What else concerns you about the pollution management project?" (Investors may withdraw their investments.) What else concerns you about the pollution management project? (Nothing else.) At this point, there is no further information to be had about the pollution problem. You have completed separating your concern. You can now begin to determine which concerns to address in which order. (See Situation Appraisal on pages 118–121 for more on prioritizing concerns.)

Pitfall

Beware: Questioning to the void types of questions may leave people feeling frustrated or uninvolved. It's always a good idea to tell people the purpose of your questioning before you start. Otherwise they may feel they are being interrogated. Use a mix of fact-finding and feeling-finding questions to reduce the potential for resentment.

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➢ **Why…? questions** help you look beyond the problem or potential problem of the moment to ensure that you have identified its root cause. You may have only uncovered one symptom of a larger problem that, if not addressed, will continue creating the same or a similar problem. For example, suppose you're managing a new product project, and one of the pieces of production equipment keeps breaking down, threatening your schedule. You identify the problem as, "Engine on Line #6 overheats." "Why does the Engine on Line #6 overheat?" (The fan belt came loose.) "Why did the fan belt come loose?" (Excessive machine vibration.) "Why does the machine vibrate excessively?" (Don't know.) In this case, the company will change the fan belt, but will also want to conduct a Problem Analysis on the problem, "Line #6 machine vibrates excessively" (see pages 127–130 for more on Problem Analysis).

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ACTIVE LISTENING

Effective questioning is only part of the communication equation. Active listening—the other component—means understanding and acknowledging the full meaning of what the speaker is saying…both facts and feelings. It allows the listener and the speaker to relate, exchange information, and reach understanding. If you're not an active listener, your questioning strategy will fail because you'll have missed salient points in the conversation or ignored both verbal and nonverbal cues.

One of the critical aspects of active listening is that it's a conscious choice: You make the decision to listen, or to do something else. Distractions caused either by noise in the environment, the speaker's use of language, or the speaker's tone of delivery can reduce your listening capability.

Listening how-to's

There are four key elements to being an active listener: hear, interpret, evaluate, and respond.

- **Hear the message**—Active listening means focusing intently on the speaker's message. If you listen selectively, you could miss important information. Your values, interests, experience, emotional "deaf spots," and even the topic's importance influence how you filter information. Hold off interpreting the message until you've heard it completely.
- **Interpret the message**—Active listening involves understanding the speaker's verbal and nonverbal messages.
  - **Verbal cues**: Words can explain ideas, concepts, and experiences, but it's the listener who ultimately provides the meaning behind the words. Your biases, prejudices, assumptions, preconceived notions, pet peeves, etc., could color your understanding of the message. Try to handle the information objectively.
  - **Nonverbal cues**: Gestures, facial expression, eye movement, posture, proximity, body position, breathing, complexion, and energy level are signals to help you interpret a speaker's message. Inflection and tone of voice can convey more meaning than the words used. Be alert to inconsistencies between the speaker's nonverbal and verbal cues.

  Verify your interpretation of verbal and nonverbal cues by paraphrasing what the speaker said, asking for clarification, questioning to the void, or providing feedback. There are usually a number of ways that a message could be interpreted. If you don't take the time to confirm your understanding, you run the risk of operating with faulty—sometimes even damaging—information.
- **Evaluate the message**—Active listening doesn't mean automatically accepting what is being said. It means thinking critically about what you've heard and being sure you've got the whole picture before reaching a conclusion. Here are some do's and don'ts that will help you evaluate the message effectively.

Tip

By listening actively to project team members, contributors, and stakeholders, you show your respect for their opinions and feelings.

Do's	*Don'ts*
Get key information	Jump to conclusions
Gain commitment	Be compliant
Think analytically	Think mechanically
Listen actively	Hear passively
Consider facts and feelings	Consider only the facts
Be objective	Make a value judgment

- **Respond to the message**—An active listener provides both verbal and nonverbal feedback when responding to a speaker. Good listeners let the speaker know the message was heard, understood, evaluated correctly, and they are prepared to follow up. When responding to a message, avoid being defensive, using the blank-stare approach, or sending a mixed message (i.e., inconsistency between verbal and nonverbal cues).

HANDLING ANSWERS

How you handle answers is another key to gathering and confirming useful information. Handling answers means receiving and assessing information given to you by others. There are five components to handling answers: listening, acknowledging, confirming, recording, and providing feedback.

