INTERNATIONAL STUDENT VERSION

PROJECT MANAGEMENT

A MANAGERIAL APPROACH

SEVENTH EDITION

Jack R. Meredith • Samuel J. Mantel

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International Student Version

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Preface

APPROACH

The use of projects and project management continues to grow in our society and its organizations. We are able to achieve goals through project organization that could be achieved only with the greatest of difficulty if organized in traditional ways. Though project management has existed since before the days of the great pyramids, it has enjoyed a surge of popularity beginning in the 1960s. A project put U.S. astronaut Neil Armstrong on the moon. A project named "Desert Storm" freed the nation of Kuwait. An annual project brings us Girl Scout cookies as a sign that winter is just about finished. (They were a bit optimistic this year.) The use of project management to accomplish the many and diverse aims of society's varied organizations continues to grow.

Businesses regularly use project management to accomplish unique outcomes with limited resources under critical time constraints. In the service sector of the economy, the use of project management to achieve an organization's goals is even more common. Advertising campaigns, voter registration drives, political campaigns, a family's annual summer vacation, and even management seminars on the subject of project management are organized as projects. A relatively new growth area in the use of project management is the use of projects as a way of accomplishing organizational change. Indeed, there is a rapid increase in the number of firms that use projects as the preferred way of accomplishing almost everything they undertake. Not even the most optimistic prognosticators foresaw the explosive growth that has occurred in the field.

As the field has grown, so has its literature. There are "cookbooks" that describe in detail the specific steps required to carry out a project, but they do not address the *whys* nor do they usually discuss how and why the parts fit together. Another type of book focuses on specific subjects important to project managers, team building or scheduling, for example. These are quite helpful for team builders or schedulers, but team building and scheduling are only two of the serious problems a project manager must face. There are books that "talk about" project management—but only occasionally about how to manage a project. There are books on earned value calculations, cost estimating, purchasing, project management software, leadership, planning information technology (IT) projects, and similar specialized or sub-specialized subjects. These are valuable for experienced project managers who can profit from an advanced education in specific areas of knowledge, but one cannot learn to manage projects from these specialized sources. There are also handbooks—collections of articles written mainly by academics and consultants on selected topics of interest to project managers. Handbooks do not, nor do they pretend to, offer broad coverage of the things project managers need to know.

Once the project manager has been educated on the basics of project management, these handbooks often represent valuable collections of relevant readings.

Unfortunately, project management seems to be reentering a stage that we thought had passed—arguments within the profession (and among those who teach it) about what we *really* need to know to manage projects. Must we know "how to manage people" or "how to use computers and do quantitative methods"? Lately we have been receiving email from teachers such as the one who urged us to drop "all the math" and pay more attention to conflict resolution, and another who suggested that we cut back on the "touchy-feely stuff and stick with the important things like scheduling and budgeting." We believe that insight into human behavior, knowledge of organizational issues, and skill with certain quantitative methods are all necessary (though not necessarily sufficient) for successful project management. This book reflects that belief.

It addresses project management from a *management* perspective rather than a cookbook, special area treatise, or collection of loosely associated articles. Such a book should address the basic nature of managing all types of projects—public, business, engineering, information systems, and so on—as well as the specific techniques and insights required to carry out this unique way of getting things done. It should deal with the problems of selecting projects, initiating them, and operating and controlling them. It should discuss the demands made on the project manager and the nature of the manager's interaction with the rest of the parent organization. The book should cover the difficult problems associated with conducting a project using people and organizations that represent different cultures and may be separated by considerable distances. Finally, it should even cover the issues arising when the decision is made to terminate a project.

This managerial perspective is the view we have taken here. As we noted earlier, we are occasionally advised to "cut the BS," apparently a reference to any aspect of project management that is not mathematical, technical, or governed by strict rules of procedure. The argument is that "management is just common sense." It is quite possible that such a statement is true, but if so, the word "common" is used in the sense of "common carrier"—something available to everyone. Sadly, everyone does not seem to have managerial common sense. If everyone did, there would be no market for Scott Adam's *Dilbert*—selected illustrations of which are reproduced here where appropriate.

