THE IIL/WILEY SERIES IN PROJECT MANAGEMENT

Managing COMPLEX PROJECTS

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Carl Belack, PMP

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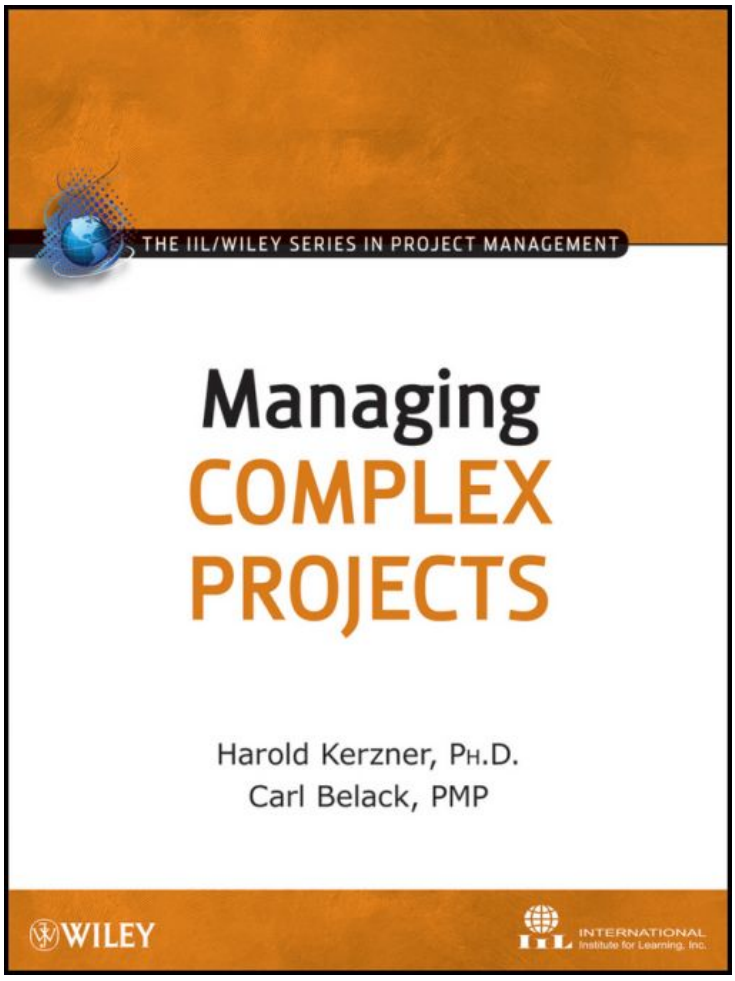
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PREFACE

For more than 50 years, project management has been in use but perhaps not on a worldwide basis. What differentiated companies early on was whether they used project management, not how well they used it. Today, almost every company uses project management, and the differentiation among companies is whether they are simply good at project management or whether they truly excel at project management. The difference between using project management and being good at project management is relatively small, and most companies can become good at project management in a relatively short time period, especially if they have executive-level support. But the difference between being good and excelling at project management is quite large.

For more than three decades, we have become experts in how to manage traditional projects. These traditional projects can be for internal as well as external clients. With these projects, the statement of work is reasonably well defined; the budget and schedule are realistic; reasonable estimating techniques are used, perhaps even estimating databases; and the final target of the project is stationary. We use a project management methodology that has been developed and undergone continuous improvements after use on several projects, and we are able to capture best practices and lessons learned. This traditional project methodology focuses on linear thinking; we follow the well-defined life-cycle phases, and we have forms, templates, checklists, and guidelines for each phase.

Now that we have become good at these traditional projects, we are focusing our attention to the nontraditional

or complex projects. The following table shows some of the differences between managing traditional and nontraditional projects:

Traditional Projects	**Nontraditional Projects**
Time duration of 6-18 months	Time duration can be over several years
The assumptions are not expected to change over the duration of the project	The assumptions can and will change over the project's duration
Technology is known and will not change over the project's duration	Technology will most certainly change
People that started on the project will remain through to completion (the team and the project sponsor)	People that approved the project and are part of the governance may not be there at the project's conclusion
The statement of work is reasonably well-defined	The statement of work is ill-defined and subject to numerous scope changes
The target is stationary	The target may be moving
There are few stakeholders	There are multiple stakeholders

Companies like IBM, Hewlett-Packard, Microsoft, and Siemens are investing heavily to become solution providers and assist clients on a worldwide basis on managing

nontraditional, complex projects. Some of the distinguishing characteristics of complex projects, just to name a few, include:

- Working with a large number of stakeholders and partners, all at different levels of project management maturity, and many of whom may not even understand the technology of the project or project management practices
- Dealing with multiple virtual teams located across the world, and where decisions on the project may be made in favor of politics, culture, or religious beliefs
- Starting projects with an ill-defined scope, thereby requiring numerous scope changes throughout the project and, consequently, having a moving target as an end point
- Working with partners and stakeholders that may have limited project management tools and antiquated processes that are incompatible with the project manager's tool kit
- Long-term projects in which the stakeholders may change, new applicable technologies may emerge, and for which funding needs to be justified on a regular basis
- Project in which the stated goals and objectives are not shared by all key stakeholders

For companies to be successful at managing complex projects on a repetitive basis and function as a solution provider, the project management methodology and accompanying tools must be fluid or adaptive. This means that you may need to develop a different project management methodology to interface with each stakeholder given the fact that each stakeholder may have different requirements and expectations, and the fact that most complex projects have long time spans. And while the

processes in the *PMBOK® Guide* remain useful on complex projects, it's often necessary to supplement the tool set normally used by project managers employing those processes.

