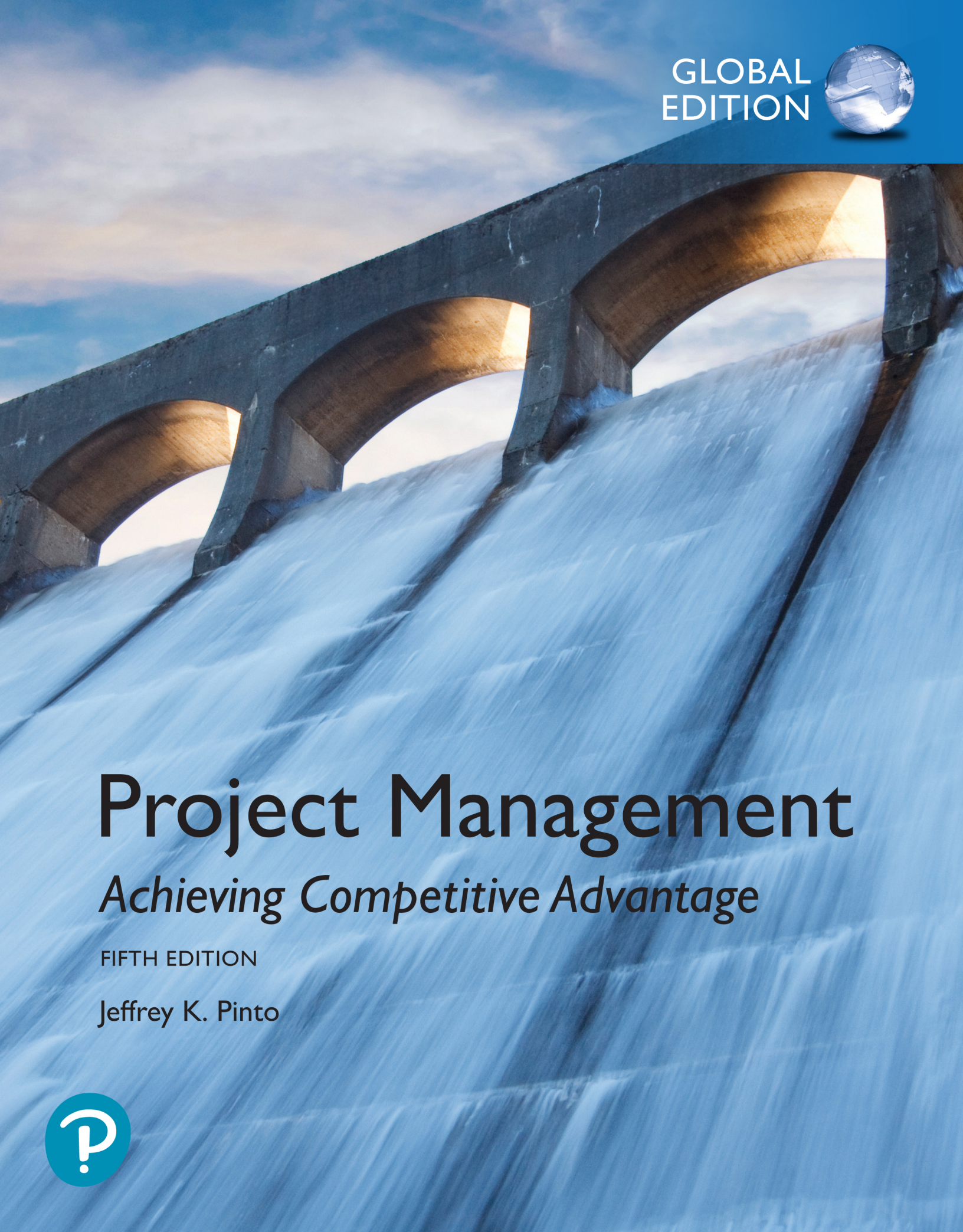

Project Management

Achieving Competitive Advantage

FIFTH EDITION

Jeffrey K. Pinto

Fifth Edition
Global edition

PROJECT MANAGEMENT

ACHIEVING COMPETITIVE ADVANTAGE

Jeffrey K. Pinto
Pennsylvania State University

Harlow, England • London • New York • Boston • San Francisco • Toronto • Sydney • Dubai • Singapore • Hong Kong
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To Mary Beth, my wife and best friend, with the most profound thanks and love for her unwavering support. And, to our children, Emily, AJ, and Joseph—three "projects" that are definitely over budget but that are performing far better than I could have hoped!

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BRIEF CONTENTS

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PREFACE

Project management has become central to operations in industries as diverse as construction and information technology, architecture and hospitality, and engineering and new product development; therefore, this text simultaneously embraces the general principles of project management while addressing specific examples across the wide assortment of its applications. This text approaches each chapter from the perspective of both the material that is general to all disciplines and project types and that which is more specific to alternative forms of projects. One way this is accomplished is through the use of specific, discipline-based examples to illustrate general principles as well as the inclusion of cases and Project Profiles that focus on more specific topics, such as, Chapter 5's treatment of IT "death march" projects (see Box 5.1 below).

BOX 5.1

Project Management Research in Brief

Information Technology (IT) Project "Death Marches": What Is Happening Here?

Every year, billions of dollars are spent on thousands of information technology (IT) projects worldwide. With the huge emphasis on IT products and advances in software and hardware systems, it is no surprise that interest in this field is exploding. Under the circumstances, we would naturally expect that, given the importance of IT projects in both our corporate and everyday lives, we are doing a reasonably good job of implementing these critical projects, right? Unfortunately, the answer is a clear "no." In fact, IT projects have a terrible track record for delivery, as numerous studies have shown. How bad? The average IT project is likely to be 6 to 12 months ***behind*** schedule and 50% to 100% ***over*** budget. Of course, the numbers vary with the size of the project, but the results still suggest that companies should expect their IT projects to lead to wasted effort, enormous delays, burnout, and many lost weekends while laboring for success with the cards stacked the other way.

What we are referring to here are "death march" projects. The death march project is typically one in which the project is set up for failure through the demands or expectations that the company places on it, leaving the intention that the project team will pull off a miracle. The term ***death march*** invokes images of team members wearily trudging along mile after mile, with no possibility of successful conclusion in sight. Death march projects are defined as projects "whose parameters exceed the norm by at least 50%." In practical terms, this can mean:

- The schedule has been compressed to less than half the amount estimated by a rational estimating process (e.g., the schedule suggests it should take one year to complete the project, but top management shrinks the schedule to six months).
- The project team staffing has been reduced to half the number that normally would be assigned to a project of this size and scope (e.g., a project manager needing 10 resources is instead given only 5).
- The budget and other necessary resources are cut in half (e.g., as a result of downsizing and other cost-cutting exercises in the company, everyone is expected to "do more with less", or competitive bidding to win the contract was so intense that when the smoke cleared the company that won the project did so at such a cut-rate price that it cannot possibly hire enough people to make it work).

The result of any or all of these starting conditions is a virtual guarantee that the project will fail. The prevalence of death march projects begs the question: Why are death march projects so common, and why do they continue to occur? According to the research, there are a number of reasons:

1. Politics—the project may be the result of a power struggle between two ambitious senior executives, or it may have been set up to fail as a form of revenge upon some manager. In these cases, the project manager just gets caught in the blast zone.
2. Naïve promises made by marketing executives or inexperienced project managers—inexperience can result in all sorts of promises made, including those that are impossible to fulfill. In order to impress the boss, a new project manager may promise more than he can deliver. Marketing managers who are concerned with sales and how to improve them may think, "what's a little exaggerated promise if it closes the deal?"
3. Naïve optimism of youth—a technical hotshot who is ambitious and feeling particularly cocky one day may make exaggerated promises that quickly result in the project team getting in over its head. Optimism is no substitute for careful planning.

Students in project management classes come from a wide and diverse cross section of university majors and career tracks. Schools of health, public administration, business, architecture and the built environment, engineering, information systems, and hospitality are all adding project management courses to their catalogs in response to the demands from organizations and professional groups that see their value for students' future careers. Why has project management become a discipline of such tremendous interest and application? The simple truth is that we live in a "projectized" world. Everywhere we look, we see people engaged in project management. In fact, project management has become an integral part of practically every firm's business model.

This text takes a holistic, integrated approach to managing projects, exploring both technical and managerial challenges. It not only emphasizes individual project execution, but also provides a strategic perspective, demonstrating the means with which to manage projects at both the program and portfolio levels.

At one time, project management was almost exclusively the property of civil and construction engineering programs where it was taught in a highly quantitative, technical manner. "Master the science of project management," we once argued, "and the 'art' of project management will be equally clear to you." Project management today is a complex "management" challenge requiring not only technical skills but a broad-based set of people skills as well. Project management has become the management of technology, people, culture, stakeholders, and other diverse elements necessary to successfully complete a project. It requires knowledge of leadership, team building, conflict resolution, negotiation, and influence in equal measure with the traditional, technical skill set. Thus, this textbook broadens our focus beyond the traditional project management activities of planning and scheduling, project control, and termination, to a more general, inclusive, and, hence, more valuable perspective of the project management process.

NEW TO THIS EDITION

New Features

- Sustainability in Project Management
- Employability Skills
- Project Management Ethics
- MS Project 2016 Step-by-Step Tutorials
- New Project Managers in Practice Profiles
- Project Portfolio selection
- Expanded discussion of Agile project management
- Updated problems in chapters
- Updated Internet Exercises
- Expanded PMP Certification Exam sample questions
- New project management cases
- All MS Project examples and screen captures updated to MS Project 2016

New and Updated Project Profiles and Cases

Chapter 1: Introduction: Why Project Management?
- Development Projects that are Transforming Africa
- Royal Mail: Moving with the Times
- London's Crossrail: Europe's Largest Construction Project

Chapter 2: The Organizational Context: Strategy, Structure, and Culture
- The Airbus A-380: A Failure of Strategy?
- Electronic Arts and the Power of Strong Culture in Design Teams

Chapter 3: Project Selection and Portfolio Management
- Project Selection Procedures: A Cross-Industry Sampler

Chapter 4: Leadership and the Project Manager
- NASA Taps a Leader with the Right Stuff to Run Their Mars 2020 Project
- Leading by Example for the London Olympics—Sir John Armitt
- British Luxury Automobile Maker Caught in Corruption Charges

Chapter 5: Scope Management
- Berlin's Brandenburg Willy Brandt International Airport
- Nicaragua's Canal and Sustainability Challenges
- Boeing's Virtual Fence
- California's High-Speed Rail Project
- The Expeditionary Fighting Vehicle

Chapter 6: Project Team Building, Conflict, and Negotiation
- Team Building Events – Heli-Skiing and Zombie Apocalypses
- Engineers Without Borders: Project Teams Impacting Lives

Chapter 7: Risk Management
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- The Building That Melted Cars

Chapter 8: Cost Estimation and Budgeting
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- Sochi Olympics—What's the Cost of National Prestige?
- The Hidden Costs of Infrastructure Projects: The Case of Building Dams

Chapter 9: Project Scheduling: Networks, Duration Estimation, and Critical Path
- Preparing for a Major Golf Tournament – It's a Long Road to the First Tee
- Moving the Historic Capen House

Chapter 10: Project Scheduling: Lagging, Crashing, and Activity Networks
- Kiruna, Sweden – A Town on the Move!

Chapter 11: Critical Chain Project Scheduling
- Adopting the Agile Methodology at Ericsson
- Eli Lilly Pharmaceutical's Commitment to Critical Chain Project Scheduling

Chapter 12: Resource Management
- Environmental Concerns and Political Leadership Impact Fossil Fuel Project Cancellations
- "First Come, First Served": Resource Challenges for Sunrise Restoration

Chapter 13: Project Evaluation and Control
- U.S. Army Can't Track Spending on its Spending Tracker Project
- Earned Value Management at Northrop Grumman
- Dear Mr. President—Please cancel our project!: The Honolulu Elevated Rail Project

Chapter 14: Project Closeout and Termination
- Amazon's Golden Touch Fails with a High-Tech Gadget
- Aftermath of a "Feeding Frenzy"—Dubai and Cancelled Construction Projects
- New Jersey Kills Hudson River Tunnel Project
- A Failure Eight Years in the Making

SOLVING TEACHING AND LEARNING CHALLENGES

Projects continue to drive innovation and advances in human development globally. Evidence from businesses, government offices, public and private organizations, and volunteer groups all point to the way in which project-based work has become central to the challenges new generations of college graduates will face. Many students initially have a difficult time understanding why projects form such a central theme in their current academic undertakings and how these project challenges will continue to grow as they move into the workforce. In project management courses in business, engineering, health administration, hospitality, and science programs, the challenge faculty and students often face is to personalize these ideas to the roles their students are preparing to undertake. Moreover, one of the principal challenges of effectively teaching project management is to understand that project management duties are broad and diverse; most particularly, they require computational, software, and organizational/behavioral knowledge. Some of our students are quickly able to understand the computational elements of using mathematical models to select projects, developing schedules and networks, using Microsoft Project and other software packages, and tracking projects, while finding the "people" skills in leading a project team daunting. Alternatively, other students are comfortable with financial and managerial concepts but experience more difficulty in transitioning to statistical, software, or arithmetic challenges. The fascinating nature of project management is that it requires students to develop a mastery of both the "people" and "numbers" sides of the discipline. Short of the CEO's office, in no other position in an organization are the duties as broad and diverse as those found in the project manager role—developing

strategies, financing, planning, budgeting, negotiating, leading, controlling, and motivating—these are all routine responsibilities of project managers.

To illustrate the computational challenges of project management, we provide many chapters, cases, and examples of how to use financial models to select a project portfolio, how to develop project networks and identify the critical path, how to use MS Project to engage its planning and tracking tools, and how to employ earned value and other methods for accurately determining the status of projects. Managerial challenges are addressed through chapters, profiles, and cases that highlight leadership, stakeholder management, team development, conflict and negotiation, ethical challenges, and project sustainability. Project management is a dynamic undertaking. We employ a simple visual device (see Figure 1.12 below) to demonstrate the manner in which technical and managerial challenges intermingle, as the project moves through its development cycle. Referring to this visual can help students understand the project life cycle and project manager duties across its development.

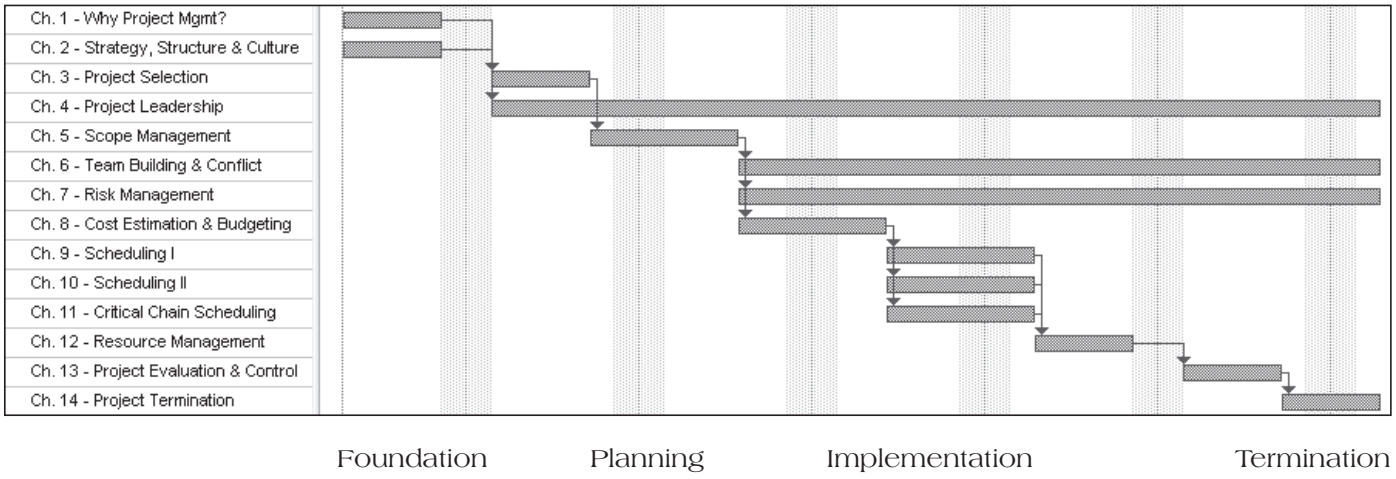


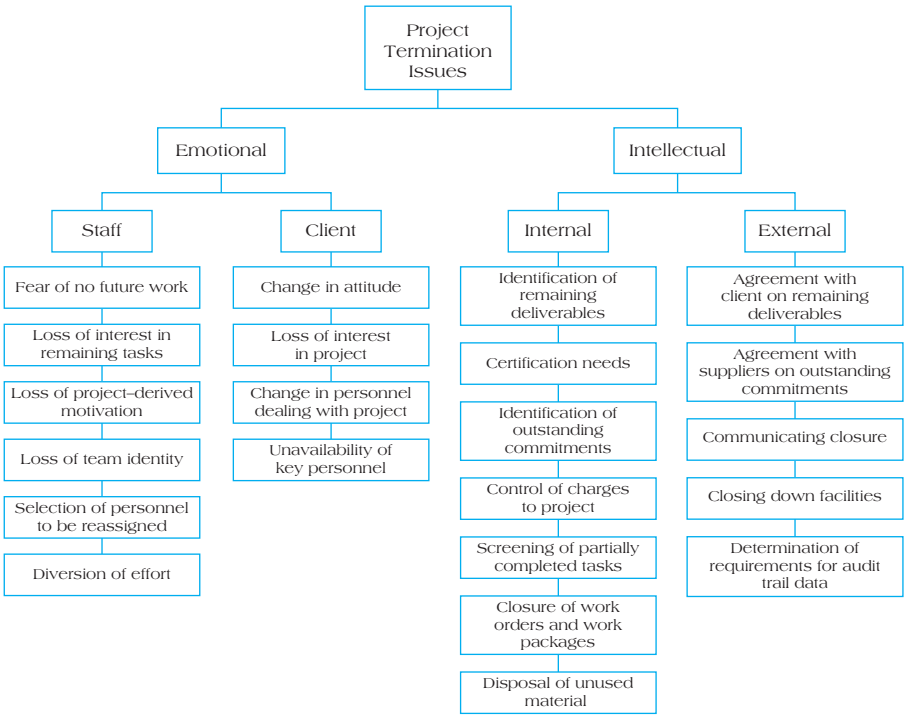
FIGURE 1.12

To support these teaching initiatives, the text employs a wide variety of pedagogical approaches, including tutorials and screen captures of Microsoft Project for scheduling and project status updating, problems, an integrated project plan to show students how to develop and plan their own projects, templates for planning and project charters, and other devices to support student learning and computational skills. Additionally, the text uses cases and profiles of current examples of projects from a wide variety of industries. Just as projects are ubiquitous across a wide variety of industries, the cases and examples in this text cover new product development, construction and infrastructure, hospitality, software and programming, as well as many other project examples. The cases and profiles were deliberately created to demonstrate the breadth of project challenges in order to reinforce for students that regardless of their undergraduate degree or career aspirations, they will be heavily involved in project-based work.

