



SELF-PACED Learning for a FAST-PACED World

# Successful Project Management

FOURTH EDITION

How to Complete Projects on Time,  
on Budget, and on Target

MICHAEL S. DOBSON

# **Successful Project Management**

## **Fourth Edition**

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Michael S. Dobson

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**FOR QUESTIONS AND COMMENTS:**

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AMASelfStudy@amanet.org for information about  
Self Study courses. And visit our website at [www.amaselfstudy.org](http://www.amaselfstudy.org)

# About This Course

“Project management is one of those applications that everyone knows someone else should be using.”

—Michael J. Miller, *InfoWorld*, 1988

The management of projects is often vital to the success and growth of organizations. Unlike ongoing operations, projects are both temporary and unique. Because they are temporary, they often do not have the benefit of fully developed, mature, and permanent organizations devoted to their success. Because they are at least in some respects unique, they each involve special problems, issues, and considerations.

Project management, in a nutshell, is the art, craft, and science of managing projects. It is a wide-ranging and complex discipline that incorporates and uses elements from many different disciplines. Although project management was once considered just an aspect of such fields as architecture or engineering, today project management is considered to be a discipline in its own right.

In a fast-moving and fast-changing world, project management skills are often a vital element in your career growth and ultimate success. Even when managing projects is only an element of your overall job, success in managing projects often has a disproportionate impact on your career.

*Successful Project Management, Fourth Edition*, is an introductory course in project management. In this course, you will learn the fundamental concepts, strategies, techniques, and approaches of modern project management. The course is designed for active project managers, technical team members who need to understand the overall project approach in order to perform their roles effectively, and senior managers and executives who must hire, supervise, and evaluate project managers in their employ.

We will follow the basic project management approach as laid out in *A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 5th Edition*, popularly known as the PMBOK® Guide, along with other sources listed in the Bibliography and Recommended Reading section at the end of the course. We strongly encourage you to read and study widely.

**Michael S. Dobson, PMP**, is an internationally known authority on project management and author of 62 books, including twelve on the topic of project management. He has written eight books published by AMACOM.

As principal of Dobson Solutions ([www.dobsonsolutions.com](http://www.dobsonsolutions.com)) and the Sidewise Institute ([www.sidewiseinsights.com](http://www.sidewiseinsights.com)), Michael consults, speaks, and trains on project management topics throughout the world. His clients range from the US Navy's nuclear propulsion program to Calvin Klein Cosmetics.

As an operating executive and project manager, Michael has held the positions of Vice President, Discovery Software International; Vice President, Games Workshop; and Director of Marketing and Games Development, TSR, Inc. He was part of the team that built the Smithsonian Institution's National Air and Space Museum in the 1970s. He holds a bachelor's degree from the University of North Carolina at Charlotte.

# How to Take This Course

This course consists of text material for you to read and three types of activities (the Pre- and Post-Test, in-text exercises, and end-of-chapter Review Questions) for you to complete. These activities are designed to reinforce the concepts brought out in the text portion of the course and to enable you to evaluate your progress.

## Pre- and Post-Tests

Both a pre-test and a post-test are included in this course. Take the pre-test before you study any of the course material to determine your existing knowledge of the subject matter. To get instructions on taking the test and having it graded, please email [AMASelfStudy@amanet.org](mailto:AMASelfStudy@amanet.org), and you will receive an email back with details on taking your test and getting your grade. This email will also include instructions on taking your post-test, which you should do upon completion of the course material.

## Certificate

Once you have taken your post-test, you will receive an email with your grade and a certificate if you have passed the course successfully (70% or higher). All tests are reviewed thoroughly by our instructors, and your grade and a certificate will be returned to you promptly.

## The Text

The most important component of this course is the text, for it is here that the concepts and methods are first presented. Reading each chapter twice will increase the likelihood of your understanding the text fully.

We recommend that you work on this course in a systematic way. Only by reading the text and working through the exercises at a regular and steady pace will you get the most out of this course and retain what you have learned. In your first reading, concentrate on getting an overview of the chapter's contents. Read the learning objectives at the beginning of each chapter first. They serve as guidelines to the major topics of the chapter and enumerate the skills



you should master as you study the text. As you read the chapter, pay attention to the heading and subheadings. Find the general theme of the section and see how that theme relates to others. Don't let yourself get bogged down with details during the first reading; simply concentrate on remembering and understanding the major themes.

