The good news is that project managers are learning how to succeed more often; the bad news is that it is still very difficult to lead successful IT projects. "The reasons for the increase in successful projects vary. First, the average cost of a project has been more than cut in half. Better tools have been created to monitor and control progress and better skilled project managers with better management processes are being used. The fact that there are processes is significant in itself."[16]

Despite its advantages, project management is not a silver bullet that guarantees success on all projects. Project management is a very broad, often complex discipline. What works on one project may not work on another, so it is essential for project managers to continue to develop their knowledge and skills in managing projects. It is also important to learn from the mistakes and successes of others.

Project Success

How do you define the success or failure of a project? The list that follows outlines a few common criteria for measuring the success of a project using the example of upgrading 500 desktop computers within three months for $300,000:

1. *The project met scope, time, and cost goals.* If all 500 computers were upgraded and met other scope requirements, the work was completed in three months or less, and the cost was $300,000 or less, you could consider the project successful. The Standish Group studies used this definition of success, but several people question this simple definition of project success and the methods used for collecting the data. (See the references by Glass on the companion Web site for this text to read more about this debate.)
2. *The project satisfied the customer/sponsor.* Even if the project met initial scope, time, and cost goals, the users of the computers or their managers might not be satisfied. Perhaps the project manager or team members never returned calls or were rude. Perhaps users had their daily work disrupted during the upgrades or had to work extra hours due to the upgrades. If the customers were not happy with important aspects of the project, it would be deemed a failure. Conversely, a project might not meet initial scope, time, and cost goals, but the customer could still be very satisfied. Perhaps the project team took longer and spent more money than planned, but they were very polite and helped the users and managers solve several work-related problems. Many organizations implement a customer satisfaction rating system to measure project success instead of tracking only scope, time, and cost performance.
3. *The results of the project met its main objective, such as making or saving a certain amount of money, providing a good return on investment, or simply making the sponsors happy.* Even if the project cost more than estimated, took longer to complete, and the project team was hard to work with, the project would be successful if users were happy with the upgraded computers, based on this criterion. As another example, suppose that the sponsor approved the upgrade project to provide a good return on investment by speeding up work and therefore generating more profits. If those goals were met, the sponsor would deem the project a success, regardless of other factors involved.

Why do some IT projects succeed and others fail? Table 1-2 summarizes the results of the 2011 CHAOS study; the factors that contribute most to the success of IT projects are listed in order of importance. The study lists user involvement as the most important factor, followed by executive support. A few of the top success factors relate to good scope management, such as having clear business objectives and optimizing scope. Project management expertise continues to be a key success factor. In fact, experienced project managers, who can often help influence all of these factors to improve the probability of project success, led 97 percent of successful projects, based on an earlier CHAOS study in 2001.

TABLE 1-2 What helps projects succeed?

1. User involvement
2. Executive support
3. Clear business objectives
4. Emotional maturity
5. Optimizing scope
6. Agile process
7. Project management expertise
8. Skilled resources
9. Execution
10. Tools and infrastructure

Source: The Standish Group, "CHAOS Activity News" (August 2011).

A 2011 U.S. government report listed the top three reasons why federal technology projects succeed:

1. Adequate funding
2. Staff expertise
3. Engagement from all stakeholders

Notice that the CHAOS study list does not include adequate funding. Most nongovernment companies must either find adequate funds for important projects or cancel projects if they cannot be funded or get an adequate return. Government projects often require that funds be allocated a year or more before they even start, and estimates often fall short. "The government has struggled when acquiring technology thanks to the convoluted nature of the federal contracting process and the shortage of qualified contracting officers and technical personnel. Critics argue that federal agencies get little return for the $80 billion the government spends annually on IT. ... 'History has shown that government IT projects frequently face challenges of meeting cost, schedule or performance goals,' said Sen. Susan Collins (R-Maine) in a statement."[17] It is interesting to compare success factors for IT projects in the United States with those in other countries. A 2004 study summarizes the results of a survey of 247 information systems project practitioners in mainland China. One of the study's key findings was that relationship management is viewed as a top success factor for information systems in China, while it is not mentioned in U.S. studies. The study also

suggested that having competent team members is less important in China than in the United States. The Chinese, like the Americans, included top management support, user involvement, and a competent project manager as vital to project success.[18]

