PROJECT
MANAGEMENT

THE MANAGERIAL PROCESS 7E

ERIK W. LARSON
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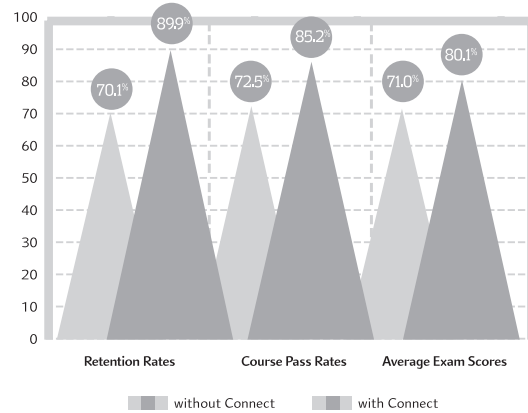
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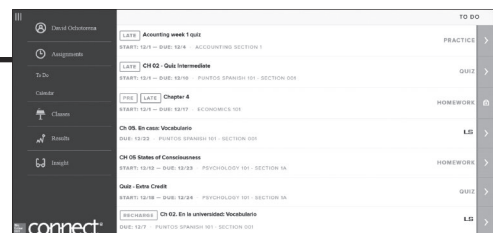
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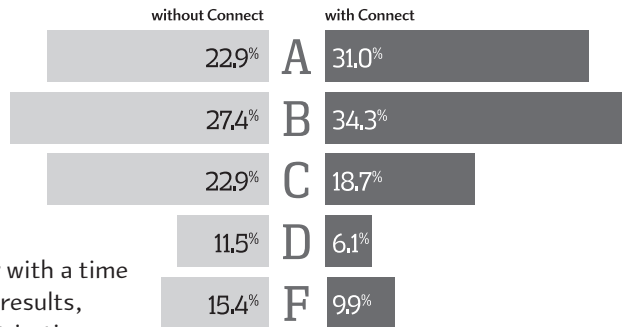
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Project Management:

The Managerial Process

Seventh Edition

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CLIFFORD F. GRAY is professor emeritus of management at the College of Business, Oregon State University. He has personally taught more than 100 executive development seminars and workshops. Cliff has been a member of the Project Management Institute since 1976 and was one of the founders of the Portland, Oregon, chapter. He was a visiting professor at Kasetsart University in Bangkok, Thailand, in 2005. He was the president of Project Management International, Inc. (a training and consulting firm specializing in project management) 1977–2005. He received his B.A. in economics and management from Millikin University, M.B.A. from Indiana University, and doctorate in operations management from the College of Business, University of Oregon. He is certified Scrum Master.

"Man's mind, once stretched by a new idea, never regains its original dimensions."

Oliver Wendell Holmes, Jr.

To my family, who have always encircled me with love and encouragement—my parents (Samuel and Charlotte), my wife (Mary), my sons and their wives (Kevin and Dawn, Robert and Sally) and their children (Ryan, Carly, Connor and Lauren).

C.F.G.

"We must not cease from exploration and the end of all exploring will be to arrive where we began and to know the place for the first time."

T. S. Eliot

To Ann, whose love and support have brought out the best in me. To our girls Mary, Rachel, and Tor-Tor for the joy and pride they give me. And to our grandkids, Mr. B, Livvy, and Xmo, whose future depends upon effective project management. Finally, to my muse, Neil—Walk on!

E.W.L

Preface

Our motivation in writing this text continues to be to provide a realistic, socio-technical view of project management. In the past, textbooks on project management focused almost exclusively on the tools and processes used to manage projects and not the human dimension. This baffled us since people not tools complete projects! While we firmly believe that mastering tools and processes is essential to successful project management, we also believe that the effectiveness of these tools and methods is shaped and determined by the prevailing culture of the organization and interpersonal dynamics of the people involved. Thus, we try to provide a holistic view that focuses on both of these dimensions and how they interact to determine the fate of projects.