- ***Project Profiles***—Each chapter contains one or more Project Profiles that highlight current examples of project management in action. Some of the profiles reflect on significant achievements; others detail famous (and not-so-famous) examples of project failures. Because they cover diverse ground (IT projects, construction, new product development, and so forth), there should be at least one profile per chapter that is meaningful to the class's focus. There is a deliberate effort made to offer a combination of project success stories and project failures. While successful projects can be

instructive, we often learn far more from examining the variety of reasons why projects fail. As much as possible, these stories of success and failure are intended to match up with the chapters to which they are attached. For example, as we study the uses of projects to implement corporate strategy, it is useful to consider the current status of Airbus's A380, the massively expensive, double-decker aircraft that appears to be ripe for early cancellation because of mediocre sales.

- ***Cases***—At the end of each chapter are some final cases that take specific examples of the material covered in the chapter and apply them in the alternate format of case studies. Some of the cases are fictitious, but the majority of them are based on real situations, even where aliases mask the real names of organizations. These cases include discussion questions that can be used either for homework or to facilitate classroom discussions. There are several "classic" project cases as well, highlighting some famous (and infamous) examples of projects whose experiences have shaped our understanding of the discipline and its best practices.



- ***Integrated Project Exercises***—Many of the chapters include an end-of-chapter feature that is unique to this text: the opportunity to develop a detailed project plan. A very beneficial exercise in project management classes is to require students, either in teams or individually, to learn the mechanics of developing a detailed and comprehensive project plan, including scope, scheduling, risk assessment, budgeting, and cost estimation. The Integrated Project exercises afford students the opportunity to develop such a plan by assigning these activities and illustrating a completed project (ABCups, Inc.) in each chapter. Thus, students are assigned their project planning activities and have a template that helps them complete these exercises.

Lastly, this text supports the employability skills goal that Pearson actively promotes in its publications by linking to important materials and knowledge from the Project Management Institute, the world's largest professional project management association. The text uses terminology for their Project Management Body of Knowledge (PMBoK), employs the PMBoK glossary of terms, and includes an expanded set of sample Project Management Professional (PMP) certification exam questions at the end of most chapters. Faculty can demonstrate that these chapters highlight critical

project management duties but also point to the professionalism opportunities from project management careers.

- ***Integration with the PMBOK***—As a means to demonstrate the coverage of the critical PMBOK elements, readers will find that the chapters in this text identify and cross-list the corresponding knowledge areas from the latest, fifth edition of PMBOK. Further, all terms (including the Glossary) are taken directly from the most recent edition of the PMBOK.

5.19 A hospital expansion is being planned for a community. As part of the scope of this project, it will be necessary to close down the access routes into the emergency room for major remodeling. However, because this is the only hospital for trauma cases within 50 miles, it is not possible to completely shut down the emergency room. The project team will have to find a means to remodel the emergency room while allowing for continuous operation of the unit. This is an example of what?
a. Negotiation points with the owner
b. Constraints
c. Initial assumptions
d. Milestone development

- ***Inclusion of Sample PMP Certification Exam Questions***—The Project Management Professional (PMP) certification represents the highest standard of professional qualification for a practicing project manager and is administered by the Project Management Institute. As of 2017, there were more than 775,000 PMPs worldwide. In order to attain PMP certification, it is necessary for candidates to undergo a comprehensive exam that tests their knowledge of all components of the PMBOK. This text includes an expanded set of sample PMP certification exam questions at the end of most of the chapters, in order to give readers an idea of the types of questions typically asked on the exam and how those topics are treated in this book.

DEVELOPING EMPLOYABILITY SKILLS

Careers in project management are in high demand, and those numbers continue to grow dramatically. Data collected in 2016 by the U.S. Bureau of Labor Statistics and the Anderson Economic Group assessed the popularity of jobs in project-based industries and concluded that there are outstanding opportunities for jobs and career growth in the discipline of project management. Moreover, it is expected that future demand for project managers will continue to grow *faster* than demand for workers in other professions. Further, this demand for trained project managers is currently expected to far outstrip the current supply of qualified individuals capable of performing these roles. This information all points to one critical conclusion: project management careers are in exceptionally high demand and are expected to remain that way for the next decade (at least, through 2027). Eleven countries studied by the Anderson Economic Group, including the United States and Canada, Brazil, Germany, China, India, and Japan, are all projecting millions of project management jobs available in the next decade, spanning a diverse set of industries, including construction, healthcare, new product development, services and hospitality, and Information Technology (IT). Finally, two critical pieces of information highlight this accelerating demand for project management professionals: first, the percentage of those in project-oriented occupations will become a larger proportion of total employment, with anticipated growth from 5.6% in 2006 to 8.3% in 2017. Second, wages in 2017 for project management-oriented professionals reflect far higher average salaries than non-project-oriented professionals, with a premium of 82% over non-project workers. Clearly, the data make a strong case that project management skills are a critical means by which students can enhance their employability.

This text reinforces Pearson's commitment to producing not only innovative educational content but ensuring that the material covered in their products addresses the critical skills that employers are looking for. As part of a recent, large-scale study, involving hundreds of respondents from universities and public and private organizations, Pearson identified a set of "employability skills," those abilities that businesses deem crucial for their new hires. These skills include: 1) communication, 2) critical thinking, 3) collaboration, 4) knowledge application and analysis, 5) business ethics and social responsibility, 6) information technology application and computer skills, and 7) data literacy. We have modeled the text material, exercises, tutorials, and case material to address each of these seven employability skills in order to provide students with the maximum advantage when transitioning from the classroom to the business enterprise. With this textbook, *Project Management: Achieving Competitive Advantage*, students receive the dual benefit of acquiring the latest information and employability skills in a discipline that is in extraordinarily high demand.

INSTRUCTOR TEACHING RESOURCES

At the Instructor Resource Center, *www.pearsonglobaleditions.com*, instructors can easily register to gain access to a variety of instructor resources available with this text in downloadable format. If assistance is needed, our dedicated technical support team is ready to help with the media supplements that accompany this text. Visit *https://support.pearson.com/getsupport* for answers to frequently asked questions and toll-free user support phone numbers.

This program comes with the following teaching resources:

Supplements available to instructors at *www.pearsonglobaleditions.com*	Features of the Supplement
Instructor's Solution Manual authored by Jeffrey Pinto	• Chapter-by-chapter summaries • Teaching outlines • Solutions to all questions and problems in the book
Test Bank authored by Jennifer Morin from University of Central Florida	1400 multiple-choice, true/false, short answer, and graphing questions with these annotations: • Difficulty level (1 for straight recall, 2 for some analysis, 3 for complex analysis) • Section number and name • Learning outcome • Application type • AACSB learning standard (Ethical Understanding and Reasoning; Analytical Thinking; Information Technology; Diverse and Multicultural Work; Reflective Thinking; Application of Knowledge)
Computerized TestGen®	TestGen allows instructors to • Customize, save, and generate classroom tests • Edit, add, or delete questions from the test item files • Analyze test results • Organize a database of tests and student results.
PowerPoint Presentations authored by Jennifer Morin from University of Central Florida	Slides include all the graphs, tables, and equations in the textbook. PowerPoints meet accessibility standards for students with disabilities. Features include, but are not limited to: • Keyboard and screen reader access • Alternative text for images • High color contrast between background and foreground colors

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In acknowledging the contributions of past and present colleagues to the creation of this text, I must first convey my deepest thanks and appreciation for the 30-year association with my original mentor, Dr. Dennis Slevin of the University of Pittsburgh's Katz Graduate School of Business. My collaboration with Denny on numerous projects has been fruitful and extremely gratifying, both professionally and personally. In addition, Dr. David Cleland's friendship and partnership in several ventures has been a great source of satisfaction through the years. A frequent collaborator who has had a massive influence on my thinking and approach to understanding project management is Professor Peter W. G. Morris, lately of University College London. Working with him has been a genuine joy and constant source of inspiration. Additional mentors and colleagues who have strongly influenced my thinking include Rodney Turner, Janice Thomas, David Frame, Nuno Gil, Ralf Müller, Andrew Davies, Jonas Soderlund, Young Kwak, Rolf Lundin, Lynn Crawford, Christophe Bredillet, Graham Winch, Terry Williams, Terry Cooke-Davies, and Karlos Artto. Each of these individuals has had a profound impact on the manner in which I view, study, and write about project management. I am also grateful for the collaboration with Jennifer Morin and Gada Baz, who contributed cases to this edition of the text. I have enjoyed very much working with them and appreciate their commitment to the book.

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FEEDBACK

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If you have questions related to this product, please contact our customer service department online at *https://support.pearson.com/getsupport*.

Finally, it is important to reflect on an additional salient issue as you begin your study of project management; *most of you will be running a project long before you are given wider management responsibilities in your organizations.* Successful project managers are the lifeblood of organizations and bear the imprint of the fast track. I wish you great success!

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Dr. Pinto has taught and consulted widely in North America, South America, and Europe on a variety of topics, including project management, new product development, supply chain management, information systems implementation, organization development, leadership, and conflict resolution.

1

Introduction

Why Project Management?

Chapter Objectives

After completing this chapter, you should be able to:

1.1 Understand why project management is becoming such a powerful and popular practice in business.

1.2 Recognize the basic properties of projects, including their definition.

1.3 Understand why effective project management is such a challenge.

1.4 Understand and explain the project life cycle, its stages, and the activities that typically occur at each stage in the project.

1.5 Understand the concept of project "success," including various definitions of success, as well as the alternative models of success.

1.6 Understand the purpose of project management maturity models and the process of benchmarking in organizations.

1.7 Recognize how mastery of the discipline of project management enhances critical employability skills for university graduates.

PROJECT MANAGEMENT BODY OF KNOWLEDGE CORE CONCEPTS COVERED IN THIS CHAPTER

1. Definition of a Project (PMBoK sec. 1.2)
2. Definition of Project Management (PMBoK sec. 1.3)
3. Relationship to Other Management Disciplines (PMBoK sec. 1.4)
4. Project Phases and the Project Life Cycle (PMBoK sec. 2.1)

The world acquires value only through its extremes and endures only through moderation; extremists make the world great, the moderates give it stability.[1]

PROJECT PROFILE

Development Projects that are Transforming Africa

The African continent is on the verge of massive changes, and projects are helping to raise the standard of living for its inhabitants. The current population of 1.2 billion is expected to double by 2050, growing at some 42 million people per year. Managing the means to accommodate this expansion is the goal of a number of governmental agencies, non-governmental organizations (NGOs), and international bodies. In order to bring prosperity to a continent that has suffered through decades of misrule, colonial exploitation, and regional conflicts, dozens of important infrastructure projects are being undertaken to improve standards of living and accommodate the needs of this rapidly-increasing population. Among the major infrastructure projects that offer great promise are:

1. The North-South Corridor – In 2009, the Common Market of Eastern and Southern Africa began work on a series of road and railways designed to link seven countries and covering more than 6,000 miles. At a cost of over $1 billion,

FIGURE 1.1 **South Africa's Jasper Solar Farm**

Source: Mikeledray/Shutterstock

the North-South Corridor is expected to improve the flow of people and goods across national boundaries, generating commerce and trade.

2. Technology Hubs – A Chinese development firm, Zendai Property, announced in 2013 the investment of $8 billion to build a hub for Chinese firms investing in African infrastructure. This hub, named Modderfontein New City, is being constructed outside of Johannesburg, South Africa. Kenya is getting its own technology hub, a $14.5 billion software center named Konza Technology City, which is situated outside Nairobi, the Kenyan capital. The Kenyan government refers to Konza as the start of the "silicon savannah."
3. Tanzania's Bagamoyo Port is slated to become Africa's largest port, with a capability of handling more than 20 million containers each year. The Chinese construction firm that has invested $11 billion in the project expects to have the port completed and operational by 2045.
4. Giant Dams – The Grand Ethiopian Renaissance Dam (budgeted at $4.8 billion) is intended to provide hydroelectric power to Ethiopia and several neighboring countries. Congo's Grand Inga Dam, with its expected cost of over $100 billion, will become the largest energy-generating dam in the world and is slated for completion in 2025.
5. South Africa's Jasper Solar Farm – Opened in 2015, the solar farm produces enough energy to power 80,000 homes. It is the largest solar power project on the African continent.
6. The "New Suez Canal" – Construction started on the expansion of the existing Suez Canal in 2014, with the goal of adding a new 22-mile shipping lane. The expansion is expected to double Egypt's annual revenue from canal traffic.
7. Expansion of Cement Production – Dangote Cement, headquartered in Lagos, Nigeria, in 2015 signed contracts with a Chinese firm to increase its cement manufacturing capacity across 15 countries to 100 million tons by 2020. This huge increase in cement production will fuel additional infrastructure projects on the African continent for decades to come.

Raising the standard of living for an entire continent with a large expected population increase is a challenging goal. In order to accommodate the needs of these population changes, as well as improve the living standards for the entire continent, it is vital that projects be undertaken that can provide value both commercially and environmentally. Successful project management offers the means to get the best out of "good intentions" by ensuring that these and other funded projects are implemented as efficiently and effectively as possible. When development projects are viewed as the roots for future expansion, it is easy to understand their importance. Future improvements in living standards depend on the current projects being done right, as the success of these projects will spawn the need and support the willingness of firms and governments to invest in subsequent projects.[2]

The Need for Projects

LO 1.1 Understand why project management is becoming such a powerful and popular practice in business.

Projects are one of the principal means by which we change our world. Whether the goal is to split the atom, tunnel under the English Channel, introduce Windows 10, or plan the 2018 Winter Olympic Games in Pyeongchang, South Korea, the means through which to achieve these challenges remains the same: project management. Project management has become one of the most popular tools for organizations, both public and private, to improve internal operations, respond rapidly to external opportunities, achieve technological breakthroughs, streamline new product development, and more robustly manage the challenges arising from the business environment. Consider what Tom Peters, best-selling author and management consultant, has to say about project management and its place in business: "Projects, rather than repetitive tasks, are now the basis for most value-added in business."[3] Project management has become a critical component of successful business operations in worldwide organizations.

One of the key features of modern business is the nature of the opportunities and threats posed by external events. As never before, companies face international competition and the need to rapidly pursue commercial opportunities. They must modify and introduce products constantly, respond to customers as fast as possible, and maintain competitive cost and operating levels. Does performing all these tasks seem impossible? At one time, it was. Conventional wisdom held that a company could compete using a low-cost strategy *or* as a product innovator *or* with a focus on customer service. In short, companies had to pick their competitive niches and concede others their claim to market share. In the past 20 years, however, everything turned upside down. Companies such as General Electric, Apple, Ericsson, Boeing, and Oracle became increasingly effective at realizing all of these goals rather than settling for just one. These companies seemed to be successful in every aspect of the competitive model: They were fast to market *and* efficient, cost-conscious, *and* customer-focused. How were they performing the impossible?

Obviously, there is no one answer to this complex question. There is no doubt, however, that these companies shared at least one characteristic: They had developed and committed themselves to project management as a competitive tool. Old middle managers, reported *Fortune* magazine,

> are dinosaurs, [and] a new class of manager mammal is evolving to fill the niche they once ruled: project managers. Unlike his biological counterpart, the project manager is more agile and adaptable than the beast he's displacing, more likely to live by his wits than throwing his weight around.[4]

Effective project managers will remain an indispensable commodity for successful organizations in the coming years. More and more companies are coming to this conclusion and adopting project management as a way of life. Indeed, companies in such diverse industries as construction, heavy manufacturing, insurance, health care, finance, public utilities, and software are becoming project savvy and expecting their employees to do the same.

What is a Project?

LO 1.2 Recognize the basic properties of projects, including their definition.

Although there are a number of general definitions of the term **project**, we must recognize at the outset that projects are distinct from other organizational processes. As a rule, a **process** refers to ongoing, day-to-day activities in which an organization engages while producing goods or services. Processes use existing systems, properties, and capabilities in a continuous, fairly repetitive manner.[5] Projects, on the other hand, take place outside the normal, process-oriented world of the firm. Certainly, in some organizations, such as construction, day-to-day processes center on the creation

and development of projects. Nevertheless, for the majority of organizations project management activities remain unique and separate from the manner in which more routine, process-driven work is performed. Project work is continuously evolving, establishes its own work rules, and is the antithesis of repetition in the workplace. As a result, it represents an exciting alternative to "business as usual" for many companies. The challenges are great, but so are the rewards of success.

First, we need a clear understanding of the properties that make projects and project management so unique. Consider the following definitions of projects:

> A project is a unique venture with a beginning and end, conducted by people to meet established goals within parameters of cost, schedule, and quality.[6]
>
> Projects [are] goal-oriented, involve the coordinated undertaking of interrelated activities, are of finite duration, and are all, to a degree, unique.[7]
>
> A project can be considered to be any series of activities and tasks that:
>
> - Have a specific objective to be completed within certain specifications
> - Have defined start and end dates
> - Have funding limits, if applicable
> - Consume human and nonhuman resources, such as money, people, equipment
> - Are multifunctional (i.e., cut across several functional lines)[8]
>
> [A project is] [o]rganized work toward a predefined goal or objective that requires resources and effort, a unique (and therefore risky) venture having a budget and schedule.[9]

Probably the simplest definition is found in the Project Management Body of Knowledge (PMBoK) guide of the Project Management Institute (PMI). The PMI is the world's largest professional project management association, with more than 475,000 members worldwide as of 2017. In the PMBoK guide, a project is defined as "a temporary endeavor undertaken to create a unique product, service, or result" (p. 553).[10]

Let us examine the various elements of projects, as identified by this set of definitions.

