to the furthering of project management. PMI is growing rapidly, which is one indicator of the growing importance of project management.[2]

PMI has done an excellent job of defining the characteristics of projects through global standards. These standards are widely accepted and, as claimed by PMI, "when consistently applied, they help you, your global peers and your organization achieve professional excellence."

The most important standard published by PMI is known as the *PMBOK®*.[3] The official title of the *PMBOK* is *A Guide to the Project Management Body of Knowledge* [3]. PMI defines the *PMBOK* as the standard formal document that describes established norms, methods, processes, and practices.

> *The PMBOK® Guide is the standard for managing projects most*[4] *of the time across many types of industries. This standard describes the project management processes, tools, and techniques used to manage a project towards a successful outcome.*

The *PMBOK* mostly addresses project management, but it also contains information about the project environment, such as program and portfolio management. It also contains information from other disciplines, such as communications theory, risk management, and quality control.

While the *PMBOK* is the definitive standard, we do not feel obligated to slavishly follow every word. Project management is a complex endeavor and applicable to a wide range of industries. We are quite comfortable challenging the *PMBOK* when we have experience, data or research to suggest a better approach. In fact, we encourage our students to examine critically all their readings, not just the *PMBOK*.[5]

1.2 What is a Project?

We begin with the formal PMBOK definition of a project:

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

A project is considered to be a unique endeavor, in that it has never been done before. Projects must be carefully distinguished from routine activities, which are repetitive in nature.

[2] The PMI website *pmi.org* has a massive collection useful information on all aspects of project management.

[3] *PMBOK* is usually pronounced as pim-bock.

[4] Most? Some standard!

[5] Challenge Everything!

This is a somewhat cryptic definition that obscures a lot of important information.[6] For example, the word "temporary" is expanded to mean that a project has definite beginning and end dates.[7] The word "temporary" is also a little unusual because it implies a short duration activity while projects often continue for long periods. A skyscraper may take many years to build. Even so, the project to create the skyscraper is referred to as a *temporary endeavor*.

The word "unique" is also a loaded term. Here, the word means that the project has not been done before. There are of course, repetitive aspects of a project, even if the overall result is unique. In our skyscraper example, the building may be highly original in design, and therefore unique. Within the construction, however, many activities are quite routine, e.g., installing the light fixtures in each floor.

The uniqueness of projects requires further clarification. Suppose one is building several houses in a development, and all of the houses have the same design. One might argue that the first house is a project, since it is unique. Building the remaining houses might be considered routine, and not really projects. It is likely, though, that one would continue to treat the other houses as projects, and manage their construction in a disciplined way.

A definition should stand alone, and precisely define a concept. We believe the above definition does not work very well in this regard, e.g., it needed several paragraphs just to clarify the idea of "temporary." Therefore, we provide another definition that we believe is more helpful:

> *A project is unique, non-routine effort, limited by time and budget, defined by a performance specification, and designed to meet stakeholder needs.*

Rather than defining a project as temporary, we used the phrase "unique, non-routine." This clarifies the idea that a project is different from anything that went before. Also by avoiding the word "temporary," we eliminate the confusion about projects that take many years, or even decades to complete. The definition also clarifies the important distinction between routine activities and projects.

The limitations on cost and schedule are also important additions. Often, some of the first questions asked about a project are: How much will it cost? When will it be completed? Since every project is limited by cost and schedule, it is appropriate to include these ideas in the definition.

Including the performance specification explains how the project is defined. The performance specification is part of the scope, which is the most important document in the project, and highlighting it in the definition elevates its importance.

[6] And, therefore, we have no problem challenging it.

[7] An activity without an end date is technically, not a project. This is a favorite trick question on exams.

Finally, the project must meet stakeholder needs. We note the use of the word, "stakeholder," who is anyone with a stake in the project. Sometimes, the word, "customer," is used in the definition, but the customer is only one of many stakeholders. It is not unusual to have stakeholders who would be happy to see the project fail, and managing such naysayers is a challenging activity. For example, in the construction of a new sidewalk, the owners of the stores lining the route may be negatively affected during construction, and might prefer that the project not be done at all.

Projects are characterized as follows:

- *Projects have an established objective.*

  In the early stages of a project's conceptual development, the project is defined by its charter, which is a short overview of the goals and objectives, and perhaps a desired schedule and rough budget. The first activity of the project is typically the development of the scope, which precisely defines the project.