The role of projects in organizations is receiving increasing attention. Projects are the major tool for implementing and achieving the strategic goals of the organization. In the face of intense, worldwide competition, many organizations have reorganized around a philosophy of innovation, renewal, and organizational learning to survive. This philosophy suggests an organization that is flexible and project driven. Project management has developed to the point where it is a professional discipline having its own body of knowledge and skills. Today it is nearly impossible to imagine anyone at any level in the organization who would not benefit from some degree of expertise in the process of managing projects.

Audience

This text is written for a wide audience. It covers concepts and skills that are used by managers to propose, plan, secure resources, budget, and lead project teams to successful completions of their projects. The text should prove useful to students and prospective project managers in helping them understand why organizations have developed a formal project management process to gain a competitive advantage. Readers will find the concepts and techniques discussed in enough detail to be immediately useful in new-project situations. Practicing project managers will find the text to be a valuable guide and reference when dealing with typical problems that arise in the course of a project. Managers will also find the text useful in understanding the role of projects in the missions of their organizations. Analysts will find the text useful in helping to explain the data needed for project implementation as well as the operations of inherited or purchased software. Members of the Project Management Institute will find the text is well structured to meet the needs of those wishing to prepare for PMP (Project Management Professional) or CAPM (Certified Associate in Project Management) certification exams. The text has in-depth coverage of the most critical topics found in PMI's *Project Management Body of Knowledge* (PMBOK). People at all levels in the organization assigned to work on projects will find the text useful not only in providing them with a rationale for the use of project management processes but also because of the insights they will gain on how to enhance their contributions to project success.

Our emphasis is not only on how the management process works, but more importantly, on *why* it works. The concepts, principles, and techniques are universally

applicable. That is, the text does not specialize by industry type or project scope. Instead, the text is written for the individual who will be required to manage a variety of projects in a variety of different organizational settings. In the case of some small projects, a few of the steps of the techniques can be omitted, but the conceptual framework applies to all organizations in which projects are important to survival. The approach can be used in pure project organizations such as construction, research organizations, and engineering consultancy firms. At the same time, this approach will benefit organizations that carry out many small projects while the daily effort of delivering products or services continues.

Content

In this and other editions we continue to try to resist the forces that engender scope creep and focus only on essential tools and concepts that are being used in the real world. We have been guided by feedback from practitioners, teachers, and students. Some changes are minor and incremental, designed to clarify and reduce confusion. Other changes are significant. They represent new developments in the field or better ways of teaching project management principles. Below are major changes to the seventh edition.

- Learning objectives have been established for each chapter and the corresponding segment has been marked in the text.
- Chapter 16 Oversight has been eliminated and critical information on project maturity models is now part of Chapter 14.
- Chapter 18 Project Management Career Paths has been eliminated and essential information from this chapter is now in Chapter 1.
- A new set of network exercises have been developed for Chapter 6.
- A new set of crashing exercises have been developed for Chapter 9 which introduce crashing concepts in a developmental way.
- The Chapter 2 Appendix on Request for Proposal is now part of Chapter 12.
- Terms and concepts have been updated to be consistent with the sixth edition of the *Project Management Body of Knowledge* (2015).
- New student exercises and cases have been added to chapters.
- The Snapshot from Practice boxes feature a number of new examples of project management in action as well as new Research Highlights that continue to promote practical application of project management.
- The Instructor's Manual contains a listing of current YouTube videos that correspond to key concepts and Snapshots from Practice.

Overall the text addresses the major questions and challenges the authors have encountered over their 60 combined years of teaching project management and consulting with practicing project managers in domestic and foreign environments. These questions include: What is the strategic role of projects in contemporary organizations? How are projects prioritized? What organizational and managerial styles will improve chances of project success? How do project managers orchestrate the complex network of relationships involving vendors, subcontractors, project team members, senior management, functional managers, and customers that affect project success? What factors contribute to the development of a high-performance project team? What project management system can be set up to gain some measure of control? How do managers prepare for a new international project in a foreign culture?

Project managers must deal with all these concerns to be effective. All of these issues and problems represent linkages to an integrative project management view. The chapter content of the text has been placed within an overall framework that integrates these topics in a holistic manner. Cases and snapshots are included from the experiences of practicing managers. The future for project managers appears to be promising. Careers will be determined by success in managing projects.