- ***Projects are complex, one-time processes.*** A project arises for a specific purpose or to meet a stated goal. It is complex because it typically requires the coordinated input of numerous members of the organization. Project members may be from different departments, other organizational units, or one functional area. For example, a project to develop a new software application for a retail company may require only the output of members of the information systems group working with the marketing staff. On the other hand, some projects, such as new product introductions, work best with representation from many functions, including marketing, engineering, production, and design. Because a project is intended to fulfill a stated goal, it is temporary. It exists only until its goal has been met, and at that point it is dissolved.
- ***Projects are limited by budget, schedule, and resources.*** Project work requires that members work with limited financial and human resources for a specified time period. They do not run indefinitely. Once the assignment is completed, the project team disbands. Until that point, all its activities are constrained by limitations on budget and personnel availability. Projects are "resource-constrained" activities.
- ***Projects are developed to resolve a clear goal or set of goals.*** There is no such thing as a project team with an ongoing, nonspecific purpose. The project's goals, or **deliverables**, define the nature of both the project and its team. Projects are designed to yield a tangible result, either as a new product or service. Whether the goal is to build a bridge, implement a new accounts receivable system, or win a presidential election, the goal must be specific and the project organized to achieve a stated aim.
- ***Projects are customer-focused.*** Whether the project is responding to the needs of an internal organizational unit (e.g., accounting) or intended to exploit a market opportunity external to the organization, the underlying purpose of any project is to satisfy customer needs. In the past, this goal was sometimes overlooked. Projects were considered successful if they attained technical, budgetary, and scheduling goals. More and more, however, companies have realized that the primary goal of a project is customer satisfaction. If that goal is neglected, a firm runs the risk of "doing the wrong things well"—pursuing projects that may be done efficiently but that ignore customer needs or fail commercially.

GENERAL PROJECT CHARACTERISTICS

Using these definitional elements, we can create a sense of the key attributes that all projects share. These characteristics are not only useful for better understanding projects, but also offer the basis for seeing how project-based work differs from other activities most organizations undertake. Projects represent a special type of undertaking by any organization. Not surprisingly, the challenges in performing them right are sometimes daunting. Nevertheless, given the manner in which business continues to evolve on a worldwide scale, becoming "project savvy" is no longer a luxury: it is rapidly becoming a necessity.

Projects are characterized by the following properties:[11]

1. ***Projects are ad hoc endeavors with a clear life cycle.*** Projects are nontraditional; they are activities that are initiated as needed, operate for a specified time period over a fairly well understood development cycle, and are then disbanded. They are temporary operations.
2. ***Projects are building blocks in the design and execution of organizational strategies.*** As we will see in later chapters, projects allow organizations to implement companywide strategies. They are the principal means by which companies operationalize corporate-level objectives. In effect, projects are the vehicles for realizing company goals. For example, Intel's strategy for market penetration with ever newer, smaller, and faster computer chips is realized through its commitment to a steady stream of research and development projects that allows the company to continually explore the technological boundaries of electrical and computer engineering.
3. ***Projects are responsible for the newest and most improved products, services, and organizational processes.*** Projects are tools for innovation. Because they complement (and often transform) traditional process-oriented activities, many companies rely on projects as vehicles for going beyond conventional activities. Projects are the stepping-stones by which we move forward.
4. ***Projects provide a philosophy and strategy for the management of change.*** "Change" is an abstract concept until we establish the means by which we can make real alterations in the things we do and produce. Projects allow organizations to go beyond simple statements of intent and to achieve actual innovation. For example, whether it is Chevrolet's Volt electric car or Samsung's newest smartphone upgrade, successful organizations routinely ask for customers' input and feedback to better understand their likes and dislikes. As the vehicle of change, the manner in which a company develops its projects has much to say about its ability to innovate and its commitment to change.
5. ***Project management entails crossing functional and organizational boundaries.*** Projects epitomize internal organizational collaboration by bringing together people from various functions across the company. A project aimed at new product development may require the combined work of engineering, finance, marketing, design, and so forth. Likewise, in the global business environment many companies have crossed organizational boundaries by forming long-term partnerships with other firms in order to maximize opportunities while emphasizing efficiency and keeping a lid on costs. Projects are among the most common means of promoting collaboration, both across functions and across organizations.
6. ***The traditional management functions of planning, organizing, motivation, directing, and control apply to project management.*** Project managers must be technically well versed, proficient at administrative functions, willing and able to assume leadership roles, and above all, goal-oriented: The project manager is the person most responsible for keeping track of the big picture. The nature of project management responsibilities should never be underestimated, because these responsibilities are both diverse and critical to project success.
7. ***The principal outcomes of a project are the satisfaction of customer requirements within the constraints of technical, cost, and schedule objectives.*** Projects are defined by their limitations. They have finite budgets, definite schedules, and carefully stated specifications for completion. For example, a term paper assignment in a college class might include details regarding form, length, number of primary and secondary sources to cite, and so forth. Likewise, in the Disney's Expedition Everest case example at the end of this chapter the executive leading the change process established clear guidelines regarding performance expectations. All these constraints both limit and narrowly define the focus of the project and the options available to the project team. It is the very task of managing successful project development within such specific constraints that makes the field so challenging.

8. ***Projects are terminated upon successful completion of performance objectives*** or earlier in their life cycle, if results no longer promise an operational or strategic advantage. As we have seen, projects differ from conventional processes in that they are defined by limited life cycles. They are initiated, completed, and dissolved. As important alternatives to conventional organizational activities, they are sometimes called "temporary organizations."[12]

Projects, then, differ from better-known organizational activities, which often involve repetitive processes. The traditional model of most firms views organizational activities as consistently performing a discrete set of activities. For example, a retail-clothing establishment buys, stocks, and sells clothes in a continuous cycle. A steel plant orders raw materials, makes steel, and ships finished products, again in a recurring cycle. The nature of these operations focuses our attention on a process orientation; that is, the need to perform work as efficiently as possible in an ongoing manner. When its processes are well understood, the organization always seeks better, more efficient ways of doing the same essential tasks. Projects, because they are discrete activities, violate the idea of repetition. They are temporary activities that operate outside formal channels. They may bring together a disparate collection of team members with different kinds of functional expertise. Projects function under conditions of uncertainty, and usually have the effect of shaking up normal corporate activities. Because of their unique characteristics, they do not conform to common standards of operations; they do things differently and often reveal new and better ways of doing things. Table 1.1 offers some other distinctions between project-based work and the more traditional, process-based activities. Note a recurring theme: projects operate in radical ways that consistently violate the standard, process-based view of organizations.

Consider Apple's use of projects to push the development of a constantly-changing range of product and service offerings. When it was first introduced in 2003, the iPod was Apple's portable MP3 player that could be integrated with Apple's popular iTunes site to record and play music downloads. From its introduction in 2003 to 2015, when Apple stopped reporting sales of the product, consumers had bought more than 400 million iPods, generating $65 billion in revenue for the firm. Customers have also purchased more than 45 billion songs through Apple's iTunes online store. In fact, Apple's iTunes division became the largest U.S. market for music sales; by 2015 it was accounting for 29% of all music sold in the United States and 64% of the digital music market. More recently, as steadily declining sales raised concern that the music downloads market has become saturated and less profitable, Apple introduced its Apple Music site to attract fans of music streaming, competing directly with Spotify and Pandora, among other music streaming services. By 2017 Apple Music had enrolled over 20 million subscribers, making it the second-largest streaming service in the world. Each of these steps demonstrates Apple's commitment to using new project ventures as a means of avoiding a business as usual mentality, as it seeks to remain on the leading edge of the industry.[13]

TABLE 1.1 Differences Between Process and Project Management[14]

Process	Project
Repeat process or product	New process or product
Several objectives	One objective
Ongoing	One shot—limited life
People are homogenous	More heterogeneous
Well-established systems in place to integrate efforts	Systems must be created to integrate efforts
Greater certainty of performance, cost, schedule	Greater uncertainty of performance, cost, schedule
Part of line organization	Outside of line organization
Bastions of established practice	Violates established practice
Supports status quo	Upsets status quo

Source: R. J. Graham. (1992). "A Survival Guide for the Accidental Project Manager," *Proceedings of the Annual Project Management Institute Symposium.* Drexel Hill, PA: Project Management Institute, pp. 355–61.

A similar set of events is currently unfolding, centered on Apple's successive upgrades of its iPad tablet. Among the numerous features offered by the iPad is the ability to download books, including college textbooks, directly from publishers, effectively eliminating the traditional middlemen—bookstores—from the process. So radical are the implications of the iPad and competing tablets like Microsoft's Surface Pro and Samsung's Galaxy to capture a share of this market that large bookstores have been forced to adapt their business models to the new electronic reality of book purchases by offering their own readers; for example, Kindle for Amazon. Some experts are suggesting that within a decade tablets and other electronic readers will make traditional books obsolete, capturing the majority of the publishing market. These are just some examples of the way that project-driven technological change, such as that at Apple, is reshaping the competitive landscape.

Given the enthusiasm with which **project management** is being embraced by so many organizations, we should note that the same factors that make project management a unique undertaking are also among the main reasons why successful project management is so difficult. The track record of project management is by no means one of uninterrupted success, in part because many companies encounter deep-rooted resistance to the kinds of changes needed to accommodate a project philosophy. Indeed, recent research into the success rates for projects offers some grim conclusions:

- A study of more than 300 large companies conducted by the consulting firm KPMG found that software and/or hardware development projects fail at the rate of 65%. Of companies studied, 65% reported projects that went grossly over budget, fell behind schedule, did not perform as expected, or all of the above. Half of the managers responding indicated that these findings were considered "normal."[15]
- A study by the META Group found that "more than half of all (information technology) IT projects become runaways—overshooting their budgets and timetables while failing to deliver fully on their goals." According to the Gallup Business Review, the U.S. economy loses somewhere between $50 and $150 billion every year because of failed IT projects.[16]
- Joe Harley, the Chief Information Officer at the Department for Work and Pensions for the UK government, stated that "only 30%" of technology-based projects and programs are a success—at a time when taxes are funding an annual budget of £14 billion (over $22 billion) on public sector IT, equivalent to building 7,000 new primary schools or 75 hospitals a year.[17]
- The United States National Nuclear Security Administration has racked up $16 billion in cost overruns on 10 major projects that are a combined 38 years behind schedule, the Government Accountability Office reports. For example, at Los Alamos National Laboratory a seven-year, $213 million upgrade to the security system that protects the lab's most sensitive nuclear bomb-making facilities did not work. A party familiar with the organization cites a "pervasive culture of tolerating the intolerable and accepting the unacceptable."[18]
- One out of six IT projects has an average cost overrun of 200% and a schedule overrun of 70%. Around 45% of companies admit that they are unclear about the business objectives of their IT projects. The Chaos Summary 2015 survey of 50,000 projects worldwide by The Standish Group reported similar findings: The majority of all projects were rated either as "challenged" due to late delivery, being over budget, or delivering less than required features, or "failed" when they were canceled prior to completion or the product developed was never used. Researchers have concluded that the average success rate of business-critical application development projects is 29%. Their statistics have remained remarkably steady since 1994.[19]
- The Special Inspector General for Afghanistan Reconstruction (SIGAR) reported that the U.S. spent more than $110 billion on postwar reconstruction projects, with some estimates suggesting that over one-third of the costs of these projects was lost due to waste, fraud, and poor planning or project execution. In a recent interview, John Sopko, the Special Investigator General, noted that because of project waste along with contracting and performance errors, "We've built an Afghanistan they can't afford." As one example, he cites the $400 million purchase of aircraft for an Afghanistan Air Force; aircraft the government couldn't use that were ultimately scrapped for a near total loss.[20]

These findings underscore an important point: although project management is becoming popular, it is not easy to assimilate into the conventional processes of most firms. For every firm discovering the benefits of projects, many more underestimate the problems involved in becoming project savvy.

These studies also point to a core truth about project management: we should not overestimate the benefits to be gained from project management while underestimating the commitment required to make a project work. There are no magic bullets or quick fixes in the discipline. Like any other valuable activity, project management requires preparation, knowledge, training, and commitment to basic principles. Organizations wanting to make use of project-based work must recognize, as Table 1.1 demonstrates, that its very strength often causes it to operate in direct contradiction to standard, process-oriented business practices.

PROJECT PROFILE

Royal Mail: Moving with the Times

Royal Mail, a postal service company whose experience spans over 500 years, has previously faced privatization on a number of occasions. After many governmental reviews and the amended EU Postal Services Directive in 2008, the company was finally floated on the London Stock Exchange in 2013, opening it up to competition. Subsequently, the company started to face a number of problems, including industrial relations issues and a decline in the use of postal mail due to increasing use of online communications tools.

Having to compete with the likes of Amazon and other package delivery services, Royal Mail was forced to look toward creating productivity efficiencies, developing better use of technology, and enhancing customer service while maintaining its day-to-day operations.

Because of the issues they faced, a Project Management Office was implemented in 2016 with the responsibility of creating change throughout the organization. The Association of Project Management guidelines were used to embed project management principles in the company, instigating over 100 projects that were centrally supported, focusing on

- development of a resource tool tailored to specific project management needs of the business.
- working within a specified budget for investment.
- following defined governance processes.
- considering complex stakeholder needs.[21]

As a result, the company modernized its services, and by 2018, a combination of these moves and the settlement of its industrial disputes saw the company's stock price rise by 51%, restoring it to the FTSE100.[22] Royal Mail is a prime example of a company that has reaped the benefits of an effective project management system and continues to look for growth in developing global reach and e-commerce capabilities.

FIGURE 1.2 **Royal Mail has successfully modernized its operations and improved the customer experience in recent years.**

Source: Chrispictures/Shutterstock

Why are Projects Important?

LO 1.3 Understand why effective project management is such a challenge.

There are a number of reasons why projects and project management can be crucial in helping an organization achieve its strategic goals. David Cleland, a noted project management researcher, suggests that many of these reasons arise from the very pressures that organizations find themselves facing.[23]

1. ***Shortened product life cycles.*** The days when a company could offer a new product and depend on having years of competitive domination are gone. Increasingly, the life cycle of new products is measured in terms of months or even weeks, rather than years. One has only to look at new products in electronics or computer hardware and software to observe this trend. Interestingly, we are seeing similar signs in traditional service-sector firms, which also have recognized the need for agility in offering and upgrading new services at an increasingly rapid pace.
2. ***Narrow product launch windows.*** Another time-related issue concerns the nature of opportunity. Organizations are aware of the dangers of missing the optimum point at which to launch a new product and must take a proactive view toward the timing of product introductions. For example, while reaping the profits from the successful sale of Product A, smart firms are already plotting the best point at which to launch Product B, either as a product upgrade or a new offering. Because of fierce competition, these optimal launch opportunities are measured in terms of months. Miss your launch window, even by a matter of weeks, and you run the risk of rolling out an also-ran.
3. ***Increasingly complex and technical products.*** It has been well-documented that the average automobile today has more computing power than the Apollo 11 space capsule that allowed astronauts to walk on the moon. This illustrates a clear point: the world today is complex. Products are complicated, technically sophisticated, and difficult to produce efficiently. The public's appetite for the next big thing continues unabated and substantially unsatisfied. We want the new models of our consumer goods to be better, bigger (or smaller), faster, and more complex than the old ones. Firms constantly upgrade product and service lines to feed this demand. This causes multiple problems in design and production as we continually seek to push the technical limits. Furthermore, in anticipating future demand many firms embark on expensive programs of research and development while attempting to discern consumer tastes. The effect can be to erroneously create expensive and technically sophisticated projects that we assume the customer will want. For example, Rauma Corporation of Finland developed a state-of-the-art loader for the logging industry. Rauma's engineers loaded the product with the latest computerized gadgetry and technologies that gave the machine a space-age feel. Unfortunately, the chief customer for the product worked in remote regions of Indonesia, with logistics problems that made servicing and repairing the loaders impractical. Machines that broke down had to be airlifted more than 1,000 miles to service centers. Since the inception of this project, sales of the logging machinery have been disappointing. The project was an expensive failure for Rauma and serves to illustrate an important point: unless companies find a way to maintain control of the process, an engineering for engineering's sake mentality can quickly run out of control.[24]
4. ***Global markets.*** The early twenty-first century has seen the emergence of enormous new markets for almost every type of product and service. Former closed or socialist societies, as well as rapidly developing economies such as Brazil, China, Vietnam, and India, have added huge numbers of consumers and competitors to the global business arena. The increased globalization of the economy, coupled with enhanced methods for quickly interacting with customers and suppliers, has created a new set of challenges for business. These challenges also encompass unique opportunities for those firms that can quickly adjust to this new reality. In the global setting, project management techniques provide companies with the ability to link multiple business partners and respond quickly to market demand and supplier needs, while remaining agile enough to anticipate and respond to rapid shifts in consumer tastes. Using project management, successful organizations of the future will recognize and learn to rapidly exploit the prospects offered by a global business environment.

5. ***An economic period marked by low inflation.*** One of the key indicators of economic health is the fact that inflation has been kept under control. In most of the developed Western economies, low inflation has helped to trigger a long period of economic expansion while also helping provide the impetus for emerging economies, such as those in India and China, to expand rapidly. Unfortunately, low inflation also limits the ability of businesses to maintain profitability by passing along cost increases. Companies cannot continue to increase profit margins through simply raising prices for their products or services. Successful firms in the future will be those that enhance profits by streamlining internal processes—those that save money by doing it better than the competition. As a tool designed to realize goals like internal efficiency, project management is a means by which to bolster profits.

These are just some of the more obvious challenges facing business today. The key point is that the forces giving rise to these challenges are not likely to abate in the near future. In order to meet these challenges, large, successful companies such as General Electric, 3M, Apple, Samsung, Bechtel, and Microsoft have made project management a key aspect of their operating philosophies.

PROJECT PROFILE

London's Crossrail: Europe's Largest Construction Project

The thought of adding another commuter rail system to the already heavily-developed London metropolitan area may seem unnecessary to those who are unfamiliar with the congestion, lost time, and travel hassles associated with using public or private means to move around Britain's capital city. For residents and people living in the outskirts of London, however, the dream of a modern rail system that connects central London with its increasingly spread-out suburbs is a vision that goes back originally to 1948 post-war London.