- *Projects have a well-defined life span.*

  Projects have a beginning date and an end date. If activities continue indefinitely into the future, then technically it is not a project. In general, it is a good idea to break up long projects into several shorter projects, each with a well-defined objective, budget, and completion date.

- *Projects require staff participation from across the organization.*

  Projects are inherently multi-disciplinary. For example, when building a house, the project manager must interact with the architect and the contractor, as well as assorted subcontractors such as roofers, plumbers, electricians, and carpenters. There are also technical requirements such as the permitting process, gas company installation and approval procedures, and voluminous fire codes, electrical codes, and environmental regulations.

  Project managers must also interact with professionals such as accountants, lawyers, engineers, and human resources personnel. Project managers will quickly find themselves immersed in many disciplines.[8]

- *Projects have defined schedules and budgets.*

  No project has the luxury of an infinite cost or schedule. Customers always have an assigned budget and a preferred delivery schedule.

- *Projects have limited resources.*

[8] There is a fascinating debate about whether a project manager can be successful if he or she does not possess technical expertise in the project's discipline. Does a project manager need to be a subject matter expert, or are project management skills universally applicable?

Resources include staff and equipment, which must be managed. Other factors may limit the performance of the project, such as competition with other projects for staff and the availability of funds.

- *Projects have multiple, often competing, stakeholders.*

  The project manager and the team are obvious stakeholders, but there are many more, including the sponsor (who pays the bill), customers, users, and trainers. Upper management also has a stake in the project's success, but if things are not going well, it may be in their best interest to cancel the project!

1.2.1 Project Time Scales

Projects have widely different time scales. Table 1.1 shows typical time scales for projects in different industries.

Table 1.1: Project time scales by industry.

Industry	Typical Project Time Scale
Military Jet	15-20 years
Mega Project Construction	10-15 years
Skyscraper Construction	3-5 years
House Construction	3-6 months
Software System	1-2 years
Web Site Construction	3-6 months
Insurance Product	1 month

1.3 Project Management

You want to study project management?
Read more, sleep less!

John Cable

Project management is the term applied to the process of managing projects.

Because projects are unique, it is difficult to develop a completely standardized approach. There is seldom a "right" way to proceed, one is always dealing with

uncertainty. On the other hand, standardized methods have evolved which reduce the risks associated with dealing with the unknown.

The Project Management Institute (PMI) defines project management as:

> *Project Management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.*

As with professions such as law, medicine, and accounting, the body of knowledge rests with the practitioners and academics who apply and advance it. The PMBOK includes proven traditional practices that are widely applied, as well as innovative practices that are emerging. As a result, the PMBOK is constantly evolving.[9]

> *The PMBOK Guide® provides guidelines for managing individual projects. It defines project management and related concepts and describes the project management life cycle and the related processes.*

How should the PMBOK be used? The project team should consult the PMBOK to identify the processes that are relevant to their own individual project objectives. Company and environmental factors may constrain project options and, therefore, affect the selection of relevant processes.

For example, it may be decided that from the planning process group, a process called *Identify Risks* is necessary and should be integrated into the specific project life cycle. When considering such a process for inclusion, it is useful to identify the relevant inputs and outputs, any forms or company templates that already exist, and any related documents.

The entire life cycle should be tailored to meet the project's and sponsor's requirements in the most efficient manner. The workload of including a process must be balanced against the elimination of the associated deliverables. Every project needs a well-constructed *scope*, and so eliminating the *Define Scope* process is a bad idea. On the other hand, if there are no subcontractors, then one can safely eliminate *Procurement Management Planning*.[10]

As an illustration of tailoring the PMBOK, for small projects we frequently combine the four PMBOK risk processes: *Identify Risks*; *Perform Qualitative Risk Analysis*; *Perform Quantitative Risk Analysis*; and *Plan Risk Responses*. We define a customized process that we call *Create Risk Management Plan*.[11]

Since every project is unique, no two life cycles will be the same. Also, the rigor with which each process is executed varies from one project to another. If the

[9] That the standard is evolving is often neglected. However, as a student of project management, your job is to question the standard, and to improve it, wherever possible.

[10] We do not recommend eliminating this entirely from the Management Plan. It is better to briefly state, "No subcontractors are planned." That way, if you later decide you need subs, you have a place to put the information in the plan.

[11] Note that we actually use the PMBOK as a checklist to ensure that we include all the necessary pieces. It would do no good if we forgot to plan the risk responses!

project is mission critical, or if the project team is not experienced, one should use more rigor in implementing and executing each process. An example of 'more rigor' is to enforce the processes and conscientiously review all deliverables and documentation.