It is also important to look beyond individual project success rates and focus on how organizations as a whole can improve project performance. Research comparing companies that excel in project delivery—the "winners"—from those that do not found four significant best practices. The winners:

1. *Use an integrated toolbox.* Companies that consistently succeed in managing projects clearly define what needs to be done in a project, by whom, when, and how. They use an integrated toolbox, including project management tools, methods, and techniques. They carefully select tools, align them with project and business goals, link them to metrics, and provide them to project managers to deliver positive results.
2. *Grow project leaders.* The winners know that strong project managers—referred to as project leaders—are crucial to project success. They also know that a good project leader needs to be a business leader as well, with strong interpersonal and intrapersonal skills. Companies that excel in project management often grow or develop their project leaders internally, providing them with career opportunities, training, and mentoring.
3. *Develop a streamlined project delivery process.* Winning companies have examined every step in the project delivery process, analyzed fluctuations in workloads, searched for ways to reduce variation, and eliminated bottlenecks to create a repeatable delivery process. All projects go through clear stages and clearly define key milestones. All project leaders use a shared road map, focusing on key business aspects of their projects while integrating goals across all parts of the organization.
4. *Measure project health using metrics.* Companies that excel in project delivery use performance metrics to quantify progress. They focus on a handful of important measurements and apply them to all projects. Metrics often include customer satisfaction, return on investment, and percentage of schedule buffer consumed.[19]

Project managers play an important role in making projects, and therefore organizations, successful. Project managers work with the project sponsors, the project team, and other stakeholders to meet project goals. They also work with sponsors to define success for particular projects. Good project managers do not assume that their definition of success is the same as the sponsors'. They take the time to understand their sponsors' expectations and then track project performance based on important success criteria.

PROGRAM AND PROJECT PORTFOLIO MANAGEMENT

As mentioned earlier, about one-quarter of the world's gross domestic product is spent on projects. Projects make up a significant portion of work in most business organizations or enterprises, and managing those projects successfully is crucial to enterprise success. Two important concepts that help projects meet enterprise goals are the use of programs and project portfolio management.

Programs

A **program** is "a group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually."[20] As you can imagine, it is often more economical to group projects together to help streamline management, staffing, purchasing, and other work. The following are examples of common programs in the IT field.

- *Infrastructure:* An IT department often has a program for IT infrastructure projects. This program could encompass several projects, such as providing more wireless Internet access, upgrading hardware and software, and developing and maintaining corporate standards for IT.
- *Applications development:* This program could include several projects, such as updating an enterprise resource planning (ERP) system, purchasing a new off-the-shelf billing system, or developing a new capability for a customer relationship management system.
- *User support:* In addition to the many operational tasks related to user support, many IT departments have several projects to support users. For example, a project might provide a better e-mail system or develop technical training for users.

A **program manager** provides leadership and direction for the project managers heading the projects within a program. Program managers also coordinate the efforts of project teams, functional groups, suppliers, and operations staff supporting the projects to ensure that products and processes are implemented to maximize benefits. Program managers are responsible for more than the delivery of project results; they are change agents responsible for the success of products and processes developed by those projects. For example, the NASA International Space Station Program is led by a program manager who oversees all U.S. projects involved with the station and is accountable for achieving their objectives, funding, and contribution to scientific knowledge.

Program managers often have review meetings with all their project managers to share important information and coordinate important aspects of each project. Many program managers worked as project managers earlier in their careers, and they enjoy sharing their wisdom and expertise with their project managers. Effective program managers recognize that managing a program is much more complex than managing a single project. They recognize that technical and project management skills are not enough—program managers must also possess strong business knowledge, leadership capabilities, and communication skills.

Project Portfolio Management

In many organizations, project managers also support an emerging business strategy of **project portfolio management** (also called just **portfolio management** in this text), in which organizations group and manage projects and programs as a portfolio of investments that contribute to the entire enterprise's success. Portfolio managers help their organizations make wise investment decisions by helping to select and analyze projects from a strategic perspective. Portfolio managers may or may not have previous experience as project or program managers. It is most important that they have strong financial and analytical skills and understand how projects and programs can contribute to meeting strategic goals.

