

Jack R. Meredith

Samuel J. Mantel



**EIGHTH EDITION**

# **PROJECT MANAGEMENT**

**A Managerial Approach**

**International Student Version**



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# PROJECT MANAGEMENT

A Managerial Approach

International Student Version

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## DEDICATION

To Avery and Mitchell, from “papajack.”

J. R. M.

To Maggie and Patty for their help, support, and affection.

S. J. M.

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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, its use has virtually exploded since the mid-1990s. 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.

As the field has grown, so has its literature. There are now professional books and booklets covering every imaginable aspect of project management: earned value calculations, team building, cost estimating, purchasing, project management software, scheduling, leadership, and so on. These are valuable for experienced project managers who can profit from advanced knowledge on specific topics. There are also handbooks—collections of articles written mainly by academics and consultants on selected topics of interest to project managers, somewhat akin to a summarized compilation of the books and booklets just noted.

When we wrote the first edition of this textbook in 1983, there weren't any textbooks for those interested in learning project management, only professional books. Now, however, there are a few, each using a different approach to learning the subject. One approach has been to take a behavioral orientation toward the subject, since teamwork is a key characteristic of projects. Another approach is to cover the basics, or tools, of project management in a straightforward and crisp manner. A third approach is to take a functional perspective, usually either engineering or information systems, since so many projects are engineering or IS endeavors. The approach we have used takes a *managerial* perspective. That is, it addresses project management from the perspective of what the project manager will encounter, both chronologically during the "life cycle" of the project as well as practically, in the sense of what the project manager needs to know and why. With this approach we hope that our educated future project managers understand not only the behaviors, tools, and topics of project

management but also the context so they can apply, or change, the behaviors and tools for each unique situation they face in their projects.

This managerial perspective, we believe, addresses 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 also deals with the problems of selecting projects, initiating and planning them, executing and controlling them, and finally evaluating and terminating them. It discusses the demands made on the project manager and the nature of the manager's interaction with the rest of the parent organization. And the book covers 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 even covers the issues arising when the decision is made to terminate a project.

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 eighth 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. Each part consists of four chapters, which seems to be a comfortable and easy 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 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, the skills the project manager 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 project managers and their teams).

*Part II, Project Planning* then moves into the planning processes starting with the major tools used in project activity and risk 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 Web site. 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.

In writing this text we assume that all readers have taken an elementary course in management or have had equivalent experience, and are familiar with some basic principles of probability and statistics. (Appendix A on the Web site (<http://www.wiley.com/go/global/meredith>) can serve as an initial tutorial on the subject or as a refresher for rusty knowledge.)

Any approach 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 for PMI certification (see Chapter 1) 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. To keep our attitude in perspective, we occasionally offer *Dilbert*® cartoons appropriate to the topic under discussion. Finally, there are questions covering the many 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 materials and concepts covered in earlier chapters. We also offer a *continuing integrative class project* for those users who prefer a running case throughout the chapters that builds on the chapter materials as students progress through the book. And at the very end of each chapter we typically offer a *reading* and/or a *case*, with potential discussion questions at the end of each.

## WHAT'S NEW

In this edition, we have made many updates, additions, and changes.

- Continuing our effort to simplify and shorten the writing, we have eliminated many of the historical explanations of the derivation of particular tools and subjects, as well as descriptions of equivalent topics in other fields, particularly systems engineering.
- One of the authors' sons, an Intel Corp. engineer, upon reading this book, had vociferous complaints about obscure Latin words and historical references, so we eliminated most (though not quite all) of these.
- Equally irritating to him, and to some of the reviewers as well, was our habit of constantly referring to locations where a topic would be again discussed in upcoming chapters, most of which we also eliminated.

We have also put a major effort into aligning the book with the 4<sup>th</sup> edition (2008) of PMBOK® in multiple ways.