Table 1.2 lists project management skills and classifies them. Fortunately, coming to the aid of the modern project manager is a discipline and methodology that provides support and professionalism in both arenas.

Table 1.2: The technical and sociocultural skills of project management.

Technical Skills	Sociocultural Skills
Scope Production	Stakeholder Management
Work Breakdown Structure	General Management
Cost & Schedule Management	Staff Management
Resource Contention	Leadership
Critical Path Management	Negotiation Skills
Earned Value Management	Politics

A project manager needs two types of skills:

1. *Sociocultural Skills:* A project manager interacts with diverse stakeholders, many of whom have different goals. The project manager reports to upper management and customers. Also, the project manager must acquire the team and develop their skills. Communication skills are therefore a critical aspect of project management.[12]

   These are often referred to as "soft" skills, and include general management skills, interpersonal communications, and staff development.[13]

2. *Technical Skills:* A project manager must be able to perform a variety of technical analyses, such as determining the value of the project to stakeholders, performing a cost estimate, constructing a work breakdown structure, building a network diagram, determining if the project is on schedule, and whether it is over or under budget. These are essential skills, as every customer wants to know the cost and the schedule.[14]

[12] Vijay is often heard to say, "Communication is 90% of project management."

[13] We prefer to think of these as the *art* of project management.

[14] We prefer to think of these as the *science* of project management.

1.4 The Project Manager

> **Managing is essentially a loser's job, and managers are about the most expendable pieces of furniture on the earth.**
>
> *Ted Williams, The Splendid Splinter.*

Let's begin with the definition:

> *The project manager is the person assigned to achieve the project's objectives.*

In this book, we are always going to assume that you, dear reader, are the project manager. Whenever we ask a question, or expect you to analyze a problem, we always assume that you should answer it from the project manager's point of view.

The project manager must possess three characteristics: Knowledge about project management; the ability to perform as a project manager; and personal effectiveness, which encompasses both skills and personality traits.

The project manager often has responsibility without authority. Rarely does the project manager have the luxury of being able to order people around. The interdisciplinary nature of projects, and the diverse skills required, means that few, if any, of the staff work directly for the project manager. Therefore, one of the key skills required of a project manager is being able to *induce* the right people to do the right thing at the right time. This includes their staff, stakeholders, customers, and even upper management. This leads to one of our most cherished beliefs:

> Project managers *induce* people to perform.

The role of the PM is to:

1. Plan and organize the project from start to finish.
2. Manage relations with stakeholders and, in particular, customers.
3. Manage relations with the parent company.
4. Develop and manage the project team.
5. Monitor and control project progress, particularly the costs and schedule.

6. Deal with uncertainty and changes.

7. Deliver the product or service and get the customer's acceptance.

Project managers must exercise control and provide leadership to their team. At the same time, they cannot do everything and so must learn to delegate, follow up, and provide training and encouragement as needed.

Since projects have not been done before, project managers must deal with uncertainty. Almost everything in project management is a compromise, there are rarely correct answers. Projects are inherently messy, and change is a fact of life. Project managers must deal with complexity and ambiguity, and be able to prioritize.

Project managers live in a permanent competition for resources. They compete for staff and with other projects for resources. They referee stakeholders, all of whom have different goals, objectives and priorities.[15]

1.4.1 Interactions

The project manager interacts with many different constituencies:

- *Stakeholders.* This is the most important group. Failure to carefully manage stakeholders will jeopardize the project. Stakeholders are usually a diverse group with competing priorities.
- *Upper Management.* The project manager must understand the role of the project in the company's strategy, and be able to defend its budget.[16]
- *Sponsor.* The person who pays for the project will want regular cost and schedule updates.
- *Customers.* The people who set the expectations for the final product or service.
- *Project Team.* It is the project manager's job to *induce* the team to perform to the best of their ability.
- *Functional Areas.* These are typically the company departments that provide the staff to the project, and may include:
  - System designers and architects.
  - Subject matter experts.
  - Business analysts, lawyers, and accountants.

[15] Challenging enough for you?

[16] We regard this a nothing less defending one's job security!

- Contractors and subcontractors.
- Testers and quality control staff.

1.5 Benefits of Project Management

There are two main benefits to a disciplined approach to project management:[17]

- *You are not alone.* There is a mountain of information available: Literature, templates, and advice. You can access it, and learn from others. Someone has probably done something similar.
- *Powerful Tools.* The critical path tells you which activity is the most important one to work on now. Earned value tells you how much your project is over budget and behind schedule. You may not like the answers, but at least you'll know the truth.