Figure 1-3 illustrates the differences between project management and project portfolio management. Notice that the main distinction is a focus on meeting tactical or strategic goals. Tactical goals are generally more specific and short-term than strategic goals, which

emphasize long-term goals for an organization. Individual projects often address tactical goals, whereas portfolio management addresses strategic goals. Project management addresses questions like "Are we carrying out projects well?", "Are projects on time and on budget?", and "Do project stakeholders know what they should be doing?"

FIGURE 1-3 Project management compared to project portfolio management

Portfolio management addresses questions like "Are we working on the right projects?", "Are we investing in the right areas?", and "Do we have the right resources to be competitive?" Pacific Edge Software's product manager, Eric Burke, defines project portfolio management as "the continuous process of selecting and managing the optimum set of project initiatives that deliver maximum business value."[21]

Many organizations use a more disciplined approach to portfolio management by developing guidelines and software tools to assist in it. The Project Management Institute (described later in this chapter) first published the *Organizational Project Management Maturity Model (OPM3) Knowledge Foundation* in 2003.[22] OPM3 describes the importance not only of managing individual projects or programs well, but the importance of following organizational project management to align projects, programs, and portfolios with strategic goals. OPM3 is a standard that organizations can use to measure their organizational project management maturity against a comprehensive set of best practices.

BEST PRACTICE

A **best practice** is "an optimal way recognized by industry to achieve a stated goal or objective."[23] Rosabeth Moss Kanter, a professor at Harvard Business School and well-known author and consultant, says that visionary leaders know "the best practice secret:

continued

Stretching to learn from the best of the best in any sector can make a big vision more likely to succeed."[24] Kanter also emphasizes the need to have measurable standards for best practices. An organization can measure performance against its own past, against peers, and even better, against potential. Kanter suggests that organizations need to continue to reach for higher standards. She suggests the following exercise regime for business leaders who want to adapt best practices in an intelligent way to help their own organizations:

- Reach high. Stretch. Raise standards and aspirations. Find the best of the best and then use it as inspiration for reaching full potential.
- Help everyone in your organization become a professional. Empower people to manage themselves through benchmarks and standards based on best practice exchange.
- Look everywhere. Go far afield. Think of the whole world as your laboratory for learning.

Robert Butrick, author of *The Project Workout*, wrote an article on best practices in project management for the *Ultimate Business Library's Best Practice* book. He suggests that organizations need to follow basic principles of project management, including these two mentioned earlier in this chapter:

- Make sure your projects are driven by your strategy. Be able to demonstrate how each project you undertake fits your business strategy, and screen out unwanted projects as soon as possible.
- Engage your stakeholders. Ignoring stakeholders often leads to project failure. Be sure to engage stakeholders at all stages of a project, and encourage teamwork and commitment at all times.[25]

As you can imagine, project portfolio management is not an easy task. Figure 1-4 illustrates one approach for project portfolio management in which one large portfolio exists for the entire organization. This allows top management to view and manage all projects at an enterprise level. Sections of the portfolio are then broken down to improve the management of projects in each sector. For example, a company might have the main portfolio categories shown in the left part of Figure 1-4—marketing, materials, IT, and human resources (HR)—and divide each of those categories further to address its unique concerns. The right part of this figure shows how the IT projects could be categorized in more detail to assist in their management. In this example, there are three basic IT project portfolio categories:

- *Venture:* Projects in this category help transform the business. For example, the large retail chain described in the opening case might have an IT project to provide kiosks in stores and similar functionality on the Internet where customers and suppliers could quickly provide feedback on products or services. This project could help transform the business by developing closer partnerships with customers and suppliers.
- *Growth:* Projects in this category would help the company grow in terms of revenues. For example, a company might have an IT project to provide information on its corporate Web site in a new language, such as Chinese or Japanese. This capability could help the company grow its business in those countries.

- *Core:* Projects in this category must be accomplished to run the business. For example, an IT project to provide computers for new employees would fall under this category.