The goal of the project is to build a 70-mile (100 km) rail line, including over 40 stations (10 brand new), at locations across suburban and urban London, from Reading in the west to Shenfield in the east. While the majority of the outlying stations will be above ground, a number of the stations will involve refurbishment or expansion of underground facilities in the city center. The construction is further complicated by the need to find a reasonable route through the middle of the city, avoiding current underground rail lines and stations.

Although Crossrail has long been on the public's wish list, planning for it has been a long, arduous process. Developing realistic cost estimates, managing the politics of opening new stations in some districts while ignoring similar requests in other locales, finding money in the budget to support such a massive project—these have all been difficult challenges that the Crossrail organization worked to meet. After nearly 40 years of development planning, and influenced by economic ups and downs, Crossrail finally broke ground in 2009.

Crossrail has given engineers an opportunity to develop new and innovative methods for project planning and monitoring of progress. For example, the entire network was first designed in a 3-D virtual environment; once the railway is up and running, a version of this 3-D model will help managers monitor, from a tablet, countless electrical components and systems across the network. "We've built two railways—one real, one virtual reality," says Rhys Williams, the head of mechanical, electrical, and public health for Crossrail. One of their goals is to show how transport networks can become safer, more efficient, and cheaper to maintain by using smart design coupled with the latest technology. Everything about Crossrail—the escalators and elevators, lighting, ventilation, communication, the railcars themselves—is being engineered to reduce energy use, improve safety, and streamline operations.

A critical component of the Crossrail project has been to embed the vision of sustainability through every component of the development process. Sustainability, for London's Crossrail, comes in four dimensions: 1) environmental, 2) economic, 3) social, and 4) archaeological. As part of the sustainability vision for Crossrail, the project is committed to:

- Minimizing the environmental impact of its construction through controlling efficient energy consumption, protecting the environment, and factoring in climate change possibilities over the planned 120-year life cycle of the railway.
- Creating a diverse supply chain of project suppliers that benefits both Crossrail and the supply chain organizations, while ensuring that materials used on the project are sustainably sourced.
- Creating a social legacy from the project, including health and safety commitments, developing a trained workforce, and promoting art programs that encourage neighborhoods and art schools to decorate the stations, and so forth.
- Respecting the long and significant history of the London area and employing archaeology to minimize disruptions or the ruining of significant buried sites. As an example, since the development of Crossrail in 2009 over 100 archaeologists have found more than 10,000 items from 40 sites, spanning 55 million years of London's history and pre-history. Although careful excavation of these sites slows progress on tunneling, it represents a commitment to London's past, just as the project is intended to improve the city's future.

FIGURE 1.3 **A Crossrail station being built in central London**

Source: Julius Lando/Alamy Stock Photo

The Crossrail construction involves an incredibly busy and diverse set of operations. Eight giant tunnel boring machines have just finished a five-year operation to create the underground sections of the rail line. In the meantime, other firms have developed and are actively testing rail cars, electronic components, and computer-linked systems for directing and monitoring rail traffic (as well as monitoring the operating behavior of the railcars themselves), all in preparation for when their parts of the project are due for development. Coordinating hundreds of suppliers, junior contractors, and public oversight groups has been an enormously complicated process. It has also required compromises and a willingness to adjust project plans to economic and political realities. For example, in 2010 the Government's Comprehensive Spending Review pushed to save on projected costs by revising the tunneling plan. In working to save over £1 billion from the budget, Crossrail services through the central section of the city are now projected to start in 2018 rather than 2017, followed by a phased introduction of services across the rest of the route. Although delaying the opening by a year, the decision allowed the Crossrail consortium (and the British government) to revise the projected project budget to £14.8 billion from £15.9 billion.

The title "Europe's Largest Construction Project" is one that carries enormous promise but also large risks. Getting all the elements right—making sure that the technology is top-notch, ensuring the myriad stakeholders' support, and pushing for sustainable operations—while keeping an eye on the project's budget and schedule to completion is tremendously complicated. Equally fascinating have been the steps undertaken to preserve ancient sites and important archaeological finds throughout the digging process. Once completed, however, Crossrail will be a superlative example of modern infrastructure projects aimed at improving the lifestyle of millions of city-dwellers.[25]

Project management also serves as an excellent training ground for future senior executives in most organizations. One unique aspect of projects is how they blend technical and behavioral challenges. The technical side of project management requires managers to become skilled in project selection, budgeting and resource management, planning and scheduling, and tracking projects. Each of these skills will be discussed in subsequent chapters. At the same time, however, project managers face the equally strong challenge of managing the behavioral, or people, side of projects. Projects, being temporary endeavors, require project managers to bring together individuals from across the organization, quickly mold them into an effective team, manage conflict, provide leadership, and engage in negotiation and appropriate political behavior, all in the name of project success. Again, we will address these behavioral challenges in this text. One thing we know is that project managers who emphasize one challenge and ignore the other, whether they choose to focus on the technical or behavioral side of project management, are not nearly as successful as those who seek to become experts in both. Why is project management such a useful training ground for senior

executives? Because it provides the first true test of an individual's ability to master both the technical and human challenges that characterize effective leaders in business. Project managers, and their projects, create the kind of value that companies need to survive and prosper.

Project Life Cycles

LO 1.4 Understand and explain the project life cycle, its stages, and the activities that typically occur at each stage in the project.

Imagine receiving a term paper assignment in a college class. Our first step would be to develop a sense of the assignment itself—what the professor is looking for, how long the paper should be, the number of references required, stylistic expectations, and so forth. Once we have familiarized ourselves with the assignment, our next step would be to develop a plan for how we intend to proceed with the project in order to complete it by the due date. We make a rough guess about how much time will be needed for the research, writing the first draft, proofreading the paper, and completing the final draft, and we use this information to create some tentative milestones for the various components of the assignment. Next, we begin to execute our plan, doing the library or online research, creating an outline, writing a draft, and so forth. Our goal is to complete the assignment on time, doing the work to our best possible ability. Finally, after turning in the paper, we file or discard our reference materials, return any books to the library, breathe a sigh of relief, and wait for the grade.

This example represents a simplified but useful illustration of a project's life cycle. In this case, the project consisted of completing the term paper to the standards expected of the instructor in the time allowed. A **project life cycle** refers to the stages in a project's development. Life cycles are important because they demonstrate the logic that governs a project. They also help us develop our plans for carrying out the project. They help us decide, for example, when we should devote resources to the project, how we should evaluate its progress, and so forth. Consider the simplified model of the project life cycle shown in Figure 1.4, which divides the life cycle into four distinct phases: conceptualization, planning, execution, and termination.

- *Conceptualization* refers to the development of the initial goal and technical specifications for a project. The scope of the work is determined, necessary resources (people, money, physical plant) identified, and important organizational contributors or **stakeholders** signed on.
- *Planning* is the stage in which all detailed specifications, schematics, schedules, and other plans are developed. The individual pieces of the project, often called *work packages,* are broken down, individual assignments made, and the process for completion clearly delineated. For example, in planning our approach to complete the term paper we determine all the necessary steps (research, drafts, editing, etc.) in the process.
- During *execution*, the actual "work" of the project is performed, the system developed, or the product created and fabricated. It is during the execution phase that the bulk of project team

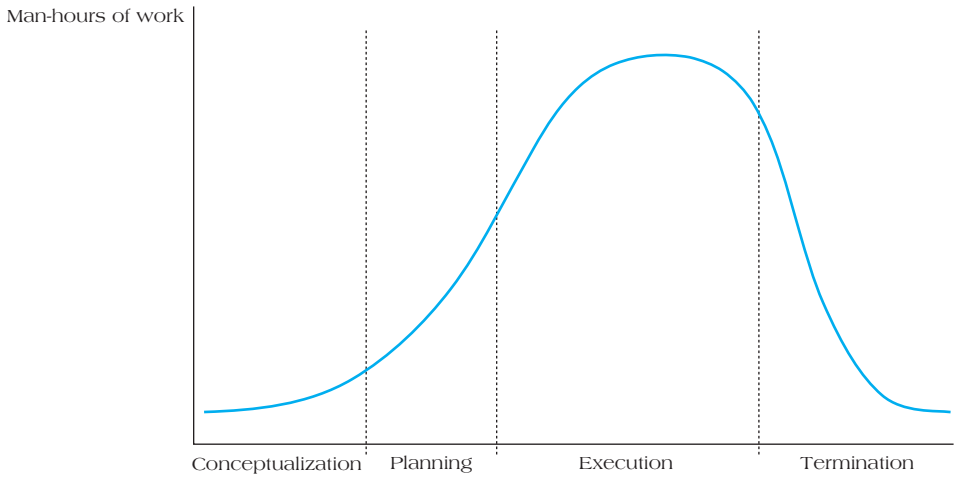

FIGURE 1.4 **Project Life Cycle Stages**

labor is performed. As Figure 1.4 shows, project costs (in man hours) ramp up rapidly during this stage.

- *Termination* occurs when the completed project is transferred to the customer, its resources reassigned, and the project formally closed out. As specific subactivities are completed, the project shrinks in scope and costs decline rapidly.

These stages are the waypoints at which the project team can evaluate both the project's performance and its overall status. Remember, however, that the life cycle is relevant only after the project has actually begun. The life cycle is signaled by the actual kickoff of project development, the development of plans and schedules, the performance of necessary work, and the completion of the project and reassignment of personnel. When we evaluate projects in terms of this life cycle model, we are given some clues regarding their subsequent resource requirements; that is, we begin to ask whether we have sufficient personnel, materials, and equipment to support the project. For example, when beginning to work on our term paper project we may discover that it is necessary to purchase a PC or hire someone to help with researching the topic. Thus, as we plan the project's life cycle we acquire important information regarding the resources that we will need. The life cycle model, then, serves the twofold function of project timing (schedule) and project requirements (resources), allowing team members to better focus on what and when resources are needed.

The project life cycle is also a useful means of visualizing the activities required and challenges to be faced during the life of a project. Figure 1.5 indicates some of these characteristics as they evolve during the course of completing a project.[26] As you can see, five components of a project may change over the course of its life cycle:

- ***Client interest:*** The level of enthusiasm or concern expressed by the project's intended customer. **Clients** can be either internal or external to the organization.
- ***Project stake:*** The amount of corporate investment in the project. The longer the life of the project, the greater the investment.
- ***Resources:*** The commitment of financial, human, and technical resources over the life of the project.
- ***Creativity:*** The degree of innovation required by the project, especially during certain development phases.
- ***Uncertainty:*** The degree of risk associated with the project. Riskiness here reflects the number of unknowns, including technical challenges that the project is likely to face. Uncertainty is highest at the beginning because many challenges have yet to be identified, let alone addressed.

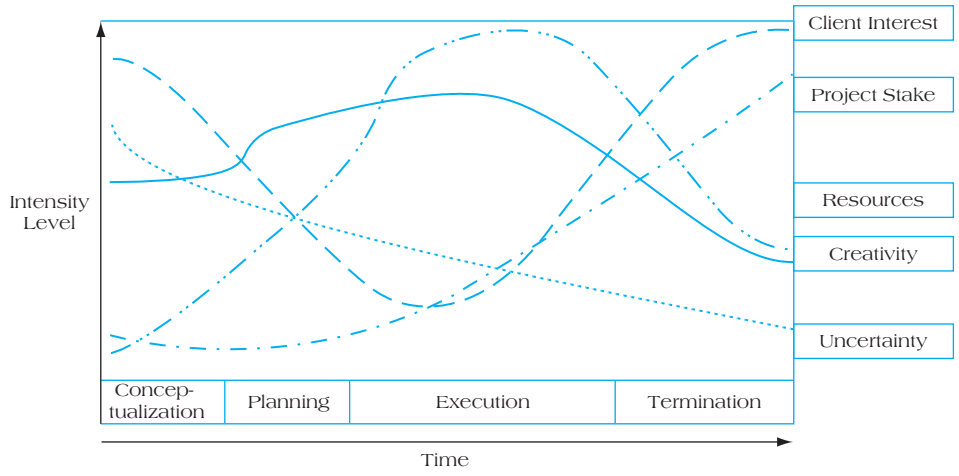

FIGURE 1.5 Project Life Cycles and Their Effects

Source: Victor Sohmen. (2002, July). "Project Termination: Why the Delay?" Paper presented at PMI Research Conference, Seattle, WA. Project Management Institute, Sohmen, Victor. "Project termination: Why the delay?" PMI Research Conference. Proceedings, p. 467–475. Paper presented at PMI Research Conference. Project Management Institute, Inc. (2002). Copyright and all rights reserved. Material from this publication has been reproduced with the permission of PMI.

Each of these factors has its own dynamic. Client interest, for example, follows a U-shaped curve, reflecting initial enthusiasm, lower levels of interest during development phases, and renewed interest as the project nears completion. Project stake increases dramatically as the project moves forward because an increasing commitment of resources is needed to support ongoing activities. Creativity, often viewed as innovative thought or applying a unique perspective, is high at the beginning of a project as the team and the project's client begin developing a shared vision of the project. As the project moves forward and uncertainty remains high, creativity also continues to be an important feature. In fact, it is not until the project is well into its execution phase, with defined goals, that creativity becomes less important. To return to our example of the term paper project, in many cases the "creativity" needed to visualize a unique or valuable approach to developing the project is needed early, as we identify our goals and plan the process of achieving them. Once identified, the execution phase, or writing the term paper, places less emphasis on creativity per se and more on the concrete steps needed to complete the project assignment.

The information simplified in Figure 1.5 is useful for developing a sense of the competing issues and challenges that a project team is likely to face over the life cycle of a project. Over time, while certain characteristics (creativity, resources, and uncertainty) begin to decrease, other elements (client interest and project stake) gain in importance. Balancing the requirements of these elements across the project life cycle is just one of the many demands placed on a project team.

BOX 1.1

Project Managers in Practice

Theresa Hinkler, R. Conrader Company

Theresa Hinkler is a Sales Manager for a small 40 + employees manufacturer of valves in Erie, PA. Her route to that position was long, with many twists and turns along the way.

Her need to be self-sufficient right out of high school, combined with a desire to obtain an education, led her through many jobs including stints as a bartender, assembler, aerobics instructor, and fitness trainer. She returned to Erie in her late 20's, taking a job in sales at Conrader Valves, and subsequently completed her BA in Business at Penn State.

In order to sell Conrader's products, Theresa felt she should know as much about them as possible, including how they were manufactured, the machining involved, and their assembly, testing, packaging, and shipping. Acquiring this understanding of process flow and supply chain management assisted her career greatly because it gave her a wealth of knowledge that helped hone her expertise about the company's products, industry, and customers. When Conrader's Production Manager position became available, top management found that she knew more than anyone about the manufacturing of the valves, which led to her move into this role. She remained involved in sales and customer interaction while simultaneously running the machine shop and assembly areas.

As Theresa transitioned to the production role, a large surge in new product sales and certification requirements challenged her to maintain high manufacturing volume along with efficiently bringing new products to market. Although at first not realizing it, she had begun developing and using a wide range of project management skills. Need-based methods, very much akin to formal project management, enabled her to manage in an increasingly efficient manner.

After three years, Theresa moved to Conrader's Sales Manager position. She had already developed a rapport with customers through interactions because of production planning. She defined the goals and needs of the customer, matching them with timelines. This understanding of company capabilities enabled her to seamlessly take customers' new product requirements through engineering, prototyping/testing, pilot runs, and final production. Once again, Theresa was utilizing project management skills that were unnamed and loosely defined.

In 2016, Theresa decided to further her education to enhance her skill sets on the job and to become more organized and project-oriented by enrolling in the Master's degree program for Project Management (MPM) at Penn State University. The educational experience not only reinforced many of the activities she was already performing, but also gave her and Conrader a solid basis to improve processes and tailor project needs to the company's organizational strategy. Project management methodologies Theresa learned helped her match project opportunities with the company's strategy for maximum benefits. Prior to her formal education in project management, projects were taken on ad hoc and without a formal system. As Theresa notes, "Many projects were thrown into the queue without proper prioritization. Being able to assess project opportunities from the perspective of the firm's overall strategy has allowed us to make better new product introduction choices and has also improved customer responsiveness. That's an advantage of a project management mindset."

There are many types of projects with which Theresa is involved, including new product development projects, certification projects, global outreach projects, new market projects, and product extension projects. The tools and components she has learned through Penn State's MPM program enabled her to tie essential elements of project management into Conrader's everyday processes in a more formal fashion. The additional structured elements have helped the company at large by making the process more transparent. As Theresa observed, "Sales involves so much more than generating revenue for the company. Every new product brought to fruition

FIGURE 1.6 **Theresa Hinkler – R. Conrader Company**

Source: Theresa Hinkler

and every product sold to new and existing companies involves a project management approach. There is critical planning, budgeting, and scheduling involved in sales. The compressor market is a 'dog eat dog' global business, so competitiveness is crucial. Incorporating project management processes into the business has improved the company's competitive advantage and focused overall business efforts on success."

Determinants of Project Success

LO 1.5 Understand the concept of project "success," including various definitions of success, as well as the alternative models of success.

Definitions of successful projects can be surprisingly elusive.[27] How do we know when a project is successful? When it is profitable? If it comes in on budget? On time? When the developed product works or sells? When we achieve our long-term payback goals? Generally speaking, any definition of **project success** *must* take into consideration the elements that define the very nature of a project: that is, time (schedule adherence), budget, functionality/quality, and customer satisfaction. At one time, managers normally applied three criteria of project success:

- ***Time.*** Projects are constrained by a specified period of **time** during which they must be completed. They are not supposed to continue indefinitely. Thus, the first constraint that governs project management involves this basic requirement: The project should come in on or before its established schedule.

- ***Budget.*** A second key constraint for all projects is a limited **budget**. Projects must meet budgeted allowances in order to use resources as efficiently as possible. Companies do not write blank checks and hope for the best. Thus, the second limit on a project raises the question: was the project completed within budget guidelines?
- ***Performance.*** All projects are developed in order to adhere to some initially determined technical specifications. We know before we begin what the project is supposed to do or how the final product is supposed to operate. Measuring **performance**, then, means determining whether the finished product operates according to specifications. The project's clients naturally expect that the project being developed on their behalf will work as expected. Applying this third criterion is often referred to as conducting a quality check.