Student Learning Aids

Student resources include study outlines, online quizzes, PowerPoint slides, videos, Microsoft Project Video Tutorials and web links. These can be found in Connect.

Acknowledgments

We would like to thank Scott Bailey for building the end-of-chapter exercises for Connect and Tracie Lee for reviewing them; Pinyarat Sirisomboonsuk for revising the PowerPoint slides; Oliver F. Lehmann for providing access to PMBOK study questions; Ronny Richardson for updating the Instructor's Manual; Angelo Serra for updating the Test Bank; and Pinyarat Sirisomboonsuk for providing new Snapshot from Practice questions.

Next, it is important to note that the text includes contributions from numerous students, colleagues, friends, and managers gleaned from professional conversations. We want them to know we sincerely appreciate their counsel and suggestions. Almost every exercise, case, and example in the text is drawn from a real-world project. Special thanks to managers who graciously shared their current project as ideas for exercises, subjects for cases, and examples for the text. Shlomo Cohen, John A. Drexler, Jim Moran, John Sloan, Pat Taylor, and John Wold, whose work is printed, are gratefully acknowledged. Special gratitude is due Robert Breitbarth of Interact Management, who shared invaluable insights on prioritizing projects. University students and managers deserve special accolades for identifying problems with earlier drafts of the text and exercises.

We are indebted to the reviewers of past editions who shared our commitment to elevating the instruction of project management. The reviewers include Paul S. Allen, Rice University; Denis F. Cioffi, George Washington University; Joseph D. DeVoss, DeVry University; Edward J. Glantz, Pennsylvania State University; Michael Godfrey, University of Wisconsin–Oshkosh; Robert Key, University of Phoenix; Dennis Krumwiede, Idaho State University; Nicholas C. Petruzzi, University of Illinois–Urbana/Champaign; William R. Sherrard, San Diego State University; S. Narayan Bodapati, Southern Illinois University at Edwardsville; Warren J. Boe, University of Iowa; Burton Dean, San Jose State University; Kwasi Amoako-Gyampah, University of North Carolina–Greensboro; Owen P. Hall, Pepperdine University; Bruce C. Hartman, University of Arizona; Richard Irving, York University; Robert T. Jones, DePaul University; Richard L. Luebbe, Miami University of Ohio; William Moylan, Lawrence Technological College of Business; Edward Pascal, University of Ottawa; James H. Patterson, Indiana University; Art Rogers, City University; Christy Strbiak, U.S. Air Force Academy; David A. Vaughan, City University; and Ronald W. Witzel, Keller Graduate School of Management. Nabil Bedewi, Georgetown University; Scott Bailey, Troy University; Michael Ensby, Clarkson University; Eldon Larsen, Marshall University; Steve Machon, DeVry University–Tinley Park; William Matthews, William Patterson

Guided Tour

Established Learning Objectives

Learning objectives have been added to this edition to help students target key areas of learning. Learning objectives are listed both at the beginning of each chapter and are called out as marginal elements throughout the narrative in each chapter.

2 Organization Strategy and Project Selection

LEARNING OBJECTIVES

After reading this chapter you should be able to:

2-1 Explain why it is important for project managers to understand their organization's strategy.

2-2 Identify the significant role projects contribute to the strategic direction of the organization.

2-3 Understand the need for a project priority system.

2-4 Apply financial and nonfinancial criteria to assess the value of projects.

2-5 Understand how multi-criteria models can be used to select projects.

2-6 Apply an objective priority system to project selection.

2-7 Understand the need to manage the project portfolio.

OUTLINE

2.1 The Strategic Management Process: An Overview

2.2 The Need for a Project Priority System

2.3 A Portfolio Management System

2.4 Selection Criteria

2.5 Applying a Selection Model

2.6 Managing the Portfolio System

Summary

LO 2-1

Explain why it is important for project managers to understand their organization's strategy.