- Listening—Use gestures and facial expressions such as making eye contact, leaning forward, and nodding your head to show the speaker that you're interested in what he or she has to say. They create a nonjudgmental atmosphere that encourages the speaker to keep speaking. In addition, make sure you give them time to talk.
- Acknowledging—Use nonjudgmental words and a neutral tone of voice to fill in the gaps when the speaker pauses. This shows that you are paying attention and encourages the speaker to continue speaking. To acknowledge, use words or phrases such as "Ah-hah," "Uh-huh," "Yeah," "I see," "I got it," "I understand," and "That's right."
- Confirming—Paraphrase what the speaker said, in your own words, to confirm the answers to your questions. This shows the speaker you understand what he or she has said and enables you to check for mutual understanding of the facts. Phrases that will help you practice this technique are: "What I hear you saying is…." and "If I understand you correctly, you think that…."
- Recording—Document the speaker's message by writing the information on a notepad or easel or recording it in the appropriate place.
- Providing feedback—Give the speaker feedback about the usefulness of his or her message. This helps the speaker understand what changes may be necessary to the message, if any. Phrases to use when you provide feedback are: "What you gave me was useful because it…" and "The way you organized the information was useful because…."

Handling unsatisfactory answers

Sometimes an answer is confusing or doesn't match the question asked. This could be because the person you asked interpreted the question incorrectly or because your intent was not clear. For example, you ask, "Have you seen Robert today?" The person, guessing at what you want to know, answers, "He hasn't submitted his report yet." To get the information you need, clarify the intent of your question, then ask it again. You respond, "I have to speak to Robert about the problem with Line #6. Have you seen him today?"

At other times, an answer may raise doubts about how the person you asked got his or her facts. For example, you ask, "When did the schedule delay start?" The person answers, "They said it started last Tuesday." To be confident that this information is factual, and to identify the credibility of the information, you should ask, "Who said that?" and/or "How do they know that?"

Incomplete answers may also cause problems. For example, you ask, "What are your objectives in choosing the computer?" and the person answers, "Processing speed." If you suspect there could be other objectives, use questioning to the void techniques to ask, "What other objectives do you have?"

Finally, the answer you receive may be too general. For example, you ask, "Why haven't you completed the report?" The information source answers, "I haven't had the time." This answer does not satisfy you, so you ask a turnaround question—"Why haven't you had the time?"—to get a more specific and useful answer.

PEOPLE IN PROJECTS SUMMARY

Managing the people involved in your project requires specific knowledge, skills, and practice; it's not a task to be handled on an as-needed basis. First, you need to understand your people—what motivates them and how they will react to things. And second, you need to understand and build a performance system within the context of your project that will help project contributors succeed. Who you tap to contribute to your project will depend on the results you are seeking. You also need to determine when you will seek to involve people and when you will go solo. Your decision to do this will be influenced by the situation, your need for a superior solution, and the time constraints you face.

Whether you seek to gather information, gain consensus, or further progress on your project, meetings will consume valuable time and resources, and often will not achieve the desired results. Using Situation Appraisal can help you clarify the purpose of the meeting before it's held, determine whether a face-to-face meeting is necessary, surface issues to address during the meeting, and ensure that the primary meeting objective is met. And finally, fundamental skills like questioning and listening play a vital role in project success. Like all other project management skills, they can be acquired with practice.

CHAPTER SIX

SIX

Project Decision Making and Problem Solving

Tim Dwight's project was making headway when things started to unravel around major deliverable 4. Office Move. Purchasing began to complain that they were experiencing "delivery problems" with the equipment ordered. Facilities Management called to say they were experiencing "personnel shortage problems," due to an employee having injured his back and the resignation of the facilities manager. They are asking for the duration of several work packages to be increased. Most of these work packages are on the critical path. A majority of employees in the Customer Services department have been asked to support a major sales effort and think they may have problems packing their personal possessions by the specified deadline. The Customer Services vice president and the various department managers have sent Tim some conflicting messages about how quickly they want to move, despite having previously concurred on the project's time frame. Tim is beginning to get overwhelmed.

Sound familiar? Tim needs to appraise the situation described above before launching needlessly into action that will consume resources but might not resolve the various difficulties he's facing. First, he needs to better understand whether the concerns can be resolved by taking some immediate action or whether they need to be analyzed further.