  This so-called **triple constraint** was once the standard by which project performance was routinely assessed. Today, a fourth criterion has been added to these three (see Figure 1.7):
- ***Client acceptance.*** The principle of **client acceptance** argues that projects are developed with customers or clients in mind, and their purpose is to satisfy customers' needs. If client acceptance is a key variable, then we must also ask whether the completed project is acceptable to the customer for whom it was intended. Companies that strictly evaluate project success according to the original "triple constraint" may fail to apply the most important test of all: the client's satisfaction with the completed project.

We can also think of the criteria for project success in terms of internal versus external conditions. When project management was practiced primarily by construction and other heavy industries, its chief value was in maintaining internal organizational control over expenditures of money and time. The traditional triple-constraint model made perfect sense. It focused internally on efficiency and productivity measures. It provided a quantifiable measure of personnel evaluation, and it allowed accountants to control expenses.

More recently, however, the traditional triple-constraint model has come under increasing criticism as a measure of project success. The final product, for example, could be a failure, but if it has been delivered in time and on budget and satisfies its original specifications (however flawed), the project itself could still be declared a success. Adding the external criterion of client acceptance corrects such obvious shortcomings in the assessment process. First, it refocuses corporate attention outside the organization, toward the customer, who will probably be dissatisfied with a failed or flawed final product. Likewise, it recognizes that the final arbiter of project success is not the firm's accountants, but rather the marketplace. A project is successful only to the extent that it benefits the client who commissioned it. Finally, the criterion of client acceptance requires project managers and teams to create an atmosphere of openness and communication throughout the development of the project.

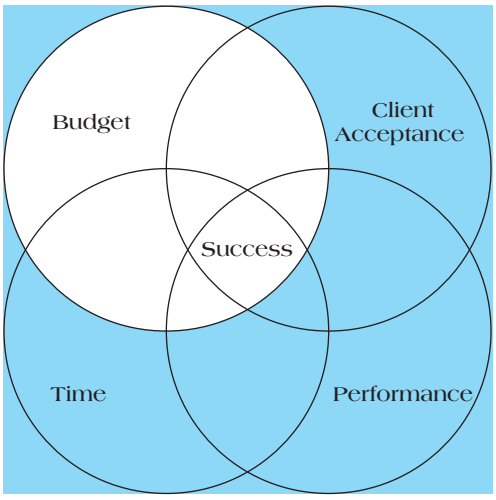

FIGURE 1.7 **The New Quadruple Constraint**

Consider one example. In his book, *What Customers Really Want*, author Scott McKain relates how a coach bus company that transports music stars was originally planning to spend a great deal on a project to improve the interior of its vehicles, because they believed that with these upgrades customers would be willing to pay more to lease or purchase their buses. However, prior to starting a full-blown overhaul of their fleet, the company's executives decided to ask past customers what they thought about this plan. Surprisingly, the company found that while its customers did want nice interiors, the single most important factor in selecting a coach company was the bus driver, who ideally would be a "nice guy," someone who could get the music stars to their destination safely, and who would also serve as a good ambassador for the band with fans. Based on this information, the company dropped its original project and instead initiated a driver education program to teach its drivers how to communicate more effectively with customers and how to retain and grow customer goodwill. The company also started compensating drivers according to how well they served the customer and how well they cultivated long-term relationships with them. Once the company did this, it moved from fourth in the marketplace to first, and grew from 28 to 56 coaches.[28]

An additional approach to project assessment argues that another factor must always be taken into consideration: the promise that the delivered product can generate future opportunities, whether commercial or technical, for the organization.[29] In other words, it is not enough to assess a project according to its immediate success. We must also evaluate it in terms of its commercial success as well as its potential for generating new business and new opportunities. Figure 1.8 illustrates this scheme, which proposes four relevant dimensions of success:

- ***Project efficiency:*** Meeting budget and schedule expectations.
- ***Impact on customer:*** Meeting technical specifications, addressing customer needs, and creating a project that satisfies the client's needs.
- ***Business success:*** Determining whether the project achieved significant commercial success.
- ***Preparing for the future:*** Determining whether the project opened new markets or new product lines or helped to develop new technology.

This approach challenges the conventional triple-constraint principle for assessing project success. Corporations expect projects not only to be run efficiently, at the least, but also to be developed to meet customer needs, achieve commercial success, and serve as conduits to new business opportunities. Even in the case of a purely internal project (e.g., updating the software for a firm's order-entry system), project teams need to focus both on customer needs and an assessment of potential commercial or technical opportunities arising from their efforts.

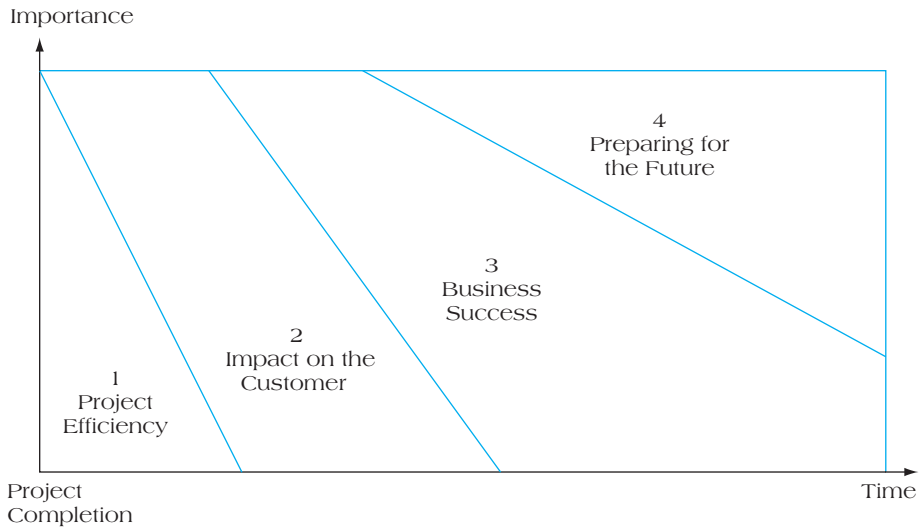

FIGURE 1.8 Four Dimensions of Project Success Importance

Source: A. J. Shenhar, O. Levy, and D. Dvir. (1997). "Mapping the Dimensions of Project Success," *Project Management Journal,* 28(2): 12. Copyright and all rights reserved. Material from this publication has been reproduced with the permission of PMI.

BOX 1.2

Project Management Research in Brief

Assessing Information Technology (IT) Project Success

As noted earlier in this chapter, IT projects have a notoriously checkered history when it comes to successful implementation. Part of the problem has been an inability to define the characteristics of a successful IT project in concrete terms. The criteria for IT project success are often quite vague, and without clear guidelines for project success it is hardly any wonder that so many of these projects do not live up to predevelopment expectations. In 1992 and again in 2003, two researchers, W. DeLone and E. McLean, analyzed several previous studies of IT projects to identify the key indicators of success. Their findings, synthesized from previous research, suggest that, at the very least, IT projects should be evaluated according to six criteria:

- ***System quality.*** The project team supplying the system must be able to assure the client that the implemented system will perform as intended. All systems should satisfy certain criteria: They should, for example, be easy to use, and they should supply quality information.
- ***Information quality.*** The information generated by the implemented IT must be the information required by users and be of sufficient quality that it is actionable. In other words, generated information should not require additional efforts to sift or sort the data. System users can perceive quality in the information they generate.
- ***Use.*** Once installed, the IT system must be used. Obviously, the reason for any IT system is its usefulness as a problem-solving, decision-aiding, and networking mechanism. The criterion of use assesses the actual utility of a system by determining the degree to which, once implemented, it is used by the customer.
- ***User satisfaction.*** Once the IT system is complete, the project team must determine user satisfaction. One of the thorniest issues in assessing IT project success has to do with making an accurate determination of user satisfaction with the system. Yet, because the user is the client and is ultimately the arbiter of whether or not the project was effective, it is vital that we attain some measure of the client's satisfaction with the system and its output.
- ***Individual impact.*** All systems should be easy to use and should supply quality information. But beyond satisfying these needs, is there a specific criterion for determining the usefulness of a system to the client who commissioned it? Is decision making faster or more accurate? Is information more retrievable, more affordable, or more easily assimilated? In short, does the system benefit users in the ways that are most important to those users?
- ***Organizational impact.*** Finally, the supplier of the system must be able to determine whether it has a positive impact throughout the client organization. Is there, for example, a collective or synergistic effect on the client corporation? Is there a sense of good feeling, or are there financial or operational metrics that demonstrate the effectiveness or quality of the system?

DeLone and McLean's work provides an important framework for establishing a sense of IT project success. Companies that are designing and implementing IT systems must pay early attention to each of these criteria and take necessary steps to ensure that the systems that they deliver satisfy them.[30]

A final model, offered recently, also argues against the triple-constraint model as a measure of project success. According to Atkinson,[31] all groups that are affected by a project (stakeholders) should have a hand in assessing its success. The context and type of a project may also be relevant in specifying the criteria that will most clearly define its success or failure. Table 1.2 shows the Atkinson model, which views the traditional "iron triangle" of cost, quality, and time as merely one set of components in a comprehensive set of measures. Of course, the means by which a project is

TABLE 1.2 Understanding Success Criteria

Iron Triangle	Information System	Benefits (Organization)	Benefits (Stakeholders)
Cost	Maintainability	Improved efficiency	Satisfied users
Quality	Reliability	Improved effectiveness	Social and environmental impact
Time	Validity	Increased profits	Personal development
	Information quality	Strategic goals	Professional learning, contractors' profits
	Use	Organization learning	Capital suppliers, content
		Reduced waste	Project team, economic impact to surrounding community

to be measured should be decided before the project is undertaken. A corporate axiom, "What gets measured, gets managed," suggests that when teams understand the standards to which a project is being held, they will place more appropriate emphasis on the various aspects of project performance. Consider, for example, an information system setting. If the criteria of success are improved operating efficiency and satisfied users, and if quality is clearly identified as a key benefit of the finished product, the team will focus its efforts more strongly on these particular aspects of the project.

Developing Project Management Maturity

LO 1.6 Understand the purpose of project management maturity models and the process of benchmarking in organizations.

With the tremendous increase in project management practices among global organizations, a recent phenomenon has been the rise of project maturity models for project management organizations. **Project management maturity models** are used to allow organizations to benchmark the best practices of successful project management firms. Project management maturity models recognize that different organizations are currently at different levels of sophistication in their best practices for managing projects. For example, it would be reasonable to expect organizations such as Boeing (aircraft and defense systems) or Fluor (industrial construction) to be much more advanced in how they manage projects, given their lengthy histories of project initiatives, than companies that have only recently developed an emphasis on project-based work.

The purpose of **benchmarking** is to systematically manage the process improvements of project delivery by a single organization over a period of time.[32] Because there are many diverse dimensions of project management practice, it is common for a new organization just introducing project management to its operations to ask, "Where do we start?" That is, "Which of the multiple project management processes should we investigate, model, and apply to our organization?" Maturity models provide the necessary framework to: first, analyze and critically evaluate current practices as they pertain to managing projects; second, compare those practices against those of chief competitors or some general industry standard; and, third, define a systematic route for improving these practices.

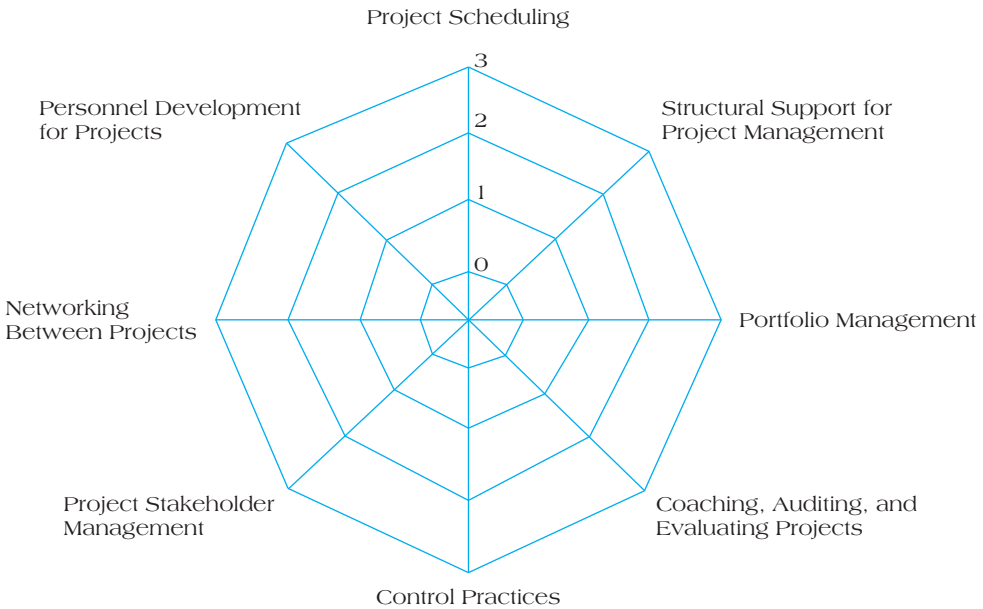

FIGURE 1.9 Spider Web Diagram for Measuring Project Maturity

Source: R. Gareis. (2001). "Competencies in the Project-Oriented Organization," in D. Slevin, D. Cleland, and J. Pinto, *The Frontiers of Project Management Research.* Newtown Square, PA: Project Management Institute, pp. 213–24, figure on p. 216. Copyright and all rights reserved. Material from this publication has been reproduced with the permission of PMI.

If we accept the fact that the development of better project management practices is an evolutionary process, involving not a sudden leap to top performance but rather a systematic commitment to continuous improvement, maturity models offer the template for defining and then achieving such progressive improvement.[33] As a result, most effective project maturity models chart a set of standards that are currently accepted as state-of-the-art as well as a process for achieving significant movement toward these benchmarks. Figure 1.9 illustrates one approach to defining current project management practices a firm is using.[34] It employs a "spider web" methodology in which a set of significant project management practices have first been identified for organizations within a specific industry. In this example, a firm may identify eight components of project management practice that are key for success, based on an analysis of the firm's own needs as well as through benchmarking against competing firms in the industry. Note that each of the rings in the diagram represents a critical evaluation of the manner in which the organization matches up with industry standards. Suppose we assigned the following meanings to the different ratings:

Ring Level	Meaning
0	Not defined or poor
1	Defined but substandard
2	Standardized
3	Industry leader or cutting edge

Following this example, we may decide that in terms of project team personnel development or project control systems our practices are poor relative to other competitors, and rate those skills as 0. On the other hand, perhaps our scheduling processes are top-notch, enabling us to rate them as a 3. Figure 1.10 shows an example of the same spider web diagram with our relative skill levels assigned across the eight key elements of project management which we have defined. This exercise helps us to form the basis for where we currently are in terms of project management sophistication, a key stage in any maturity model in which we seek to move to a higher level.

Once we have established a sense of our present project management abilities, as well as our shortcomings, the next step in the maturity model process is to begin charting a step-by-step, incremental path to our desired goal. Table 1.3 highlights some of the more common project maturity

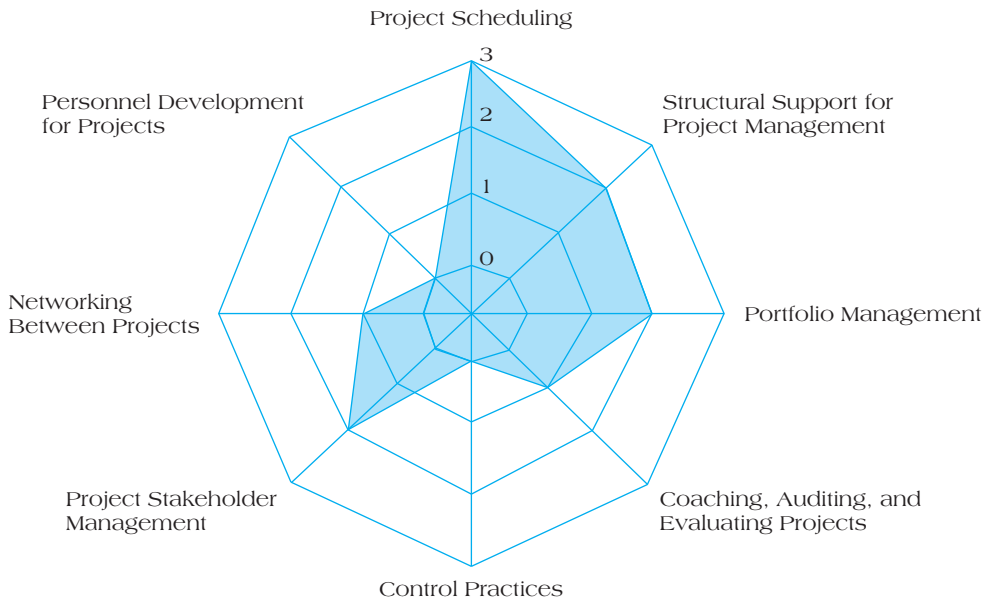

FIGURE 1.10 **Spider Web Diagram with Embedded Organizational Evaluation**

Source: R. Gareis. (2001). "Competencies in the Project-Oriented Organization," in D. Slevin, D. Cleland, and J. Pinto, *The Frontiers of Project Management Research*. Newtown Square, PA: Project Management Institute, pp. 213–24, figure on p. 216. Copyright and all rights reserved. Material from this publication has been reproduced with the permission of PMI.