The project manager capability set is necessarily expanded for the management of complex projects. To manage projects with the characteristics noted above, the project manager needs to be able to thrive in and manage an environment of constant change—change in technologies, change in the business and market environments, change in organizational structures and policies, and change among the project's key stakeholders. This requires an increased deftness in the management of what are traditionally known as the "soft skills" of project management—team building, stakeholder management, and leadership, to name a few. There has always been a need for technical credibility and some business knowledge in traditional project management. However, managing complex projects, with their emerging emphasis on returning real business value to both the owner and the contractor, requires an added understanding of the business implications not only of the project itself but also of the project's end product and its value to end users. Finally, the transnational nature of many complex projects requires both political astuteness and cultural sensitivity.

The 4th edition of the *PMBOK® Guide* does an excellent job emphasizing the importance of stakeholder management. Stakeholder management, the first process of the Communications Management knowledge area, may very well be one of the keys to successful management of complex projects. Equally important is the management of project risk, since all of the uncertainties associated with the management of complex projects boils down to risk management. The mastering of the remaining processes of

the Communications Management knowledge area, an area of project management in which project managers spend the preponderance of their time, is also a critical success factor in the management of complex projects.

In this book, we first set out to describe project management in terms of its application to, and the differences between, traditional and complex projects. We spend the rest of our time looking at each of the nine knowledge areas of the *PMBOK® Guide* and show how some of the knowledge may have to be applied differently when managing complex projects. The *PMBOK® Guide* is certainly applicable to complex projects, but other factors, such as enterprise environmental factors, may take on a higher degree of importance than they normally would.

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Chapter 1

PROJECT MANAGEMENT FRAMEWORK

PROJECT CHARACTERISTICS

- Have a specific objective (which may be unique or one-of-a-kind) to be completed within certain specifications
- Have defined start and end dates
- Have funding limits (if applicable)
- Have quality limits (if applicable)
- Consume human and nonhuman resources (i.e., money, people, equipment)
- Be multifunctional (cut across several functional lines)

We must begin with the definition of a project. Projects are most often unique endeavors that have not been attempted before and might never be attempted again. Projects have specific start and end dates. In some cases, projects may be very similar or identical and repetitive in nature, but those situations would be an exception rather than the norm. Because of the uniqueness of projects and their associated activities, estimating the work required to complete the project may be very difficult and the resulting estimates may not be very reliable. This may create a number of problems and challenges for the functional manager.

Projects have constraints or limitations. Typical constraints include time frames with predetermined milestones, financial limitations, and limitations regarding quality as identified in the specifications. Another typical constraint may be the tolerance for risk and the amount of risk that the project team or owner can accept. There may also be limitations on the quality and skill levels of the resources needed to accomplish the tasks.

Projects consume resources. Resources are defined as human—people providing the labor and support; and nonhuman—equipment, facilities, and money, for example.

Projects are also considered to be multifunctional, which means that projects are integrated and cut across multiple functional areas and business entities. One of the primary roles of the project manager is to manage the integration of project activities. The larger the project, and the greater the number of boundaries to be crossed, the more complex the integration becomes.

THE COMPLEXITY OF DEFINING *COMPLEXITY*

Projects are usually defined as being complex according to one or more of the following elements interacting together:

- Size
- Dollar value
- Uncertain requirements
- Uncertain scope
- Uncertain deliverables
- Complex interactions
- Uncertain credentials of labor pool

- Geographic separation across multiple time zones
- Other factors

Complex projects differ from traditional projects for a multitude of reasons, many of which are shown in the following feature. There are numerous definitions of a complex project. The projects that you manage within your own company can be regarded as a complex project if the scope is large and the statement of work only partially complete.

Some people believe that research and development (R&D) projects are always complex because, if you can lay out a plan for R&D, then you probably do not have R&D. R&D is when you are not 100 percent sure where you are heading, you do not know what it will cost, and you do not know when you will get there.

Complexity can also be defined according to the number of interactions that must take place for the work to be executed. The greater the number of functional units that must interact, the harder it is to perform the integration. The situation becomes more difficult if the functional units are dispersed across the globe and if cultural differences makes integration difficult.

Complexity can also be defined according to size and length. The larger the project in scope and cost, and the greater the time frame, the more likely it is that scope changes will occur affecting the budget and schedule. Large, complex projects tend to have large cost overruns and schedule slippages. Good examples of this are Denver International Airport, the Chunnel between England and France, and the “Big Dig” in Boston.