The book is primarily intended for use as a college textbook for teaching project management at the advanced undergraduate or master's level. The book is also intended for current and prospective project managers who wish to share our insights and ideas about the field. We have drawn freely on our personal experiences working with project managers and on the experience of friends and colleagues who have spent much of their working lives serving as project managers in what they like to call the "real world." Thus, in contrast to the books described earlier *about* project management, this book teaches students how to *do* project management.

As well as being a text that is equally appropriate for classes on the management of service, product, or engineering projects, we have found that information systems (IS) students in our classes find the material particularly helpful for managing their IS projects. Thus, we have included some coverage of material concerning information systems and how IS projects differ from and are similar to regular business projects.

ORGANIZATION AND CONTENT

Given this managerial perspective, we have arranged the book to use the *project life cycle* as the primary organizational guideline. In this seventh edition we have altered the organization slightly to demark more clearly the activities that occur before the launch of the project, setting up those activities that have to do with the *context* (or *initiation*) of the project in the

first part of the book, and those that have to do with the *planning* for the project in the second part. Actually *executing* the project to completion constitutes the third part of the book. We have found it to be a comfortable framework for the reader.

Following an introductory chapter that comments on the role and importance of projects in our society and discusses project management as a potential career for aspiring managers, the book covers the context, events, and issues arising during the management of projects in the order in which they usually occur in the life of a project. *Part I, Project Initiation* concerns the context of the project, which is crucial for the project manager (PM) to understand if he or she is to be successful in executing the project. It begins with a description of how projects are selected for implementation, frequently based on their tie to the organization's strategy and goals. Part I also covers the many roles and responsibilities of the project manager (PM), the skills the PM needs for handling conflict, and the various ways of setting up the project within the organization's reporting structure (including how different ways of organizing projects tend to create different problems for PMs and their teams).

Part II, Project Planning then moves into the project planning process starting with the major tools used in project planning. This is followed by project budgeting, project scheduling, and finally, resource allocation among the activities. *Part III, Project Execution* finally gets into the action, beginning with monitoring the activities, largely through information systems, and then controlling them to assure that the results meet expectations. Evaluating and possibly auditing the project at its major milestones or phase-gates is another, though separate, control action that senior management often employs, and last, the project must be terminated.

We have relegated the discussion of two important aspects of projects that usually occur very early in the project life cycle—creativity/idea generation and technological forecasting—to the book's website. Although few project managers engage in either of these tasks (typically being appointed to project leadership after these activities have taken place), we believe that a knowledge of these subjects will make the project manager more effective.

Any way chosen to organize knowledge carries with it an implication of neatness and order that rarely occurs in reality. We are quite aware that projects almost never proceed in an orderly, linear way through the stages and events we describe here. The need to deal with change and uncertainty is a constant task for the project manager. We have tried to reflect this in repeated references to the organizational, interpersonal, economic, and technical glitches that create crises in the life cycle of every project, and thus in the life of every project manager.

Finally, although we use a life-cycle approach to organization, the chapters include material concerning the major areas of the *Project Management Body of Knowledge* (PMBOK®) as defined by the Project Management Institute. (See Bibliography for Chapter 1.) Anyone wishing to prepare thoroughly in some of these areas may have to go beyond the information covered in this text.

PEDAGOGY

Because this book is primarily a textbook, we have included numerous pedagogical aids to foster this purpose. As in earlier editions, *short summaries* appear at the end of the text of each chapter, followed by *glossaries* defining key terms and concepts introduced in the chapter. End-of-chapter materials also include *review questions* and *problems* revisiting the materials covered in the chapter. The answers (though not the detailed solutions) to the even-numbered problems are on the book's Web site. There are also sets of conceptual *discussion questions* intended to broaden the students' perspectives and to force them to think beyond the chapter materials to its implications. Finally, there are questions covering the Project Management in Practice application examples located throughout the chapters.