The word "problem" has surfaced several times and is being used to express very different concerns: a situation that requires action; something that has gone wrong and the reason for this is not known; a choice that has to be made. Each of these concerns requires a different approach. **Situation Appraisal** provides a common sense approach to clarifying concerns, setting priority on those concerns, and making them manageable. **Decision Analysis** provides an approach to making the best choice after considering the risks inherent in that choice. **Problem Analysis** provides an approach to finding the true cause of a problem so the problem can be fixed permanently.

SITUATION APPRAISAL

Situation Appraisal is a step-by-step process that enables you to systematically identify, sort, and prioritize concerns. It is especially effective in a project management environment where you encounter many issues that compete for your attention.

WHERE TO USE IT

Situation Appraisal will be useful throughout Definition, Planning, and Implementation of your project. But here are a few especially valuable areas where you can apply Situation Appraisal:

- Producing the list of reasons for completing the project prior to writing the project statement.
- Identifying and clarifying the things that need to be completed or addressed during the project (prior to Definition).
- Listing concerns around how an objective will be met prior to developing the work breakdown structure or designing a work package.
- Clarifying concerns arising from project monitoring and other sources to better understand how your project plan should be modified.
- Creating and maintaining an "open" Situation Appraisal on issues that arise and are resolved during the life of the project. This will help you keep track of issues, resolutions, decisions, and changes and help you prepare status reports and a closeout report at the end of the project.

☞ Tip

Most likely, your Situation Appraisal will require the input of more than one or two individuals. Involve the appropriate project team members, contributors, stakeholders, and experts to ensure that you capture all relevant concerns.

STEPS IN THE PROCESS

The first step in a Situation Appraisal is to establish a theme and time frame. The **theme** is a brief phrase that describes the target of your Situation Appraisal, and it can be general or specific. For example, if you're defining a safety improvement project, your theme might be "All concerns we have about safety." Later on in the project, you might conduct another Situation Appraisal that's more focused, such as "The delay in the oil clean-up work package."

☞ Tip

Situation Appraisal is one of the best tools to use at *ad hoc* or agenda-less project team meetings and for confronting concerns (whenever they may arise) with the project's progress.

Adding a time frame focuses the appraisal on a block of time because, as you are aware, information and priorities are constantly changing and need to be updated frequently. Restrict your Situation Appraisal to a time frame such as "this year" or "within the last quarter" or "this week" if it's appropriate.

After recording the theme and time frame, list all of your **concerns**. A concern can be a decision to be made, a problem that needs to be solved or prevented, an action that requires completion, or an opportunity that needs to be seized. Record everything that's revealed during this step, even if you're not sure it qualifies as a concern. However, avoid

extended discussion or thinking about any one concern—this may indicate you've moved into analyzing the concerns—you'll create a plan for analysis later in the Situation Appraisal.

Now that you have a list of concerns, you'll need to obtain a better understanding of what they mean. To do this, rewrite the concern as one or more statements in which the meaning and the action required are clear. If you're not sure whether a concern should be separated or clarified, follow these guidelines:

- Separate a concern if it contains more than one issue or action. For example, the concern "Work package 3.1 is delayed and the output is poor quality" should be separated into two concerns—"Work package 3.1 is delayed" and the "Output for 3.1 is poor quality."
- Clarify a concern if one of the words is vague or too general or if, as written, it doesn't tell you what action or process will resolve it. For example, look again at "Output for 3.1 is poor quality." This needs to be rewritten because it's unclear which output is of poor quality, and it's also unclear what "poor quality" means. After clarifying this concern, it might become "Research report did not include the requested executive summary." Now, the output is clear (research report) and "poor" is understood (missing an executive summary).

Pitfall

As you separate and clarify your concerns, make sure the new and revised statements are factual. If you're not sure about the validity of a concern, ask, "What evidence do we have that this is an actual concern?" Trying to analyze concerns that aren't factual will waste your time.