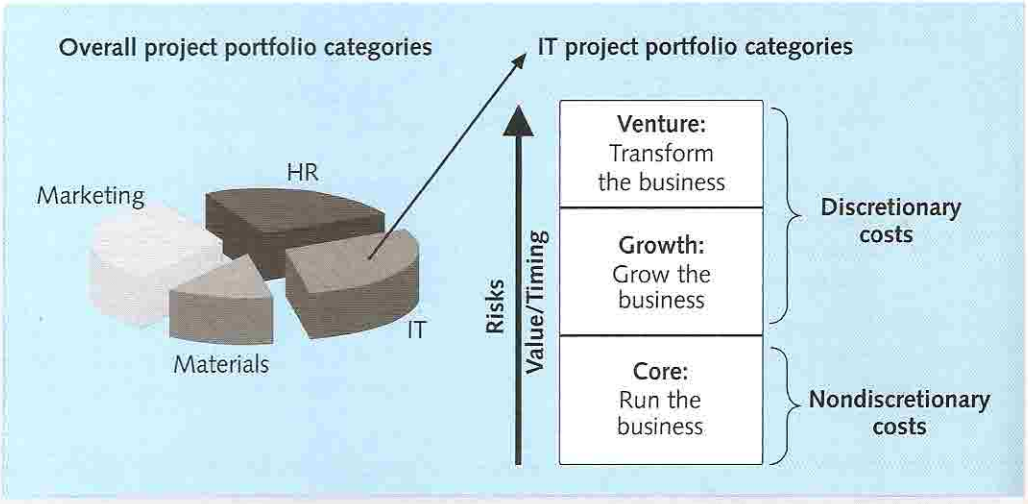
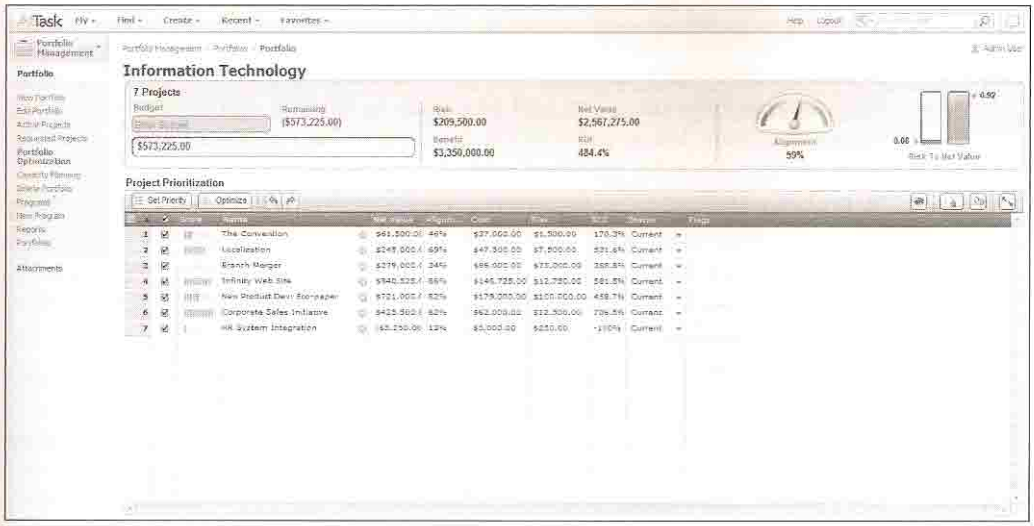


FIGURE 1-4 Sample project portfolio approach

Note in Figure 1-4 that the Core category of IT projects is labeled as nondiscretionary costs. This means that the company has no choice in whether to fund these projects; they must be funded for the company to stay in business. Projects that fall under the Venture or Growth category are discretionary costs because the company can use its own discretion or judgment in deciding whether to fund them. Notice the arrow in the center of Figure 1-4; it indicates that the risks, value, and timing of projects normally increase as you move from Core to Growth to Venture projects. However, some core projects can also be high risk, have high value, and require good timing. As you can see, many factors are involved in portfolio management.

Many organizations use specialized software to organize and analyze all types of project data into project portfolios. **Enterprise** or **portfolio project management software** integrates information from multiple projects to show the status of active, approved, and future projects across an entire organization. In 2011, Gartner published a report that summarized and reviewed numerous project portfolio management tools. Only five companies received a "strong positive" rating for their software: Daptiv, Innotis, Instantis, Microsoft, and PowerSteering. Several companies, including AtTask, HP, and Oracle, received positive ratings.[26] Figure 1-5 shows a sample screen provided by AtTask demonstrating how portfolio management software can aid in optimizing portfolios. This capability helps organizations to select and focus on projects that meet current business needs. Managers must enter information related to costs, risks, ROI, alignment, and other factors into a business case for each project. The portfolio optimization feature then allows users to enter a budget, adjust priorities, and see which project mix is best. See specific company Web sites for more information on their products, such as Microsoft's 143-page "EPM Solutions Guide" and its video explaining enterprise project management (EPM).