In your second reading, look for the details that underlie the themes. Read the entire chapter carefully and methodically, underlining key points, working out the details of the examples, and making marginal notations as you go. Complete the exercises.

### **Exercises and Activities**

Interspersed with the text in each chapter you will find exercises that take a variety of forms. In some cases, no specific or formal answers are provided. Where appropriate, suggested responses or commentary follow the exercises.

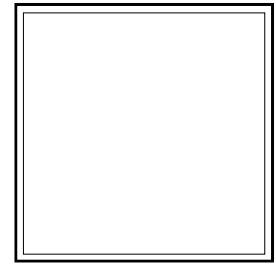
### **The Review Questions**

After reading a chapter and before going on to the next, work through the review questions. By answering the questions and comparing your own answers to the answers provided, you will find it easier to grasp the major ideas of that chapter. If you perform these self-check exercises conscientiously, you will develop a framework in which to place material presented in later chapters.

### **Questions About Grading/Retaking the Test**

If you have questions regarding the tests, the grading, or the courses itself, please email Self Study at *AMASelfStudy@amanet.org*.

If you fail the Post-Test, you have one year to retake the test for one year after the course's purchase date.



# Pre-Test

## Successful Project Management

Fourth Edition

### Course Code 98004

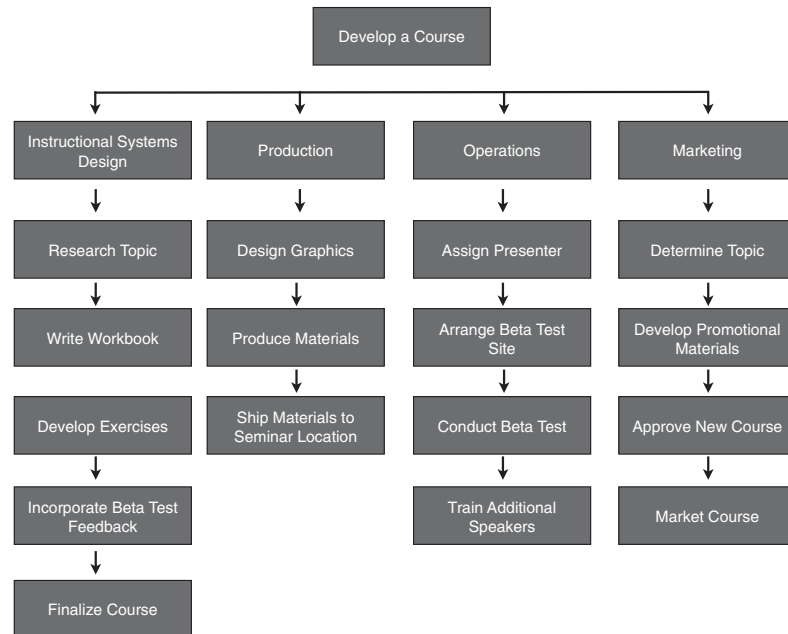
INSTRUCTIONS: *To take this test and have it graded, please email AMASelfStudy@amanet.org. You will receive an email back with details on taking your test and getting your grade.*

FOR QUESTIONS AND COMMENTS: *You can also contact Self Study at 1-800-225-3215 or visit the website at [www.amaselfstudy.org](http://www.amaselfstudy.org).*

1. In a PERT analysis, what is the probability that an activity will be completed no later than the PERT estimate?
  - (a) 50.00%
  - (b) 84.13%
  - (c) 15.87%
  - (d) 61.79%
  
2. The triple constraints include:
  - (a) risk, quality, and procurement.
  - (b) time, risk, and quality.
  - (c) time, cost, and quality.
  - (d) time, cost, and performance.

3. A critical path activity can be compressed from eight weeks to four weeks at a cost of \$1,000 per week. The available float on the parallel path is two weeks. There is a \$1,200 bonus for each week early. How would you crash this project?
  - (a) Crash four weeks from the critical path activity.
  - (b) Do not crash; it's not financially appropriate.
  - (c) Crash two weeks from the critical path activity.
  - (d) Crash both critical and noncritical paths two weeks.
  