As in the past, we include *incidents for discussion*, which are brief "caselettes" oriented primarily toward the specific subjects covered in the chapter, but sometimes allow use of materials and concepts covered in earlier chapters. New to this edition is a *continuing integrative class project* to respond to requests from users for some type of running case throughout the chapters that builds on the chapter materials as students progress through the book. And at the end of each chapter we offer a *reading* and/or a *case*, with questions concerning the reading and/or case at the end.

We have noticed that many undergraduate introductory courses, and even a few such graduate courses, have no prerequisites. We feel individuals beginning their education in the management of projects would profit with some background knowledge. Thus, in writing this text we have made some assumptions about both student and professional readers. First, we assume that all readers have taken an elementary course in management or have had equivalent experience. The reader with a background in management theory or practice will note that many of the principles of good project management are also principles of good general administrative management. Project management and administrative management are not entirely distinct. Further, we assume that readers are familiar with the fundamental principles of accounting, behavioral science, finance, and statistics as would be a typical manager. Because the assumption concerning statistics is not always met, we include Appendix A on the Web site (http://www.wiley.com/go/global/meredith). This appendix on probability and statistics serves as an initial tutorial or as a refresher for rusty knowledge.

WHAT'S NEW

In this edition, we have made a great many small updates, additions, and changes, including dropping the case in the conflict/negotiation chapter (which no one seemed to use) and adding one in the auditing/evaluation chapter, which many requested. We also dropped the project management software reading in the information systems chapter since software reviews are never up to date. As noted above, we also reorganized the structure of the text slightly by regrouping the chapters, and moving the conflict/negotiation chapter to earlier in the book. Also new is the *continuing integrative class project* at the end of every chapter, as noted above. The largest change however is probably the attempt to simplify our writing style, eliminating many of the references to additional ways to address some of the issues, references to the thoughts of other practitioners and researchers, and references to opposing points of view. We hope that this will not only eliminate confusion on the part of students but will also simplify their understanding of the basic material—it also helps in reducing the length and cost of the book, of course.

When we started writing the first edition of this book around 1980—the first "textbook" in the field—there weren't all that many publications addressing project management, so we tried to document and describe all of them. Over the decades however, we were overwhelmed but still tried to note in the appropriate chapters the major new publications in the field—books, articles, etc. The purpose of doing so is, of course, to give the student recourse to additional explanation and discussion, or opposing points of view, or alternative ways of achieving the same objective. However, given the tsunami of interest, and publications, in the area since 1980, we have concluded that we must be much more selective, so have tried to cut back substantially in this edition, and will probably do more in the future as well.

As before, a student version of Crystal Ball®, an Excel® add-in, again comes with the book. This software makes simulation reasonably straightforward and not particularly complicated. The use of simulation as a technique for risk analysis is demonstrated in several ways in different chapters. (Because relatively few students are familiar with simulation software, step-by-step instruction is included in the text.)

Microsoft Project® has become the dominant application software in the field, outselling its closest competitor about 4 to 1. As with the last edition, a free trial version of Microsoft

Project® is included with every copy of the book. Our coverage of software tends, therefore, to be centered on Microsoft Project® (and on Crystal Ball®), but includes a brief discussion of the many "add-ons" that are now available to supplement Microsoft Project® and its competitors. Because the various versions of Microsoft Project® are quite similar in the way that they perform most of the basic tasks of project management, we generally do not differentiate between the versions, referring to any and all simply as Microsoft Project (MSP). We have also added some exercises to the end-of-chapter material that can utilize computer software. Similar materials are also available on the website.