TABLE 1.3 A Comparison of Project Maturity Models and Incremental Stages

Center for Business Practices				
Level 1: Initial Process • Ad hoc process • Management awareness	Level 2: Structure, Process, and Standards • Basic processes, not standard on all projects • Management supports use • Estimates, schedules based on expert knowledge	Level 3: Institutionalized Project Management • All project processes are repeatable • Estimates, schedules based on industry standards	Level 4: Managed • Project management practices integrated with corporate processes • Solid analysis of project performance • Estimates, schedules based on corporate specifics	Level 5: Optimizing • Processes to measure project efficiency • Processes in place to improve project performance • Company focuses on continuous improvement
Kerzner's Project Management Maturity Model				
Level 1: Common Language • Sporadic use of project management • Small pockets of interest in the firm • No investment in PM training	Level 2: Common Processes • Tangible benefits made apparent • PM support throughout the firm • Development of a PM curriculum	Level 3: Singular Methodology • Integrated processes • Cultural and management support • Financial benefit from PM training	Level 4: Benchmarking • Analysis and evaluation of practices • Project office established	Level 5: Continuous Improvement • Lessons learned, files created • Knowledge transfer between teams • Mentorship program
ESI International's Project Framework				
Level 1: Ad Hoc • Processes ill-defined because they are applied individually • Little support by organization	Level 2: Consistent • Organization is well intentioned in its methods • No project control processes or lessons learned	Level 3: Integrated • Processes are tailored to enhance all PM aspects • Common use and understanding of methods across the firm	Level 4: Comprehensive • PM fully implemented across the firm • Information is used to evaluate processes and reduce variation • Advanced PM tools and techniques are developed	Level 5: Optimizing • Continual effort to improve and innovate project capability • Common failures are eliminated
SEI's Capability Maturity Model Integration				
Level 1: Initial • Ad hoc, chaotic processes	Level 2: Managed • Requirements management, project planning, and control occur • Process quality assurance occurs • Configuration management is used	Level 3: Defined • Requirements development and product integration occur • Verification and validation of processes • Risk management is emphasized	Level 4: Quantitative Management • Process performance is gauged • Quantitative PM highlighted	Level 5: Optimizing • Innovation and deployment accentuated • Causal analysis and resolution occur

models and the interim levels they have identified en route to the highest degree of organization-wide project expertise. Several of these models were developed by private project management consultancies or professional project organizations.

It is interesting to compare and contrast the four maturity models highlighted in Table 1.3. These examples of maturity models are taken from the most well-known models in the field, including Carnegie Mellon University's Software Engineering Institute's (SEI) Capability Maturity Model, Harold Kerzner's Maturity Model, ESI International's Project Framework, and the maturity model developed by the Center for Business Practices.[35] Illustrating these dimensions in pyramid form, we can see the progression toward project management maturity (Figure 1.11). Despite some differences in terminology, a clear sense of pattern exists among these models. Typically they start with the assumption that project management practices within a firm are not planned and are not collectively employed; in fact, there is likely no common language or methods for undertaking project management. As the firm grows in project maturity, it begins to adopt common practices, starts programs to train cadres of project management professionals, establishes procedures and processes for initiating and controlling its projects, and so forth. Finally, by the last stage not only is the organization "project-savvy," but it also has progressed beyond simply applying project management to its processes and is now actively exploring ways to continuously improve its project management techniques and procedures. It is during the final stage that the organization can be truly considered "project mature"; it has internalized all necessary project management principles and is actively seeking to move beyond them in innovative ways.

Project maturity models have become very useful in recent years precisely because they reflect the growing interest in project management while highlighting one of its recurring problems: the lack of clear direction for companies in adopting, adapting, and improving these processes for optimal use. The key feature of these models is the important recognition that change typically does not occur abruptly; that is, companies that desire to become skilled in their project management approaches simply cannot progress in immediate steps from a lack of project management understanding to optimal project practices. Instead, the maturity models illustrate that maturity is an ongoing process based on continuous improvement through identifiable incremental steps. Once we have an accurate picture of where we fit into the maturity process, we can begin to determine a reasonable course of action to progress to our desired level. In this manner, any organization, no matter how initially unskilled in project management, can begin to chart a course toward the type of project organization it hopes to become.

FIGURE 1.11 **Project Management Maturity—A Generic Model**

Employability Skills

LO 1.7 Recognize how mastery of the discipline of project management enhances critical employability skills for university graduates.

Pearson is committed to not only producing innovative educational content but ensuring that the material covered in its products addresses the critical skills that employers are looking for. As part of a recent large-scale study involving hundreds of respondents from universities and public and private organizations, Pearson identified a set of "employability skills" that businesses deem crucial for their new hires. Let us consider them in turn and then briefly address how this text supports developing skills in these critical areas.

COMMUNICATION

Communication is defined as effective use of oral, written, and nonverbal communication skills for multiple purposes, such as to inform, instruct, motivate, persuade, and share ideas. It also includes effective listening, using technology to communicate, and being able to evaluate the effectiveness of communication efforts—all within diverse contexts. This text offers important principles of communication, such as steps needed to build a business case and project charter in Chapter 5 on scope management, negotiation skills in Chapter 6 on team building, and steps needed to work with stakeholders in closing out a finished project in Chapter 14. Effective project managers are effective communicators, and this text offers many examples and methods for improving your skills.

CRITICAL THINKING

Critical thinking involves purposeful and goal-directed thinking used to define and solve problems, make decisions, or form judgments related to a particular situation or set of circumstances. From the wide variety of critical thinking elements embedded in Internet exercises within each chapter to end-of-chapter cases and Project Management Research in Brief boxes, this text will push readers to think beyond the obvious and to recognize the challenge of open-ended problems or case examples without obvious answers. For successful project managers, critical thinking is a critical skill.

COLLABORATION

Collaborative learning is a situation in which individuals actively work together on a task, constructing meaning and knowledge as a group through dialogue and negotiation resulting in a final product reflective of their joint, interdependent actions. As discussed below, this text offers many opportunities for collaborative thinking and working in teams. The semester-long exercise on building a project plan, ABCups Inc., offers students multiple opportunities for collaborative interaction, as do case assignments and other team-based experiences such as the negotiation exercise in Chapter 6.

KNOWLEDGE APPLICATION AND ANALYSIS

Knowledge application and analysis is the ability to learn a concept and then appropriately apply that knowledge in another setting to achieve a higher level of understanding. As the previous section of the chapter indicated, this text is laid out in a dynamic format; that is, it is organized to mirror the project life cycle, establishing conceptual goals and scope development followed by planning steps, cost and risk management, project monitoring, and so forth. Each stage of the text builds upon the previous elements and requires that knowledge learned in one part of the book be transferrable and applicable as we move forward. This integrative approach to the book's topics highlights the manner in which knowledge is applied and linked to the skills of project management.

BUSINESS ETHICS AND SOCIAL RESPONSIBILITY

Business ethics are sets of guiding principles that influence the way individuals and organizations behave within the society in which they operate. Corporate social responsibility (CSR) is a form of ethical behavior that requires that organizations understand, identify, and eliminate unethical economic, environmental, and social behaviors. In this edition of the textbook, two important elements have been added: project management and ethics—including social responsibility—in Chapter 4,

and sustainability in Chapter 5. Managers are learning that organizations "do well by doing good." This same principle applies to the material covered in this textbook.

INFORMATION TECHNOLOGY APPLICATION AND COMPUTING SKILLS

Information technology application and computing skills are the ability to select and use appropriate technology to accomplish a given task. The individual is also able to apply computing skills to solve problems and show proficiency with computer software programs. Since the first edition of this textbook, I have worked to update technology links and computing skills, particularly in the application of critical software packages such as Microsoft Project. Now in its 2016 release, we will continue to apply MS Project through tutorials, the use of screenshots, and other references to its applicability.

DATA LITERACY

Data literacy is the ability to access, assess, interpret, manipulate, summarize, and communicate data. One of the challenges of successful project management is the need to have equal facility in soft skills of project team development and leadership as well as computational abilities that allow us to understand financial models for project selection (Chapter 3), cost accounting principles (Chapter 8), scheduling and network development (Chapters 9 through 11), resource management (Chapter 12), and evaluation and control (Chapter 13). Students who intend to succeed in their later careers must become comfortable with data, recognize and identify critical information, and manipulate this information appropriately. This text offers students the full range of employability skills that will be critical to their future success.

Project Elements and Text Organization

This text was written to provide a holistic, managerial-based approach to project management. The text is holistic in that it weaves together the wide variety of duties, responsibilities, and knowledge that successful project managers must acquire. Project management is a comprehensive and exciting undertaking. It requires us to understand aspects of management science in building schedules, assigning resources, monitoring and controlling our projects, and so forth. At the same time, successful project managers must also integrate fundamental issues of behavioral science, involving knowledge of human beings, leadership practices, motivation and team development, conflict resolution, and negotiation skills. Truly, a science-heavy approach to this subject will make us no more successful in our future project management responsibilities than will a focus that retains an exclusively people-based outlook. Project management is an exciting and challenging blend of the science and art of management.

Figure 1.12 offers a model for the organization of this text. The figure is a Gantt chart, a project scheduling and control device that we will become more familiar with in Chapter 10. For now, however, we can apply it to the structure of this book by focusing on some of its simpler features. First, note that all chapters in this book are listed down the left-hand column. Across the bottom and running from left to right is a simple time line that illustrates the point at which each of the chapters' topics will be introduced. For simplicity's sake, I have divided the X-axis time line into four distinct project phases that roughly follow the project life cycle discussed earlier in this chapter: (1)

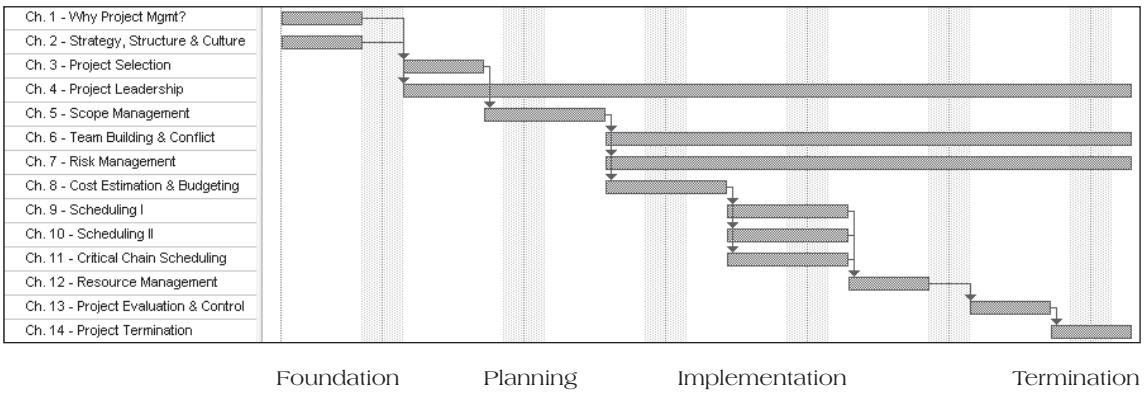

FIGURE 1.12 **Organization of Text**

Foundation, (2) Planning, (3) Implementation, and (4) Termination. Notice how some of the topics we will cover are particularly relevant only during certain phases of the project while others, such as project leadership, are significant across much of the project's life cycle. Among the benefits of setting up the text to follow this sequence are that, first, it shows the importance of blending the human-based topics (leadership and team building) directly with the more analytical or scientific elements of project management. We cannot compartmentalize our approach to project management as either exclusively technical or behavioral; the two are opposite sides of the same coin and must be appreciated jointly. Second, the structure provides a simple logic for ordering the chapters and the stage of the project at which we are most likely to concern ourselves with these topics. Some concepts, as illustrated by the figure, are more immediately concerned with project planning while others become critical at later phases in the project. Appreciating the elements of project management *and their proper sequencing* is an important learning guide. Finally, the figure offers an intuitively appealing method for visually highlighting the structure and flow we will follow across the topics in the text.

The foundation stage helps us with our fundamental understanding of what projects are and how they are typically managed in modern organizations. As part of that understanding, we must necessarily focus on the organizational setting within which projects are created, selected, and developed. Some of the critical issues that can affect the manner in which projects are successfully implemented are the contextual issues of a firm's strategy, structure, and culture. Either these elements are set up to support project-based work or they are not. In the former case, it is far easier to run projects and achieve positive results for the organization. As a result, it is extremely helpful for us to clearly understand the role that organizational setting, or context, plays in project management.

In Chapter 3 we explore the process of project screening and selection. The manner in which a firm selects the projects it chooses to undertake is often critical to its chances of successful development and commercial profitability. Chapter 4 introduces the challenges of project management from the perspective of the project leader. Project management is an extremely leader-intensive undertaking: the project manager is the focal point of the project, often functioning as a miniature CEO. The more project managers understand about project leadership and the skills required by effective project managers, the better companies can begin training project managers within their own ranks.

The second phase is related to the up-front issues of project planning. Once a decision to proceed has been made, the organization must first select a suitable project manager to oversee the development process. Immediately, this project manager is faced with a number of responsibilities, including:

1. ***Selecting a team***—Team building and conflict management are the first challenges that project managers face.
2. ***Developing project objectives and a plan for execution***—Identifying project requirements and a logical plan to develop the project are crucial.
3. ***Performing risk management activities***—Projects are not developed without a clear sense of the risks involved in their planning and implementation.
4. ***Cost estimating and budgeting***—Because projects are resource-constrained activities, careful budgeting and cost estimation are critical.
5. ***Scheduling***—The heart of project planning revolves around the process of creating clear and aggressive, yet reasonable schedules that chart the most efficient course to project completion.
6. ***Managing resources***—The final step in project planning is the careful management of project resources, including project team personnel, to most efficiently perform tasks.

Chapter 5, which discusses project scope management, examines the key features in the overall plan. "Project scope management" is something of an umbrella term under which we consider a number of elements in the overall project planning process. This chapter elaborates the variety of planning techniques and steps for getting a project off on the right foot.

Chapter 6 addresses some of the behavioral challenges project managers face in terms of effective team building and conflict management. This chapter looks at another key component of effective human resource management: the need to create and maintain high-performance teams. Effectively building and nurturing team members—often people from very different backgrounds—is a constant challenge and one that requires serious consideration. Conflict occurs on a number of levels, not just among team members but between the team and project stakeholders, including top

management and customers. This chapter will identify some of the principal causes of conflict and explain various methods for resolving it.

Chapter 7 deals with project risk management. In recent years, this area of project management has become increasingly important to companies that want to ensure, as far as possible, that project selection choices are appropriate, that all the risks and downside potential have been considered, and that, where appropriate, contingency plans have been developed. Chapter 8 covers budgeting and cost estimation. Because project managers and teams are held to both standards of performance and standards of cost control, it is important to understand the key features of cost estimation and budgeting.

Chapters 9 and 10 focus on scheduling methodologies, which are a key feature of project management. These chapters offer an in-depth analysis of various project-scheduling tools, discuss critical software for project scheduling, and explain some recent breakthroughs in project scheduling. Chapter 11 covers some important recent developments in project scheduling, the Agile project planning methodology, and the development and application of Critical Chain project scheduling. Chapter 12 considers the challenges of resource allocation. Once various project activities have been identified, we must make sure they work by allocating the resources needed to support them.

The third process in project management, *implementation*, is most easily understood as the stage in which the actual "work" of the project is being performed. For example, engineers and other technical experts determine the series of tasks necessary to complete the overall project, including their individual responsibilities, and each of the tasks is actively managed by the manager and team to ensure that there are no significant delays that can cause the project to exceed its schedule. Chapter 13 addresses the project challenges of control and evaluation. During the implementation phase, a considerable amount of ambiguity regarding the status of the project is possible unless specific, practical steps are taken to establish a clear method for tracking and controlling the project.

Finally, the processes of project termination reflect the fact that a project is a unique organizational endeavor, marked by a specified beginning and ending. The process of closing down a project, whether due to the need to "kill" it because it is no longer viable or through the steps of a planned termination, offers its own set of challenges. A number of procedures have been developed to make this process as smooth and logical as possible. Chapter 14 discusses the elements in project *closeout*— the phase in which the project is concluded and resources (both monetary and human) are reassigned.

This book was written to help create a new generation of effective project managers. By exploring the various roles of project managers and addressing the challenges and opportunities they constantly face, we will offer a comprehensive and integrative approach to better understand the task of project management—one that explores the full range of strategic, technical, and behavioral challenges and duties for project managers.

This text also includes, at the end of relevant chapters, a series of activities designed to help students develop comprehensive project plans. It is absolutely essential that persons completing a course in project management carry away with them practical knowledge about the steps involved in creating a project, planning its development, and overseeing its work. Future managers need to develop the skills to convert the theories of project management into the successful practice of the craft. With this goal in mind, the text contains a series of exercises designed to help professors and students construct overall project plans. Activities involve the development, from beginning to end, of a project plan, including narrative, risk analysis, work breakdown structure, activity estimation and network diagramming, resource leveling and project budgeting, and so forth. In order to add a sense of realism to the process, later chapters in the book also include a series of hypothetical problems. By the end of the course, students should have created a comprehensive project document that details the necessary steps in converting project plans into practical accomplishments.

As a template for providing examples, this text employs a hypothetical company called ABCups Inc., which is about to initiate an important project. Chapter-ending activities, including exercises in scheduling, budgeting, risk management, and so forth, will often include examples created from the ABCups project for students to use as a model for their own work. In this way, students will be presented both with a challenge and with an example for generating their own deliverables as they progressively build their project plans.

Several software packages are available for planning and tracking the current status of a project. Some of them, such as products by SAP and Oracle, are large, quite complex, and capable of linking project management functions to other critical through-put operations of a company. Other

desktop software packages are more readily accessible and easier to interpret for the average novice interested in improving his or her project management skills. This text uses examples throughout from Microsoft's Project 2016, including screen captures, to illustrate how MSP 2016 can be used for a variety of planning and tracking purposes. Additionally, some simple tutorials are included in the appendices at the end of this text to give readers a feel for how the software works and some of the features it offers. As a method for learning the capabilities of the software, it's a start. For those committed to fully learning one of these project management scheduling packages, I encourage you to investigate alternative packages and, once you have made your choice, invest in a comprehensive training manual.

An additional feature of this text is the linkage between concepts that are discussed throughout and the Project Management Body of Knowledge (PMBoK), which was developed by the Project Management Institute (PMI). As the world's leading professional organization for project management, with nearly half a million members, PMI has been in the forefront of efforts to standardize project management practices and codify the necessary skills to be successful in this field. Now in its fifth edition (a sixth edition is scheduled for release soon), the PMBoK identifies ten critical knowledge areas of project management skills and activities that all practitioners need to master in order to become fully trained in their profession. These knowledge areas, which are shown in Figure 1.13, encompass a broad overview of the component processes for project management. Although it is not my intention to create a text to serve as a primer for taking a professional certification exam, it is important for us to recognize that the skills we develop through reading this work are directly applicable to the professional project management knowledge areas.