4. Which of the following is a step in project closeout?
  - (a) Charter
  - (b) Quality assurance
  - (c) Transfer
  - (d) Baseline
  
5. Which project management process includes activities needed to define a new phase of an existing project?
  - (a) Progressive elaboration
  - (b) Project planning
  - (c) Project transfer
  - (d) Project initiation
  
6. What project management tool links resources to activities?
  - (a) WBS
  - (b) RAM
  - (c) PERT
  - (d) EVM
  
7. A particular business opportunity requires an investment of \$150,000, and has a 70% chance of success. If it succeeds, you will earn \$275,000, but if the investment fails, you will lose your entire investment. What is the expected monetary value?
  - (a) \$275,000
  - (b) -\$150,000
  - (c) \$125,000
  - (d) \$147,500
  
8. What is a characteristic of a well-written requirement?
  - (a) Condition → Consequence
  - (b) Described in the project charter
  - (c) Unambiguous and verifiable
  - (d) Exists as a work package in the project's WBS
  
9. The technique of adjusting your estimates as the project moves forward to take advantage of improved knowledge and understanding is known as:
  - (a) the Monte Carlo simulation.
  - (b) the earned value method.
  - (c) rolling wave estimating.
  - (d) the program evaluation and review technique.

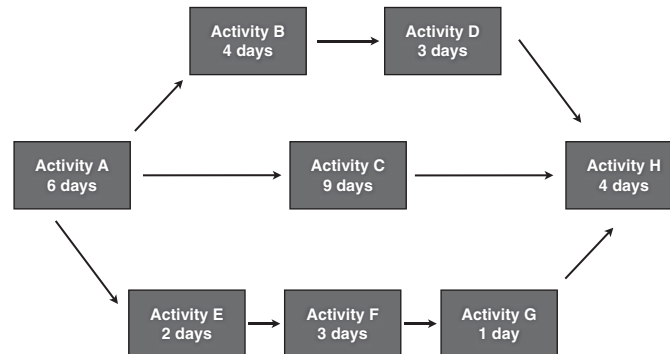
10. Look at the WBS that follows this question. How is it organized?
- By department or work group
  - By phase
  - By cost account
  - By difficulty or risk



11. For a particular activity, we determine that optimistically it will take 6 weeks, pessimistically it will take 30 weeks, but it will most likely take 12 weeks. What is the PERT estimated time and the standard deviation?
- $E = 12, \sigma = 6$
  - $E = 14, \sigma = 4$
  - $E = 8, \sigma = 4$
  - $E = 30, \sigma = 12$
12. An analogous estimate is considered accurate if the final project cost is within the range:
- 25%, +100%.
  - 10%, +25%.
  - 5%, +10%.
  - 5%, +0%.
13. The extent to which the project's product, service, and result satisfy the needs for which it was undertaken is known as:
- quality.
  - scope.
  - risk.
  - WBS.

14. Look at the following network diagram. What is the critical path?

- (a) A→B→D→H
- (b) A→E→C→D→H
- (c) A→E→F→G→H
- (d) A→C→H



15. Today, we were supposed to have completed four activities that were planned to cost \$2,500 each. We have actually accomplished only three of those activities and we have spent \$7,000 to date. In earned value method terms, what is our cost performance index, rounded to the nearest whole percent?

- (a) 93%
- (b) 107%
- (c) 75%
- (d) 133%

16. What document formally authorizes the existence of a project and gives the project manager working authority to proceed?

- (a) Project scope statement
- (b) Project authorization document
- (c) Project plan
- (d) Project charter

17. What is “the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements”?

- (a) Progressive elaboration
- (b) Program evaluation and review technique
- (c) Project management
- (d) Iterative planning

18. What performance measurement baseline can serve as a metric for all three triple constraints?

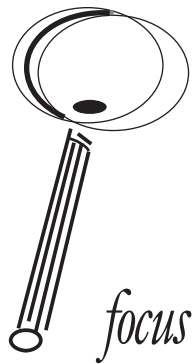
- (a) Cost baseline
- (b) Responsibility assignment matrix
- (c) Tracking Gantt chart
- (d) Weekly status reports