We have also updated and extended the end-of-chapter pedagogical material. We have updated the bibliographies, added additional questions, added new incidents, added some problems (including some now in the Budgeting chapter), and added more cost definitions to the glossary in the Budgeting chapter. In response to queries about the cases at the end of the chapters, these typically integrate materials from previous chapters rather than focusing solely on the content of the chapter where they are placed, though that will be their primary focus.

ONLINE SUPPLEMENTS

The *Instructor's Resource Guide* on the Web site www.wiley.com/go/global/meredith provides additional assistance to the project management instructor. In addition to the answers/solutions to the problems, questions, readings, and cases, this edition includes teaching tips, additional cases, and PowerPoint slides. All of these valuable resources are available online (http://www.wiley.com/go/global/meredith). In addition, the student Web site contains Web quizzes, PowerPoint® slides, Appendix A: Probability and Statistics, Appendix B: Answers to the Even-Numbered Problems, Creativity and Idea Generation, Technological Forecasting, a Glossary, and a Microsoft Project Manual.

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Please visit http://www.wiley.com/go/global/meredith for Appendices. A: Probability and Statistics and Appendix B: Answers to the Even-Numbered Problems.

CHAPTER

1

The World of Projects

The past several decades have been marked by rapid growth in the use of project management as a means by which organizations achieve their objectives. In the past, most projects were external to the organization—building a new skyscraper, designing a commercial ad campaign, launching a rocket—but the growth in the use of projects lately has primarily been in the area of projects internal to organizations: developing a new product, opening a new branch, improving the services provided to customers. As exhilarating as outside projects are, successfully executing internal projects is even more satisfying in that the organization has substantially improved its ability to execute more efficiently, effectively, or quickly, resulting in an agency or business that can even better contribute to society while simultaneously enhancing its own competitive strength. Project management provides an organization with powerful tools that improve its ability to plan, implement, and control its activities as well as the ways in which it utilizes its people and resources.

It is popular to ask, "Why can't they run government the way I run my business?" In the case of project management, however, business and other organizations learned from government, not the other way around. A lion's share of the credit for the development of the techniques and practices of project management belongs to the military, which faced a series of major tasks that simply were not achievable by traditional organizations operating in traditional ways. The United States Navy's Polaris program, NASA's Apollo space program, and more recently, the space shuttle and the development of "smart" bombs and missiles are a few of the many instances of the application of these specially developed management approaches to extraordinarily complex projects. Following such examples, nonmilitary government sectors, private industry, public service agencies, and volunteer organizations have all used project management to increase their effectiveness. Most firms in the computer software business routinely develop their output as projects or groups of projects.

Project management has emerged because the characteristics of our contemporary society demand the development of new methods of management. Of the many forces involved, three are paramount: (1) the exponential expansion of human knowledge; (2) the growing demand for a broad range of complex, sophisticated, customized goods and services; and (3) the evolution of worldwide competitive markets for the production and consumption of goods

and services. All three forces combine to mandate the use of teams to solve problems that used to be solvable by individuals. These three forces combine to increase greatly the complexity of goods and services produced plus the complexity of the processes used to produce them. This, in turn, leads to the need for more sophisticated systems to control both outcomes and processes.

Forces Fostering Project Management

First, the expansion of knowledge allows an increasing number of academic disciplines to be used in solving problems associated with the development, production, and distribution of goods and services. Second, satisfying the continuing demand for more complex and customized products and services depends on our ability to make product design an integrated and inherent part of our production and distribution systems. Third, worldwide markets force us to include cultural and environmental differences in our managerial decisions about what, where, when, and how to produce and distribute output. The requisite knowledge does not reside in any one individual, no matter how well educated or knowledgeable. Thus, under these conditions, teams are used for making decisions and taking action. This calls for a high level of coordination and cooperation between groups of people not particularly used to such interaction. Largely geared to the mass production of simpler goods, traditional organizational structures and management systems are simply not adequate to the task. Project management is.