Example 6-1: Situation Appraisal—Clarification and Priority

Theme
The software installation project is behind schedule

Concern	Clarified Concerns	Current Impact	Future Impact	Time Frame	Priority
Some work packages are delayed	Work package 4.1.4 "Upgrade skills of the IT department" has fallen behind	Behind 4 days and counting. So far, we've spent $16,346 on contractors to cover for them — H	We will spend $4,000 a day until they possess the skills. Project is to be about another 12 days delayed — H	If we don't have the skills by April 14, the resources will have all been spent on contractor cost — H	H
	Work package 14.2.5 "Receive new hardware" was delayed because it was damaged and we were forced to send it back	Behind 6 days; cost us administrative time in evaluating it and sending it back — M	No future impact on the outcome of the project's schedule or budget — L	Potential to make the same mistake on the next project — L	M
	Work package 8.4 "Hire database administrator (DBA)" is delayed	Delayed by 14 days and counting — L	Without a DBA the entire plan will begin to be delayed — H	If we don't have a DBA by the end of June, we won't be able to complete the project — M	L
Jim Flanders was reassigned	Jim Flanders, a member of the project team, was reassigned to another project. We need a replacement	He is responsible for 12 work packages. They have fallen behind by one day each. One of them is on the critical path — M	We will not be able to install the software for our remote users without Jim's skills — H	Every day it gets closer to impossible for someone to step in and assume Jim's responsibilities and still meet the project deadline — H	H

Pitfall

Not everything is a high priority. Although it may seem like every concern is screaming for your immediate attention, some are more important than others. Trying to handle them all at once may lead to failure.

Pitfall

This data will only help you set priority if it's specific. For example, instead of recording "losing money" as Current Impact, write "losing $75,000 a day."

Example 6-1 illustrates how to list concerns, and separate and clarify them. The software installation project team uses Situation Appraisal to resolve concerns regarding why the project is behind schedule.

It's possible that after separating and clarifying your concerns, you'll know which ones need your immediate attention and which can wait. But don't count on it. If you need an effective, rational way to set priority, consider these three measures:

- **Current Impact**—What is the severity of the concern at the present time in terms of cost, quality, human resources, safety, or any other related criteria?
- **Future Impact**—What is the potential change in severity of a concern over time…will the concern stabilize, get better, get worse, or disappear altogether? This is measured in terms of the anticipated change in cost, quality, human resources, safety, or any other related criteria.
- **Time Frame**—What is the amount of time left before a concern becomes too difficult, expensive, impossible, or pointless to resolve?

Record factual information on the Current Impact, Future Impact, and Time Frame of each concern, and then make your judgments as to which concerns are high, medium, and low priority for each area. Then, taking these ratings into account, assign an overall priority to each concern.

Example 6-2: Situation Appraisal—Action Plan

Clarified Concerns	Process Needed	Resolution	Actions	Who	By When
Work package 4.1.4 "Upgrade skills of the IT department" has fallen behind	Decision Analysis (DA)	Conduct a DA to select the best way to train the staff quickly	Frame the objectives. Research the alternatives. Present recommendations	John Smalley	March 30
Work package 14.2.5 "Receive new hardware" was delayed because it was damaged and we were forced to send it back	Problem Analysis (PA)	Conduct PA on the cause of the damage	Describe the problem. Find the cause. Implement the solution	Sergi Zumonv Adam Eaton	April 15
Work package 8.4 "Hire database administrator (DBA)" is delayed	Situation Appraisal (SA)	We've already conducted a DA, but we haven't had luck finding qualified candidates	Reopen the search	Shirley Manderville and project team	March 28
		We have concerns about getting this individual trained quickly	Separate and clarify the concerns		April 5
Jim Flanders, a member of the project team, was reassigned to another project. We need a replacement	Decision Analysis (DA)	Conduct a DA to select a replacement for Jim	Frame the objectives. Research candidates. Make an offer to selected candidate. Find a temporary replacement	John Smalley	March 28
	Potential Problem Analysis (PPA)	Conduct a PPA to plan for the possibility of another person leaving the project or the company	Find likely causes and take preventive action	Shirley Manderville and project team	March 25

The next step in Situation Appraisal pertains to the actions you'll take to resolve the concerns. There are several choices:

- If the concern indicates a need to make a decision, write the decision statement and conduct a Decision Analysis (see pages 122–126 for more about Decision Analysis).
- If the concern indicates that a problem needs to be solved, write a problem statement and conduct a Problem Analysis (see pages 127–130 for more about Problem Analysis).
- If the concern refers to a future problem, conduct a Potential Problem Analysis (see pages 54–58 for more about Potential Problem Analysis).
- If the concern refers to a future opportunity, conduct a Potential Opportunity Analysis (see page 59 for more about Potential Opportunity Analysis).
- If the concern is an action, schedule it to be completed as a part of the project plan.