19. The fundamental formula for risk is:
- (a)  $P \times I$
  - (b)  $(O + 4M + P) / 6$
  - (c)  $EV - AC$
  - (d)  $BAC / CPI$
20. How frequently should you hold status meetings or require status reports?
- (a) Preferably weekly, but no less often than monthly
  - (b) Whenever a problem or issue arises
  - (c) When the project sponsor or customer need an update
  - (d) Varies based on the speed of change within the project
21. What is defined as a “hierarchical decomposition of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables”?
- (a) Responsibility assignment matrix
  - (b) Work breakdown structure
  - (c) Critical path
  - (d) Project charter
22. What is one piece of information that should be included in a communications and stakeholder management plan?
- (a) To whom stakeholders report
  - (b) Ways to get around difficult stakeholders
  - (c) Stakeholder leadership roles in the project
  - (d) What we need/want from the stakeholder
23. The process of prioritizing risks for further analysis or action by assessing and combining their probability of occurrence and impact is known as:
- (a) quantitative risk analysis.
  - (b) risk response planning.
  - (c) decision tree analysis.
  - (d) qualitative risk analysis.
24. What is a constraint?
- (a) Something that limits your choices
  - (b) Something considered true for planning purposes
  - (c) Just the three elements of time, cost, and performance
  - (d) One of the nine knowledge areas of project management

25. You have identified a risk that the price of raw materials you need for the project could potentially double in price by the time you would normally purchase them. You decide you will buy the materials far in advance of need to lock in the price. What risk response strategy have you used?
- (a) Avoid
  - (b) Mitigate
  - (c) Transfer
  - (d) Contingency plan

# 1

## Understanding Project Management



### *Learning Objectives*

By the end of this chapter, you should be able to:

- Describe the origins and growth of project management as a discipline.
- Define projects and project management and explain the concepts of progressive elaboration and iterative activity as they apply to project management.
- Describe the relationship between projects and the organization, including the roles of programs and portfolios, the function of a Project Management Office (PMO), and the characteristics of functional, projectized, and matrix organizations.
- Identify and describe the five fundamental processes of project management.
- List and define the ten knowledge areas of project management.

### Estimated timing for this chapter:

Reading	1 hour 20 minutes
Exercises	1 hour 30 minutes
Review Questions	10 minutes
Total Time	3 hours



## ORIGINS OF MODERN PROJECT MANAGEMENT

Though projects have been managed since the beginning of civilization, project management as a discipline is of more recent vintage. Imhotep, builder of the first pyramid, was an architect, a physician, and possibly most importantly the equivalent of prime minister, able to command all the resources necessary to manage the project.

Military leaders were often project managers as well, and not merely on the battlefield. At the Battle of Alesia (52 BCE), Gaius Julius Caesar built 24 miles of fortifications with a fortlet every 80 feet to defend his small force against the massive Gallic army of Vercingetorix.

As mechanical and civil engineering emerged as formal disciplines in the late 18<sup>th</sup> and early 19<sup>th</sup> centuries, engineers often served as project managers. Gustave Eiffel did not merely design the tower that bears his name, but oversaw its construction as well. This allowed him to identify and respond to some of the technical challenges, such as building elevators that ran on slanted tracks—something that had never been done before.

The new concepts of engineering led to the consideration of management as a scientific discipline. Mechanical engineer Frederick W. Taylor began studying ways to improve industrial efficiency and became one of the first management consultants. He became known as the “father of scientific management” for his empirical studies, and many of his concepts, ideas, and approaches remain in use to this day. Although general management and project management each have their unique qualities, the systematic study of general management had a great influence on the way projects were managed.

Taylor’s college roommate, Henry Gantt, continued to work with him for 30 years. Gantt developed the concept of incentive pay, linking the bonus paid to managers to how well they trained their employees. He is, however, best remembered in the discipline of project management for his development of a bar chart that shows project progress. Though the chart is today known as the Gantt chart, much of its modern format was actually developed by Polish engineer Karol Adamiecki.

What is often thought of as modern project management is even more recent, dating back to the late 1950s. The Program Evaluation and Review Technique (PERT), a creation of the US Navy and Booz Allen Hamilton, allows schedule analysis when details and durations of individual activities are uncertain. At roughly the same time, DuPont Corporation and Remington Rand developed the Critical Path Method (CPM), based on earlier scheduling techniques that had played a role in the management of the Manhattan Project.