Why Project Managers Need to Understand Strategy

Project management historically has been preoccupied solely with the planning and execution of projects. Strategy was considered to be under the purview of senior management. This is old-school thinking. New-school thinking recognizes that project management is at the apex of strategy and operations. Aaron Shenhar speaks to this issue when he states, ". . . it is time to expand the traditional role of the project manager from an operational to a more strategic perspective. In the modern evolving organization, project managers will be focused on business aspects, and their role will expand from getting the job done to achieving the business results and winning in the marketplace."[1]

There are two main reasons why project managers need to understand their organization's mission and strategy. The first reason is so they can make appropriate decisions and adjustments. For example, how a project manager would respond to a suggestion to modify the design of a product to enhance performance will vary depending upon whether his company strives to be a product leader through innovation or to achieve operational excellence through low cost solutions. Similarly, how a project manager would respond to delays may vary depending upon strategic concerns. A project manager will authorize overtime if her firm places a premium on getting to the market first.

End-of-Chapter Content

Both static and algorithmic end-of-chapter content, including Review Questions and Exercises, are now assignable in Connect.

SmartBook

The SmartBook has been updated with new highlights and probes for optimal student learning.

Snapshots

The Snapshot from Practice boxes have been updated to include a number of new examples of project management in action. New questions based on the Snapshots are also now assignable in Connect.

SNAPSHOT FROM PRACTICE 3.4 Google-y*

In 2016 Google Inc. topped *Fortune* magazine's list of best companies to work at for the seventh time in the past ten years. When one enters the 24-hour Googleplex located in Mountain View, California, you feel that you are walking through a new-age college campus rather than the corporate office of a billion-dollar business. The collection of interconnected low-rise buildings with colorful, glass-encased offices feature upscale trappings—free gourmet meals three times a day, free use of an outdoor wave pool, indoor gym and large child care facility, private shuttle bus service to and from San Francisco and other residential areas—that are the envy of workers across the Bay area. These perks and others reflect Google's culture of keeping people happy and thinking in unconventional ways.

The importance of corporate culture is no more evident than in the fact that the head of Human Resources,

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teams typically have daily "stand-up" meetings seven minutes after the hour. Why seven minutes after the hour? Because Google cofounder Sergey Brin once estimated that it took seven minutes to walk across the Google campus. Everybody stands to make sure no one gets too comfortable and no time is wasted during the rapid-fire update. As one manager noted, "The whole concept of

New and Updated Cases

Included at the end of each chapter are between one and five cases which demonstrate key ideas from the text and help students understand how Project Management comes into play in the real world. New cases have been added across several chapters in the 7th edition.

Note to Student

You will find the content of this text highly practical, relevant, and current. The concepts discussed are relatively simple and intuitive. As you study each chapter we suggest you try to grasp not only how things work, but why things work. You are encouraged to use the text as a handbook as you move through the three levels of competency:

I know.

I can do.

I can adapt to new situations.

Project management is both people and technical oriented. Project management involves understanding the cause-effect relationships and interactions among the sociotechnical dimensions of projects. Improved competency in these dimensions will greatly enhance your competitive edge as a project manager.

The field of project management is growing in importance and at an exponential rate. It is nearly impossible to imagine a future management career that does not include management of projects. Résumés of managers will soon be primarily a description of the individual's participation in and contributions to projects.

Good luck on your journey through the text and on your future projects.

Chapter-by-Chapter Revisions for the Seventh Edition

Chapter 1: Modern Project Management

- New Snapshot: *Project Management in Action 2016*.
- Information updated.
- New Snapshot: *Ron Parker* replaced Research Highlight: *Works well with others*.
- New case: *The Hokie Lunch Group*.

Chapter 2: Organization Strategy and Project Selection

- New Snapshot: *Project Code Names* replaced *HP's Strategy Revision.*

Chapter 3: Organization: Structure and Culture

- Learning objectives established.
- Snapshot: *Google-y* updated.
- Snapshot: *Skunk Works at Lockheed Martin* updated.

Chapter 4: Defining the Project

- Learning objectives established.
- New case: *Home Improvement Project*.

Chapter 5: Estimating Project Times and Costs

- Learning objectives established.
- New Snapshot: *London 2012 Olympics: Avoiding White Elephant curse*.
- Expanded discussion of Mega Projects including the emergence of *white elephants.*

Chapter 6: Developing a Project Schedule

- Learning objectives established.
- New Exercises 2-15 and Lag Exercises 18-21.
- *Shoreline Stadium* case replaces *Greendale Stadium* case.