Source: AtTask

FIGURE 1-5 Sample project portfolio management screen showing portfolio optimization

THE ROLE OF THE PROJECT MANAGER

You have already read that project managers must work closely with the other stakeholders on a project, especially the sponsor and project team. They are also more effective if they are familiar with the 10 project management knowledge areas and the various tools and techniques related to project management. Experienced project managers help projects succeed. But what do project managers do, exactly? What skills do they really need to do a good job? The next section provides brief answers to these questions, and the rest of this book gives more insight into the role of the project manager. Even if you never become a project manager, you will probably be part of a project team, and it is important for team members to help their project managers.

Project Manager Job Description

A project manager can have many different job descriptions, which can vary tremendously based on the organization and the project. For example, Monster.com includes thousands of job listings for project managers, and even has a job category for project/program managers. Here are a few edited postings:

- *Project manager for a consulting firm:* Plans, schedules, and controls activities to fulfill identified objectives applying technical, theoretical, and managerial skills to satisfy project requirements. Coordinates and integrates team and individual efforts and builds positive professional relationships with clients and associates.
- *IT project manager for a financial services firm:* Manages, prioritizes, develops, and implements IT solutions to meet business needs. Prepares and

executes project plans using project management software following a standard methodology. Establishes cross-functional end-user teams defining and implementing projects on time and within budget. Acts as a liaison between third-party service providers and end users to develop and implement technology solutions. Participates in vendor contract development and budget management. Provides post-implementation support.

- *IT project manager for a nonprofit consulting firm:* Responsibilities include business analysis, requirements gathering, project planning, budget estimating, development, testing, and implementation. Responsible for working with various resource providers to ensure development is completed in a timely, high-quality, and cost-effective manner.

The job description for a project manager can vary by industry and by organization, but most project managers perform similar tasks regardless of these differences. In fact, project management is a skill needed in every major IT field, from database administrator to network specialist to technical writer.

Suggested Skills for Project Managers

In an interview with two chief information officers (CIOs), John Oliver of True North Communications, Inc. and George Nassef of Hotjobs.com, both men agreed that the most important project management skills seem to depend on the uniqueness of the project and the people involved.[27] Project managers need to have a wide variety of skills and be able to decide which skills are more important in different situations. As you can imagine, good project managers should have many skills. *A Guide to the Project Management Body of Knowledge*—the *PMBOK® Guide*—recommends that the project management team understand and use expertise in the following areas:

- The Project Management Body of Knowledge
- Application area knowledge, standards, and regulations
- Project environment knowledge
- General management knowledge and skills
- Soft skills or human relations skills

This chapter introduced the 10 project management knowledge areas, as well as some general tools and techniques project managers use. The following section focuses on the IT application area, including skills required in the project environment, general management, and soft skills. Note that the *PMBOK® Guide, Fifth Edition* describes three dimensions of project management competency: project management knowledge and performance competency (knowing about project management and being able to apply that knowledge) as well as personal competency (attitudes and personality characteristics). Consult PMI's Web site at *www.pmi.org* for further information on skills for project managers and PMI's Career Framework for Practitioners.

The project environment differs from organization to organization and project to project, but some skills will help in almost all project environments. These skills include understanding change and understanding how organizations work within their social, political, and physical environments. Project managers must be comfortable leading and handling change, because most projects introduce changes in organizations and involve changes within the projects themselves. Project managers need to understand the

organization in which they work and how that organization develops products and provides services. The skills and behavior needed to manage a project for a Fortune 100 company in the United States may differ greatly from those needed to manage a government project in Poland. Chapter 2, The Project Management and Information Technology Context, provides detailed information on these topics.