As projects have expanded in size and complexity, so has project management grown as a discipline and career field distinct from engineering, architecture, and the military. The International Project Management Association (IPMA), established in 1965, is a federation of more than 50 national and international project management associations, and offers the IPMA Competence Baseline (ICB<sup>®</sup>) certification. The United Kingdom’s Association for Project Management (APM) offers a Registered Project Professional (RPP) designation.

In the United States, the largest and best-known project management organization is the Project Management Institute (PMI), established in 1984. Its standard terminology and guidelines for project management are contained in *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, currently in its fifth edition. The *PMBOK® Guide* is used by both the American National Standards Institute (ANSI) and the Institute of Electrical and Electronics Engineers (IEEE) as its official standard. The PMI offers a range of credentials for project managers, most famously the Project Management Professional (PMP®) designation. This course is designed to be compatible with the fifth edition of the *PMBOK® Guide*.

## PROJECTS AND PROJECT MANAGEMENT

The general concept of work can be subdivided into *ongoing work efforts*, also known as *operations*, and projects. A *project*, according to the *PMBOK® Guide*, is “a temporary endeavor undertaken to create a unique product, service, or result.”

Unlike ongoing work efforts, projects always and necessarily end. Ideally, the project ends when the “unique product, service, or result” has been delivered successfully. Projects also end when the attempt to do so has failed, or when the customer no longer wants (or can pay for) it. Projects can also evolve and change as they move forward, based on a better understanding of the objectives, the need to address problems or challenges as they arise, or changes in the environment or circumstances surrounding the project.

*Project management* is defined as “the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.” Although this definition is a bit self-referential, it does provide a sense of the scope and breadth of the discipline. It’s extremely difficult to define the borders of project management, as project managers must often apply general management knowledge, technical knowledge, organizational understanding, and much more in order to accomplish the job. There’s no safe area in which you can say, “This isn’t part of what a project manager needs to know.”

The concept of *progressive elaboration* lies at the heart of many project management concepts, tools, and techniques. When you are first given a project, it may seem utterly impossible, and that’s not uncommon. But remember the old joke: How do you eat an elephant? One bite at a time. In project management, progressive elaboration means that you take the big, unwieldy project, and you break it into smaller pieces that you can get your arms around. Each piece can be defined, and you can plan the steps necessary to accomplish it.

Often, people begin projects without a full understanding of the issues, problems, and challenges involved. That leads to the other core concept at the heart of project management: it is an *iterative activity*. You gain increasing understanding and insight into the project, allowing you to expand on the details and confront the problems, risks, and challenges more effectively.

Exhibit 1–1 defines a sample project that we will use as a case study throughout this course. In Exercise 1–1, you will take the first step toward managing the project.



## Exhibit 1–1

### Case Study: Establishing a Project Management Office (PMO)

You've learned that many organizations establish a Project Management Office (PMO) to provide guidance, leadership, resources, and technical support to individual projects throughout the organization, and your CEO has expressed a desire to establish a PMO function in your own organization. Because you are studying project management, you've been asked to lead this project.

In your initial discussions, you discover that the organization has relatively little understanding of what a PMO is or what it does, and that some managers are skeptical of it. There is a concern that managers may lose power and authority to the new PMO. On the other hand, several recent projects have ended up failing, and there is a fear that your competitors, many of whom already have PMOs, may pull ahead in the marketplace.

You have been directed to establish a PMO in time for the annual stockholders' meeting, which will take place in nine months.



## Exercise 1–1

### Getting Started

*Instructions:* We will use the Exhibit 1–1 case study, “Establishing a PMO,” throughout this book to practice the skills we are learning.

When you are first given a project, it's often the case that the project is not fully fleshed out, and that's okay. You normally must go through a process of gaining additional understanding and insight about the project before you can manage it effectively. Read the following series of questions. Some of the answers are contained in the case study description, but not all of them. Answer the questions to the best of your ability. Don't worry if you can't answer every question fully—that's quite normal at the beginning of a project.

When you have finished, turn to Appendix A: Answers to Exercises and Case Studies at the end of this course to compare your responses with ours.

1. What is the project that must be accomplished?

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2. Why are we doing this project? How will the project benefit us if it is successful?