Chapter 7: Managing Risk

- Learning objectives established.

Chapter 8 Appendix 1: The Critical-Chain Approach

- Learning objectives established.

Chapter 9: Reducing Project Duration

- Learning objectives established.
- Snapshot: *Smartphone Wars* updated.
- New exercises 1-7.

Chapter 10: Leadership: Being an Effective Project Manager

- Learning objectives established.
- New Research Highlight: *Give and Take*.
- Ethics discussion expanded.

Chapter 11: Managing Project Teams

- Learning objectives established.
- Expanded discussion on project vision.

Chapter 12: Outsourcing: Managing Interorganizational Relations

- Learning objectives established.
- Discussion of RFP process.
- New Snapshot: *U.S. Department of Defense's Value Engineering Awards 2015*.

Chapter 13 Progress and Performance Measurement and Evaluation

- Learning Objectives established.
- Discussion of milestone schedules.
- New Snapshot: *Guidelines for Setting Milestones.*
- Discussion of Management Reserve Index.
- New case: *Shoreline Stadium Status Report*.

Chapter 14: Project Closure

- Major Revision of chapter with more attention to project audit and closing activities.
- New Snapshot: *The Wake.*
- New Snapshot: *2015 PMO of the Year.*
- New Snapshot: *Operation Eagle Claw.*
- Project Management Maturity model introduced.

Chapter 15: International Projects

- Learning Objectives established.

Chapter 16: An Introduction to Agile Project Management

- Learning Objectives established.
- New Snapshot: *Kanban.*

Brief Contents

Contents

Project Management:

The Managerial Process

1 Modern Project Management

LEARNING OBJECTIVES

After reading this chapter you should be able to:

1-1 Understand why project management is crucial in today's world.

1-2 Distinguish a project from routine operations.

1-3 Identify the different stages of project life cycle.

1-4 Understand the importance of projects in implementing organization strategy.

1-5 Understand that managing projects involves balancing the technical and sociocultural dimensions of the project.

OUTLINE
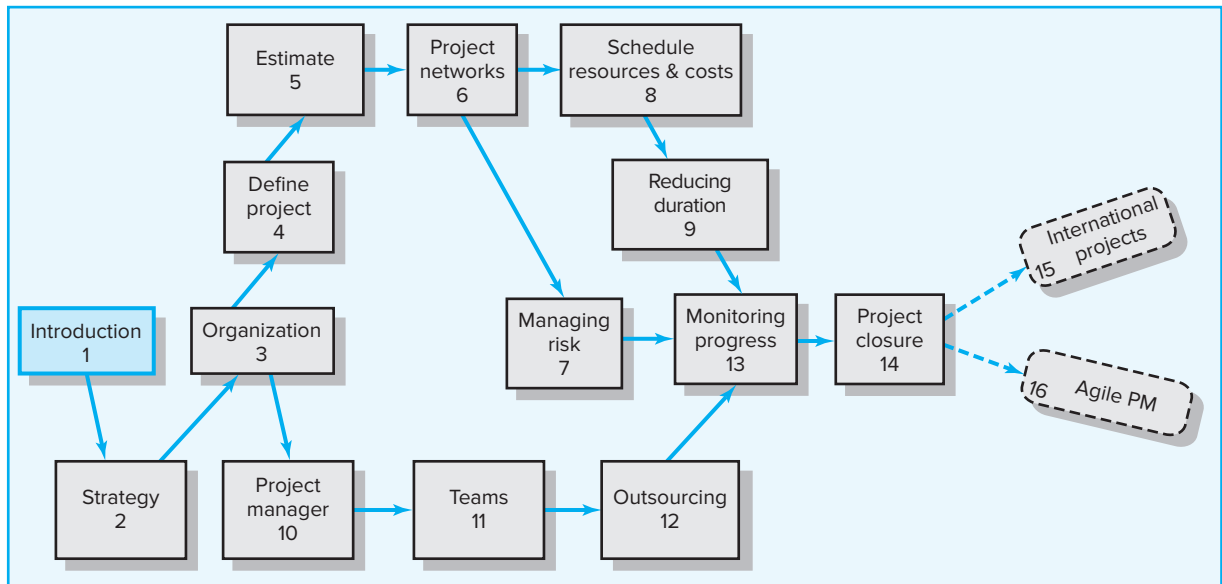
All of mankind's greatest accomplishments—from building the great pyramids to discovering a cure for polio to putting a man on the moon—began as a project.