The organizational response to the forces noted above cannot take the form of an instantaneous transformation from the old to the new. To be successful, the transition must be systematic, but it tends to be slow and tortuous for most enterprises. Accomplishing organizational change is a natural application of project management, and many firms have set up projects to implement their goals for strategic and tactical change.

Another important societal force is the intense competition among institutions, both profit and not-for-profit, fostered by our economic system resulting in organizational "crusades" such as "total quality control," "supply chain management," and particularly prominent these days: "Six-sigma*." The competition that all of these crusades engenders puts extreme pressure on organizations to make their complex, customized outputs available as quickly as possible. "Time-to-market" is critical. Responses must come faster, decisions must be made sooner, and results must occur more quickly. Imagine the communications problems alone. Information and knowledge are growing explosively, but the time permissible to locate and use the appropriate knowledge is decreasing.

In addition, these forces operate in a society that assumes that technology can do anything. The fact is, this assumption is reasonably true, within the bounds of nature's fundamental laws. The problem lies not in this assumption so much as in a concomitant assumption that allows society to ignore both the economic and noneconomic costs associated with technological progress until some dramatic event focuses our attention on the costs (e.g., the Chernobyl nuclear accident, the *Exxon Valdez* oil spill, or the possibility of global warming). At times, our faith in technology is disturbed by difficulties and threats arising from its careless implementation, as in the case of industrial waste, but on the whole we seem remarkably tolerant of technological change. For a case in point, consider California farm workers who waited more than 20 years to challenge a University of California research program devoted to the development of labor-saving farm machinery

*Six-sigma (see Pande et al., 2000; Pyzdek, 2003) itself involves projects, usually of a process improvement type that involves the use of many project management tools (Chapter 8), teamwork (Chapters 5 and 12), quality tools such as "benchmarking" (Chapter 11), and even audits (Chapter 12).

(Sun, 1984). The acceptance of technological advancement is so strong it took more than two decades to muster the legal attack. Consider also the easy acceptance of communication by e-mail and shopping on the Internet.

Finally, the projects we undertake are large and getting larger. The modern advertising company, for example, advances from blanket print ads to regionally focused television ads to personally focused Internet ads. As each new capability extends our grasp, it serves as the base for new demands that force us to extend our reach even farther. Projects increase in size and complexity because the more we can do, the more we try to do.

The projects that command the most public attention tend to be large, complex, multidisciplinary endeavors. Often, such endeavors are both similar to and different from previous projects with which we may be more or less familiar. Similarities with the past provide a base from which to start, but the differences imbue every project with considerable risk. The complexities and multidisciplinary aspects of projects require that many parts be put together so that the prime objectives—performance, time (or schedule), and cost—are met.

Three Project Objectives

While multimillion-dollar, five-year projects capture public attention, the overwhelming majority of all projects are comparatively small—though nonetheless important to doer and user alike. They involve outcomes, or deliverables, such as a new floor for a professional basketball team, a new insurance policy to protect against a specific casualty loss, a new Web site, a new casing for a four-wheel-drive minivan transmission, a new industrial floor cleanser, the installation of a new method for peer-review of patient care in a hospital, even the development of new software to help manage projects. The list could be extended almost without limit. These undertakings have much in common with their larger counterparts. They are complex, multidisciplinary, and have the same general objectives—performance (or *scope*), time, and cost. We refer to these as "direct" project objectives or goals.

There is a tendency to think of a project solely in terms of its outcome—that is, its performance. But the time at which the outcome is available is itself a part of the outcome, as is the cost entailed in achieving the outcome. The completion of a building on time and on budget is quite a different outcome from the completion of the same physical structure a year late or 20 percent over budget, or both.