Sometimes, it's helpful to construct a "Resolution" column where you record how you plan to resolve the concern and why. In either case, the final step involves assigning the actions to project contributors or team members, with their agreement, and making sure you set expectations for the outcome in terms of time, cost, and performance. Example 6-2 illustrates how to plan the resolution of concerns for the software installation project.

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DECISION ANALYSIS

Decision Analysis is a step-by-step process that helps you make a choice. It's especially effective if you face a very complex or important decision, or if you need to demonstrate the thinking that goes into your decision making.

WHERE TO USE IT

Use Decision Analysis to handle the many choices that arise during Definition, Planning, and Implementation. Here are just a few areas where you can use Decision Analysis in a project:

- Selecting a project manager
- Designing work packages
- Selecting capital equipment
- Determining the facility you'll use to complete part of the project
- Selecting vendors
- Choosing people for responsibility assignments
- Demonstrating the benefits and risks of any decision you need to present to stakeholders
- Choosing the most effective method and times for monitoring the project
- Selecting the best way to bring a project back on track
- Selecting the best way to acknowledge project contributors

☞ Tip

Use Decision Analysis to determine which projects to work on. Your objectives should include the anticipated results of the project, as well as resource and other restrictions you face.

STEPS IN THE PROCESS

The first step in Decision Analysis is to write a **decision statement.** Ask yourself (and others involved), "What are we trying to decide?" Phrase your answer into a decision statement starting with a choice word like "select," "pick," or "choose." For example, your project may involve conducting the company's annual sales conference and you need to decide which hotel will host the sales conference. Your decision statement might be, "Select a hotel to host our annual sales conference." Or, maybe you have to select a resource to lead a particular work package, in which case your decision statement might be, "Select a resource to lead work package 12.1 Technical Manuals Produced."

☞ Tip

Objectives can have either a quantifiable measure or measures that are clearly understood. In either case, the measures should be documented.

Once you've written the decision statement, list the **objectives** that describe the ideal outcome for your decision. Like project objectives, your decision objectives will contain results you want and restrictions you must adhere to.

For "select a hotel to host our annual sales conference," your list of sales objectives might include the following:

- Minimize cost per participant
- Offers the most on-site dining options
- Has a strong reputation for service (as measured by annual hospitality industry customer satisfaction survey)
- Maximizes seating in the main conference room
- Has at least 200 rooms available next February 14–18

There are a few things to keep in mind when writing decision objectives:

1) A feature is a prominent aspect or characteristic of something. Decision objectives are not features…they are statements of benefit. For example, if you're choosing which car to buy, a feature might be "leather bucket seats." However, your true objective is "comfortable seats"…leather bucket seats are just one way to meet that objective.

2) Each decision objective should be measurable, just like your project objectives. After you write an objective, add the phrase "as measured by…" to the end of it. This will help you think of how the objective should be measured.

3) Decision objectives can draw on the project objectives, but they should never contradict them. Your project objectives represent overall goals for the project—writing decision objectives that contradict them will make it more difficult to reach your goals.

Now that you've written the objectives, separate them into two groups—**Musts** and **Wants**. Must objectives represent those that are absolutely mandatory, have a set limit, and are realistic. Want objectives, on the other hand, are those that aren't Musts. If you need additional details about how important each Want is to the outcome of the decision, rate them on a scale of 10–1 with 10 indicating the most important objectives. This is called the "weight." Here's how you might rate the hotel objectives:

- Minimize cost per participant (Want, 5)
- Offers the most on-site dining options (Want, 7)
- Has a strong reputation for service (as measured by annual hospitality industry customer satisfaction survey) (Want, 10)
- Maximizes seating in the main conference room (Want, 9)
- Has at least 200 rooms available next February 14–18 (Must)

Your decision should have at least one objective that is rated a "10" so that you can compare the other objectives to it. You can also have more than one 10-rated Want. Example 6-3 lists, classifies, and weights objectives for selecting a resource to lead work package 12.1 Technical Manuals Produced.

Tip

Ask yourself this question about each Must: "Would I accept something slightly more or less than outlined in the objective?" If the answer is "yes," then the objective is a Want, not a Must.