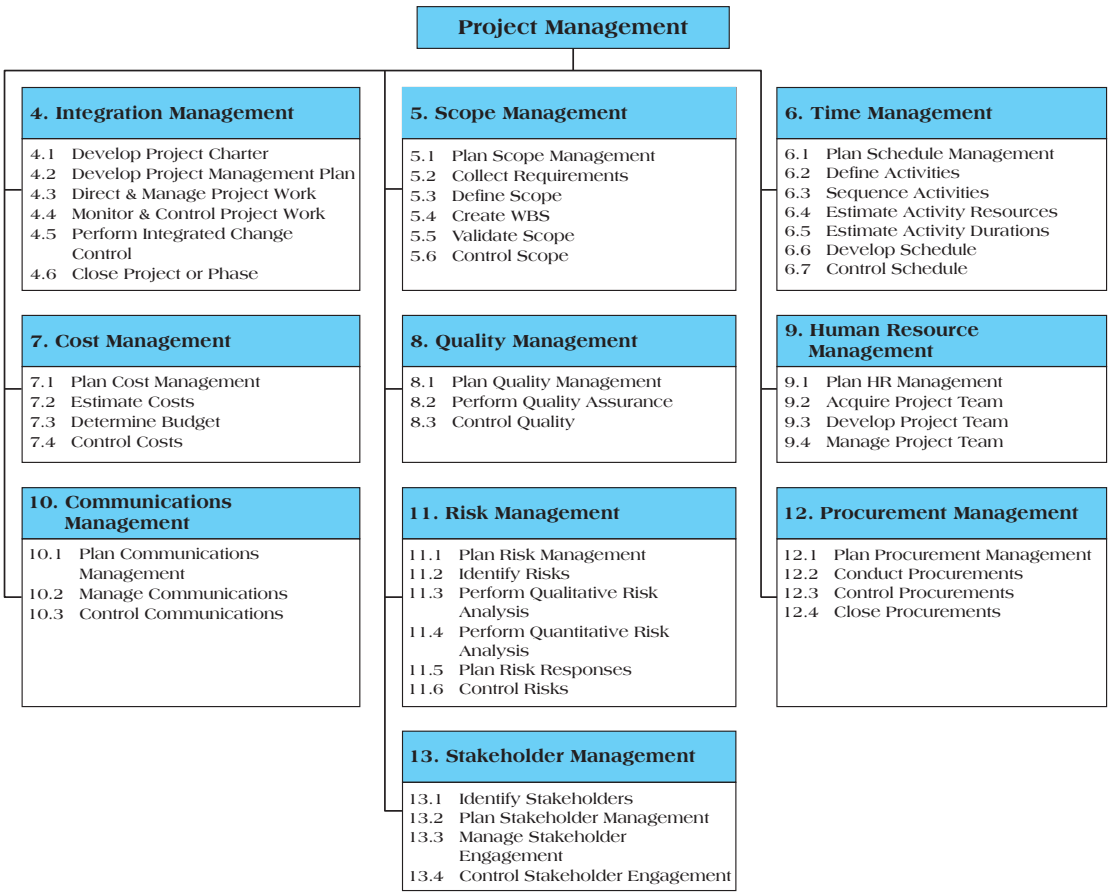

FIGURE 1.13 **Overview of the Project Management Institute's PMBoK Knowledge Areas**

Source: Project Management Institute. (2013). *A Guide to the Project Management Body of Knowledge (PMBoK Guide)*, 5th ed. Project Management Institute, Inc. Copyright and all rights reserved. Material from this publication has been reproduced with the permission of PMI.

Students will find several direct links to the PMBoK in this text. First, the key terms and their definitions are intended to follow the updated, fifth edition PMBoK glossary (included as an appendix at the end of the text). Second, chapter introductions will also highlight references to the PMBoK as we address them in turn. We can see how each chapter not only adds to our knowledge of project management but also directly links to elements within the PMBoK. Finally, many end-of-chapter exercises and Internet references will require direct interaction with PMI through its Web site.

As an additional link to the Project Management Institute and the PMBoK, this text will include sample practice questions at the end of relevant chapters to allow students to test their in-depth knowledge of aspects of the PMBoK. Over 30 years ago, the PMI instituted its Project Management Professional (PMP) certification as a means of rewarding those with expert knowledge of project management practice. The PMP certification is the highest professional designation for project management expertise in the world and requires in-depth knowledge in all ten areas of the PMBoK. To date, more than 750,000 project professionals worldwide have attained the PMP certification and the numbers are steadily growing each year. Other certifications, such as CAPM (Certified Associate in Project Management) and PgMP (Program Management Professional), have been instituted by PMI to recognize those with other advanced project management skills, academic degrees, and professional experience. The inclusion of questions at the end of the relevant chapters offers students a way to assess how well they have learned the important course topics and the nature of PMP certification exam questions, and points to areas that may require additional study in order to master this material.

This text offers an opportunity for students to begin mastering a new craft—a set of skills that is becoming increasingly valued in contemporary corporations around the world. Project managers represent the new corporate elite: a corps of skilled individuals who routinely make order out of chaos, improving a firm's bottom line and burnishing their own value in the process. With these goals in mind, let us begin.[36]

Summary

1.1 ***Understand why project management is becoming such a powerful and popular practice in business.*** Project management offers organizations a number of practical competitive advantages, including the ability to be both effective in the marketplace and efficient with the use of organizational resources. It also offers the ability to achieve technological breakthroughs, to streamline new-product development, and to manage the challenges arising from the business environment.

1.2 ***Recognize the basic properties of projects, including their definition.*** Projects are defined as temporary endeavors undertaken to create a unique product or service. Among their key properties are that projects are complex, one-time processes; they are limited by budget, schedule, and resources; they are developed to resolve a clear goal or set of goals; and they are customer-focused.

1.3 ***Understand why effective project management is such a challenge.*** Projects operate outside of normal organizational processes, typified by the work done by functional organizational units. Because they are unique, they require a different mind-set, one that is temporary and aimed at achieving a clear goal within a limited time frame. Projects are ad hoc endeavors with a clear life cycle. They are employed as the building blocks in the design and execution of organizational strategies, and they provide a philosophy and a strategy for the management of change. Other reasons why they are a challenge include the fact that project management requires the crossing of functional and organizational boundaries while trying to satisfy the multiple constraints of time, budget, functionality, and customer satisfaction.

1.4 ***Understand and explain the project life cycle, its stages, and the activities that typically occur at each stage in the project.*** The project life cycle is a mechanism that links time to project activities and refers to the stages in a project's development. The common stages used to describe the life cycle for a project are (1) conceptualization, (2) planning, (3) execution, and (4) termination. A wide and diverse set of activities occurs during different life cycle stages; for example, during the conceptualization phase the basic project mission and scope are developed and the key project stakeholders are signed on to support the project's development. During planning, myriad project plans and schedules are created to guide the development process; execution requires that the principal work of the project be performed. Finally, during the termination stage the project is completed, the work finished, and the project transferred to the customer.

1.5 ***Understand the concept of project "success," including various definitions of success as well***

as the alternative models of success. Originally, project success was predicated simply on a triple-constraint model that rewarded projects if they were completed with regard to schedule, budget, and functionality. This model ignored the emphasis that needs to be placed on project clients, however. In more accurate terms, project success involves a "quadruple constraint," linking the basic project metrics of schedule adherence, budget adherence, project quality (functionality), and customer satisfaction with the finished product. Other models of success for IT projects employ the measures of (1) system quality, (2) information quality, (3) use, (4) user satisfaction, (5) individual impact, and (6) organizational impact.

1.6 ***Understand the purpose of project management maturity models and the process of benchmarking in organizations.*** Project management maturity models are used to allow organizations to benchmark the best practices of successful project management firms. Project maturity models recognize that different organizations are at different levels of sophistication in their best practices for managing projects. The purpose of benchmarking is to systematically manage the process improvements of project delivery by a single organization over a period of time. As a firm commits to implementing project management practices, maturity models offer a helpful, multistage process for moving forward through increasing levels of sophistication of project expertise.

1.7 ***Recognize how mastery of the discipline of project management enhances critical employability skills for university graduates.*** The employability skills identified by Pearson include communication, critical thinking, collaboration, knowledge application and analysis, business ethics and social responsibility, information technology application and computing skills, and data literacy. Chapter content and numerous cases examples within this text cover this broad array of technical, interpersonal, and information-related challenges. Moreover, mastering the science of project management will lead to a valuable skill set that directly relates to each of the critical employability skills enumerated by Pearson. In short, project management themes map closely to the variety of skills that modern businesses deem an absolute necessity for successful growth. Becoming adept at project management will provide students with numerous "resume enhancers" sought by public and private organizations.

Key Terms

Benchmarking *(p. 41)*
Client acceptance *(p. 38)*
Clients *(p. 35)*
Budget *(p. 38)*
Deliverables *(p. 26)*
Performance *(p. 38)*
Process *(p. 25)*
Project *(p. 25)*
Project life cycle *(p. 34)*
Project management *(p. 29)*
Project management maturity models *(p. 41)*
Project success *(p. 37)*
Stakeholders *(p. 34)*
Time *(p. 37)*
Triple constraint *(p. 38)*

Discussion Questions

1.1 Describe the features of a project. How do they differ from day-to-day processes within an organization?

1.2 What do you see as the primary challenges to introducing a project management philosophy in most organizations? That is, why is it difficult to shift to a project-based approach in many companies?

1.3 What are the advantages and disadvantages of using project management?

1.4 What key characteristics do all projects possess?

1.5 Describe the basic elements of a project life cycle. Why is an understanding of the life cycle relevant for our understanding of projects?

1.6 Think of both a successful project and an unsuccessful project with which you are familiar. What distinguishes the two, both in terms of the process used to develop them and their outcomes?

1.7 Consider the case on the BBC's Digital Initiative Media in this chapter. What do you think were the main problems associated with the BBC's approach to project management? What challenges did the project management team face in this project, and how can a firm responsible for large IT transformation projects overcome some of these challenges?

1.8 Consider the six criteria for successful IT projects. Why is IT project success often so difficult to assess? Make a case for some factors being more important than others.

1.9 As organizations seek to become better at managing projects, they often engage in benchmarking with other companies in similar industries. Discuss the concept of benchmarking. What are its goals? How does benchmarking work?

1.10 Explain the concept of a project management maturity model. What purpose does it serve?

1.11 Compare and contrast the four project management maturity models shown in Table 1.3. What strengths and weaknesses do you perceive in each of the models?

CASE STUDY 1.1

MegaTech, Inc.

MegaTech, Inc. designs and manufactures automotive components. For years, the company enjoyed a stable marketplace, a small but loyal group of customers, and a relatively predictable environment. Though slow, annual sales continued to grow until recently hitting $300 million. MegaTech products were popular because they required little major updating or yearly redesign. The stability of its market, coupled with the consistency of its product, allowed MegaTech to forecast annual demand accurately, to rely on production runs with long lead times, and to concentrate on internal efficiency.

However, with the advent of the North American Free Trade Agreement (NAFTA) and other international trade agreements, MegaTech found itself competing with auto parts suppliers headquartered in countries around the world. The company was thrust into an unfamiliar position: it had to become customer-focused and quicker to market with innovative products. Facing these tremendous commercial challenges, top management at MegaTech decided to recreate the company as a project-based organization.

The transition, though not smooth, has nonetheless paid big dividends. Top managers determined, for instance, that product updates had to be much more frequent. Achieving this goal meant yearly redesigns and new technologies, which in turn meant making innovative changes in the firm's operations. In order to make these adjustments, special project teams were formed around each of the company's product lines and given a mandate to maintain market competitiveness.

At the same time, however, MegaTech wanted to maintain its internal operating efficiencies. Thus, all project teams were given strict cost and schedule guidelines for new product introductions. Finally, the company created a sophisticated research and development team, which is responsible for locating likely new avenues for technological change 5 to 10 years down the road. Today, MegaTech operates project teams not only for managing current product lines but also for seeking longer-term payoffs through applied research.

MegaTech has found the move to project management challenging. For one thing, employees are still rethinking the ways in which they allocate their time and resources. In addition, the firm's success rate with new projects is still less than management had hoped. Nevertheless, top managers feel that, on balance, the shift to project management has given the company the operating advantage that it needed to maintain its lead over rivals in its globally competitive industry. "Project management," admits one MegaTech executive, "is certainly not a magic pill for success, but it has started us thinking about how we operate. As a result, we are doing smarter things in a faster way around here."

Questions

1. What is it about project management that offers MegaTech a competitive advantage in its industry?
2. What elements of the marketplace in which MegaTech operates led the firm to believe that project management would improve its operations?

CASE STUDY 1.2

The HealthSMART Program

In 2003, the Department of Health and Human Services in Victoria, Australia, initiated a AU$323 million project to develop HealthSMART, an integrated IT system that would deliver resource management, a medical imaging archive, and centralized patient and financial management across ten health care service providers in half of the state. The system aimed to bring efficiency to health care and benefit patients and service users.

HealthSMART promised implementation of its deliverables by 2007 and purchased a base system from an American organization that was intended to meet local requirements. However, upon commencement of the project, the scope of the IT system that had been brought in from the United States proved inadequate. This meant that customizing it for local requirements was ineffective, and further financial investment had to be made to reprogram the base system.

A myriad other problems soon followed. Each health care service had individual business needs from the system that were not considered central to the project and were therefore overlooked, and end users were not managed appropriately as high-priority stakeholders. Managers were also unable to hire people to fill important roles.

One of the major criticisms of this project was that it often focused too much on short-term wins and disregarded the bigger picture. For example, in 2011, the department announced that the financial and patient management part of the system had been built within budget. However, this was a misleading claim: due to lack of funds for implementation, the system could only be rolled out in four out of ten local services. Once implemented, doctors complained of incorrect terminology and out-of-date medical information.

The absence of detailed project planning was fundamental to the project's failure and resulted in costs overrunning by AU$140 million. The project was finally brought to a close at the end of June 2012 after the Department of Health refused to provide any more investment.

The issues with HealthSMART are not unique to Australia, and parallels of this kind of development can be found across the globe. Projects that are funded by state governments are often subject to external audits to ensure value for public money and to learn valuable lessons for the future. HealthSMART is an unfortunate illustration of how poor planning can harm a project rather than lead it to success.

Questions

1. Imagine that you are the project manager of the HealthSMART program. What factors should be considered at the start of the project to ensure that the project is successful?
2. Now imagine that you are auditing the project several years after it has started. What would you advise the project manager to do to improve the situation?

CASE STUDY 1.3

Disney's Expedition Everest

One of the newest thrill rides to open in the Walt Disney World Resort may just be the most impressive. As Disney approached its 50th anniversary, the company wanted to celebrate in a truly special way. What was its idea? Create a park attraction that would in many ways serve as the link between Disney's amazing past and its promising future. Disney showed that it was ready to pull out all stops in order to get everything just right.

In 2006, The Walt Disney Company introduced Expedition Everest in Disney's Animal Kingdom Park at Lake Buena Vista, Florida. Expedition Everest is more than just a roller coaster. It is the embodiment of the Disney spirit: a ride that combines Disney's trademark thrills, unexpected twists and turns, incredible attention to detail, and impressive project management skills.

First, let's consider some of the technical details of Expedition Everest:

- With a peak of just under 200 feet, the ride is contained within the tallest of 18 mountains created by Disney's Imagineers at Disney parks worldwide.
- The ride contains nearly a mile of track, with twists, tight turns, and sudden drops.
- The Disney team created a Yeti: an enormous, fur-covered, Audio-Animatronics monster powered by a set of hydraulic cylinders whose combined thrust equals that of a Boeing 747 airliner. Through a series of sketches, computer-animated drawings, sculptures, and tests that took more than two years to perfect, Disney created and programmed its Abominable Snowman to stand over 10 feet tall and serve as the focal point of the ride.
- More than 900 bamboo plants, 10 species of trees, and 110 species of shrubs were planted to re-create the feeling of the Himalayan lowlands surrounding Mount Everest.
- More than 1,800 tons of steel were used to construct the mountain. The covering of the framework was done using more than 3,000 prefabricated chips created from 25,000 individual computer-molded pieces of steel.
- To create the proper color schemes, 2,000 gallons of stain and paint were used on rockwork and throughout the village Disney designed to serve as a backdrop for the ride.
- More than 2,000 handcrafted items from Asia are used as props, cabinetry, and architectural ornamentation.

Building an attraction does not come easily or quickly for Disney's Imagineers. Expedition Everest was several years in development while Disney sent teams, including Walt Disney Imagineering's Creative Executive Joe Rohde, on repeated trips to the Himalayas in Nepal to study the lands, architecture, colors, ecology, and culture in order to create the most authentic setting

(*continued*)

for the new attraction. Disney's efforts reflect a desire to do much more than provide a world-class ride experience; they demonstrate the Imagineers' eagerness to tell a story—a story that combines the mythology of the Yeti figure with the unique history of the Nepalese living in the shadow of the world's tallest mountain. Ultimately the attraction, with all its background and thematic elements, took nearly five years to complete.

Riders on Expedition Everest gain a real feel for the atmosphere that Disney has worked so hard to create. The guests' adventure starts by entering the building of the "Himalayan Escape" tour company, complete with Norbu and Bob's booking office, to obtain permits for their trip. Overhead flutter authentic prayer flags from monasteries in Nepal. Next, guests pass through Tashi's General Store and Bar to stock up on supplies for their journey to the peak of the mountain. Finally, guests pass through an old tea warehouse that contains a remarkable museum of artifacts reflecting Nepal's culture, a history of the Himalayas, and tales of the Yeti, which is said to inhabit the slopes of Mount Everest. It is only now that guests are permitted to board the Anandapur Rail Service for their trip to the peak. Each train is modeled after an aging steam-engine train, seating 34 guests per train.

Over the next several minutes, guests are transported up the roller coaster track, through a series of winding turns, until their encounter with the Yeti. At this point another unique feature of the attraction emerges: The train begins rushing backward down the track, as though it were out of control. Through the balance of the ride, guests experience a landscape of sights and sounds culminating in a 50 mph final dash down the mountain and back to the safety of the Nepalese village.

Disney's approach to the management of projects such as Expedition Everest is to combine careful planning, including schedule and budget preparation, with the imagination and vision for which the company is so well known. Creativity is a critical element in the development of new projects at Disney. The company's Imagineers include some of the most skilled artists and computer-animation experts in the world. Although it is easy to be impressed by the technical knowledge of Disney's personnel, it is important to remember that each new project is approached with an understanding of the company's underlying business and attention to market projections, cost control, and careful project management discipline. New attraction proposals are carefully screened and researched. The result is the creation of some of the most innovative and enjoyable rides in the world. Disney does not add new attractions to its theme parks frequently, but when it does, it does so with style!