Indeed, even the concept of performance or scope is more complex than is apparent. Much has been written in recent years arguing that, in addition to time, cost, and specifications, there is a fourth dimension to be considered. This fourth dimension is the expectations of the client (see Darnell, 1997), which sometimes tend to increase as the project progresses, known as "scope creep" (see Chapter 11). One might say that the expectations of the client are not an additional target, *but an inherent part of the project specifications*. However, to consider the client's desires as different from the project specifications is to court conflict between client and project team, each of whom has unique ideas about the deliverables' nature. Also, to separate client desires from project specifications creates conflict because client and team rarely act in concert. The client specifies a desired outcome. *Then* the project team designs and implements the project. *Then* the client views the result of the team's ideas. Despite this logic, differences between the client's expectations and the project team's designs are common. As a result, meeting the client's desires may *not* be well reflected by the specified performance of the project. The expectations of client and project team should be aligned and integrated throughout the entire project, but rarely are.

As a result of the above, we include the nebulous elements of the client's expectations and desires along with the "specified" performance, as stated in the project proposal, as the total "required performance" objective for the project. The three direct project objectives are

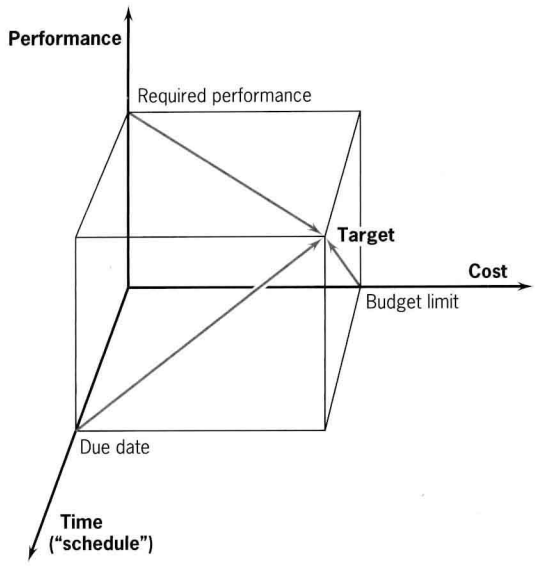

Figure 1-1 Direct project goals—performance, cost, time.

shown in Figure 1-1, with the specified project objectives on the axes. This illustration implies that there is some "function" that relates them, one to another—and so there is! Although the functions vary from project to project, and from time to time for a given project, we will refer to these relationships, or trade-offs, throughout this book. The primary task of the project manager is to manage these trade-offs, along with a fourth, unspecified trade-off that always exists between the direct project objectives/goals and a set of *ancillary* (or process) objectives/goals.

In a more basic sense, those with a stake in the project (the project manager, project team, senior management, the client, and other project stakeholders) have an interest in making the project a success. In a thorough, empirical research study that we will consider in more detail in Chapter 12, Shenhar et al. (1997) have concluded that project success has four dimensions: (1) project efficiency, (2) impact on the customer, (3) the business impact on the organization, and (4) opening new opportunities for the future. The first two are clearly part of what we have defined as the project's direct objectives, the latter two are also specific objectives of the project and are thus direct goals. Ancillary goals include improving the organization's project management competency and methods, individuals' increased managerial experience gained through project management, and similar goals.

One other crucial, but unstated, element of ancillary trade-offs that a PM must consider is the health of the project team as well as the rest of the organization. The PM cannot burn out the team in an attempt to achieve the direct objectives, nor destroy the organization's functional departments in an attempt to meet the project's direct goals. Another ancillary element is the project's *environment*, that is, those things or persons outside the project, and often outside the sponsoring organization, that affect the project or are affected by it. Examples of this environment might be antipollution groups, trade unions, competitive firms, and the like. We will deal with these issues in more detail in Chapter 12.

From the early days of project management, the direct project objectives of time, cost, and performance (as generally agreed to by the client and the organization actually doing the project) have been accepted as the primary determinants of project success or failure. In the past 25 years or so, other direct and ancillary objectives have been suggested. These did not replace the traditional time, cost, and performance, but were added as also relevant. For the most part, however, Chapters 1–11 will focus mainly on the traditional direct objectives.