Example 6-3: Decision Analysis—Objectives

Decision Statement
Select a resource to lead Work Package 12.1 Technical Manuals Produced

Objectives	Classification
Has content expertise (certification in subject area)	Must
Cost no more than $60/hour	Must
Has time to manage the work (unallocated in master schedule)	Want
Understands the publishing process (interaction with the process)	Want
Has managed similar project work before (number of times)	Want
Willing to take ownership (exhibited similar behavior on other projects)	Want
Has experience writing technical manuals (years of experience)	Want
Will work well with the team (has established a relationship)	Want
Can provide thought leadership to the team (ability to influence the direction of the work based on expertise and communication skills)	Want
Minimize cost to the project	Want

Want Objectives	Weight
Has time to manage the work	10
Has experience writing technical manuals	9
Willing to take ownership	8
Can provide thought leadership to the team	7
Will work well with the team	6
Has managed similar project work before	3
Understands the publishing process	5
Minimize cost to the project	4

Tip

You can also use Decision Analysis to recommend a choice to stakeholders or customers. To do this, complete the Decision Analysis process and record the results in report form. The report should contain your preferred choice as well as the main reasons you selected it and any risks associated with it.

The final piece of Decision Analysis deals with **alternatives**, and how well the alternatives perform against the objectives. Alternatives are possible choices that you consider for your decision. First, record all the alternatives that you and others propose. Then, take each one through your Must objectives. If the alternative doesn't meet the Must set limit, then discard it. For example, if you set a Must as "Provides a two-year warranty at no additional cost," and two of your alternatives do not, eliminate these two from consideration. (As you can see, it's very important that each Must objective is truly mandatory—not just an important Want.)

After testing the alternatives against the Must objectives, compare them against the Wants. Which alternative best satisfies this objective? How well do the others satisfy this objective? Now, you'll use a 10–0 scale, but this time it will be used to score the alternatives. The alternative that best meets the objective receives a 10. The rest receive a score based on how well they meet the objective compared to the 10. More than one alternative can merit a "10" if each alternative satisfies the objective equally well.

Example 6-4: Decision Analysis—Alternatives

Objectives	Weight	Product Development Associate	Training Senior Associate	Publishing Editor	Contract Resource
Cost no more than $60/hour	Must	$40/hour	$55/hour	$40/hour	$35/hour
Has content expertise	Must	Is certified in subject area	Newly certified in subject area	Is unfamiliar with subject matter	Is certified in subject area
Has time to manage the work	10	Is currently available 10/100	Schedule is open currently 10/100		Is currently available 10/100
Has experience writing technical manuals	9	Has 6 years' experience 7/63	Has 3 years' experience 4/36		Has 10 years' experience 10/90
Willing to take ownership	8	Has proven track record (8 years with company) 10/80	Fairly new to the company (one year only) 6/48		Has indicated willingness to make "top priority" 8/64
Can provide thought leadership to the team	7	Has not yet demonstrated this ability, but has knowledge and experience in subject area 5/35	Does not have enough experience in subject area 2/14		Background and experience in subject area will be an asset 10/70
Will work well with the team	6	Has established relationship with entire team 10/60	Has worked with some team members 7/42		Will be new to the team 3/18
Has managed similar project work before	3	Has done so 5 times previously 10/30	Has never done so before, but has project mgmt. experience 5/15		Has done so 4–5 times previously 10/30
Understands the publishing process	5	Understands the business well (8 years' interaction) 8/40	Has some knowledge of the business (3 years' interaction) 3/15		Has spent many years in the business (10 years' interaction) 10/50
Minimize cost to the project	4	$40/hour 8/32	$55/hour 5/20		$35/hour 10/40
TOTAL		440	290		462

In Example 6-4, the alternatives have been tested and compared. The numbers you see in the alternative cells represent the score as well as the weight multiplied by the score. For example, Product Development Associate scores a "10" for "Has time to manage the work." The "10" is then multiplied by the weight ("10") to get "100." This is represented by 10/100.

Add up the multiplied scores for each alternative to get a total score. For example, the total score for the Product Development Associate would be 440 (100 + 63 + 80 + 35 + 60 +30 + 40 + 32 = 440).

The alternative that scores the highest may be your best choice. However, you first must assess risks and potential adverse consequences. Ask, "If we choose this alternative, what could go wrong?" This will give you a list of risks. For each risk, ask, "If this risk happens (probability), what will be the consequences (seriousness)?" Then rate the probability and the seriousness of each risk using a High-Medium-Low scale.