Project managers should also possess general management knowledge and skills. They should understand important topics related to financial management, accounting, procurement, sales, marketing, contracts, manufacturing, distribution, logistics, the supply chain, strategic planning, tactical planning, operations management, organizational structures and behavior, personnel administration, compensation, benefits, career paths, and health and safety practices. On some projects, it will be critical for the project manager to have a lot of experience in one or several of these general management areas. On other projects, the project manager can delegate detailed responsibility for some of these areas to a team member, support staff, or even a supplier. Even so, the project manager must be intelligent and experienced enough to know which of these areas are most important and who is qualified to do the work. The project manager must make all key project decisions and take responsibility for them.

Achieving high performance on projects requires soft skills, otherwise called human relations skills. Some of these soft skills include effective communication, influencing the organization to get things done, leadership, motivation, negotiation, conflict management, and problem solving. Why do project managers need good soft skills? One reason is that to understand, navigate, and meet stakeholders' needs and expectations, project managers need to lead, communicate, negotiate, solve problems, and influence the organization at large. They need to be able to listen actively to what others are saying, help develop new approaches for solving problems, and then persuade others to work toward achieving project goals. Project managers must lead their project teams by providing vision, delegating work, creating an energetic and positive environment, and setting an example of appropriate and effective behavior. Project managers must focus on teamwork skills to employ people effectively. They need to be able to motivate different types of people and develop *esprit de corps* within the project team and with other project stakeholders. Because most projects involve changes and trade-offs between competing goals, it is important for project managers to have strong coping skills as well. Project managers need to be able to cope with criticism and constant change. Project managers must be flexible, creative, and sometimes patient in working toward project goals; they must also be persistent in making project needs known.

Finally, project managers, especially those managing IT projects, must be able to make effective use of technology as it relates to the specific project. Making effective use of technology often includes special product knowledge or experience with a particular industry.

Project managers must make many decisions and deal with people in a wide variety of disciplines, so it helps tremendously to have a project manager who is confident in using the special tools or technologies that are the most effective in particular settings. Project managers do not normally have to be experts on any specific technology, but they have to know enough to build a strong team and ask the right questions to keep things on track. For example, project managers for large IT projects do not have to be experts in the field of IT, but they must have working knowledge of various technologies and understand how the project would enhance the business. Many companies have found good business managers can be very good IT project managers because they focus on meeting business needs and rely on key project members to handle the technical details.

All project managers should continue to develop their knowledge and experience in project management, general management, soft skills, and the industries they support. Non-IT business people are now very savvy with IT, but few IT professionals have developed their business savvy.[28] IT project managers must be willing to develop more than their technical skills to be productive team members and successful project managers. Everyone, no matter how technical they are, should develop business and soft skills.

Importance of People Skills and Leadership Skills

Project management experts from various industries were asked to identify the 10 most important skills and competencies for effective project managers. Table 1-3 shows the results.

TABLE 1-3 Ten most important skills and competencies for project managers

1. People skills
2. Leadership
3. Listening
4. Integrity, ethical behavior, consistency
5. Strength at building trust
6. Verbal communication
7. Strength at building teams
8. Conflict resolution, conflict management
9. Critical thinking, problem solving
10. Understanding and balancing of priorities

Source: Jennifer Krahn, "Effective Project Leadership: A Combination of Project Manager Skills and Competencies in Context," *PMI Research Conference Proceedings* (July 2006).

Respondents were also asked what skills and competencies were most important in various project situations:

- *Large projects:* Leadership, relevant experience, planning, people skills, verbal communication, and team-building skills were most important.
- *High-uncertainty projects:* Risk management, expectation management, leadership, people skills, and planning skills were most important.
- *Very novel projects:* Leadership, people skills, vision and goals, self-confidence, expectations management, and listening skills were most important.[29]

Notice that a few skills and competencies not cited in the top 10 list were mentioned when people thought about the context of a project. To be most effective, project managers require a changing mix of skills and competencies depending on the project being delivered.

Also notice the general emphasis on people and leadership skills. As mentioned earlier, all project managers, especially those working on technical projects, need to demonstrate leadership and management skills. *Leadership* and *management* are terms often used interchangeably, although there are differences. Generally, a **leader** focuses on long-term goals and big-picture objectives while inspiring people to reach those goals. A **manager** often deals with the day-to-day details of meeting specific goals. Some people say: "Managers do things

right, and leaders do the right things." "Leaders determine the vision, and managers achieve the vision." "You lead people and manage things."