COMPONENTS OF COMPLEX PROJECTS

For the purposes of this book, we will consider complex projects to be defined according to the five elements shown in the preceding feature:

- *Size and cost*. According to size, we shall assume that this project is possibly one of the largest and most costly projects that you have ever worked on. The budget could be in hundreds of millions or, if your company works on projects up to $5 million, then this project might be $20 million. Furthermore, the project is being accomplished for a client external to your company.
- *Interactions*. You must interface with several subcontractors or suppliers, and many of them may be in different time zones. You are most likely using a virtual team concept for all or part of the people you must interface with.
- *Cultural implications*. Because some or all of your team members may come from various locations around the globe, cultural differences can have a severe effect on the management of the project.
- *Uncertainty*. This project is unlike any other project you have managed, and there is a great deal of uncertainty. The uncertainty deals with not only the

scope and the deliverables, but also with the size of the project team and the cultural differences.

- *Stakeholders*. There are several stakeholders that you must interface with, and getting them all to agree on the scope, the deliverables, and the approval of change requests will be difficult. Stakeholders may have their own agendas for the project, and each stakeholder may have funded part of the project.

THE TRIPLE CONSTRAINT

Project management is an attempt to improve efficiency and effectiveness in the use of resources by getting work to flow multidirectionally through an organization. This holds true for both traditional projects and complex projects. Initially, this might seem easy to accomplish, but there are typically a number of constraints imposed on a project. The most common constraints are time, cost, and performance (also referred to as scope or quality), known as the triple constraints.[3]

From an executive management perspective, the preceding feature is the goal of project management,

namely, meeting the triple constraints of time, cost, and performance while maintaining good customer relations. Unfortunately, because most projects have some unique characteristics, highly accurate estimates may not be possible, and trade-offs among the triple constraints may be necessary. Executive management and functional management must be involved in almost all trade-off discussions to ensure that the final decision is made in the best interest of both the project and the company. If multiple stakeholders are involved, as there are on complex projects, then agreement from all of the stakeholders may be necessary. Project managers may possess sufficient knowledge for some technical decision making, but may not have sufficient business or technical knowledge to adequately determine the best course of action to address interests of the company as well as the project.

The preceding feature shows that resources are consumed on a project. Typical traditional resources include money, manpower, information, equipment, facilities, and materials. Assuming that the project manager and functional manager are separate roles assigned to different people, the resources are generally administratively under the control of the functional managers. The project managers must therefore negotiate with the functional managers for some degree of control over these resources. It is not uncommon for project managers to have minimal or no direct control over project resources and to rely heavily on the functional managers for resource-related issues. The resources may be in a solid line type of reporting relationship to their functional manager and dotted line or indirect reporting to the project manager. The solid-dotted line relationship can become quite difficult to manage if the resources are under the control of functional managers geographically separated from the project manager.

Some people argue that project managers have direct control over all budgets associated with a project. The truth of the matter is that project managers have the right to open and close charge numbers or cost accounts for a project. But once the charge numbers are opened, the team members performing the work and their respective functional managers are actually in control of how the money is being spent as long as the charge number limits are not exceeded. With geographically dispersed teams, the problem of monitoring and controlling funds can create monumental headaches. Currency exchange rates also add to the complexity.

SECONDARY SUCCESS FACTORS

Secondary Factors

- Customer reference
- Commercialization
- Follow-on work
- Financial success
- Technical superiority
- Strategic alignment
- Regulatory agency relationships
- Health and safety
- Environmental protection
- Corporate reputation
- Employee alignment
- Ethical conduct (Sarbanes-Oxley law)

In the previous features, we discussed that time, cost, and performance were the primary components to the triple constraint. Project success is usually measured by how well we perform within the triple constraint. While that is true, there are secondary constraints that can be of greater importance to stakeholders than the primary constraints. As an example, a company agreed to execute a contract for a client at a contract price that was 40 percent below their own cost of doing the work. When asked why they bid on the contract at such a low price and knew full well that they would be losing money, an executive said: “We are doing this only once. We need to the client’s name on our resume of clients that we have serviced.” In this case, the contractor’s definition of success was customer reference.

In another example, the R&D group of a manufacturer of paint products stated that their definition of success was measured by product commercialization. Any R&D project that eventually gets commercialized is viewed as a success. While this definition seems plausible, there may be a problem if marketing and sales cannot find customers for the product. In other words, we can have project success

but product/program failure. It is better if both project and program success are achieved.

In a third example, an aerospace company underbid the initial contract to develop a complex product for the Department of Defense. When asked why the R&D effort was bid at a loss, the company responded that they would make up the difference when they were awarded the follow-on contract. In this case, success was measured by the amount of work to be received in the future.

OTHER SUCCESS FACTORS

Other Factors

- With minimum or mutually agreed upon scope changes
- Without disturbing the normal flow of work within the business
- Without changing the corporate culture
- Without a disruption to organizational governance

There are many components of project success. Most components of success involve the deliverables provided at the end of the project. However, for large, possibly long-term complex projects, there can also exist components of success related to changes that occurred in the company in the way the project was executed. On complex projects with multiple stakeholders and possibly several contractors, each company involved in the project can be impacted differently.