Pitfall

Don't eliminate a high-scoring alternative simply because it contains significant risks and adverse consequences. First determine whether you can take action to minimize the risks and handle the adverse consequences if they do occur. Then decide if you need to consider the next highest scoring alternative.

Pitfall

Does this seem like a lot to do for just a simple decision? You may be right. Conducting a full Decision Analysis for every decision you make is not time efficient. Sometimes, just agreeing on a decision statement and objectives will give you and your team the clarity to make a sound decision.

Are you willing to handle the risks to get the benefits of this alternative? If your answer is no, consider the next alternative. Now that you've examined both the results and the risks, make your decision.

Look at the alternatives in Example 6-4. Contract resource scored the highest at 462, but before making a selection, the decision makers viewed some of the risks and adverse consequences for the highest performers.

The decision makers examined the risks and adverse consequences associated with selecting the product development associate and the contract resource (see Example 6-5). After determining they would be able to manage the risks, they selected the product development associate to lead the work package.

Record the actions you need to take to implement the decision. Make sure you include any actions you need to take to prevent or prepare for the risks and adverse consequences.

Example 6-5: Decision Analysis—Risks

Risks and Adverse Consequences

Alternative: Product Development Associate

Risk	Probability	Adverse Consequence	Seriousness
If she continues to be involved in major projects for other clients,	M	Then conflicting interests may prevent her from devoting sufficient time to leading this work package	H
If assigned responsibility for other work packages on this project,	L	Then she may be distracted from leading this work package	M

Alternative: Contract Resource

Risk	Probability	Adverse Consequence	Seriousness
If he finds other more attractive (higher paying, longer-term) contract work,	H	Then he may not want to or be able to play the leadership role as expected	H
If the schedule slips and we are unable to provide him with work at the agreed upon time,	L	Then he may not be available when the work has to be done	H

PROBLEM ANALYSIS

Problem Analysis is a step-by-step process that helps you find the cause of a problem. However, Problem Analysis should only be applied if your concern meets the following qualifications:

- It represents a deviation between what should be happening and what is actually happening. For example, a work package is delayed because a prototype failed in testing.
- You don't know the cause of the failure. If you already know the true cause, you should decide what action to take to fix it.
- You need to know what caused it to fail in order to take the most appropriate action.

WHERE TO USE IT

If your concern qualifies, Problem Analysis will provide a means for revealing the true cause of problems in Planning and Implementation. Here are a few areas where Problem Analysis can be applied:

- Finding the true cause of problems that occurred with similar projects in the past (to better define and plan the current project).
- Finding the true cause of something that goes wrong with your plan during implementation. This can include delays, inaccurate budget estimates, and not-as-expected output.
- Resolving the "people problems" that occur during a project. (see Solving People Problems on pages 88–89 for more information).

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Time and budget pressures can cause project managers to jump into immediate action when something goes wrong. However, stepping back and doing a Problem Analysis can save you from wasting time and money fixing the wrong cause.

STEPS IN THE PROCESS

The first step is to write a **problem statement**. A problem statement contains the object that has the problem and the deviation that it has. The deviation is the gap between what should be happening and what is actually happening. Here are some examples of problem statements:

- Work stations arrived late
- Metal cabinets are getting dented during installation
- Dry skin medication produces bumps on test subjects

The next step asks you to answer a series of questions that describes the problem in four dimensions—What, Where, When, and Extent. This process is called developing a **problem specification**. You'll need to ask the questions in two ways—you'll ask what the problem Is and what it Is Not.

Problem Specification Questions

Dimension	*Is Question*	*Is Not Question*
What	What specific (object) has the (deviation)?	What could have the (deviation), but doesn't?
	What specific (deviation) does the (object) have?	What deviations could the (object) have, but doesn't?
Where	Where is the (object) when it has the (deviation)?	Where could it have been when it had the (deviation), but wasn't?
	Where on the (object) is the (deviation)?	Where could the (deviation) be on the object, but isn't?
When	When was the first time the (object) was observed to have the (deviation)?	When could it (object) have been observed first with the (deviation), but wasn't?
	When since the first time has the (object) been observed with the (deviation)?	When since the first time could the (object) have been observed with the (deviation), but wasn't?
	When in the object's life cycle did the problem first occur?	When in the object's life cycle could the problem have occurred first, but didn't?
Extent	How many (objects) have the (deviation)?	How many (objects) could have the (deviation), but don't?
	How many (deviations) are on each (object)?	How many (deviations) could be on each (object,) but aren't?
	What's the size of a single (deviation)?	What could the size of a single (deviation) be, but isn't?
	What is the trend in the object and/or deviation (increasing, decreasing, or staying the same)?	What could the trend be, but isn't?