However, project managers often take on the role of both leader and manager. Good project managers know that people make or break projects, so they must set a good example to lead their team to success. They are aware of the greater needs of their stakeholders and organizations, so they are visionary in guiding their current projects and in suggesting future ones. As mentioned earlier, companies that excel in project management grow project "leaders," emphasizing development of business and communication skills. Yet, good project managers must also focus on getting the job done by paying attention to the details and daily operations of each task. Instead of thinking of leaders and managers as specific people, it is better to think of people as having leadership skills, such as being visionary and inspiring, and management skills, such as being organized and effective. Therefore, the best project managers have leadership and management characteristics; they are visionary yet focused on the bottom line. Above all else, good project managers focus on achieving positive results!

Careers for IT Project Managers

As shown earlier, the IT market continues to grow, and the need for people to lead IT projects has remained solid. In fact, every IT worker needs some skills in project management.

Computerworld's annual forecast survey supports this career projection. IT executives listed the "nine hottest skills" they planned to hire for in 2012. Programming and application development took over first place from project management, mainly due to the increased need for programmers of mobile devices. Managers also noted that they were looking for "working" project managers and business analysts who could get projects done, not just oversee and monitor projects. Table 1-4 shows the results of the latest survey, as well as the percentage of respondents who listed the skill as being in demand. Even if you choose to stay in a technical role, you still need project management knowledge and skills to help your team and your organization succeed.

TABLE 1-4 Nine hottest IT skills

Skill	Percentage of Respondents
Programming and application development	60%
Project management	44%
Help desk/technical support	35%
Networking	35%
Business intelligence	23%
Data center	18%
Web 2.0	18%
Security	17%
Telecommunications	9%

Source: Rick Saia, "9 Hot IT Skills for 2012," *Computerworld*, September 26, 2011.

THE PROJECT MANAGEMENT PROFESSION

The profession of project management is growing at a very rapid pace. To understand this line of work, it is helpful to briefly review the history of project management, introduce you to the Project Management Institute (PMI) and some of its services (such as certification), and discuss the growth in project management software.

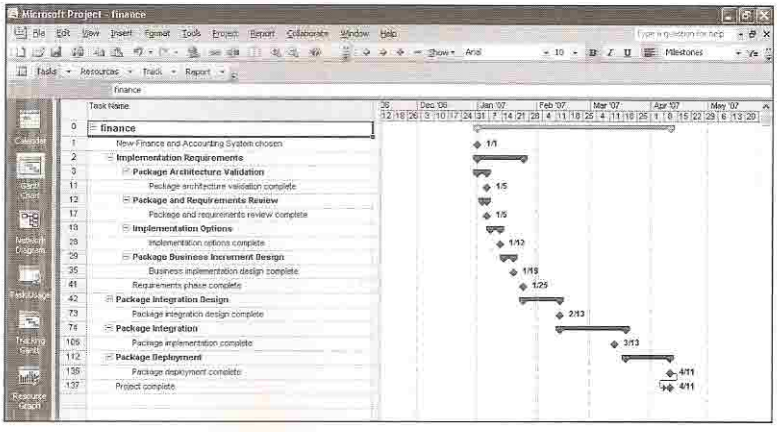
History of Project Management

Although people have worked on projects for centuries, most agree that the modern concept of project management began with the Manhattan Project, which the U.S. military led to develop the atomic bomb in World War II. The Manhattan Project involved many people with different skills at several different locations. It also clearly separated the overall management of the project's mission, schedule, and budget under General Leslie R. Groves and the technical management of the project under the lead scientist, Dr. Robert Oppenheimer. The Manhattan Project lasted about three years and cost almost $2 billion in 1946.

In developing the project, the military realized that scientists and other technical specialists often did not have the desire or the necessary skills to manage large projects. For example, after being asked several times for each team member's responsibilities at the new Los Alamos laboratory in 1943, Dr. Oppenheimer tossed the project organization chart at his director and said, "Here's your damn organization chart."[30] Project management was recognized as a distinct discipline requiring people with special skills and, more importantly, the desire to lead project teams.

In 1917, Henry Gantt developed the famous Gantt chart for scheduling work in factories. A **Gantt chart** is a standard format for displaying project schedule information by listing project activities and their corresponding start and finish dates in calendar form. Initially, managers drew Gantt charts by hand to show project tasks and schedule information. This tool provided a standard format for planning and reviewing all the work on early military projects.