1.5.1 Project Success

A significant challenge of project management is that every project must aim to be successful. In a routine manufacturing environment, the failure of a few products (out of a million) might not be regarded as catastrophic. However, the failure of a project critical to the mission of a company might lead to a crash of the entire company. Finally, projects are almost always produced to a tight deadline with constrained funds. This all adds pressure to the project manager to succeed.

When discussing "success," however, it is important to distinguish between: [5]

1. *Project management success.* . This is typically measured in terms of the quality of the process, e.g., whether the project was delivered on schedule and within budget.
2. *Project success.* This is usually defined in terms of product quality, and measured by whether the project met its overall objectives, e.g., its critical success factors.[18]

One should also distinguish between size and importance because the importance of a project is not necessarily related to its size. Small, mission-critical projects are much more important than their larger non-critical cousins. Neither is technical complexity related to size. Small, mission-critical, technically challenging projects will require the best from a project manager.

[17] As explained in the introduction, we are resisting the urge to say that you will deliver your project on schedule and on budget.

[18] Despite being over budget and late, did the project deliver value to the stakeholders?

The subject of project failure garners a lot of attention. First, we point out that *failure* is a complex concept: Is a project a failure if it successfully meets stakeholder needs but comes in late and over budget? Is a project successful that is on time and on budget, but leaves some stakeholders unhappy?

One of the most quoted sources of project failure is the *CHAOS Report* by the Standish Group who studied 365 companies with a total of 8,380 Information System applications. [6] The report divided projects into three distinct outcomes, as shown in Table 1.3.

Table 1.3: The CHAOS data on project failure.

Project Outcome	1994	2009	Definition
Successful	16%	32%	Completed on time and budget, with all features as specified.
Challenged	53%	44%	Completed, but were over cost, over time, and/or lacking features
Impaired/Failed	31%	24%	Abandoned or canceled **Total losses!**

The first percentage is for the original data from 1994, and the second is for 2009. While these are Information Technology (IT) projects, similar data exists for other types of projects in other countries and industries. The point is that while things have improved somewhat in 15 years, the CHAOS data suggest that most projects fail!

There are major criticisms, however, of the Standish interpretation of "failure." [7] For example, a project 25% over budget that meets stakeholder needs and is on time is a failure according to the Standish criteria.

Another interesting factor is the forecast bias. The data is biased in that it ignores projects that under-run in cost and time. Since most people underestimate their forecast,[19] without taking these biases into account the Standish data are highly suspect.

These are excellent examples of a technique that we wish to inculcate into our reader: Challenge Everything![20]

[19] Whether by design or ignorance is another fascinating question

[20] Just because you read it in a fancy report, you don't have to take it for granted. Ask questions. Examine assumptions. Find your own data.

CHAPTER 2

THE PROJECT ENVIRONMENT

There are two ways of being creative. One can sing and dance.
Or one can create an environment in which singers and dancers flourish.

Warren G. Bennis

A project manager must be aware of the external environment surrounding the project, as well as creating a positive internal environment for the team.

2.1 The Internal Environment

The internal project environment influences team members' attitudes and their desire to perform. For a project to succeed, team members must be committed to the project's goals and care about producing a quality product or service.[1] A positive internal environment includes:

1. A corporate culture that acknowledges and appreciates the efforts of team members.
2. Good working relationships among team members.
3. Clear and open communications.

[1] Again, we see the idea that you cannot 'order' someone to succeed, you can only create an environment that helps them to succeed.

4. An environment of trust.
5. A willingness to take risks.
6. Recognition of efforts and achievements.

Apart from the first item, which depends on the corporate climate, these qualities are the responsibility of the project manager. They are important because they relate directly to the characteristics of a project. Since projects are unique, the project manager must ensure that everyone understands both the objectives and their own roles. A willingness on the part of the team to take risks is required because they are venturing into uncharted territory.

2.2 The External Environment

The external environmental influences include:

1. The parent company, including upper management.
2. Organizational assets, including policies and procedures, lessons from previous projects, etc.
3. The company culture, existing staff, and company investment in tools and technologies.
4. The political environment, including government policies, tax incentives, etc.
5. The business climate, including company strength, business strategies, and access to funds.
6. The geographical setting, including environmental issues.
7. Social commitments, including benefits and working conditions.

2.3 The Project's Rationale

An important and critical aspect of the external environment is the business need of the project—its rationale for existence. This need is documented in the business case, and must be aligned with company objectives. (This is covered in the section on portfolio management 2.4.2.)