This is a good time to be reading a book about project management. Business leaders and experts have proclaimed that project management is critical to sustainable economic growth. New jobs and competitive advantage are achieved by constant innovation, developing new products and services, and improving both productivity and quality of work. This is the world of project management. Project management provides people with a powerful set of tools that improves their ability to plan, implement, and manage activities to accomplish specific objectives. But project management is more than just a set of tools; it is a results-oriented management style that places a premium on building collaborative relationships among a diverse cast of characters. Exciting opportunities await people skilled in project management.

The project approach has long been the style of doing business in the construction industry, U.S. Department of Defense contracts, and Hollywood, as well as big consulting firms. Now project management has spread to all avenues of work. Today,

project teams carry out everything from port expansions to hospital restructuring to upgrading information systems. They are creating next-generation fuel-efficient vehicles, developing sustainable sources of energy, and exploring the farthest reaches of outer space. The impact of project management is most profound in the electronics industry, where the new folk heroes are young professionals whose Herculean efforts lead to the constant flow of new hardware and software products.

Project management is not limited to the private sector. Project management is also a vehicle for doing good deeds and solving social problems. Endeavors such as providing emergency aid to areas hit by natural disasters, devising a strategy for reducing crime and drug abuse within a city, or organizing a community effort to renovate a public playground would and do benefit from the application of modern project management skills and techniques.

Perhaps the best indicator of demand for project management can be seen in the rapid expansion of the Project Management Institute (PMI), a professional organization for project managers. PMI membership has grown from 93,000 in 2002 to more than 478,000 currently. See Snapshot from Practice 1.1 for information regarding professional certification in project management.

It's nearly impossible to pick up a newspaper or business periodical and not find something about projects. This is no surprise! Approximately $2.5 trillion (about 25 percent of the U.S. gross national product) is spent on projects each year in the United States alone. Other countries are increasingly spending more on projects. Millions of people around the world consider project management the major task in their profession.

Most of the people who excel at managing projects never have the title of project manager. They include accountants, lawyers, administrators, scientists, contractors, public health officials, teachers, and community advocates whose success depends upon being able to lead and manage project work. For some, the very nature of their work is project driven. Projects may be cases for lawyers, audits for accountants, events for

SNAPSHOT FROM PRACTICE 1.1   The Project Management Institute*

The Project Management Institute (PMI) was founded in 1969 as an international society for project managers. Today PMI has members from more than 180 countries and more than 478,500 members. PMI professionals come from virtually every major industry, including aerospace, automotive, business management, construction, engineering, financial services, information technology, pharmaceuticals, health care, and telecommunications.

PMI provides certification as a **Project Management Professional (PMP)**—someone who has documented sufficient project experience, agreed to follow the PMI code of professional conduct, and demonstrated mastery of the field of project management by passing a comprehensive examination. The number of people earning PMP status has grown dramatically in recent years. In 1996 there were fewer than 3,000 certified project management professionals. By 2016 there were more than 695,000 Professional credential holders.

Just as the CPA exam is a standard for accountants, passing the PMP exam may become the standard for project managers. Some companies are requiring that all their project managers be PMP certified. Moreover, many job postings are restricted to PMPs. Job seekers, in general, are finding that being PMP certified is an advantage in the marketplace.

PMI added a certification as a *Certified Associate in Project Management (CAPM)*. CAPM is designed for project team members and entry-level project managers, as well as qualified undergraduate and graduate students who want a credential to recognize their mastery of the project management body of knowledge. CAPM does not require the extensive project management experience associated with the PMP. For more details on PMP and CAPM, google PMI to find the current website for the Project Management Institute.