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**Exercise 1-1 continues on next page.**

**Exercise 1–1** continued from previous page.

3. When must the project be accomplished?

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4. What people, resources, and budget are available to us?

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5. What authority and power do we have to accomplish the work?

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6. Who are the stakeholders—the people who will be affected by our project?

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7. Does our project face opposition? What is the nature of that opposition? Why are some people opposed? Can their issues be addressed?

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8. Are there any major known risks that we can see at the beginning of the project?

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9. How will we measure our success?

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## PROJECTS AND THE ORGANIZATION

Projects normally take place inside a larger organizational environment, and no matter how important your project may be, it's never the only game in town. Here are some organizational issues that may affect your projects.

### Programs and Portfolios

Projects are often grouped into programs and portfolios. A *program* is simply a group of projects that are managed together. This is usually because their subject matter is similar. The IT department normally manages most IT projects, because it has the expertise and technical capability to do so.

A *portfolio*, on the other hand, organizes projects in terms of their organizational perspective. Individual IT projects support many different parts of the organization. If we are developing a new product, it might include project components in IT, engineering, marketing, warehousing and distribution, industrial design, and many other areas. The portfolio cuts across organizational boundaries and ties these very different projects together to achieve an overall strategic objective.

Your project may be part of both a program and a portfolio, giving you two sets of stakeholders to manage. You must understand the needs and goals of both in order to manage your project effectively.

### Project Management Office (PMO)

Our case study project involves establishing a Project Management Office (PMO), but exactly what that is can vary by organization.

PMOs consolidate various project-related functions into a central office. Depending on the organization, the PMO may establish policies, allocate resources, provide technical support to individual project managers and teams, consolidate status reporting, improve project management skills through training and coaching, and provide centralized information to senior management.

PMOs come in various flavors: supportive, controlling, and directive. A supportive PMO primarily provides technical support to projects: templates, best practices, training, coaching, and lessons learned. Controlling PMOs set and enforce policy. Directive PMOs control and manage the projects themselves, centralizing control. There may not always be a clear dividing line among these functions, so your mileage may vary.

### Organizational Structure and Project Management

Most organizations traditionally operate as *functional* organizations, in which the individual departments have particular technical functions: IT, marketing, HR, engineering, sales, etc. This is excellent for ongoing operational work, but less effective for projects, because projects frequently cut across organizational boundaries.

*Projectized* organizations are completely organized around projects, with a small central core providing overall leadership. A movie studio is a good example. Each individual movie is its own project, a business unit in itself. It contains all the different departments: set builders, electricians, costumers,

special effects, transportation, and craft services. This gives maximum control to the project manager (director or producer) at the expense of significant duplication of effort.

*Matrix* organizations seek to have the best of both worlds (and occasionally end up with the worst of both worlds) by combining elements of functional and projectized based on the needs of the individual organization. In weak matrix organizations, project managers have limited cross-departmental authority and primarily coordinate and persuade. Strong matrix organizations give project managers substantial authority to direct and control resources even though they live in functional departments, and balanced matrix organizations operate somewhere in between.

No organizational structure is right for all situations; each contains both advantages and disadvantages. As a project manager, you need to understand your own organizational environment (which may include unofficial as well as official characteristics) in order to operate effectively. It's never the case that every decision and element will be optimized for your specific project needs (nor should it be), so you will always need to adapt your project to its environment.



### **Think About It . . . Organization**

Is your organization primarily functional, projectized, or matrix? Do you have a PMO, and if so, what type is it? What do you see as the advantages and disadvantages as far as your projects are concerned?

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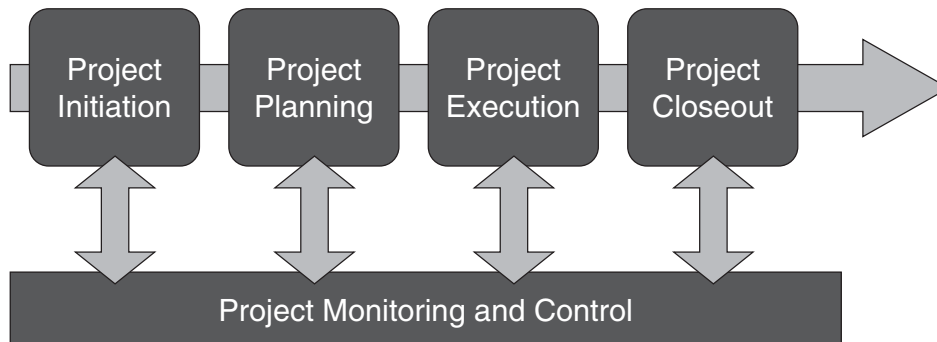
## **THE PROCESS OF PROJECT MANAGEMENT**