If the need for the project disappears, the project will also disappear. A threat to all projects is the evolution of the business that eliminates the need for the project. Project managers must be on the lookout for this.[2]

2.4 Programs

Programs are collections of projects that have a natural association, and are managed together for mutual benefit. The definition of a program is:

> *A program is a group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually.*

Suppose a company's marketing department creates a program to launch a new product. That program might include the following projects:

- Launch the product at a national trade show.
- Plan and implement a marketing campaign.
- Create the supply chain for the product.
- Create new marketing channels for the product.

Sometimes a program has routine activities as part of its mission. In the above example, routine activities might include updating the marketing materials and publication of a weekly sales brochure to selected clients.

An organization that uses the term "program" in the way we have defined it is NASA. For example, NASA's Mars exploration program consisted of many projects, including Spirit and Opportunity Launches, 2001 Mars Odyssey, Mars Express, and the Mars Reconnaissance Orbiter.

[2] No project, no job!

2.4.1 The Program Management Office

Program management is often accomplished in a Program Management Office (PMO).[3] A Project Management Office is responsible for the coordinated management of projects. The job of the PMO is to:

- Develop and manage the company standards, policies and procedures that apply to projects.

[3] Note: The PMBOK defines the PMO organization as the *Project* Management Office. A program is a collection of projects, and managing them collectively is the job of the PMO. Therefore, we believe it is more correct to call it the *Program* Management Office. Besides, almost all companies call it that.

- Invest in project management technology, best practices, tools and techniques, and implement them across projects.
- Manage the information technology system
- Supervise functions that are managed centrally, such as the portfolio selection system, and risk pools.
- Collect and manage lessons learned.

2.4.2 Portfolios

A portfolio is an entity that is managed from a business perspective. A comparison of portfolios, programs and projects is shown in Table 2.1, which is based on a similar table in the PMBOK.

> *A portfolio is a collection of programs, projects, products, and routine activities managed together for mutual benefit.*

That is, a portfolio consists of all the activities necessary to make a product (or line) successful. Portfolios, therefore, include projects, programs, as well as routine activities.

Table 2.1: A comparison of portfolios, programs, and projects.

	Projects	Programs	Portfolios
Scope	Clearly defined objective	Wider scope with corporate objectives	Business objectives aligned with corporate strategy
Planning	Progressive elaboration of project objectives	Program plan	Business Plan
Management	The project	The program	The portfolio
Success	Meets stakeholder objectives, within cost & schedule	Meets business objectives	Meets corporate objectives

Developing a new product is a project, but the activities to make the product successful include many routine activities such as marketing, product maintenance, inventory control, and customer service. A new product cannot be successful without all of these non-project activities, so it makes sense for a company to manage it all as a coherent whole.

2.5 Mission, Goals, Objectives, and Strategy

A project manager must be able to define and articulate clearly the link between their project and the company's mission, goals, and objectives. Projects compete for both client and company funds and resources, and projects without a clear link to the mission are at risk of cancellation.[4] Every project manager should have an "elevator speech" about why the company cannot possibly survive without their particular project.[5]

Therefore, it is important to understand the precise difference between mission, goals, objectives, and strategy, as well as their relation to portfolios, programs, and projects.

2.5.1 Mission

The mission is the company's reason for existing. The mission statement is often aspirational, providing the vision and values for the company. It defines who you are, what you do, and why. Every project must have a clear link to the mission and strategy. Otherwise, why do it?

For example, Google's mission is to "organize the world's information and make it universally accessible and useful." Notice that this does not say anything about search engines. If I had asked you what Google is known for, you'd probably say something about web searching.

Google's is an excellent example of mission statement. It is concise and clear, and sets out their goals for everyone to see. An excellent example of how that mission statement helped to guide Google is to think about what happened when digital mapping became available. If the Google mission had been to create a great search engine, then digital mapping might have been viewed as outside the realm of their mission. But since their mission is to 'organize information,' and maps are an organizational tool, digital mapping was clearly within their domain.

Many companies had the capabilities to include mapping in their portfolios, but failed to see the link to the organization of information. Google understood that mapping was clearly linked to their mission and became one of the leading mapping companies.

2.5.2 Goals

The goals are what you wish to accomplish. For example, a company goal might be to: *Diversify our products to get into new markets.*

[4] Again, it is simply job security to be able to defend your project.

[5] The notion of an elevator speech is that if you find yourself in the elevator with the President of the corporation, you have about 60 seconds to justify your existence. Practice it.