☞ Tip

If you still need help identifying possible causes, examine each Is/Is Not pair and ask, "What is different, special, odd, or unusual about the (Is information) as compared to the (Is Not information)?" This will produce a list of distinctions that can also provide you with possible causes.

Although it might seem to be a waste of time at first, answering both the Is and Is Not questions will narrow the problem further. Often, as you'll read later, it's in the comparison between the two answers that you'll find cause. The problem specification questions are listed above. In Example 6-6 you will find a completed problem specification for the problem statement "Workstations arrived late."

After assembling the answers to these specification questions, you might have some new ideas about what caused the problem. If no new ideas are immediately forthcoming, hypothesize about what could have caused this problem using your knowledge and experience with similar problems. Record the possible causes you identified and then determine which one best fits the problem description by asking, "If (the cause) is the true cause, how does it explain both the (Is) and the (Is Not)?" The cause that has the least and/or most reasonable assumptions is likely your most probable cause. Example 6-7 illustrates how to identify and

Example 6-6: Problem Analysis—Statement and Specification

Problem Statement		
Workstations arrived late		
Dimension	***Is***	***Is Not***
What	Workstation desks Arrived late	Workstation returns, lateral file cabinets, hutches Missing, arrived damaged, wrong workstations
Where	Vendor's warehouse Not applicable	Vendor's shipping dock Not applicable
When	12 August Still had not arrived between 12 August and 20 August Single incident—no pattern During preparation for shipping by vendor	Before or after Could have arrived between 12 August and 19 August Could have arrived after 20 August During submission of purchase order During purchase order processing
Extent	All workstation desks 7 days late Not applicable Occurred once	None, one or two More or less than 7 days Not applicable Less or more

evaluate possible causes for the problem statement "Workstations arrived late."

The final step in Problem Analysis is to confirm that the most probable cause is actually the true cause. Do this by testing the most probable cause, gathering facts to confirm it, or by watching the problem as it happens. Then assign actions to fix the problem.

Problem Analysis may seem complex at first, but it doesn't have to be. Sometimes, just asking the problem specification questions can help you and others solve the problem.

> ☞ **Tip**
>
> If you're still searching for causes, examine the list of distinctions and ask, "What has changed in, on, around, or about each distinction?" These changes can help suggest causes.

Example 6-7: Problem Analysis—Most Probable Cause

Identify Possible Causes	Evaluate Possible Causes	
	Does not explain…	*Explains only if…*
Delay during shipping caused late arrival	Why only the desks were delayed and not the returns?	Desks were separated from the returns during shipping
		Desks and returns were shipped out separately
Vendor's new inventory system delays arrival	Why only the desks were delayed and not the returns?	Desks inventoried incorrectly
Purchase order delayed	Why only the desks were delayed and not the returns?	Separate purchase orders were processed for the desks and returns
		Decision to buy desk and returns was made at different times
		Purchase orders for desks were submitted later than purchase orders for returns
New purchasing procedures were followed	Why only the desks were delayed and not the returns?	New procedures were followed for the desks and not the returns
New shipping supervisor intercepted order and delayed shipment of desks	Why only the desks were delayed and not the returns?	Desks were specifically targeted for delay due to lack of funding

Determine Most Probable Cause	Confirm True Cause
Purchase order delayed	Ask Purchasing whether separate orders were placed for each item (workstation desks, workstation returns, cabinets, hutches) and when they were sent out
	Review when the decision to buy the desks and returns was made and communicated to Purchasing
	Ask vendor whether separate purchase orders were received for each item and when they were received

DECISION MAKING AND PROBLEM SOLVING SUMMARY

The processes discussed in this chapter are not a brand new way of thinking. Situation Appraisal, Decision Analysis, and Problem Analysis simply take the common sense ideas you have always used and put them in a logical framework. Because they are systematic, thorough approaches to dealing with concerns, they will help you gather and organize information effectively. They will guide you through unfamiliar situations by helping you draw on your experience and judgment. In short, they will help you and your project team deal in a rational manner with the challenges that projects throw your way.

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ABOUT THE AUTHORS

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