Because projects are temporary, with clear beginnings and ends, they follow a natural process, often described in terms of the five component *process groups* shown in Exhibit 1–2. Although these process groups are designed to take you from the beginning of a project to its end, they also involve a fair amount of iteration, especially as project monitoring and control identifies issues that require adjustment as you move forward in the project.

### **Project Initiation**

Before there is a project, there is some sort of need—a gap between where we are and where we want to be. There may be more than one way to bridge

## **E** Exhibit 1-2 The Five Project Management Process Groups



that gap, but eventually someone in authority (customer, project sponsor, executive) decides on the basic direction, and that leads to a project.

A project is not only temporary and unique, but also purposeful. Even if the project is accomplished on time, on budget, and meets requirements, it's hard to call it successful if it doesn't achieve its goal.

The process of *project initiation* involves defining this potential project, determining how much it is likely to cost and how long it is likely to take, and deciding who will lead the project and who will staff it. Though it's ideal if you're involved in that process if you will eventually be the project manager, it's quite common for most of these major decisions to be made by other people before you receive the project assignment.

Whether or not you were part of the process of defining the project, when you get the assignment it's a good idea to perform your own due diligence before committing yourself to the work. In particular, it's desirable to take a good hard look at *assumptions* and *constraints*.

*Assumptions* are things we believe to be true though we don't actually have any proof. It's often necessary to make assumptions. In a research project, you must assume that an answer actually exists—even though you may discover later that it doesn't, or that it isn't at all what you expected or wanted. Often, such factors as the budget and deadline rest on the assumption that there won't be any other important projects or emergencies that will interrupt you. Some assumptions are more realistic or likely than others, but all assumptions need to be out in the open where people can examine them properly.

*Constraints* are things that limit your choices. A deadline is a constraint; so is a budget. Rules, laws, and policies are constraints. The particular skill sets and talents available to you for the project are constraints. Sometimes constraints are negotiable; other times they are not. The nature and extent of constraints has a major effect on your ability to accomplish the project. Understanding them from the beginning is a crucial element in your eventual success.

The project initiation phase ends with a *project charter*. That's the formal, written document that authorizes the project. The project charter takes many different forms in different organizations, and often isn't called by that name. Still, it's vital to have a clear, bright line that separates just talking about a project from a formal directive to get started on it.



### Think About It . . . New Projects

How is a new project established in your organization? Is there a formal project charter? Is there another document that accomplishes the same thing? What works well or needs improvement in how you start a project?

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### Project Planning

*Project planning* includes all the tools and processes necessary to define, organize, and develop the course of action that will accomplish the project goals. It includes plans to manage schedule, cost, scope, risk, procurement, quality, human resources, and stakeholders.

It is often said that failing to plan is planning to fail. Most of the tools and techniques generally thought of as “project management” are actually tools for planning: the work breakdown structure, Gantt charts, network diagrams, and the like. If project management is an “iterative process of progressive elaboration,” as we've said, then project planning is the methodology to accomplish this.

Many people confuse a project schedule with a project plan. Although clearly a schedule is part of a plan, so is the budget, the communications strategy, the risk management approach, and many other elements. Because projects differ, individual project plans may emphasize one of these elements more than another.

Unless the project is fairly simple, planning doesn't end just because you've started work. Often, important parts of the project remain obscure until some preliminary activities are complete. If you're going to test a prototype of whatever you're building, the outcome of the test will reveal what corrective actions are necessary. Until the test is performed, you don't know what those actions might be, and therefore you can't do a whole lot of detailed planning until you reach that point. Often, you begin with a plan that is detailed in its opening phases but becomes increasingly sketchy as it extends into the future, and you fill in the details (iterate and progressively elaborate) as you gain new information.