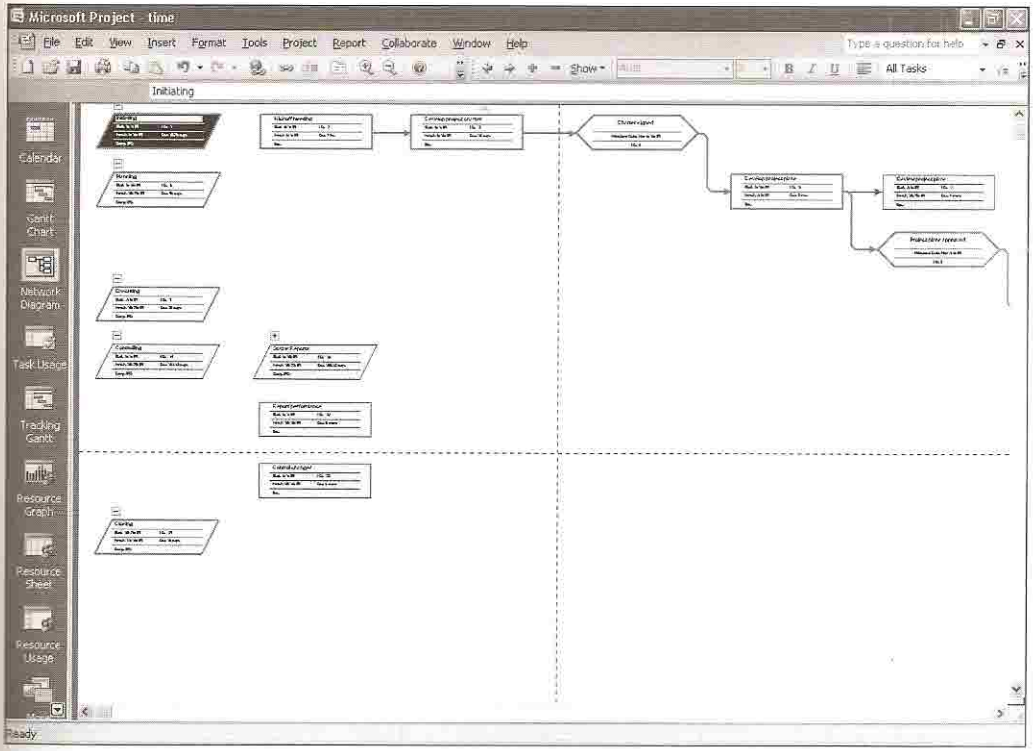
Today's project managers still use the Gantt chart as the primary tool to communicate project schedule information, but with the aid of computers, it is no longer necessary to draw the charts by hand, and they are easier to share and disseminate to project stakeholders. Figure 1-6 displays a Gantt chart created with Project 2010, the most widely used project management software today. You will learn more about using Project 2010 in Appendix A.



Used with permission from Microsoft Corporation

FIGURE 1-6 Sample Gantt chart created with Project 2010

During the Cold War years of the 1950s and '60s, the military continued to be important in refining several project management techniques. Members of the U.S. Navy Polaris missile/submarine project first used network diagrams in 1958. These diagrams helped managers model the relationships among project tasks, which allowed them to create schedules that were more realistic. Figure 1-7 displays a network diagram created using Project 2010. Note that the diagram includes arrows that show which tasks are related and the sequence in which team members must perform the tasks. The concept of determining relationships among tasks is essential in helping to improve project scheduling. This concept allows you to find and monitor the **critical path**—the longest path through a network diagram that determines the earliest completion of a project. It shows you which tasks affect the target completion date of a project, and it can change as work proceeds and more information becomes available. You will learn more about Gantt charts, network diagrams, critical path analysis, and other time management concepts in Chapter 6, Project Time Management.



Used with permission from Microsoft Corporation

FIGURE 1-7 Sample network diagram created with Project 2010

By the 1970s, the U.S. military and its civilian suppliers had developed software to assist in managing large projects. Early project management software was very expensive to purchase, and it ran exclusively on mainframe computers. For example, Artemis was an early project management software product that helped managers analyze complex schedules for designing aircraft. A full-time employee was often required to run the complicated software, and expensive pen plotters were used to draw network diagrams and Gantt charts.