- First, we combined most of the risk techniques and discussion throughout the book into Chapter 6, now called "Project Activity and Risk Planning," although we still discuss risk when talking about project selection, budgeting, and control. In the risk discussion we now include examples of FMEA, cause-effect diagrams, risk matrices, and decision trees.
- We moved the risk technique of simulating costs with Crystal Ball® from Chapter 2 to Chapter 7: "Budgeting: Estimating Costs and Risks." Reviewers were concerned that introducing simulation so early in Chapter 2 not only was tackling a difficult subject too early but also made the chapter too long—moving it to Chapter 7 not only gives the student more time to digest the subject but also puts it where it belongs in the costs chapter, which was short to begin with.
- We also followed PMBOK in dropping the concept of the Action Plan in Chapter 6 and instead use the work breakdown structure (WBS) to lay the foundation for project planning.
- We also dropped the concepts of a "master schedule" as well as that of a "project plan," instead referring to the project "charter."
- Last, we refer to the PMBOK more frequently in our discussions, and when we do, we identify where in PMBOK that topic is covered.
- Similar to our aggregating most of the risk topics in one chapter, we also aggregated most of the discussion of "scope creep" in Chapter 11: Project Control. We do mention scope creep in many places throughout the book but the major discussion, including how it arises and how to control it, now is aggregated in Chapter 11.
- Last, we have added a lot more Project Management in Practice examples (sidebars) from the very recent literature (mostly 2010), and deleted some older ones. As well, we have slimmed down some of the lengthy older ones to focus more directly on their message. New discussion questions have been added for the new PMIP examples also, of course.

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. 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 Web site.

A new option now available to educational institutions adopting this Wiley textbook is a free 3-year membership to the MSDN Academic Alliance. The MSDN AA is designed to provide the easiest and most inexpensive way for academic departments to make the latest Microsoft software available in labs, classrooms, and on student PCs.

Microsoft Project 2007 software is available through this Wiley and Microsoft publishing partnership, free of charge with the adoption of any qualified Wiley textbook. Each copy of Microsoft Project is the full version of the software, with no time limitations, and can be used indefinitely for educational purposes. Contact your Wiley sales rep for details. For more information about the MSDN AA program, go to <http://msdn.microsoft.com/academic/>.

There is, of course, the danger that human nature, operating in its normal discreet mode, will shift the task of learning project management to that of learning project management *software*. Projects have often failed because the project manager started managing the software instead of the project. Instructors need to be aware of the problem and must caution students not to fall into this trap.

## ONLINE SUPPLEMENTS

The *Instructor's Resource Guide* on the Web site [www.wiley.com/go/global/meredith](http://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, a computerized test bank, 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.

## ACKNOWLEDGMENTS

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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.*

# Projects in Contemporary Organizations

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, and achieving strategic objectives. 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 engender 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 global financial crisis, the Gulf oil spill). 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 (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.

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\*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).

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 project's objectives—deliverables, time (or schedule), and cost—are met.

### Three Project Objectives: The “Triple Constraint”

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—specified deliverables (also commonly known as *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 scope. 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 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). However, it seems that the expectations of the client are not an additional target, *but an inherent part of the project specifications*. To consider the client's desires as different from the project specifications is to court conflict between client and project team 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 commonly develop as a project proceeds. As a result, meeting the client's desires may *not* be well reflected by the initially specified scope of the project. The expectations of client and project team should therefore be realigned and integrated throughout the entire project,



\*The term “scope” is typically used when differentiating between what is included and what is excluded in something, but in project management the term has come to mean the specified deliverables. The Project Management Institute's Project Management Body of Knowledge (“PMBOK®”) defines Scope as: “The sum of the products, services, and results to be provided as a project.” We will refer to the PMBOK guide frequently throughout this book and use the icon seen here in the margin to draw the student's attention to this important reference (see the PMI reference in the chapter Bibliography). If particular PMBOK Figures, Tables, Sections, or Chapters are relevant to the discussion, we note this under the icon as, for example, 3.2, which means Chapter 3, Section 2.