*PMI Today, March 2016, p. 4.

artists, and renovations for contractors. For others, projects may be a small, but critical part of their work. For example, a high school teacher who teaches four classes a day is responsible for coaching a group of students to compete in a national debate competition. A store manager who oversees daily operations is charged with developing an employee retention program. A sales account executive is given the additional assignment of team lead to launch daily deals into a new city. A public health official who manages a clinic is also responsible for organizing a Homeless Youth Connect event. For these and others, project management is not a title, but a critical job requirement. It is hard to think of a profession or a career path that would not benefit from being good at managing projects.

Not only is project management critical to most careers, the skill set is transferable across most businesses and professions. At its core, project management fundamentals are universal. The same project management methodology that is used to develop a new product can be adapted to create new services, organize events, refurbish aging operations, and so forth. In a world where it is estimated that each person is likely to experience three to four career changes, managing projects is a talent worthy of development.

The significance of project management can also be seen in the classroom. Twenty years ago major universities offered one or two classes in project management, primarily for engineers. Today, most universities offer multiple sections of project management classes, with the core group of engineers being supplemented by business students majoring in marketing, management information systems (MIS), and finance, as well as students from other disciplines such as oceanography, health sciences, computer sciences, and liberal arts. These students are finding that their exposure to project management is providing them with distinct advantages when it comes time to look for jobs. More and more employers are looking for graduates with project management skills.

SNAPSHOT FROM PRACTICE 1.2

A Dozen Examples of Projects Given to Recent College Graduates

1. Business information: Join a project team charged with installing new data security system.
2. Physical education: Design and develop a new fitness program for senior citizens that combines principles of yoga and aerobics.
3. Marketing: Execute a sales program for new home air purifier.
4. Industrial engineering: Manage a team to create a value chain report for every aspect of key product from design to customer delivery.
5. Chemistry: Develop a quality control program for organization's drug production facilities.
6. Management: Implement a new store layout design.
7. Pre-med neurology student: Join project team linking mind mapping to an imbedded prosthetic that will allow blind people to function near normally.
8. Sports communication: Join Olympic project team that will promote women's sports products for the 2016 Games in Rio de Janeiro, Brazil.
9. Systems engineer: Become a project team member of a project to develop data mining of medical papers and studies related to drug efficacy.
10. Accounting: Work on an audit of a major client.
11. Public health: Research and design a medical marijuana educational program.
12. English: Create a web-based user manual for new electronics product.

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See the nearby Snapshot from Practice 1.2 for examples of projects given to recent college graduates. The logical starting point for developing these skills is understanding the uniqueness of a project and of project managers.

1.1 What Is a Project?

LO 1-2

Distinguish a project from routine operations.

What do the following headlines have in common?

Millions watch Olympic Opening Ceremony
Citywide WiFi System Set to Go Live
Hospitals Respond to New Healthcare Reforms
Apple's New iPhone Hits the Market
City Receives Stimulus Funds to Expand Light Rail System

All of these events represent projects.

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The Project Management Institute provides the following definition of a project:

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

Like most organizational efforts, the major goal of a project is to satisfy a customer's need. Beyond this fundamental similarity, the characteristics of a project help

differentiate it from other endeavors of the organization. The major characteristics of a project are as follows:

1. An established objective.
2. A defined life span with a beginning and an end.
3. Usually, the involvement of several departments and professionals.
4. Typically, doing something that has never been done before.
5. Specific time, cost, and performance requirements.

First, projects have a defined objective—whether it is constructing a 12-story apartment complex by January 1 or releasing version 2.0 of a specific software package as quickly as possible. This singular purpose is often lacking in daily organizational life in which workers perform repetitive operations each day.

Second, because there is a specified objective, projects have a defined endpoint, which is contrary to the ongoing duties and responsibilities of traditional jobs. In many cases, individuals move from one project to the next as opposed to staying in one job. After helping to install a security system, an IT engineer may be assigned to develop a database for a different client.

Third, unlike much organizational work that is segmented according to functional specialty, projects typically require the combined efforts of a variety of specialists. Instead of working in separate offices under separate managers, project participants, whether they be engineers, financial analysts, marketing professionals, or quality control specialists, work closely together under the guidance of a project manager to complete a project.