Questions

1. Suppose you were a project manager for Disney. Based on the information in this case, what critical success metrics do you think the company uses when designing a new ride? That is, how would you prioritize the needs for addressing project cost, schedule, quality, and client acceptance? What evidence supports your answer?
2. Why is Disney's attention to detail in its rides unique? How does the company use the "atmosphere" discussed in the case to maximize the experience while minimizing complaints about the length of wait for the ride?

CASE STUDY 1.4

"Throwing Good Money after Bad": the BBC's Digital Media Initiative

The British Broadcasting Corporation (BBC) recently announced the cancellation of a major Information Technology (IT) project intended to update their vast broadcast operations. The project, called the Digital Media Initiative (DMI), was originally budgeted at £81.7 million ($140 million) and was developed to eliminate the outdated filing systems and use of old-fashioned analog videotapes with their expensive archival storage. The BBC is one of the world's largest and most widely recognized news and media organizations; it is publicly funded and under British government oversight. The DMI project was intended to save the organization millions annually by eliminating the cost of expensive and outdated storage facilities, while moving all media content to a modern, digital format. As an example of a large-scale IT project, the plan for the DMI involved media asset management, archive storage and retrieval systems, and media sharing capabilities.

The DMI project was begun in 2008 when the BBC contracted with technology service provider Siemens, with consulting expertise to be provided by Deloitte. Interestingly, the BBC never put the contract out for

competitive bidding, reasoning that it already had a 10-year support contract with Siemens and trusted Siemens' judgment on project development. As part of this hands-off attitude, executives at the BBC gave Siemens full control of the project, and apparently little communication flowed back and forth between the organizations. The BBC finally grew concerned with the distant relationship that was developing between itself and the contractor when Siemens began missing important delivery milestones and encountering technical difficulties. After one year, the BBC terminated its $65 million contract with Siemens and sued the company for damages, collecting approximately $47 million in a court settlement. Still, losing nearly $20 million in taxpayer money after only one year, with nothing to show for it, did not bode well for the future.

Having been burned by this relationship with an outside contractor, the BBC next tried to move the project in house, assigning its own staff and project manager to continue developing the DMI. The project was under the overall control of the BBC's Chief Technology Officer, John Linwood. It was hoped that the lessons learned from the first-round failure of the project would help improve the technology and delivery of the system throughout the organization. Unfortunately, the project did no better under BBC control. Reports started surfacing as early as 2011 that the project was way behind schedule, was not living up to its promises, and, in fact, had been failing most testing along the way. However, although there are claims that the BBC was well aware of the flaws in the project as early as 2011, the picture it presented to the outside world, including Parliamentary oversight committees, was relentlessly upbeat. The BBC's Director General, Mark Thompson, appeared before a committee in 2011 and told them the DMI was definitely on schedule and was actually working already: "There are many programs that are already being made with DMI and some have gone to air and are going to air," he told members of Parliament.

The trouble was, the project was not working well at all. Continual failures with the technology were widely known within the project team and company executives, but reports suggest that these concerns were buried under a flood of rosy projections. In fact, a later report on the project by an outside consulting firm suggests that throughout 2012 the deteriorating fortunes of the DMI were not accurately reported either within management or, critically, to the BBC Trust. For example, the BBC's own internal project management office issued a "code red" warning of imminent project failure in February that was not reported to the trust until six months later. The CTO, John Linwood, maintained that the project did work and would lead to a streamlined and more cost-effective method for producing media; he did not waver from this view throughout these years.

This rosy view hid a deeper problem: the technology was just not working. Different views emerged as to why the DMI was not progressing. To the "technologists," there was nothing wrong with the system; it did deliver working technology, but the project was undermined by would-be users who never bought into the original vision and who continually changed their requirements. They believed that the DMI was failing not because it did not work, but as a result of internal politics. On the other side were those who questioned the development of the project because the technology, whether it had been "delivered" or not, never really worked, certainly not at the scale required to make it adopted across the whole organization. Furthermore, it was becoming evident that off-the-shelf technology existed in the marketplace which did some of what the DMI promised but which, critically, already worked well. Why, then, was the BBC spending so much time and money trying to create its own system out of thin air?

According to a news report, it was not until April 2013 that events demonstrated the ongoing problems with the DMI. During BBC coverage of the death and funeral of Margaret Thatcher, news staff worked feverishly to transfer old archived analog videotapes to a digital format in order to produce footage for background on the life and career of the former Prime Minister. So poorly did the new digital archive system work that it was reported tapes had to be physically transported around London by taxi and subway system to get to their locations while video transfer work was being carried out by private production companies. All this after nearly four years working to develop the DMI!

The failure of the system during Thatcher's funeral was the final straw. In May 2013 the new Director General of the BBC, Lord Hall, announced the cancellation of the project and that the BBC's Chief Technology Officer, John Linwood, was to be suspended pending an external investigation into the management of the DMI project. It was later revealed that a senior BBC manager had expressed grave doubts about the DMI to BBC Chairman Lord Patten one year before the project was cancelled. He had also claimed that there was a "very significant risk" that the National Audit Office had been misled about the actual progress of the DMI in 2011. Other BBC executives had also voiced similar concerns for about two years before the DMI was abandoned. The final cost of the project to the BBC and British taxpayers has been estimated at about $160 million. BBC Trust member Anthony Fry remarked that the DMI had been a "complete catastrophe" and said that the project was "probably the most serious, embarrassing thing I have ever seen."

(*continued*)

Members of Parliament, looking into the failure of the DMI, also had a number of very pointed criticisms of the project, the executive oversight of the DMI, and the operations of the BBC in general. Margaret Hodge MP, Chair of the Committee of Public Accounts, summed up the project in her Parliament report:

> "The BBC's Digital Media Initiative was a complete failure. Licence fee payers paid nearly £100 million [$160 million] for this supposedly essential system but got virtually nothing in return.
>
> The main output from the DMI is an archive catalogue and ordering system that is slower and more cumbersome than the 40-year-old system it was designed to replace. It has only 163 regular users and a running cost of £3 million [$5.1 million] a year, compared to £780,000 [$1.3 million] a year for the old system.
>
> When my Committee examined the DMI's progress in February 2011, the BBC told us that the DMI was "an absolutely essential have to have" and that a lot of the BBC's future was tied up in the successful delivery of the DMI.
>
> The BBC also told us that it was using the DMI to make many programmes and was on track to complete the system in 2011 with no further delays. This turned out not to be the case. [. . .]
>
> The BBC was far too complacent about the high risks involved in taking it in-house. No single individual had overall responsibility or accountability for delivering the DMI and achieving the benefits, or took ownership of problems when they arose.
>
> Lack of clearly defined responsibility and accountability meant the Corporation failed to respond to warning signals that the programme was in trouble."

A lengthy post-project analysis of the DMI's failure by Britain's National Accounting Office identified a series of errors that all contributed to the fiasco. As part of its final report, the NAO noted that it was never clear where responsibility lay within the BBC for the completion of the project; in other words, when concerned parties asked to speak to those "in charge," it was never clear just who those people actually were. This issue was made more significant as a result of the BBC losing a case brought against it by its former CTO John Linwood. Even though Linwood was fired by the BBC, the judge found that he was not responsible for the failure of the DMI. The NAO report stated that the BBC must make clear who is accountable for projects and define anticipated benefits at the start. Without a clear sense of benefits from a project such as the DMI, it was impossible to evaluate whether stakeholders were receiving value for the work undertaken.

Bad planning, poor corporate governance, excessively optimistic projections, and a cloak of secrecy regarding the real status of the Digital Media Initiative project all resulted in a very public black eye for one of the most respected broadcasting organizations in the world. It is likely that the causes of the failure of the DMI project will be debated for years to come, but at a minimum this story should be a cautionary tale for organizations developing sophisticated IT projects.[37]

Questions

1. What does the story of the BBC's failed Digital Media Initiative suggest to you about the importance of carefully managing not only the project, but the "message" of the project? That is, why is "benefits management" critical for project success?
2. Successful project management requires clear organization, careful planning, and good execution. How was the absence of each of these traits shown in this example?

Internet Exercises

1.12 The largest professional project management organization in the world is the Project Management Institute (PMI). Go to its Web site, www.pmi.org, and examine the links you find. Which links suggest that project management has become a sophisticated and vital element in corporate success? Select at least three of the related links and report briefly on the content of these links.

1.13 Go to the PMI Web site and examine the link "Membership." What do you discover when you begin navigating among the various chapters and cooperative organizations associated with the PMI? How does this information cause you to rethink project management as a career option?

1.14 Go to http://www.pmi.org/business-solutions/case-studies and examine some of the cases included on the Web page. What do they suggest about the challenges of managing projects successfully? The complexity of many of today's projects? The exciting breakthroughs or opportunities that projects allow us to exploit?

1.15 Using your favorite search engine (Google, Yahoo!, etc.), type in the keywords "project" and "project management." Randomly select three of the links that come up on the screen. Summarize what you find.

1.16 Go to the Web site for the Software Engineering Institute of Carnegie Mellon University at https://resources.sei.cmu.edu/asset_files/SpecialReport/1994_003_001_16265.pdf and access the software process maturity questionnaire. What are some of the questions that IT companies need to consider when assessing their level of project management maturity?

PMP CERTIFICATION SAMPLE QUESTIONS

1.17 The majority of the project budget is expended upon:

- **a.** Project plan development.
- **b.** Project plan execution.
- **c.** Project termination.
- **d.** Project communication.

1.18 Which of the following is the most critical component of the triple constraint?

- **a.** Time, then cost, then quality.
- **b.** Quality, then budget, then time.
- **c.** Scope.
- **d.** They are all of equal importance unless otherwise stated.

1.19 Which of the following best describes a project stakeholder?

- **a.** A team member.
- **b.** The project manager.
- **c.** Someone who works in an area affected by the project.
- **d.** All of the above are stakeholders.

1.20 All of the following are elements in the definition of a project, except:

- **a.** A project is time-limited.
- **b.** A project is unique.
- **c.** A project is composed of unrelated activities.
- **d.** A project is undertaken for a purpose.

1.21 All of the following distinguish project management from other process activities, except:

- **a.** There are no fundamental differences between project and process management.
- **b.** Project management often involves greater certainty of performance, cost, and schedule.
- **c.** Process management operates outside of line organizations.
- **d.** None of the above correctly distinguish project from process management.

Answers

1.17. b—The majority of a project budget is spent during the execution phase;
1.18. d—Unless otherwise stated, all elements in the triple-constraint model are equally critical;
1.19. d—All of the examples listed are types of project stakeholders;
1.20. c—A project is composed of "interrelated" activities;
1.21. d—None of the answers given correctly differentiates "process" from "project" management.

Notes

1. Valery, Paul, quoted in "Extreme chaos" (Boston: Standish Group International, 2001).
2. Source: Weller, C. (2016). "11 giant infrastructure projects that are reshaping Africa," *Business Insider*, Dec 18, retrieved at: http://www.businessinsider.com/giant-infrastructure-projects-reshaping-africa-2016-12
3. Peters, Thomas. (1994). *Liberation Management: Necessary Disorganization for the Nanosecond Nineties*. New York: Fawcett Books.
4. Stewart, Thomas H. (1995). "The corporate jungle spawns a new species," *Fortune,* July 10, pp. 179–80.
5. Gilbreath, Robert D. (1988). "Working with pulses not streams: Using projects to capture opportunity," in Cleland, D., and King, W. (Eds.), *Project Management Handbook.* New York: Van Nostrand Reinhold, pp. 3–15.
6. Buchanan, D. A., and Boddy, D. (1992). *The Expertise of the Change Agent: Public Performance and Backstage Activity.* London: Prentice Hall.

7. Frame, J. D. (1995). *Managing Projects in Organizations,* 2nd ed. San Francisco, CA: Jossey-Bass. See also Frame, J. D. (2002). *The New Project Management,* 2nd ed. San Francisco, CA: Jossey-Bass.
8. Kerzner, H. (2003). *Project Management,* 8th ed. New York: Wiley.
9. Field, M., and Keller, L. (1998). *Project Management.* London: The Open University.
10. Project Management Institute. (2013). *A Guide to the Project Management Body of Knowledge,* 5th ed. Newtown Square, PA: PMI.
11. Cleland, D. I. (2001). "The discipline of project management," in Knutson, J. (Ed.), *Project Management for Business Professionals.* New York: Wiley, pp. 3–22.
12. Lundin, R. A., and Soderholm, A. (1995). "A theory of the temporary organization," *Scandinavian Journal of Management,* 11(4): 437–55.
13. Resnikoff, P. (2016), "Apple terminating music download 'within two years'," *Digital Music News*, May 11, retrieved at: http://www.digitalmusicnews.com/2016/05/11/apple-terminating-music-downloads-two-years/; Sources: http://macs.about.com/b/a/087641.htm; Mossberg, W. S. (2004). "The music man," *Wall Street Journal,* June 14, p. B1.
14. Graham, R. J. (1992). "A survival guide for the accidental project manager." Proceedings of the Annual Project Management Institute Symposium. Drexel Hill, PA: Project Management Institute, pp. 355–61.
15. Pinto, J. K., and Millet, I. (1999). *Successful Information Systems Implementation: The Human Side,* 2nd ed. Newtown Square, PA: PMI.
16. Kapur, G. K. (1998). "Don't look back to create the future." Presentation at the Frontiers of Project Management Conference, Boston, MA; Dey, P.C. (2016). "Complete collection of project management statistics 2016," *Project Planning Pro*, Sept 1, retrieved at: https://www.planningproapp.com/blog/complete-collection-project-management-statistics-2016/
17. Collins, T. (2007, May 17). "Public sector IT projects have only 30% success rate - CIO for Department for Work and Pensions," Retrieved at: http://www.computerweekly.com/blogs/public-sector/2007/05/public-sector-it-projects-have.html
18. Clausing, J., and Daly, M. (2013, Sept 14). "US nuclear agency faulted for laxity and overspending," *Boston Globe*, retrieved at: www.bostonglobe.com/news/nation/2013/09/13/nation-bloated-nuclear-spending-comes-under-fire/O2uP7gv06vTAEw0AIcCIlL/story.html
19. Dey, P. C. (2016). "Complete collection of project management statistics 2016," *Project Planning Pro*, Sept. 1, retrieved at: https://www.planningproapp.com/blog/complete-collection-project-management-statistics-2016/; Hastie, S. and Wojewoda, S. (2015). "Standish Group 2015 Chaos Report: Q&A with Jennifer Lynch," *InfoQueue*, Oct 4, retrieved at: https://www.infoq.com/articles/standish-chaos-2015.
20. MacVicar, S. (2015). "SIGAR: We built an Afghanistan they can't afford," *Al Jazeera*, June 17, retrieved at: http://america.aljazeera.com/watch/shows/compass/articles/2015/6/17/john-sopko-sigar.html; Pager, T. (2015). "Debate over success of Afghanistan projects," *Military Times*, Jan 28, retrieved at: http://www.militarytimes.com/story/military/pentagon/2015/01/28/sigar-afghanistan-projects-fail/22426679/
21. Association for Project Management (2018), "Winner's Case Study: Royal Mail", https://www.apm.org.uk/media/2557/apm-pmawards-2016-royal-mail-final.pdf, accessed December 12.
22. "Royal Mail's Challenge to Be Fit for the Future," *Financial Times*, https://www.ft.com/content/6075210e-1e25-11e8-aaca-4574d7dabfb6.
23. Cleland, D. I. (1994). *Project Management: Strategic Design and Implementation.* New York: McGraw-Hill; Pinto, J. K., and Rouhiainen, P. (2001). *Building Customer-Based Project Organizations.* New York: Wiley; Gray, C. F., and Larson, E. W. (2003). *Project Management,* 2nd ed. Burr Ridge, IL: McGraw-Hill.
24. Petroski, H. (1985). *To Engineer Is Human—The Role of Failure in Successful Design.* London: St. Martin's Press.
25. Moore, M. (2016). "Here's why Crossrail will be the FUTURE of London travel," Express, Oct 7, retrieved at: http://www.express.co.uk/life-style/science-technology/718432/crossrail-underground-transport-london-tour-farringdon-station-elizabeth-line; http://www.crossrail.co.uk/sustainability http://www.express.co.uk/life-style/science-technology/718432/crossrail-underground-transport-london-tour-farringdon-station-elizabeth-line; http://www.crossrail.co.uk/sustainability; Peplow, M. (2016). "London's Crossrail is a $21 billion test of virtual modeling," IEEE Spectrum, Mar 24, retrieved at: http://spectrum.ieee.org/transportation/mass-transit/londons-crossrail-is-a-21-billion-test-of-virtual-modeling; Moore, R. (2013). "Crossrail: Britain's biggest archaeological dig will transform London," *The Guardian*, Nov. 23, retrieved at: https://www.theguardian.com/uk-news/2013/nov/23/crossrail-london-east-west-tunnel-railway
26. Sohmen, Victor. (2002, July). "Project termination: Why the delay?" Paper presented at PMI Research Conference, Seattle, WA.
27. Freeman, M., and Beale, P. (1992). "Measuring project success," *Project Management Journal,* 23(1): 8–17.
28. Morris, P. W. G. (1997). *The Management of Projects.* Thomas Telford: London; McKain, S. (2005). *What Customers Really Want*. Thomas Nelson: Nashville, TN.
29. Shenhar, A. J., Levy, O., and Dvir, D. (1997). "Mapping the dimensions of project success," *Project Management Journal,* 28(2): 5–13.
30. DeLone, W. H., and McLean, E. R. (1992). "Information systems success: The quest for the dependent variable," *Information Systems Research,* 3(1): 60–95; Seddon, P. B. (1997). "A respecification and extension of the DeLone and McLean model of IS success," *Information Systems Research,* 8(3): 249–53; DeLone, W. H., and McLean, E. R. (2003). "The DeLone and McLean model of information system success: A ten-year update," *Journal of Management Information Systems,* 19(4): 9–30; Wang, Y-S. (2008). "Assessing e-commerce systems success: a respecification and validation of the DeLone and McLean model of IS success," *Information Systems Journal*, 18, 529–557.
31. Atkinson, R. (1999). "Project management: Cost, time and quality, two best guesses and a phenomenon, it's time to accept other success criteria," *International Journal of Project Management,* 17(6): 337–42; Cooke-Davies, T. (2002). "The 'real' success factors on projects," *International Journal of Project Management,* 20(3): 185–90; Olson, D. L. (2001).