The fourth characteristic of a project is that it is nonroutine and has some unique elements. This is not an either/or issue but a matter of degree. Obviously, accomplishing something that has never been done before, such as building an electric automobile or landing two mechanical rovers on Mars, requires solving previously unsolved problems and using breakthrough technology. On the other hand, even basic construction projects that involve established sets of routines and procedures require some degree of customization that makes them unique.

Finally, specific time, cost, and performance requirements bind projects. Projects are evaluated according to accomplishment, cost, and time spent. These triple constraints impose a higher degree of accountability than you typically find in most jobs. These three also highlight one of the primary functions of project management, which is balancing the trade-offs among time, cost, and performance while ultimately satisfying the customer.

What a Project Is Not

Projects should not be confused with everyday work. A project is not routine, repetitive work! Ordinary daily work typically requires doing the same or similar work over and over, while a project is done only once; a new product or service exists when the project is completed. Examine the list in Table 1.1 that compares routine, repetitive work and projects. Recognizing the difference is important because too often resources can be used up on daily operations which may not contribute to longer range organization strategies that require innovative new products.

Program versus Project

In practice the terms *project* and *program* cause confusion. They are often used synonymously. *A* **program** *is a group of related projects designed to accomplish a*

TABLE 1.1 **Comparison of Routine Work with Projects**

Routine, Repetitive Work	Projects
Taking class notes	Writing a term paper
Daily entering sales receipts into the accounting ledger	Setting up a sales kiosk for a professional accounting meeting
Responding to a supply-chain request	Developing a supply-chain information system
Practicing scales on the piano	Writing a new piano piece
Routine manufacture of an Apple iPod	Designing an iPod that is approximately 2 × 4 inches, interfaces with PC, and stores 10,000 songs
Attaching tags on a manufactured product	Wire-tag projects for GE and Walmart

common goal over an extended period of time. Each project within a program has a project manager. The major differences lie in scale and time span.

Program management is the process of *managing* a group of ongoing, interdependent, related *projects* in a coordinated way to achieve strategic objectives. For example, a pharmaceutical organization could have a program for curing cancer. The cancer program includes and coordinates *all* cancer projects that continue over an extended time horizon (Gray, 2011). Coordinating all cancer projects under the oversight of a cancer team provides benefits not available from managing them individually. This cancer team also oversees the selection and prioritizing of cancer projects that are included in their special "Cancer" portfolio. Although each project retains its own goals and scope, the project manager and team are also motivated by the higher program goal. Program goals are closely related to broad strategic organization goals.

The Project Life Cycle

LO 1-3

Identify the different stages of project life cycle.

Another way of illustrating the unique nature of project work is in terms of the **project life cycle.** Some project managers find it useful to use the project life cycle as the cornerstone for managing projects. The life cycle recognizes that projects have a limited life span and that there are predictable changes in level of effort and focus over the life of the project. There are a number of different life-cycle models in project management literature. Many are unique to a specific industry or type of project. For example, a new software development project may consist of five phases: definition, design, code, integration/test, and maintenance. A generic cycle is depicted in Figure 1.1.

The project life cycle typically passes sequentially through four stages: defining, planning, executing, and delivering. The starting point begins the moment the project is given the go-ahead. Project effort starts slowly, builds to a peak, and then declines to delivery of the project to the customer.

1. **Defining stage:** Specifications of the project are defined; project objectives are established; teams are formed; major responsibilities are assigned.
2. **Planning stage:** The level of effort increases, and plans are developed to determine what the project will entail, when it will be scheduled, whom it will benefit, what quality level should be maintained, and what the budget will be.
3. **Executing stage:** A major portion of the project work takes place—both physical and mental. The physical product is produced (a bridge, a report, a software program). Time, cost, and specification measures are used for control. Is the project on schedule, on budget, and meeting specifications? What are the forecasts of each of these measures? What revisions/changes are necessary?
4. **Closing stage:** Closing includes three activities: delivering the project product to the customer, redeploying project resources, and post-project review. Delivery of